

Quickie QM-7 Series Service Manual



QUICKIE®



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Introduction

Please read and follow instructions in this service manual before attempting to troubleshoot or repair this product for the first time. If anything in this Service Manual is not clear, or if you require additional Technical assistance, contact Sunrise Medical at: (800) 333-4000 option 2, then option 1.

Safely troubleshooting and/or repair of this product depends on your diligence at following the instructions within this manual. Sunrise Medical is not responsible for injuries or damage resulting from a person's failure to exercise good judgement and/or common sense.

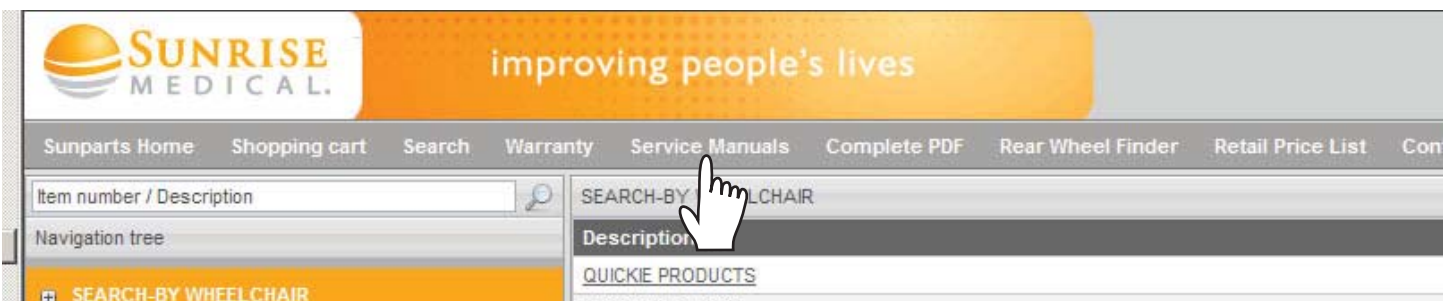
This Service Manual is intended as a troubleshooting guide for the Quickie QM-7 Series of products. Photographs and content may differ from the actual products in some cases due to changes in specifications and other factors.

This Service Manual is intended for use by persons with a basic working knowledge and the skills required to service and maintain a Power Wheelchair. Persons without a general working knowledge and expertise in the servicing of this product should not carry out troubleshooting procedures. This can result in personal safety issues, problems with future servicing, and/or damage to the unit.

Parts, configuration, and/or specifications of Products included in this Service Manual are subject to change without prior notice.



There are warning symbols used in this document that are intended to focus attention on any hazard that could effect the safety of the individual troubleshooting the Power Wheelchair covered by this Service Manual.



**For up-to-date parts, and the latest version of this Service Manual go to:
www.sunparts.us
and click on the Service Manuals tab**

Basic Setup

When setting up the components of the chair, complete the following checklist to ensure proper and safe operation of the equipment.

Check :

- Are the batteries fully charged?
 - a. Test battery voltage with D.C. meter across the terminals of batteries. The measurement should be above 12 volts D.C. (Note: a fully charged battery is between 12.9 and 13.1 VDC)
 - b. If not, fully charge the batteries.

- Are all necessary power components installed and connected ?
 - a. Input device? (normally Joystick)
 - b. Cable from Joystick to the Bus Line
 - c. Control Module; for the QM-7 series located at back of chair behind shroud
 - d. Are batteries installed correctly? (refer to Section 1 of this manual)

- Are all necessary connections fastened and fully engaged?
 - a. Battery connectors to the batteries
 - b. Cable between Joystick and the Control
 - c. Both Motor Connectors to the Control Module.

- Is the Drive Gear engaged? See (figures .2.1 and .2.2)
 - a. With the power off, the chair should not move if pushed from behind.
 - b. If the chair moves when pushed, the drive gear needs to be engaged on both motors.
 - c. Does Display light up when Power On/Off switch is depressed?

If no - Follow checklist a second time, then refer to the section on Diagnostics.

If yes – The Power Wheelchair is ready to drive!

Motor - Drive Gear engaged



Motor - Free-wheel



Section 1

Multimeter Tutorial

The Multimeter

For Powerchairs, the multimeter is one of the most useful tools in the toolbox (figure .3.1). It can be used to check wires, shorts, voltages, resistance, and all manner of electrical circuits. This tutorial is designed to help clarify the symbols and socket options. This Section is meant to be a General tutorial and may not apply to all of the specific options on the meter in use. Please consult your user's manual, to avoid errant readings.

The Probes

Probes are found on various multimeters (figure 3.2). The Probes connect the meter to the circuit. Simply touch them to the directed area with the Multimeter on the correct settings, and read the display. Carefully follow instructions for placement of the probes to avoid errant reads.

The Ports

1. The Common Port. (figure .3.3)
Generally, the black probe plugs in here (negative) and as the name suggests, it's the common element to all of the testing circuits. Think of it as the ground rail.
2. Voltage, Resistance and Continuity port.
This is a commonly used option. Connect the red (positive) probe to this port when finding voltage readings, resistance readings or when checking wire continuity. This is explained in more detail later in the tutorial.
3. Current up to 400mA.
This port is used for "counting electrons" in a circuit, and thus their rate of flow (current being the flow of electrons). You'll notice that this side is "fused", so that you don't end up melting the meter's circuits.
4. Current up to 10A.
Same as above, except it can take more current, as the name suggests.



Fig. 3.1

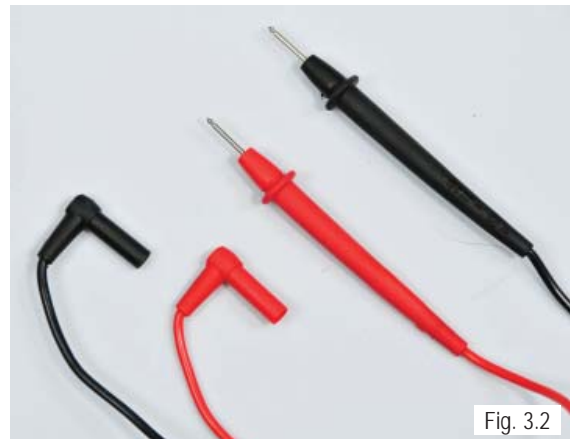


Fig. 3.2



Fig. 3.3

Section 1

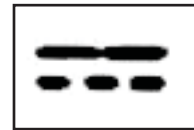
Multimeter Symbol Definition



AC - ALTERNATING CURRENT - Use this when you want to test something that has AC current running through it. Typically you'd want to test the voltage of an inverter (for cold cathodes or neons), or a similar device



DC- DIRECT CURRENT. This is the type of electrical power produced by a battery. With a battery connector, the black wire(s) should be connected to the negative(-) terminal of the battery and should be considered the common ground. The red wire(s) should be connected to the positive(+) terminal of the battery and is considered the "hot" lead.



Voltage- This means Voltage or Potential Difference. It will measure the potential difference between the two probes. To measure voltage, connect the positive probe to a port that is marked "V" or Voltage. Note: "mV" means milli-volts = .001 Volt



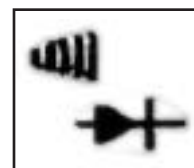
Current- Since current is measured in Amps and the readout value is in amps, the symbol "A" is used. On this setting the unit measures current that is flowing through the part of the circuit between the two probes (the meter itself). Typically, you need to plug the positive terminal into a port marked "A" or Current. You need to put the meter "In Series" in the circuit to use this feature correctly.



Resistance- This symbol represents Resistance and is measured in Ohms. You can use this setting to measure the resistance between two points; for example across a piece of wire or a resistor (to check its value). If you don't have a continuity check, then this can be used to check for shorts. Any value below 0.05 Ohms constitutes a short, meaning that whatever the probes are attached to is connected electrically.



Continuity- A commonly used function. By putting a current through the two terminals (the same as the Ohm-meter function) it can be determined if the resulting value is within the "contact" range, this is signified with a beep. Found on some multimeters, it allows a check for shorts without taking your eyes off your work. Other meters signify this with a small flashing light.



Section 1

Health and Safety

While working on powered mobility products, it is essential to observe good working practices. Below are a series of safety guidelines and recommendations. Please note that these precautions are intended to serve only as a guide, not to supersede or replace any safety statute, NHS or other safety regulations.

General



- Always wear suitable protective clothing when handling batteries.
- Always wear suitable eye protection when drilling or inspecting.
- When safe to do so, wear protective gloves when handling the running gear or batteries, as these parts are exposed to paths, parks etc.
- If the drive wheels have to be raised off the floor, always use a pair of axle stands to secure the vehicle.



Battery Safety

- Use extra caution when working with batteries.
- Always make sure that the batteries are disconnected from the device before commencing work.
- Always check that the battery charger is disconnected from the device /batteries before commencing work.
- Do not smoke while working on this device.
- Keep batteries away from all sources of ignition.
- Do not place objects on top of the batteries.
- Always keep someone close to your work area so that they may come to your assistance if needed.
- Always wear personal protection when handling batteries, including, eye/face protection and gloves.
- Make sure there is easy access to soap and water in case of acid spills.
- Avoid touching eyes or unprotected parts of the body while working on batteries.
- Remember that non-sealed batteries can contaminate any packaging, housing, or boxes they may have been transported in so handle all packaging with care, especially during disposal.
- If battery acid should come into contact with bare skin or clothing, be sure to wash contacted area immediately, using plenty of soap and water. If battery acid enters the eyes, flush with running cold water for as long as possible while medical help is being sought.
- When the tops of batteries are exposed, take extra care when working on or around the terminals.
- Do not allow metal tools to drop on to or touch the exposed terminals of the batteries or other exposed connections, as this could cause a short circuit, which may result in an explosion.



Section 1

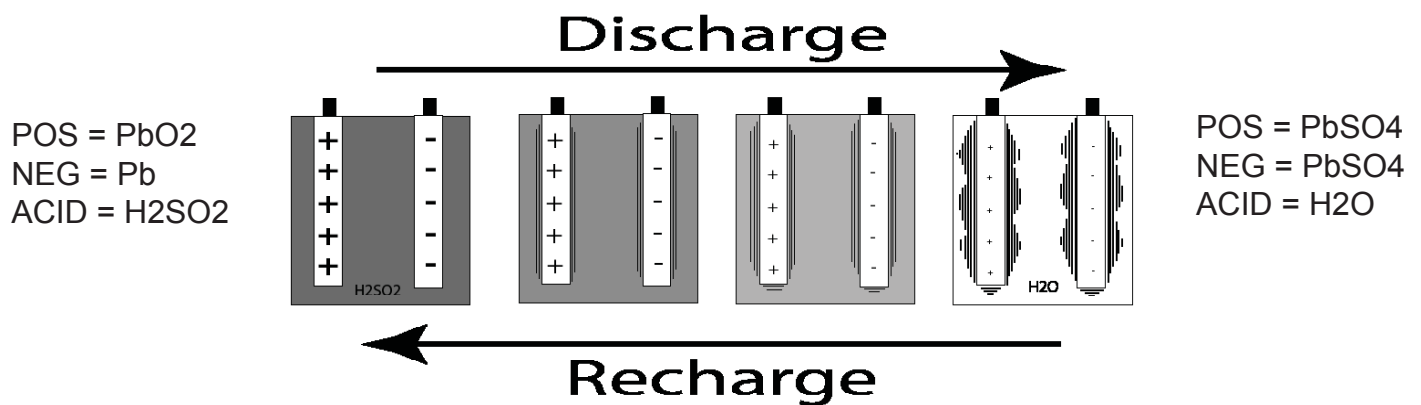
Health and safety (cont.)

If mishandled batteries can be dangerous and hazardous.

- All mobility batteries, whether wet type or gel/sealed type, contain lead and sulfuric acid. Both of these materials are toxic and in the case of sulfuric acid, highly corrosive. Additionally, when batteries are charged, they produce hydrogen gas which is “highly” flammable and can cause explosion. This is why proper handling is mandatory at all times.
- Battery explosion - This is frequently the result of too low an acid/ electrolyte level in the battery, which allows high concentrations of hydrogen to build up. This is possible with all batteries if improper charging or battery failure occurs, but not common in gel/sealed batteries.
- < KEEP SPARKS AND FLAMES AWAY FROM BATTERIES >
- Burns - dropping a wrench or screwdriver across battery terminals results in sparks, and intense heat. Improper assembly of battery boxes or battery box wiring may short the battery through the wiring and produce a possible electrical fire.
- Electronic damage - batteries that are improperly wired can short out electronic chair components resulting in expensive repairs.
- Pollution - improper disposal of batteries could damage the environment. All batteries should be disposed of through a reliable battery recycler.



Battery Charge Cycle Illustration
Typical Flooded Battery



As battery discharges, the sulfate from the electrolyte forms on the plates.
As battery recharges, the sulfate is driven back into the electrolyte

Section 1

Health and Safety (cont.)

- Remove personal items of jewelry, such as rings, watches, chains etc. before working on batteries. Such items could cause short circuits resulting in serious burns.
- Batteries are constructed of heavy materials. Therefore moving batteries requires appropriate lifting techniques. Safety footwear should also be worn. In addition, disposal of old batteries requires compliance to state laws. Contact your local authority for their recommendations.



Battery Chargers

- Remember battery chargers are connected to household current.
- Always observe all guidelines and laws relating to electrical equipment.
- Never operate the battery charger in wet or damp conditions.
- If you think that the charger has been exposed to water or excessive dampness, do not use it. Return the unit to the dealer/supplier for inspection/replacement.
- If you think the battery charger is defective or is visibly damaged, return the unit to the dealer/supplier for inspection.



EMI Warnings

- EMI means electromagnetic (EM) interference (I). EMI comes from radio wave sources, such as radio transmitters and transceivers. A “transceiver” is a device that both sends and receives radio wave signals.)
- There are a number of sources of intense EMI in our daily environment. Some of these are obvious and easy to avoid. Others are not, and the user may not be able to avoid them.
- Powered wheelchairs, although tested in accordance with EMC guidelines, may be susceptible to electromagnetic interference (EMI) emitted from sources such as, radio stations, TV stations, amateur radio (HAM) transmitters, two-way radios, and cellular phones.
- EMI can also be produced by conducted sources or electro-static discharge (ESD).



What effect can EMI have?

1. EMI can, without warning, can cause a power chair to:

- Release its electronic brakes
- Move by itself
- Move in unintended directions.



If any of these occur, severe injury could result.

2. EMI can damage the control system of a power chair, resulting in a safety hazard and/or costly repairs.

Section 1

Sources of EMI

1. Hand-Held Transceivers: Antenna is usually mounted directly on the unit.

These include:

- Citizens band (CB) radios
- “Walkie-talkies”
- Security, fire and police radios
- Cellular phones
- Lap top computers with phone or fax
- Other personal communication devices

Note - These devices can transmit signals while they are on, even if not in use. The wheelchair should be switched off when not in use.

2. Medium-Range Mobile Transceivers: include two-way radios used in police cars, fire engines, ambulances and taxi cabs. The antenna is usually mounted on the outside of the vehicle.

3. Long-Range Transceivers: These include commercial radio and TV broadcast antenna towers, amateur (HAM) radios, and alarm systems.

NOTE- The following are Not likely to cause EMI problems: Lap-top computers (without phone or fax), cordless phones, TV sets or AM/FM radios, CD or tape players.

EM energy rapidly becomes more intense as you get closer to the source. For this reason, EMI from handheld devices is of special concern. A person using one of these devices can bring high levels of EM energy very close to a power chair without the user’s knowledge.

Immunity level

The level of EM is measured in volts per metre (V/m). Every power wheelchair can resist EMI up to a certain level. This is called its “immunity level”. The higher the immunity level, the less the risk of EMI. It is believed that a 20 V/m immunity level will protect the power wheelchair user from the more common sources of radio waves.

For the QM-710, the configuration tested and found to be immune to at least 20 V/m is: a right-handed mounted joystick system, 18” seat width, 18” seat depth, dual-post height-adjustable armrests, fixed tapered legrests with one-piece solid footplate and Gp 24 gel cell batteries.

The following dealer installed speciality input devices have an unknown effect on the immunity level because they have not been tested with the Quickie control systems:

- Breath Control (“Sip n Puff”)
- Tri-Switch Head Array
- Proximity Head Array
- Proportional Mini-Joystick/Chin Control
- Buddy Button
- Wafer Board



Section 1

Cautions for circuit boards

To help prevent Electro Static Discharge (ESD) the following proper handling techniques should be followed:

ESD:

- Do not place Printed Circuit Boards or their containers near sources of strong electrical fields (such as above a CRT).
- To avoid the occurrence of static charge or discharge due to friction, keep the Printed Circuit Boards separate from one another and do not stack them directly on top of one another if not protected by antistatic bags.
- Store each Printed Circuit Board in an antistatic bag with an external cushioning bubble-wrap layer until assembled to wheelchair. Antistatic bag must have metal content to protect the printed circuit board. Gray bag protects from ESD, pink bag or bubble wrap does not protect as well.
- Always wear an ESD preventive wrist or ankle strap when handling electronic components. Connect one end of the strap to an ESD jack or an unpainted metal component on the system (such as a captive installation screw).
- Handle Printed Circuit Boards by the edges only; avoid touching the Printed Circuit Board and connector pins.
- Place any removed Printed Circuit Board on an antistatic surface or in a static shielding bag.
- Avoid contact between the Printed Circuit Boards and clothing. The wrist strap only protects the card from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Make sure that the Printed Circuit Board power is off by disconnecting the seating harness prior to attaching or removing printed circuit board.



Printed Circuit Board Flexing:

- The printed circuit board has surface-mount components that may break when the board is flexed. To minimize the amount of board flexing, observe the following precautions:
- Hold the printed circuit board only by the edges.
- Do not place the printed circuit board on a hard surface.
- Tighten board mounting screws only hand tight (torque 12.4 in lbs/1.4Nm) in a cross pattern to reduce stress on mounting holes and PCB board material.

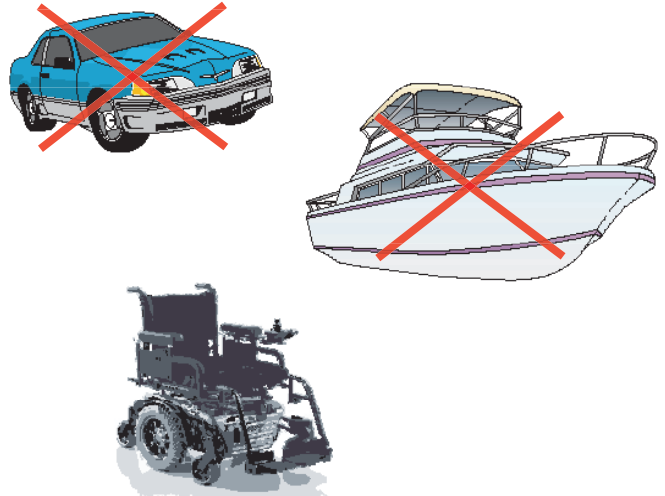
Section 1

Battery Types



IT IS THE RESPONSIBILITY OF THE INSTALLER TO KNOW WHAT KIND OF BATTERIES TO INSTALL IN A CUSTOMER'S WHEELCHAIR!

- Deep-cycle batteries used in wheelchairs are designed to be discharged and recharged on a regular basis.
- Starting or automotive type batteries use a rapid burst of power to start an engine and are quickly recharged by an alternator or generator. They are rated by cold cranking amps, a measure that has no relevance to wheelchair application.
- Marine and RV batteries frequently are not deep-cycle as they are often used for starting engines.
- **Only use Deep-Cycle sealed type batteries in a wheelchair.**



Battery Size

- Batteries function as a power wheelchair's fuel tank. The larger the group size, the farther the wheelchair will go.
- Use the size specified by the wheelchair manufacturer. Never use undersized batteries
- This chair uses either 22NF, or GRP 24 Batteries. Flat-top batteries help lower the seat to floor height.



Battery Installation

- Batteries installed incorrectly can blow the fuse for this system. Pay careful attention to install the battery harness across both batteries instead of to each of the batteries individually. See Section 7 for correct Battery Removal and/or Installation

Section 1

VR2 Remote Controller



VR2 Controller Buttons

Battery Gauge

A series of ten LED's, which indicate charge level, and is also used for determining fault codes.

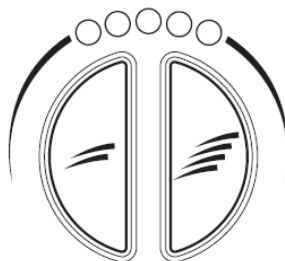


On/Off Key- Press to power on or off the power chair or Controller.

Horn Key- Activates a warning horn.



Speed Decrease. Used to decrease the Speed/ Profile setting.

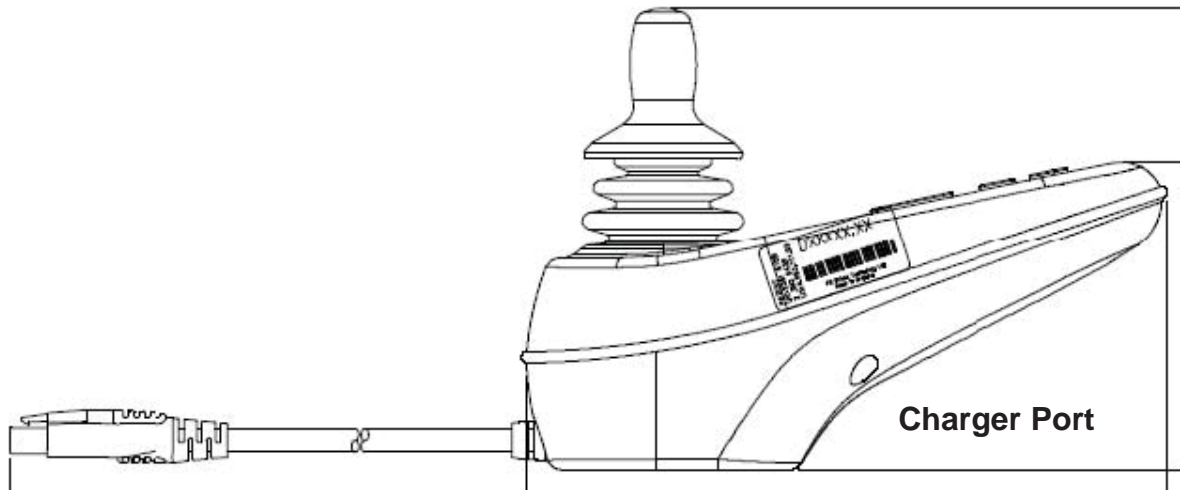


Speed/Profile indicator- A series of five LED's, which display speed and profile settings

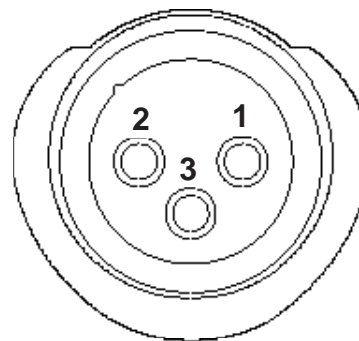
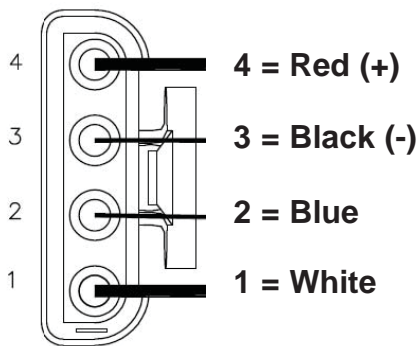
Speed Increase. Used to Increase the Speed/ Profile setting.

Section 1

VR2 Plugs and Connectors



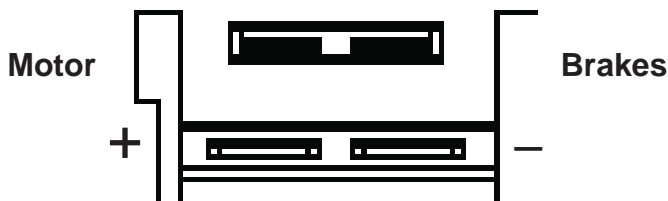
Joystick 4pin connector



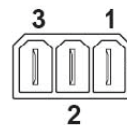
- 1 = 24 Vdc (POS)
- 2 = 0 Vdc (NEG)
- 3 = Inhibit 1/
Programmer

Charger port

Motor Plug Port

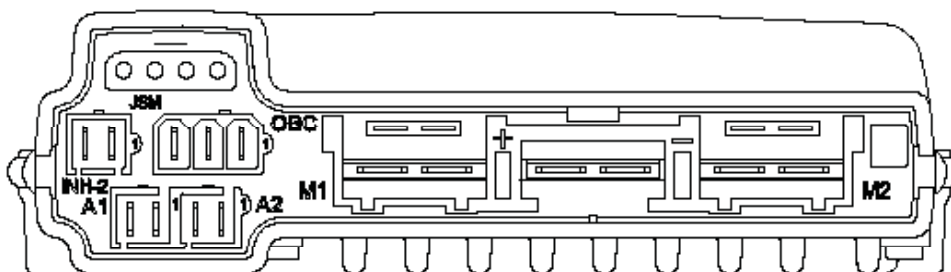


On-Board Charger - Used to power Switch-controlled actuators and Actuator Inhibit.



- 1 = 24 Vdc
- 2 = 0 Vdc
- 3 = INHIBIT 1/
PROGRAMMER

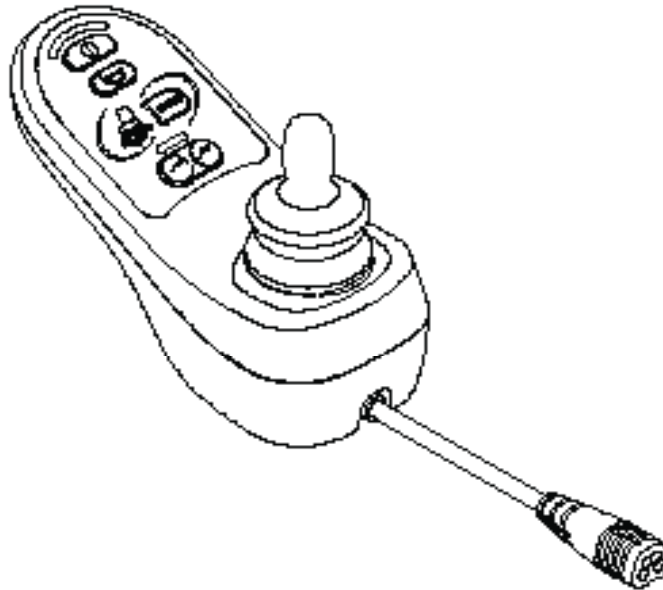
VR2 Controller



- M1 = LEFT SIDE MOTOR
- M2 = RIGHT SIDE MOTOR
- JSM = JOYSTICK MODULE
- INH-2 = INHIBIT 2
- A1 = ACTUATOR 1
- A2 = ACTUATOR 2
- OBC = ON BOARD CHARGER
- + - = BATTERY

Section 1

R-NET LED Remote Controller



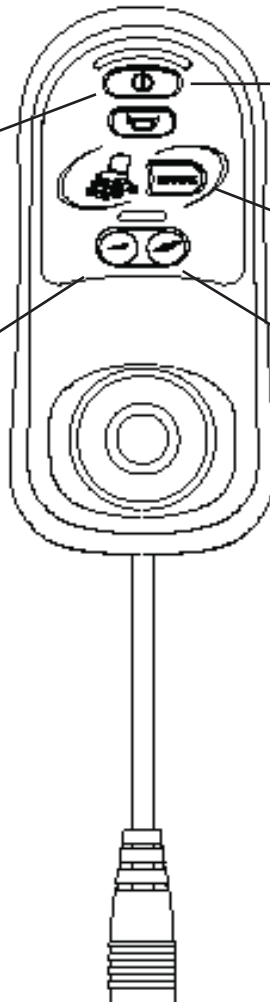
On/Off Key- Press to power on or off the power chair or Controller.

Horn Key- Activates a warning horn.

Mode Button
Used to change modes

* **Speed down button**
2nd function Tilt down.

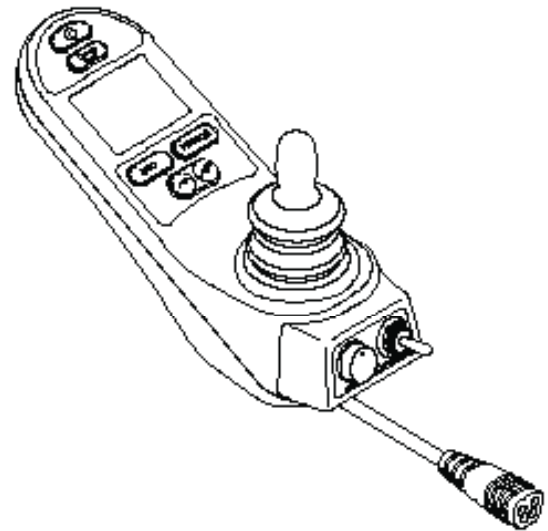
* **Speed up button**
2nd function Tilt Up



***NOTE:** If unit is set-up with elevate, 2nd function could be elevate up or down.

Section 1

R-NET Remote Controller w/Display



On/Off Key- Press to power on or off the power chair or Controller.

Horn Key- Activates a warning horn.

* **Mode Button**
Used to change modes

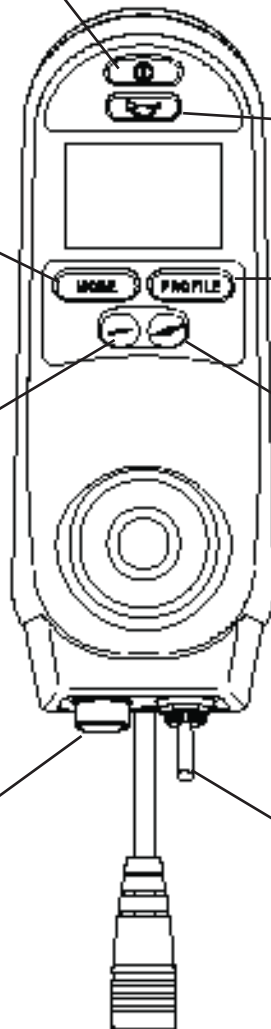
* **Profile Key-** Set function Profiles

* **Speed down button**
2nd function Tilt down.

* **Speed up button**
2nd function Tilt Up

Speed Pot. - Adjust Min. and Maximum Speed settings.

Toggle.
Up to power up chair
Down to change profiles

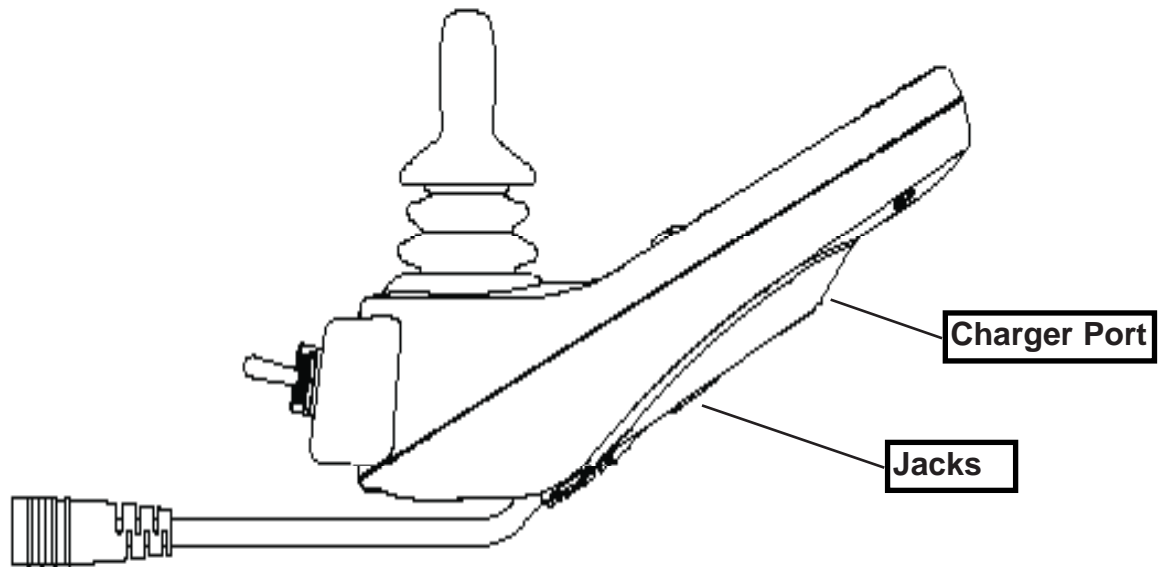


NOTE: Speed buttons do not affect speed on joysticks with Pots.

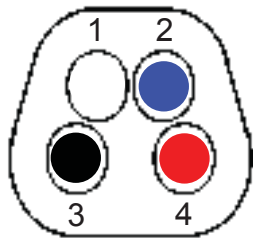
***NOTE:** 2nd function setup per configuration and is changeable using the Dealer PC Programmer with dongle.

Section 1

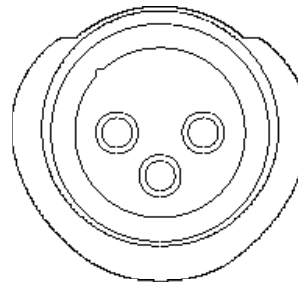
R-NET Plugs and Connectors



Pinout for Rnet Harness

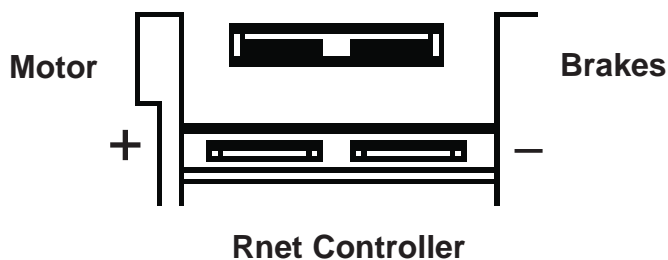


- 4 = Red (+)
- 3 = Black (-)
- 2 = Blue wire
- 1 = White wire

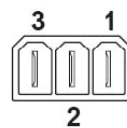


- 1 = 24 Vdc (POS)
- 2 = 0 Vdc (NEG)
- 3 = Inhibit

Motor Plug Port

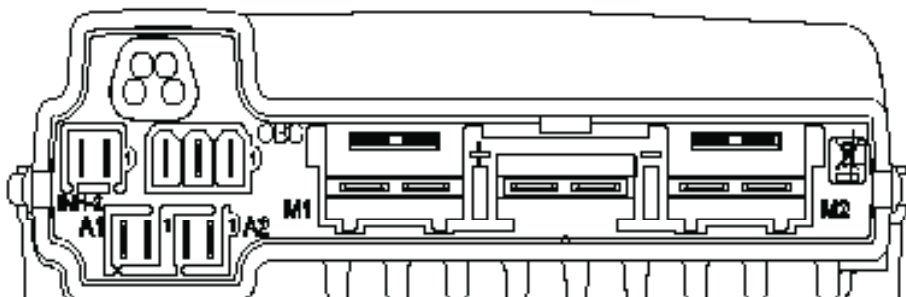


On-Board Charger - Used to power Switch-controlled actuators and Actuator Inhibit.



- 1 = 24 Vdc
- 2 = 0 Vdc
- 3 = INHIBIT 1/
PROGRAMMER

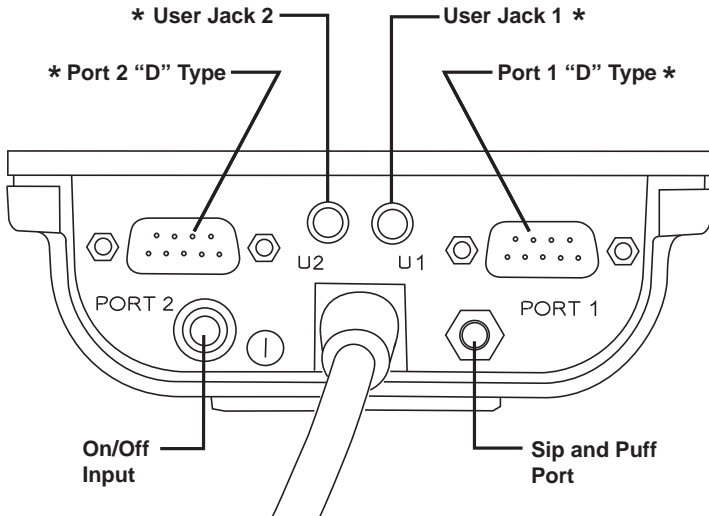
- M1 = LEFT SIDE MOTOR
- M2 = RIGHT SIDE MOTOR
- INH-2 = INHIBIT 2
- A1 = ACTUATOR 1
- A2 = (NOT USED)
- OBC = ON BOARD CHARGER
- + - = BATTERY



Section 1

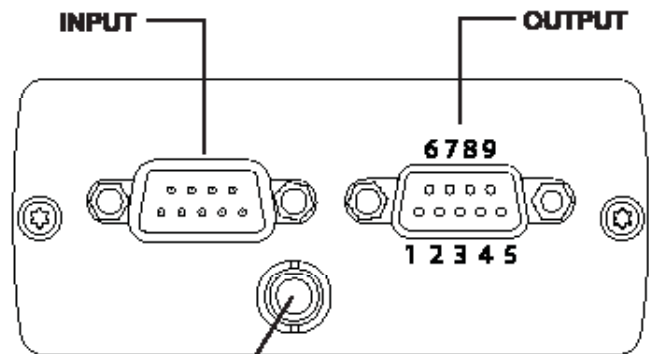
QM-7 Series Modules

OMNI (BOTTOM)



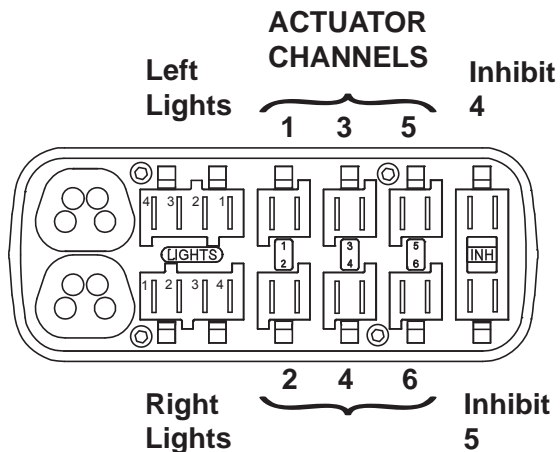
***NOTE:** User Jacks and Ports may be used for assignable buttons.

OUTPUT MODULE



- 1. FORWARD
- 2. REVERSE
- 3. LEFT
- 4. RIGHT
- 5. SPEED DWN
- 6. SPEED UP
- 7. HORN
- 8. COMMON
- 9. NC

ISM (Intelligent Seating Module)



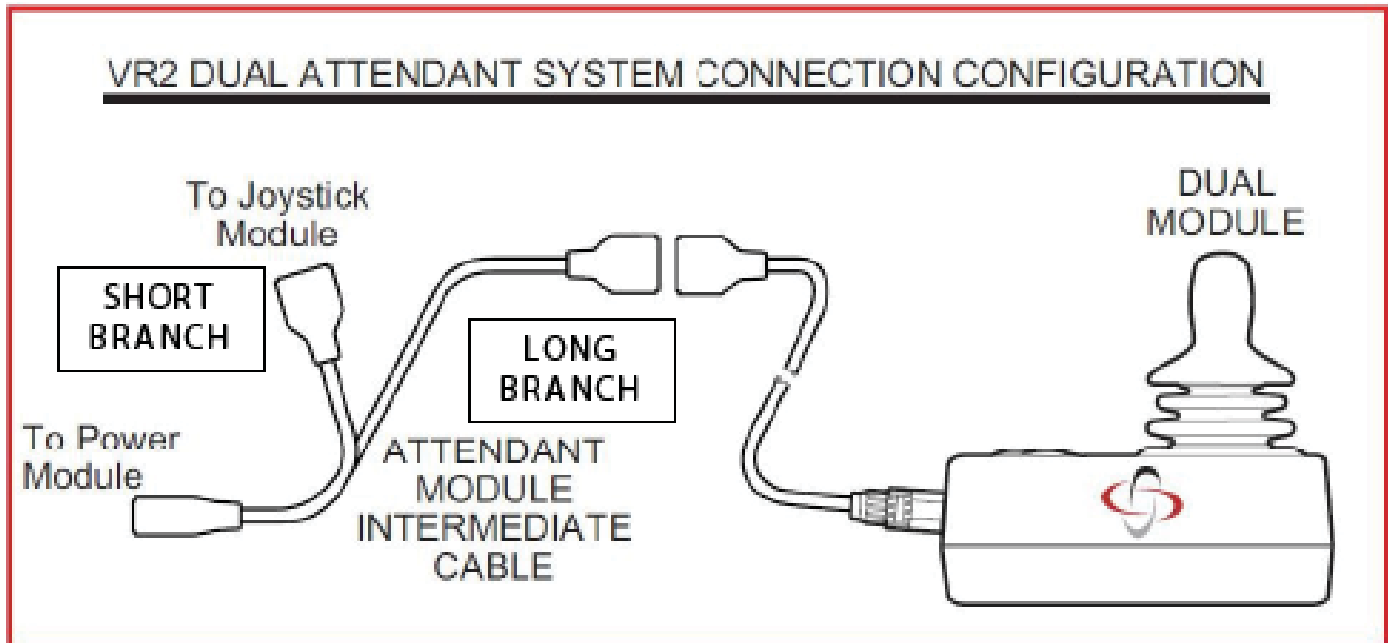
Actuator Channel	Seat Function
1	Backrest
2	Tilt
3	Lift
4	Left ELR
5	Right ELR
6	Not used

Lights	Function
1	Ground
2	Lights
3	Indicator
4	Brake/Horn

Section 2

VR2 Dual Attendant System

1. As shown below, the 4 or 6 button joystick module must be connected to the short branch of the attendant module intermediate cable and the attendant joystick must be connected to the long branch.



2. If these connections are reversed a "7-flash" communications fault will be displayed on the 4 or 6 button joystick module.

Basic Tool List

This list of tools will be needed to accomplish all of the tasks given in this Technical Manual

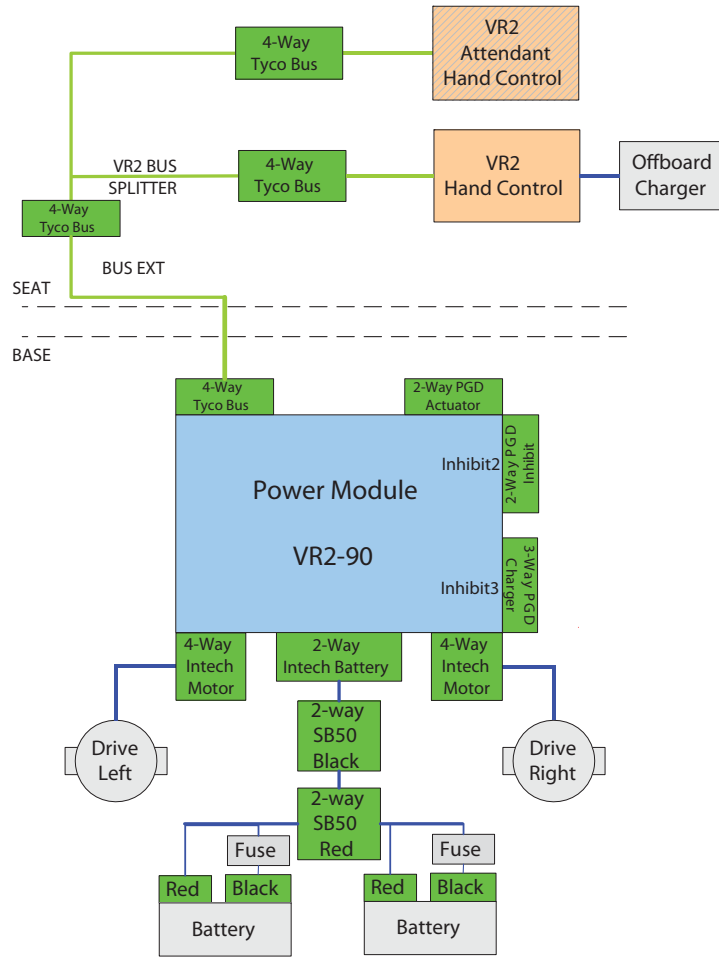
- Multimeter - Voltage/Resistance/Current
- Metric socket Set
- SAE Socket Set
- Open-end Wrenches (SAE and Metric)
- 3.5-8mm flat screwdriver
- Number 0-2 Phillips screwdriver
- Vise Grips
- Adjustable Plyers
- Hex Head Wrenches (SAE and Metric)
- Hammers small and large
- Soft Hammer (Rubber and/or Plastic)
- Cutter for zip-tie
- Needle nose pliers
- Wire Strippers
- Shrader valve
- Tie-Wraps short/Medium/Long

Specialty Tools:

- DTT Programmer with 2 provided Cables
- R-NET In-Line programmer

Section 2

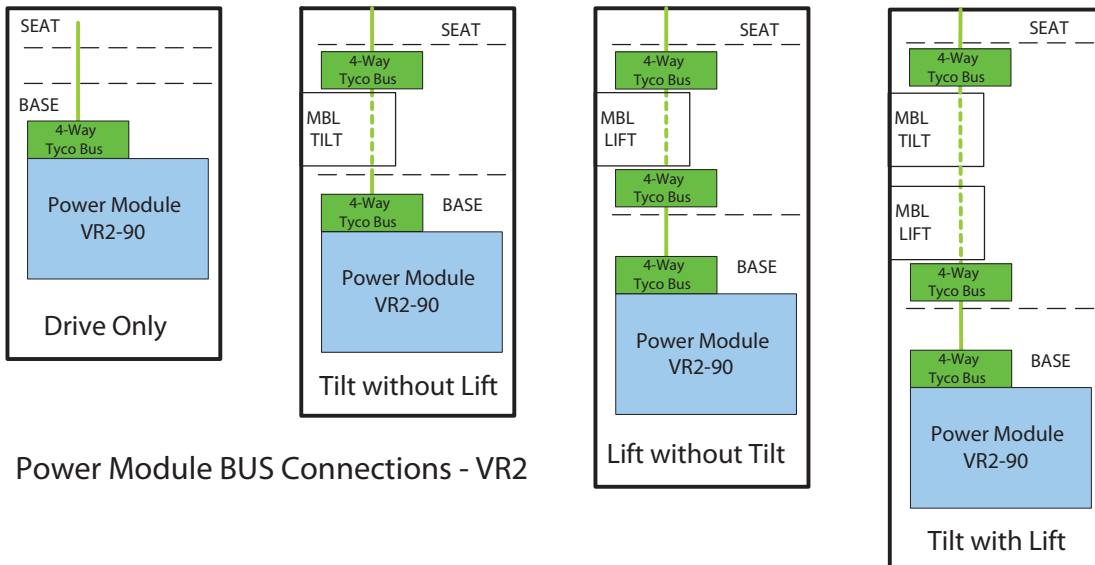
VR2 Main Wiring Diagrams



VR2-90

NOTE: HARNESS 108277-100 IS INCLUDED IN RETRO ASSEMBLY 110842

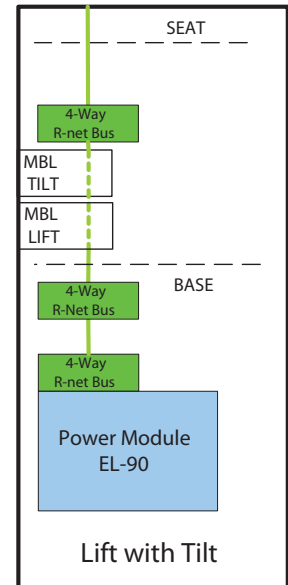
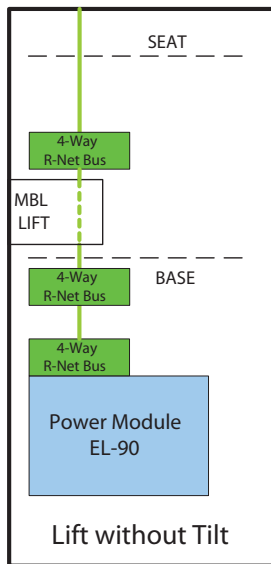
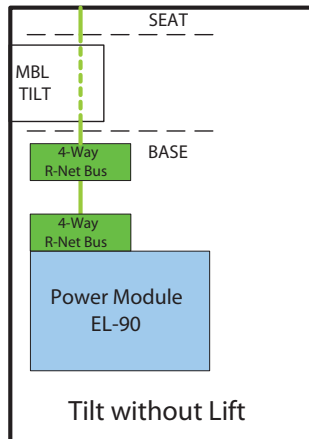
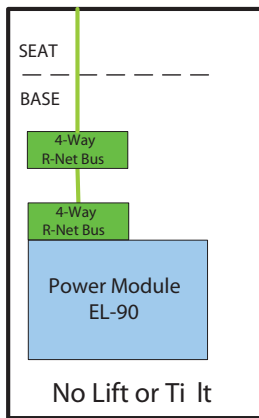
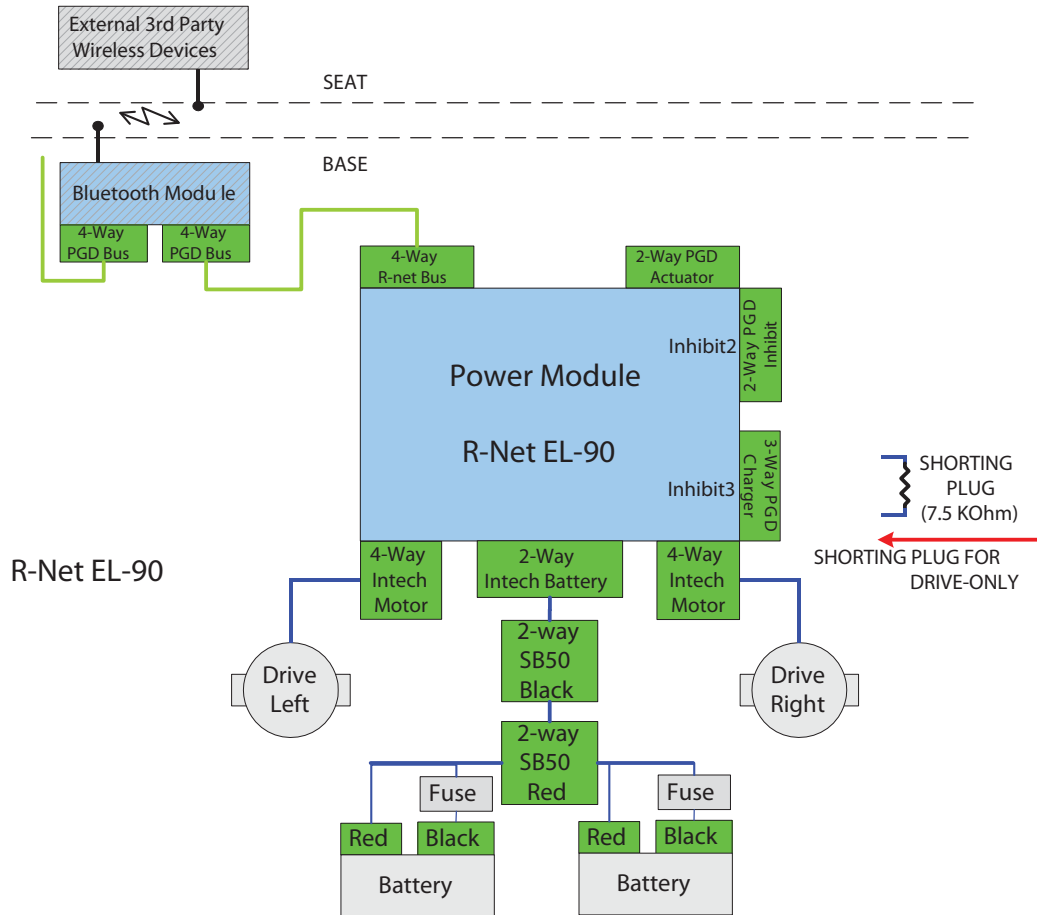
Power Module Connections VR2



Power Module BUS Connections - VR2

Section 2

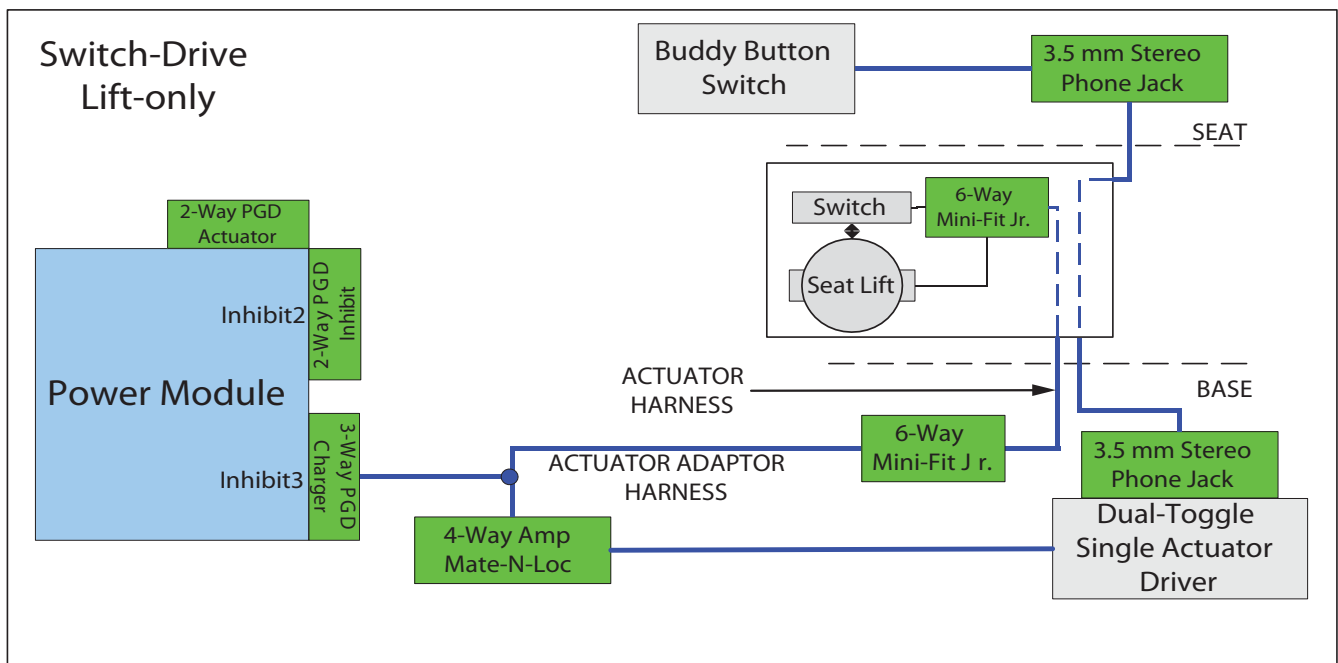
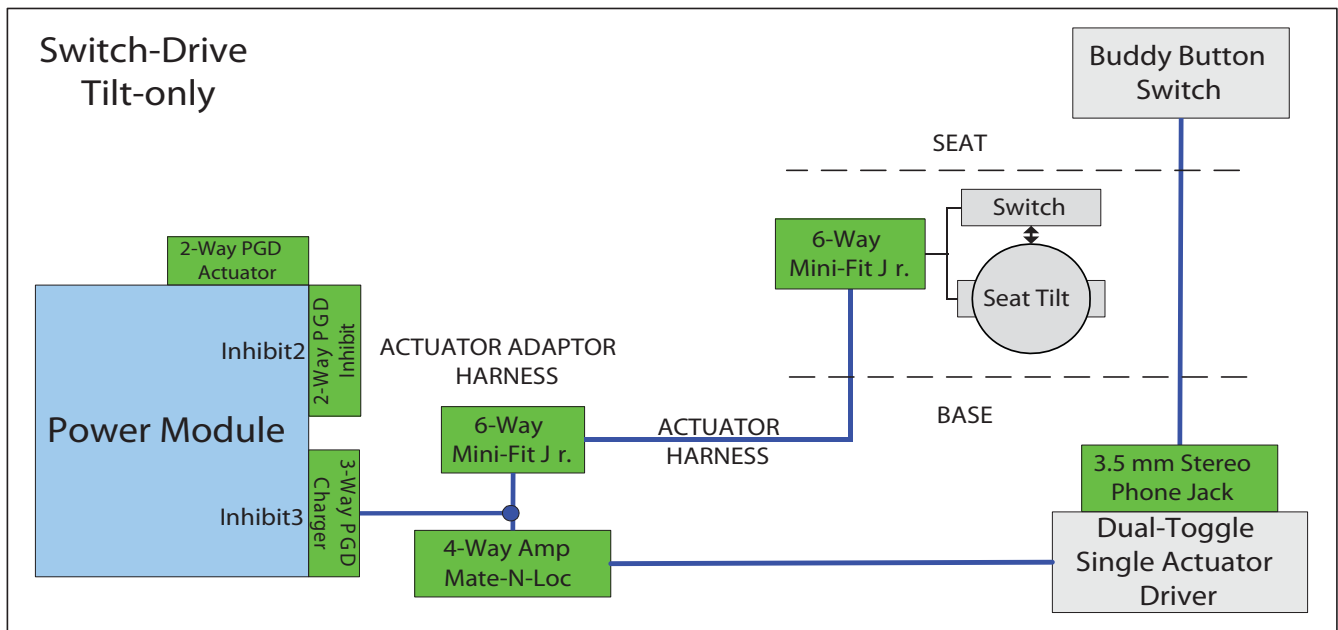
Power Module Connections R-Net



Power Module BUS Connections - R-Net

Section 2

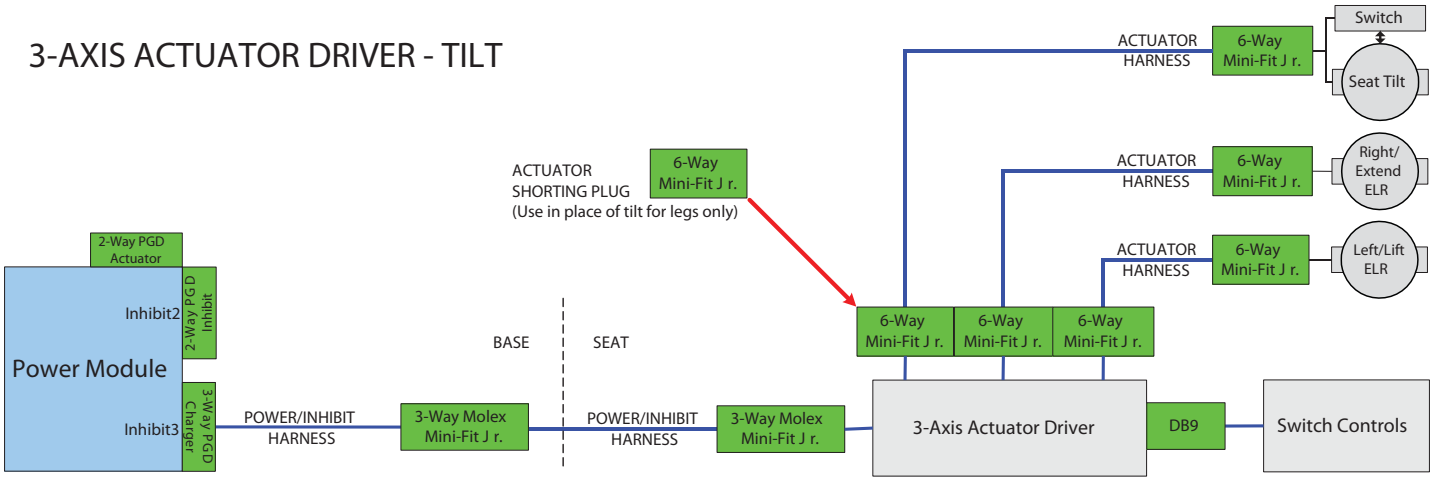
Switch Operating System VR2 & R-NET



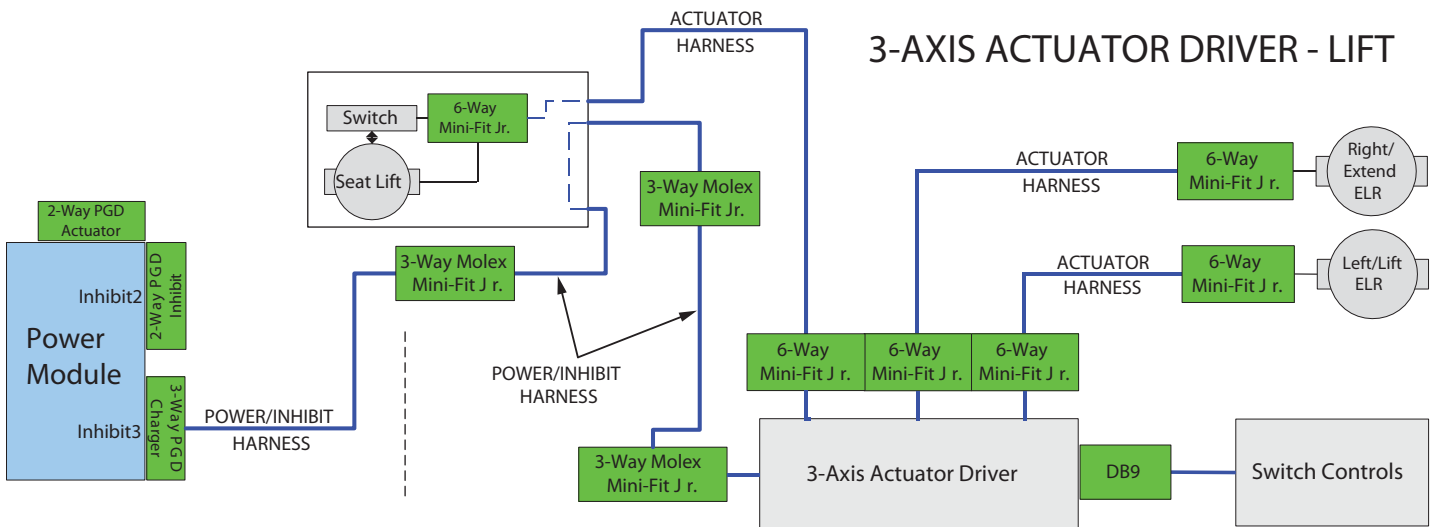
Section 2

3 Axis Actuator Drivers VR2 and R-NET

3-AXIS ACTUATOR DRIVER - TILT

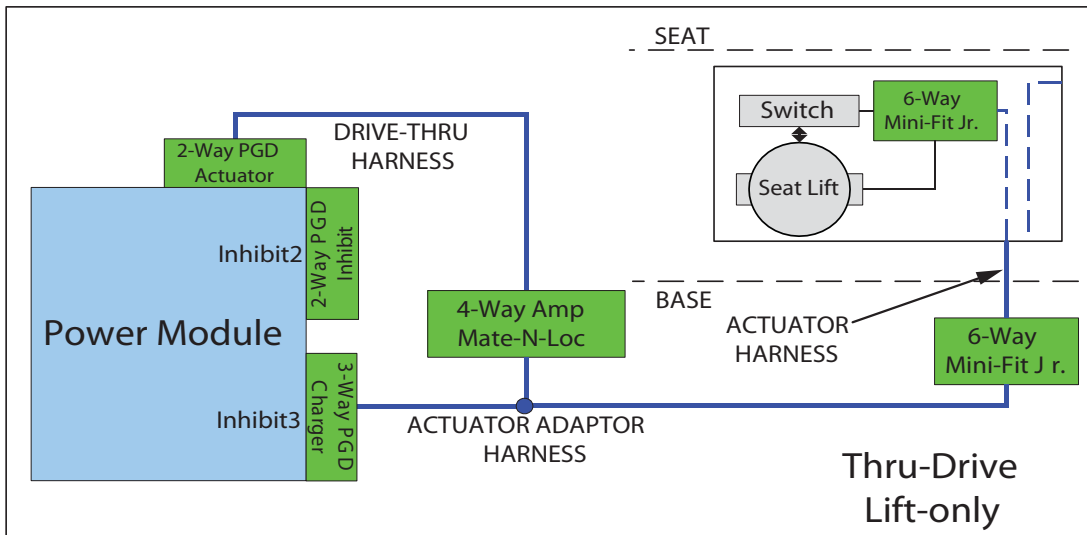
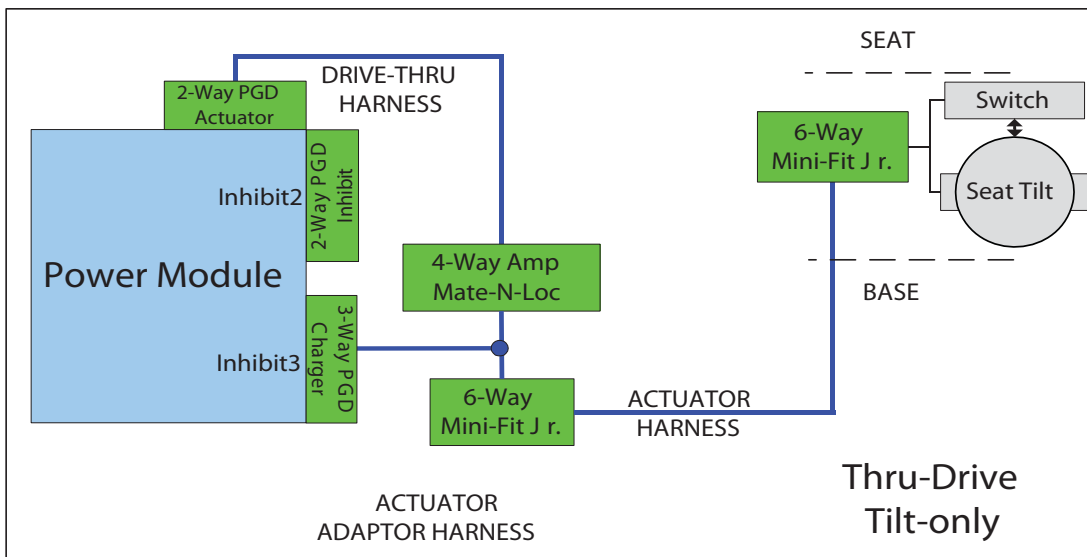
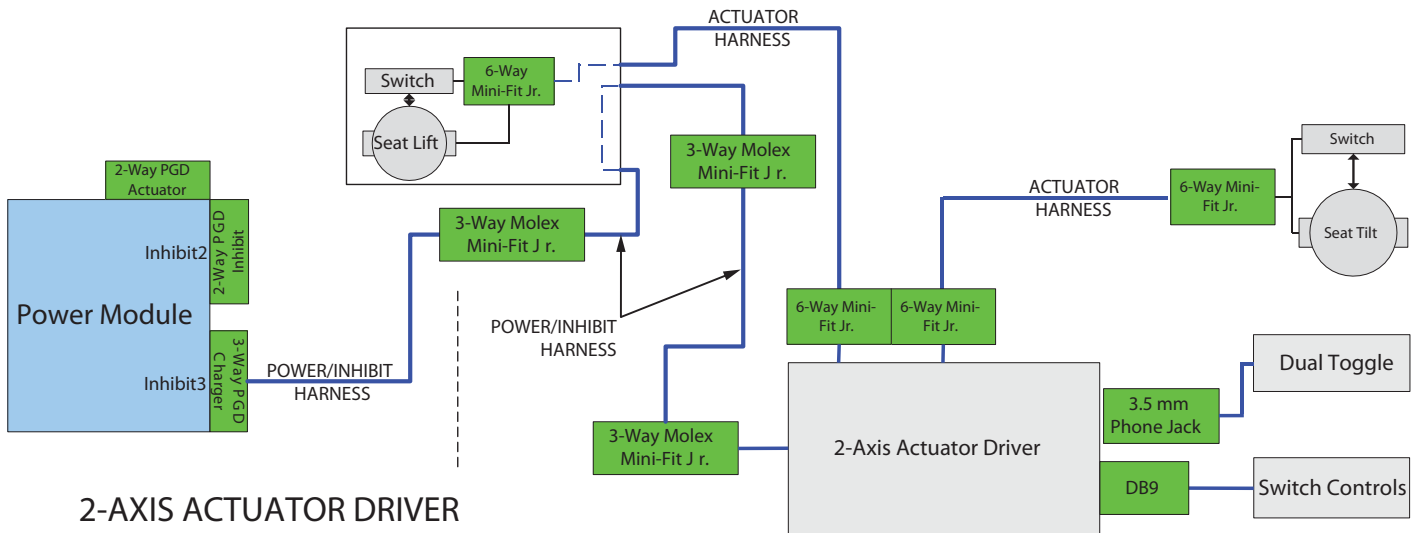


3-AXIS ACTUATOR DRIVER - LIFT



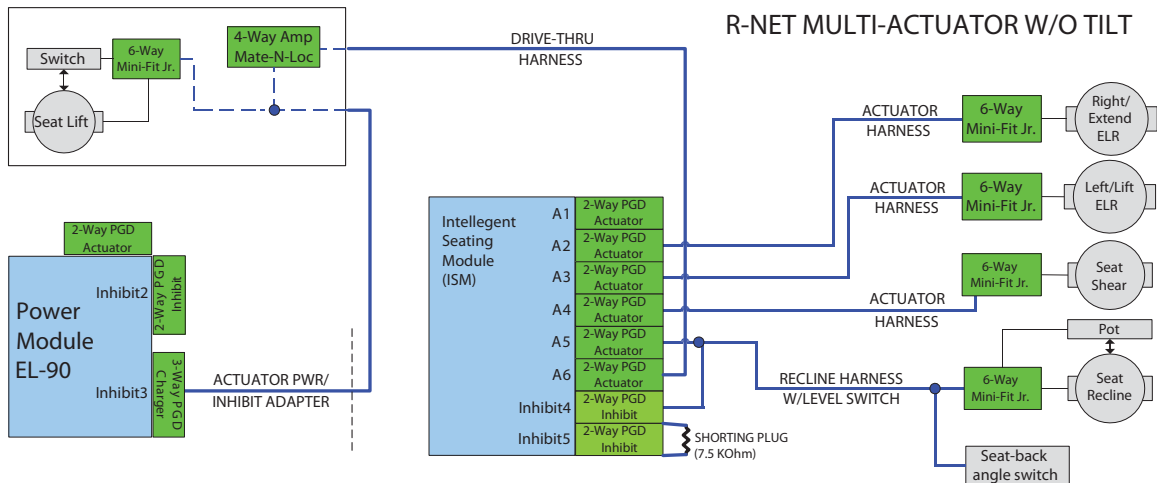
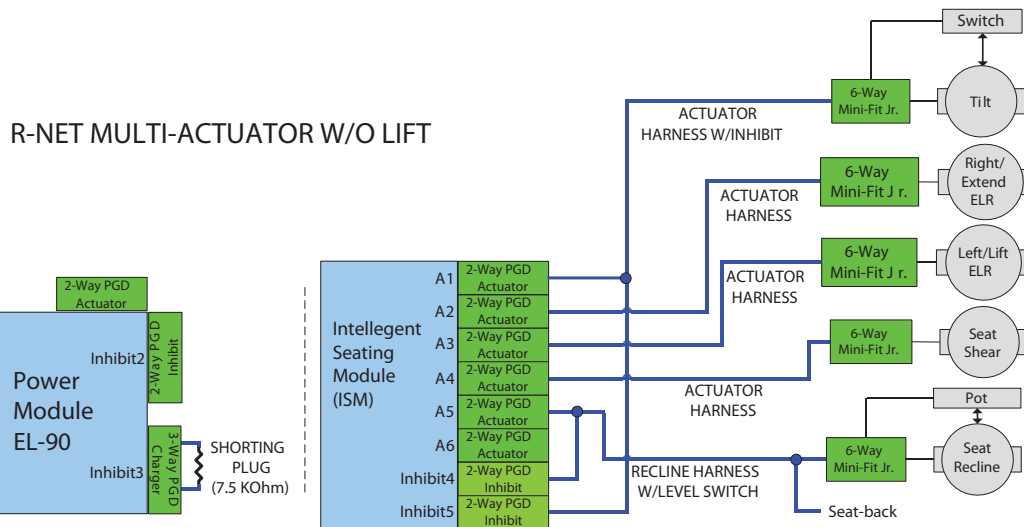
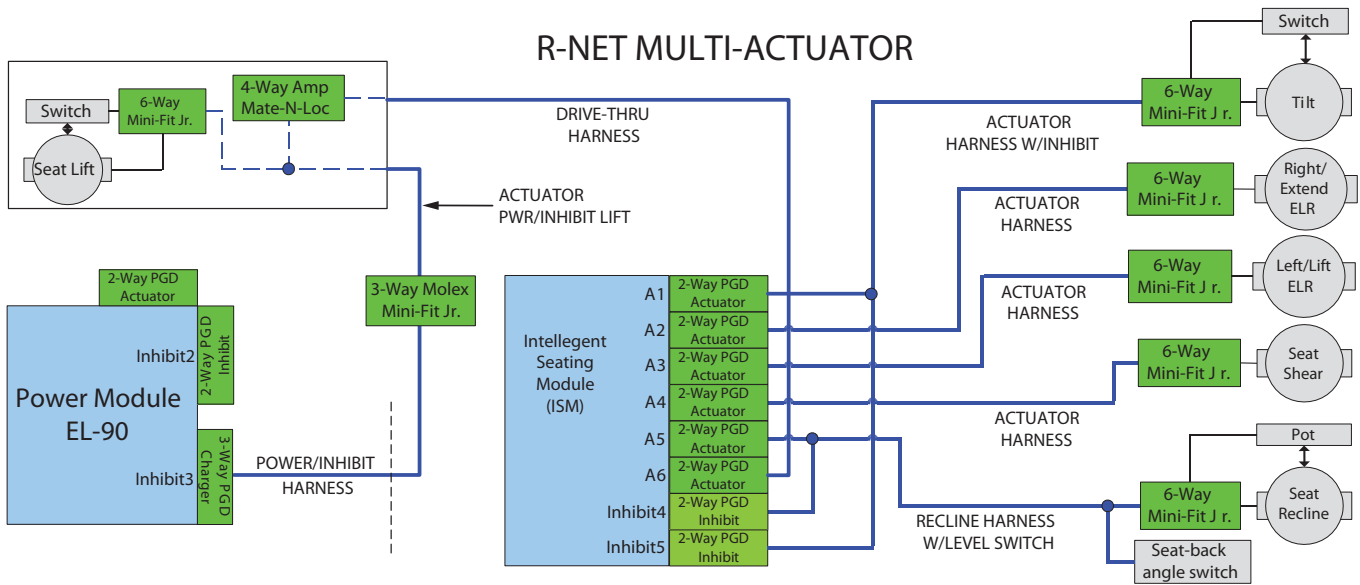
Section 2

2 Axis Actuator & Thru-Drive VR2 and R-NET



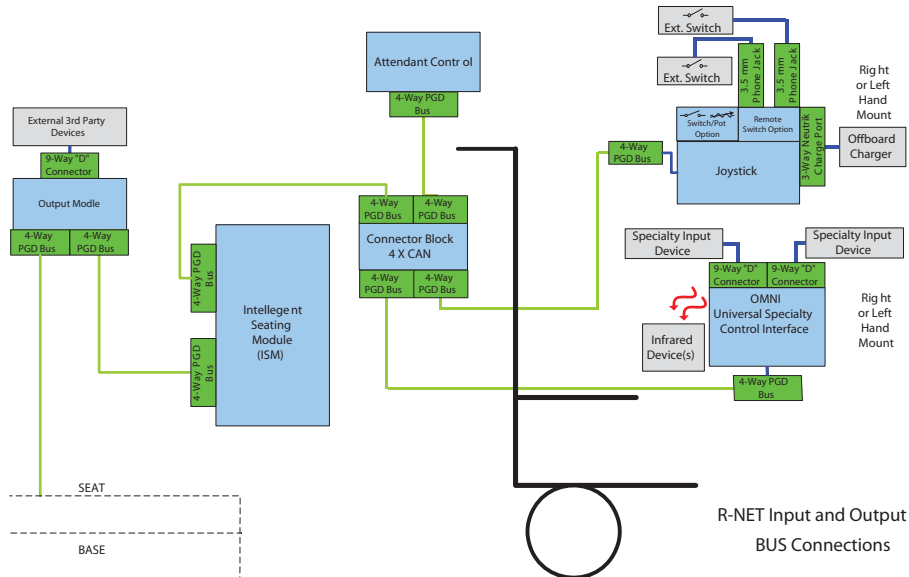
Section 2

R-NET Multi Actuators



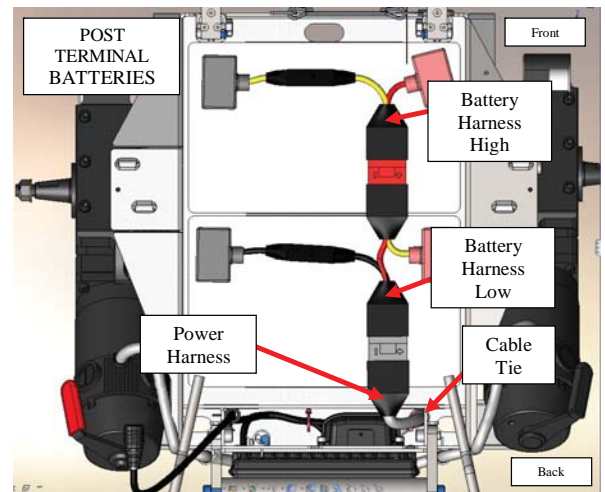
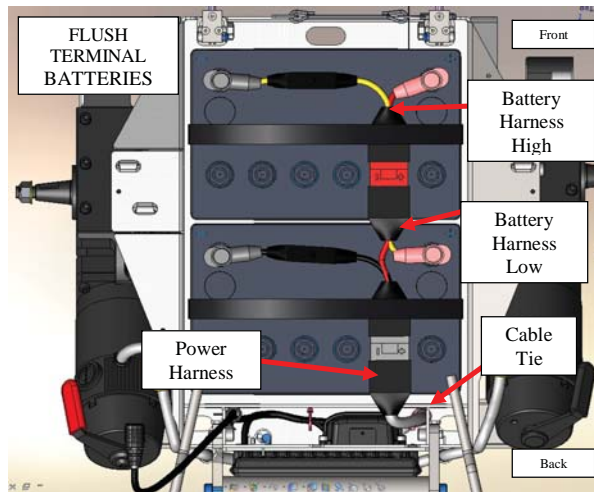
Section 2

R-NET Specialty Controls

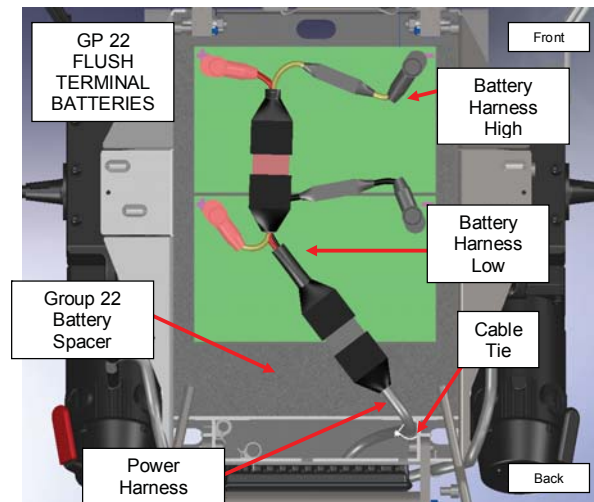


Batteries

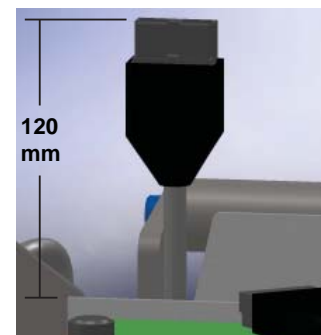
Group 24 Type



Group 22 Type



Leave at least 120mm from top of Battery box, and secure with cable tie as shown in (figure 4.3.4) when replacing Power Harness.



Section 3

VR2 Troubleshooting

No power: Battery Diagnostics

Note: For access to batteries, refer to beginning of Section 7 (Battery Access/ removal)

Battery Servicing and Replacement

Batteries should last an average of 1 to 1.5 years.

Listed below are some Factors that may effect battery performance:

- Maintenance - Poor maintenance.
- Charging - Improper charging shortens battery life.
- Chair Components - Malfunctioning electronics, bad motors, electric brakes, and corroded wiring are also capable of degrading the battery performance.

A routine test of deep-cycle wheelchair batteries should follow these guidelines:

1. Never replace just one battery at a time. This will create an imbalance when charging and ultimately damage both batteries.
2. Check batteries for a voltage difference. A voltage difference of more than .4 volts D.C. is a good indicator of a bad battery.
3. Voltage test - A dead battery cannot be effectively tested, yet many people mistakenly try to do just that. **Any battery that reads 11.0 volts or less is technically dead.**

To perform any testing, especially a load test:

- A. Batteries must be charged
- B. The top charge must be taken from fully charged batteries if charge rate has just finished.

Battery Tests

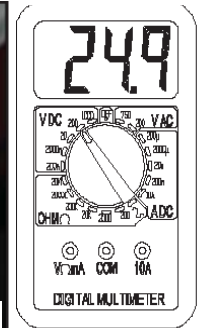
- *Load Test* - This test can only be done on fully charged batteries and can only diagnose one type of problem, (an internal short.)
- *Capacity/Discharge Test* - This is the only accurate way to test a deep-cycle battery for adequate running time. The problem with this test is that it is time consuming.
- *Current / Voltage check with a regular interval check* - Another way of truly knowing how much time your battery will last, but it is also time consuming.

Note: The voltmeters on load testers are not accurate enough to establish a state of charge.

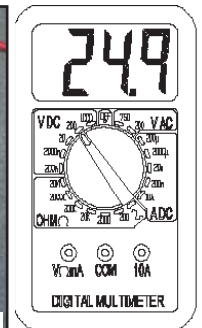
Section 3

Battery Connection Test

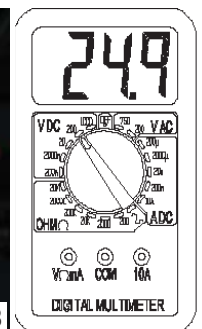
1. Check that the female VR2 Bus plug on the chair has voltage. Set the meter to DC volts and measure pins 4 (using the red lead of the meter) and 1 (using the black lead of the meter) as shown in (fig 3.2.1)



2. If the voltage meter reads full voltage, then replace the joystick module
If the voltage meter reads zero voltage, measure the corresponding pins on the VR2 controller as shown in (fig 3.2.2).



If the voltage meter reads full voltage, then replace the jumper cable. If the voltage meter reads zero, then measure the Battery Connector as shown in (fig 3.2.3). If the voltage meter reads full voltage, replace the controller, or proceed to the next step.



Note: For access to batteries, refer to beginning of Section 7 (Battery Access/ removal)

Check Battery Wire Harness

1. Check that the battery wire harness has the correct polarity. Set the meter to dc volts and measure the connector with the red lead on the positive terminal, and the black lead on the negative terminal as shown in (figure 3.2.4). If the voltage is absent Replace the Main Battery wire Harness. If the polarity is reversed correct battery wiring.



Section 3

VR2 Remote Controller Display

The Maximum Speed Indicator Ripples

How to Lock or Unlock the Wheelchair

Maximum Speed Indicator Ripples. This Indicates that the wheelchair is locked. To unlock the wheelchair, deflect the joystick forwards until the control system chirps. Then deflect the joystick in reverse until the control system chirps. Release the joystick, there will be a long beep. The wheelchair is now unlocked. To lock the wheelchair, while the control system is switched on, depress and hold the on/off button. After 1 second, the control system will chirp. Now release the on/off button, deflect the joystick forwards until the control system chirps, and deflect the joystick in reverse until the control system chirps. Release the joystick, there will be a long beep. The wheelchair is now locked.

The Maximum Speed Indicator Flashes

This indicates that the chair is charging . The chair will be ready to drive as soon as the charger is unplugged.

Battery Gauge is Steady

This indicates that all is well.

Battery Gauge Flashes Slowly

The control system is functioning correctly, but you should charge the battery as soon as possible. At 22 V, the red light starts to blink. Each bar represents a .5V value. The controller requires 18V to start and a minimum of 16V to work once started

Battery Gauge Steps Up.

Indicates the wheelchair batteries are being charged with the offboard charger. You will not be able to drive the wheelchair until the charger is disconnected and you have reset the control system by switching off the power and then powering up again.

Battery Gauge Blinks Every 2.5 Seconds

The control system has "gone to sleep" because the wheelchair has not been driven for a period of time. The time period depends on the programming of the system. To re-start, reset the system by switching off the power and then powering up again.

Battery Gauge Flashes Rapidly

Make sure the Joystick is completely released (Joystick should be centered and/or nothing is pushing the gimble out of center). The control system safety circuits have been activated and the control system has been prevented from moving the wheelchair. This indicates a system trip, i.e. the VR2 has detected a problem somewhere in the wheelchair's electrical system. Please refer to this Section (VR2 Controller Diagnostics).

Section 3

Troubleshooting with VR2 Diagnostic Codes

One Bar - Low Battery Voltage

This code could indicate discharged batteries, failed batteries, or poor battery connections. Begin by recharging the batteries and then refer to 3.2 to check batteries and connections.



Fig 3.4.1

Two Bars - Left Motor Disconnected

1. Check that the batteries are fully charged and in good condition. Check all cables and connections. Check the connections to the left motor, look for a loose or damaged connector.



Fig 3.4.2

2. Otherwise, check the brushes on the left motor. Using a Flat head screwdriver (figure 3.4.1) remove the brush cap to access the brush (figure 3.4.2). Refer to section 6 (Motor Brush Inspection). Ensure brush is not excessively worn, (brush need to be at least 1/2" long) note taper (figure 3.4.3) on brush for re-installation (figure 3.4.4) Replace as required.



Fig 3.4.3



Fig 3.4.4

Section 3

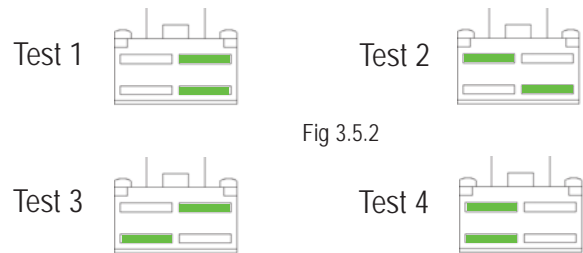
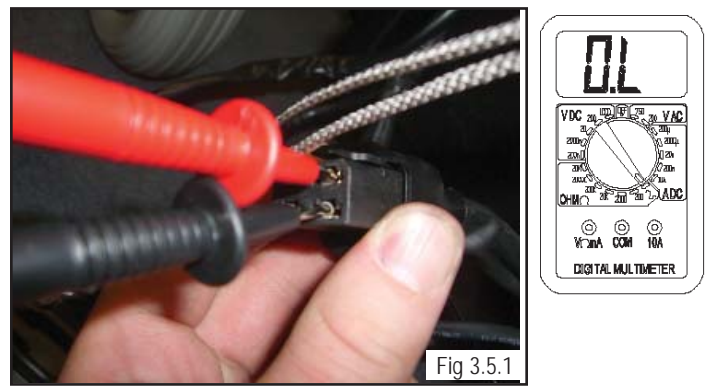
3. Use the meter to check the resistance across the two bottom contacts (thicker wires) on the 4-pin motor connector as shown in (figure 3.4.5). If the meter reads between 0 to 1.5 ohms, then replace the controller. If none of the above corrects the problem, replace the left motor.



Three Bars - Left Motor Wiring Trip

1. Check that the batteries are fully charged and in good condition; and check all cables and connections. Check the connections to the left motor, look for a loose or damaged connector.

2. Measure the resistance from the bottom contact of the red thick wire on the 4-pin left motor connector to each of the top contacts of the connector (figure 3.5.1). Measure the resistance from the bottom contact of the black thick wire on the 4-pin left motor connector to each of the top contacts of the connector (figure 3.5.2). If all of the readings are open, then replace the controller. If any of the readings are short, then replace the left motor.



Four Bars- Right Motor Disconnected

1. Check that the batteries are fully charged and in good condition; and check all cables and connections. Check the connections to the right motor, look for a loose or damaged connector.

2. Use the meter to check the resistance across the two bottom contacts of the thicker wires on the 4-pin motor connector as shown in (figure 3.5.3). If the meter reads between 0 to 1.5 ohms, then replace the controller. If none of the above corrects the problem, replace the right motor.



Section 3

3. Otherwise, check the brushes on the Right motor (figure 3.6.1). Using a Flat head screwdriver remove the brush cap to access the brush. Refer to section 6 (Motor Brush Inspection). Ensure brush is not excessively worn, (brushes need to be at least 1/2" long) note taper on brush for re-installation (figure 3.6.2) Replace as required (figure 3.6.3).



Fig 3.6.2



Fig 3.6.1



Fig 3.6.3

Five Bars - Right Motor Wiring Trip

1. Check that the batteries are fully charged and in good condition; and check all cables and connections. Check the connections to the right motor, look for a loose or damaged connector.

2. If the reading is short, (resistance is less than 10 K ohms) on any of the readings, proceed to check the 4-pin motor connector. Measure the resistance from the bottom contact of the red thick wire on the 4-pin right motor connector to each of the top contacts of the connectors see (figure 3.6.4). Measure the resistance from the bottom contact of the black thick wire on the 4-pin right motor connector to each the top contacts of the connector (below right). If all of the readings are open, (figure 3.6.5) then replace the controller. If any of the readings are short, then replace the right motor.



Fig 3.6.4

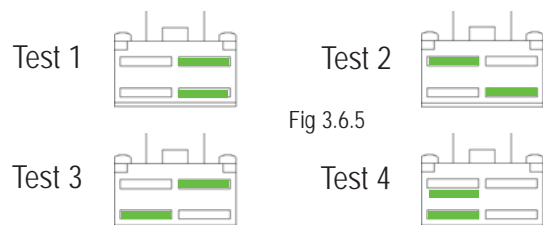
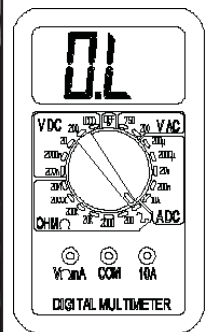


Fig 3.6.5

Section 3

Six Bars - Charger Connected

The onboard batteries are being charged with the off-board charger. You will not be able to drive the wheelchair until the charger is disconnected. You will have to reset the control system by switching off the power and then powering up again. The On-Board charger has no indication that the chair is charging, and the chair will not move until complete. If the condition still exists after the charger has been disconnected, and the chair has been switched off and then powered up again, the Joystick module may be defective.

Seven Bars - Possible Joystick Trip

A joystick trip is indicated. Make sure that the joystick is in the center position before switching on the control system. Check that the batteries are fully charged and in good condition, examine the joystick for damage. This fault can also be caused by a joystick that fails to center itself due to being dirty, bent or broken. If this is the case, replace the joystick module.

Note: If replacing the joystick does not resolve the issue, replace the cable connecting the joystick to the controller.

Seven Bars + Speed Profile Indicator error

Inspect the wiring between joystick module and controller. Replace a jumper or joystick module that has damaged wiring. If the problem persists replace the controller.

Eight Bars - Possible Control System Trip

Controller Fault - A control system trip is indicated. Make sure that all connections are secure. Check that the batteries are fully charged and in good condition, and check all joystick connections and cables. If this does not correct the problem, disconnect the power to the controller for 2 minutes, replug in to reboot the module. If the condition still exists, then replace the controller.

Section 3

Nine Bars - Solenoid Brake Trip

The parking brakes have a bad connection. Make sure that the motor is in the locked/engaged position. Check the parking break and motor connections. Make sure the control system connections are secure. Measure the two small contacts on the four-pin motor connector (figure 3.8.1).



(figure 3.8.2) shows Motor in locked (Drive) position, for Testing in Nine bar state.

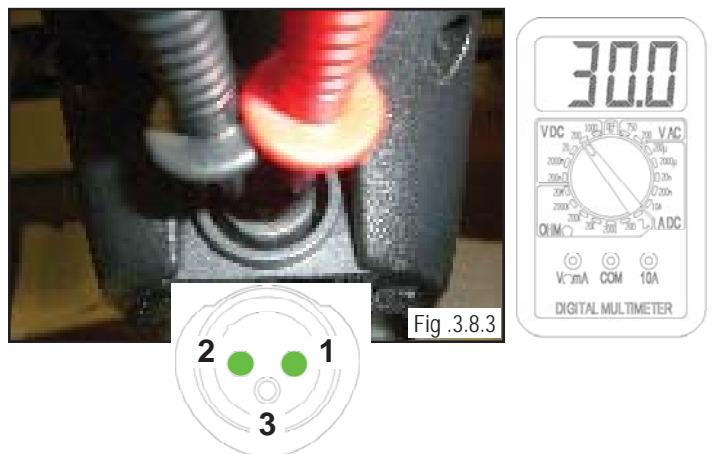


Ten Bars - High Battery Voltage

An excessive voltage has been applied to the control system. This is usually caused by a poor battery connection. Check the battery connections.

Battery Fault

Check that the batteries are fully charged, at the correct voltage, and in good condition. Take a voltage reading from pin 1 and pin 2 of the charger port of the VR2 controller, see (figure 3.8.3) If the meter reads more than 30 volts, then check the charger. Otherwise, replace your controller.



Section 4

R-net Troubleshooting

Chair Will Not Power Up

1. Check for battery voltage at the hand control using a Multimeter. Connect the Multimeter between the two outside pins (figure 4.1.2), pin 1 is positive (+), pin 2 is negative (-).

2. If full battery voltage is present, replace the following components in this order:
 - a. Communication Cable
 - b. Hand control
 - c. Control module. (refer to the Control Module Replacement section of this manual.)
 - d. Retest as necessary.

3. If battery voltage is not present, (figure 4.1.3) then replace the batteries.

If battery voltage is low (figure 4.1.4) then recharge the batteries and retest

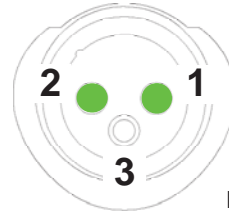


Fig. 4.1.1



Fig. 4.1.2



Fig. 4.1.3

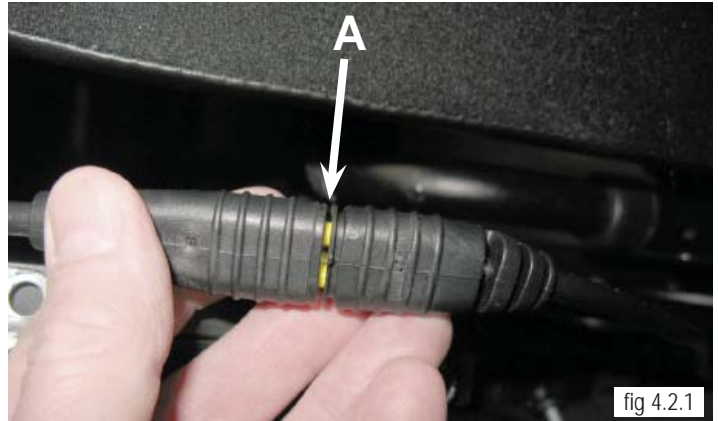


Fig. 4.1.4

Section 4

Note: The connector shown in (figure 4.1.3) is mated incorrectly. The connectors are designed to visually indicate when they are not mated correctly. If yellow is showing between the halves (A), push them closer together until only black is visible. Retest as necessary.

4. Verify that the bus cables are correctly mated between the hand control and the control module (figure 4.2.1).



Note: For the next step, locate the power connector plug. It is a large 2-pin connector between left and right motor cable.

5. Disconnect the power connector from the control module, and use a Multimeter to check for battery voltage at the connector. If a good voltage is present, with batteries fully charged, (figure 4.2.2), then replace the control module. Retest as necessary.



Section 4

Note: For access to batteries, refer to beginning of Section 7 (Battery Access/ removal)

Battery Voltage Tests

6. Verify that battery voltage is present at each connector leading to the batteries (figure. 4.3.1).



7. If battery voltage is not present, as shown in (figure 4.3.2) use a Multimeter and measure for continuity across the fusible links connected to positive (+) terminal of each battery (figure. 4.3.2). Normal resistance is less than 1 ohm. If open, replace the defective battery harness. Retest as necessary. .

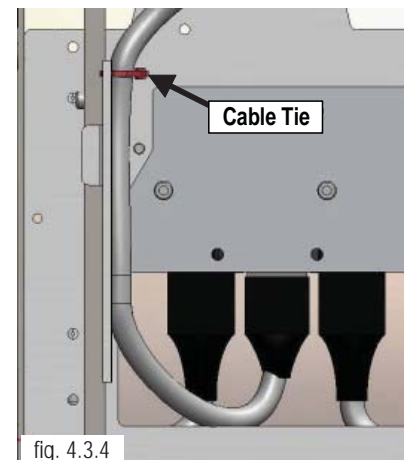
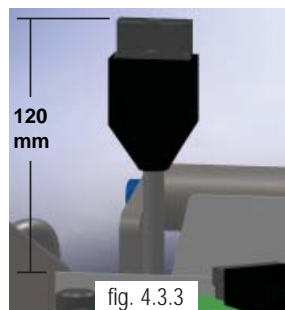


8. If the above tests pass, replace the wiring harness leading from the batteries to the control module. Retest as necessary..



Note: If replacing the power harness, It is important to position the lead as shown below

9. When replacing the harness it becomes necessary to cut the cable tie to fully remove the harness from the chair. Please note power harness plugin (figure 4.3.3) and leave 120mm from top of Battery box. You must then secure the wire with a cable tie where shown on (figure 4.3.4) this will protect the cable from damage, and allow enough slack to plug into the batteries.



Section 4

R-net Fault Codes

Fault Codes for Hand Control or Omni

The R-Net control used on this power chair is constantly monitoring for conditions that can cause unsafe or erratic operation. When a fault is displayed, refer to the fault code table shown below for a list of corrective actions.

The following identifies which module of the control system has registered the problem.

- PM-Power Module (Control Module)
- JSM-Joystick Module/Omni Module
- ISM-Intelligent Seating/lighting Module

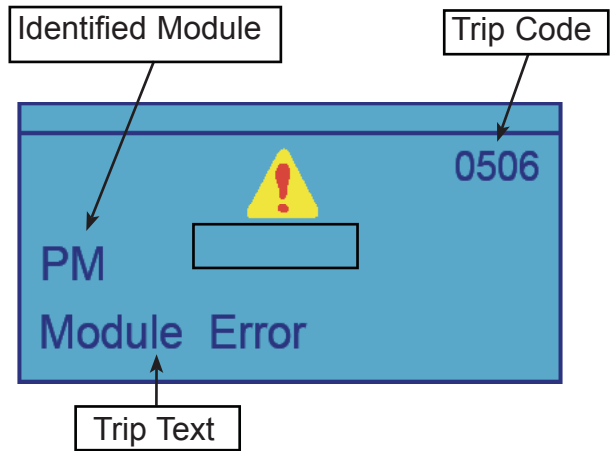


Table 1- Error Codes & Corrective action

Trip Text	Corrective Action
Joystick Error	Ensure that the joystick is centered upon power up. If it is centered, replace the hand control.
Low Battery	Recharge the batteries. After charging, perform the Battery Testing section of this manual.
High Battery	Verify that the battery charger is not defective. Leave the chair on for a few minutes to drain off the excess charge. Check the condition of the battery charger.
M1 Brake Error	Verify left motor is connected to the control module. Disengage Micro-switch. Complete the Motor & Gearbox Inspection (section 6)
M2 Brake Error	Verify right motor is connected to the control module. Disengage Microswitch. Complete the Motor & Gearbox Inspection (section 6)
M1 Motor Error	Verify that the left motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
M2 Motor Error	Verify that the right motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
Inhibit Active	Cycle power. Check all cable connections. If this does not correct the fault, contact Sunrise Technical Service for assistance.
Joystick Cal Error	Calibrate the joystick. If the error is still present, the hand control may be defective.
Latched Timeout	A latch function has exceeded it's preset time.
Brake Lamp Short	N/A
Left Lamp Short	N/A
Right Lamp Short	N/A
L Ind Lamp Short	N/A
R Ind Lamp Short	N/A
L Ind Lamp Failed	N/A
R Ind Lamp Failed	N/A

Section 4

Table 1- R-NET Error Codes (Cont.)













Trip Text	Corrective Action
Over-current	This fault occurs when the limits of an actuator circuit is exceeded. Perform Tilt Will Not Operate troubleshooting section of this manual to test the end of travel limit switches.
Overtemp. (Acts)	This error indicates that the Intelligent Seating Module (ISM) has become excessively warm. Note: An ISM is only required when there are more than 2 actuators and may not be mounted on this power chair. Allow the unit to cool. If the error repeats, the actuator may be defective or over loaded.
Overtemp. (Lamps)	Note: This fault can only occur if an Intelligent Seating Module is used on this power chair and connected to external lights.
DIME Error	This error indicates that one or more of the modules are not compatible. Remove the last module installed and retest. Recycle the power. If this error persists, Contact Sunrise Technical Service for assistance.
Memory Error	Recycle the power. Verify that cables are correctly mated. If a module has been replaced recently, it may be defective. If error persists, contact Sunrise Technical Service for assistance.
PM Memory Error	Recycle power. Verify cables are correctly mated. If a module has been replaced recently, that module may be defective. If error persists, contact Sunrise Technical Service for assistance.
Bad Cable	Inspect and replace the defective cable(s).
Bad Settings	Verify that programming agrees with installed equipment. If all settings are correct, the control module may be defective. If error persists, contact Sunrise Technical Service for assistance.
Module Error	Recycle power. Verify that cables are correctly mated. If a module has been replaced recently, it may be defective. If error persists, contact Sunrise Technical Service for assistance.
System Error	Recycle power. Verify that cables are correctly mated. If a module has been replaced recently, it may be defective. If error persists, contact Sunrise Technical Service for assistance.
SID Detached	The Omni has detected that a specialty control has become disconnected. Recheck all cables. If the error is still present, replace the specialty control.
User Switch Detached	Indicates that a user switch has become disconnected. Find the disconnected switch and reconnect.
Gone to Sleep	The predetermined sleep time has been exceeded due to inactivity by the user.
Charging	This indication is present when the battery charger is connected. There may also be an error in the control module. If error persists, contact Sunrise Technical Service for assistance.

Section 4

Fault Codes from LED Battery Gauges

Table 2- Hand control Fault Codes

Note: On hand controls that contain LED battery gauges, they will display the fault code by illuminating various LEDs . Refer to table below for corrective action

Bar Indication	Corrective Action
1 Bar 	The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, recharge the battery.
2 Bar 	Verify that the left motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.
3 Bar 	The left motor has a short circuit to a battery connection. Contact Sunrise Medical Technical Service for assistance.
4 Bar 	The right motor has a bad connection. Complete the Motor and Gearbox Inspection section of this manual.
5 Bar 	The right motor has a short circuit to a battery connection. Contact Sunrise Medical Technical Service for assistance.
6 Bar 	The wheelchair is being prevented from driving by an external signal. Verify that the battery charger is not connected. Contact Sunrise Medical Technical Service for assistance.
7 Bar 	Ensure that the joystick is centered upon power up. If it is centered, replace the hand control, and or cable.
8 Bar 	A control system fault is indicated. Make sure that all connections are secure. Contact Sunrise Medical Technical Service for assistance.
9 Bar 	The parking brakes have a bad connection. Complete the Motor and Gearbox Inspection section of this manual.
10 Bar 	Verify that the battery charger is not defective. Leave the chair on for a few minutes to drain off the excess charge. Check the condition of the battery charger.
7 Bar + S 	A communication fault is indicated. Make sure that joystick cable is securely connected and not damaged.
Actuator Flash 	An Actuator trip is indicated. If more than one actuator is fitted, check which actuator is working correctly. Check the actuator wiring.

Section 4

Example of R-10 Fault Isolation

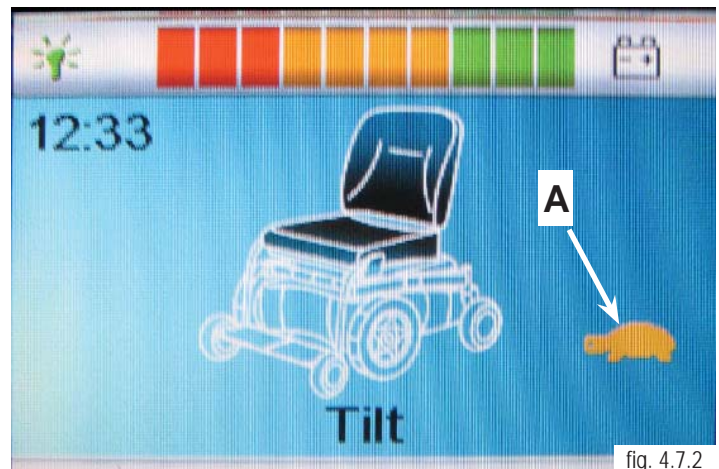
1. In this example, the right motor has been disconnected. (figure.4.7.1). The hand control displays the fault and the power chair will not operate.
2. To troubleshoot this problem, refer to Table 1, Error Codes.
3. From this error we see that the problem is being recorded in the PM (Control Module).
4. The hand control tells us that motor 2 (M2) has the error and it is with the brake circuit. Motor 2 is the right motor.
5. Table 1 informs us to, “Verify that the right motor is connected to the control module. Complete the Motor and Gearbox Inspection section of this manual.”
6. The next step is to complete the Motor and Gearbox Inspection section of this manual and retest.



Power Chair Will Not Drive Full Speed

An external micro-switch is mounted next to the actuator in the rear of the lift system. This micro-switch is closed when the tilt is lowered. The closing of this micro-switch sends a signal to the control module through the 6-pin connector located on the back of the tilt. The presence of this signal informs the control module that the tilt is less than 20 degrees and that maximum speed should be used. If the tilt is more than 20 degrees, the switch opens and invokes “creep” speed. Creep speed is a predetermined speed programmed at time of manufacture. Creep is indicated by a “turtle” on either the hand control or Omni.

1. “Creep” speed as indicated by the turtle on the hand control (A) figure 4.7.2). If the turtle symbol persists after a power down, proceed to step 2.
2. Tilt the seating system to the rear, enough to gain access to the micro switch and proceed to Step 3.



Section 4

3. Locate the creep micro-switch mounted at the rear of the actuator (A) (figure 4.8.1).

Note: The creep micro-switch may be seen from the top of the seating system on the right rear of the actuator. It may be necessary to remove the seat pan to access the switch.

4. Manually operate the creep micro-switch while observing the hand control or Omni for the turtle symbol to go on and go off with the micro-switch operation. If the symbol changes, the problem is in the programming. Contact Sunrise Medical Technical Service for assistance. If the symbol does not change, proceed to step 5.

5. Lower the tilt system.

6. Locate the 6-pin connector (B) at the rear of the tilt unit (figure 4.8.2).

7. Disconnect the connector leading to the control module.

8. Test the micro-switch wiring by performing the following test.

a. Ensure that the seat is in the full down position. (No Tilt)

b. Use Multimeter and measure continuity between the indicated pins (figure 4.8.3) on the 6-pin connector mounted on the tilt. When seating is in the untilted position, the indication should be closed (Resistance) (figure 4.8.4).

c. If it is open, (No Resistance) replace the micro-switch assembly. Refer to Tilt Actuator and Micro-Switch Removal section of this manual.

d. Retest as necessary.

9. If the test in step 8 passes, replace in this order:

a. Cable leading from tilt to control module.
b. Control module

10. Retest as necessary

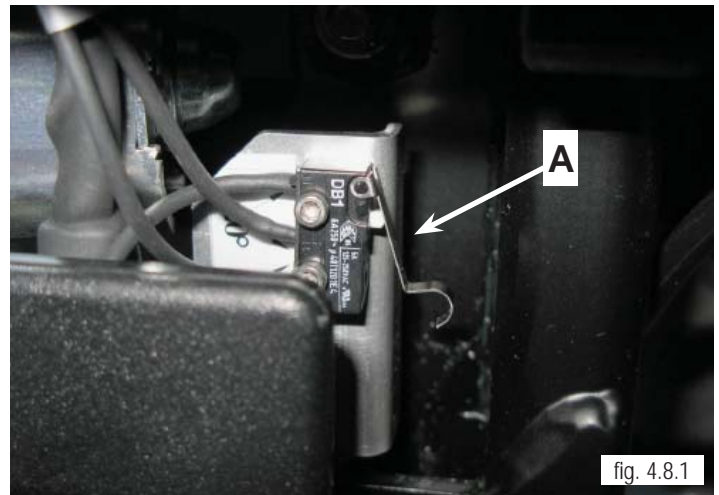


fig. 4.8.1

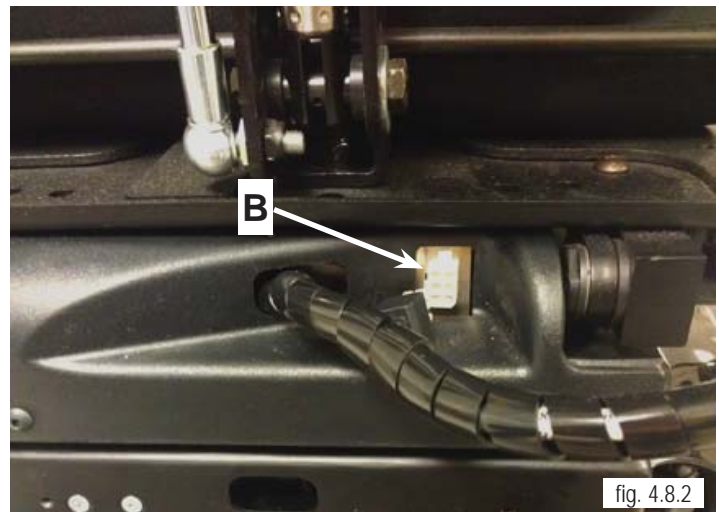


fig. 4.8.2

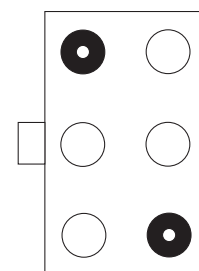


fig. 4.8.3



fig. 4.8.4

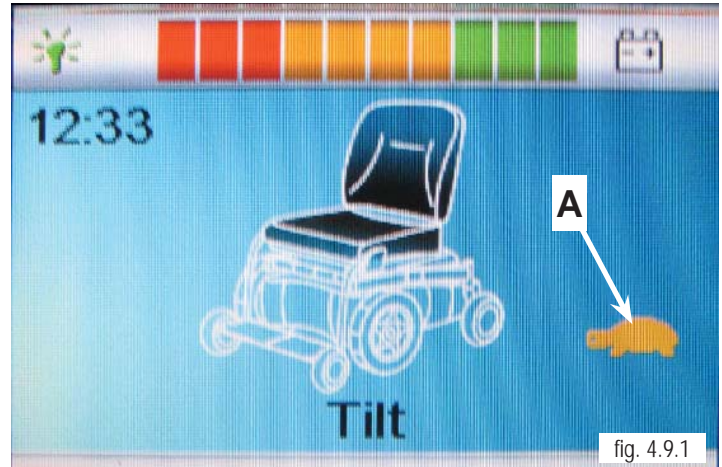
Section 4

Chair Won't Drive in Creep Speed When Tilted

An external micro-switch is mounted next to the actuator in the rear of the lift system. This micro-switch is closed when the tilt is lowered. When micro-switch is closed, it sends a signal from the control module through the 6-pin connector. The presence of this signal informs the control module that the tilt is less than 20 degrees and that maximum speed can be used. If the tilt is more than 20 degrees, the switch opens and invokes “creep” speed. Creep speed is a predetermined speed programmed at time of manufacture. Creep is indicated by a “turtle” on either the hand control or Omni.

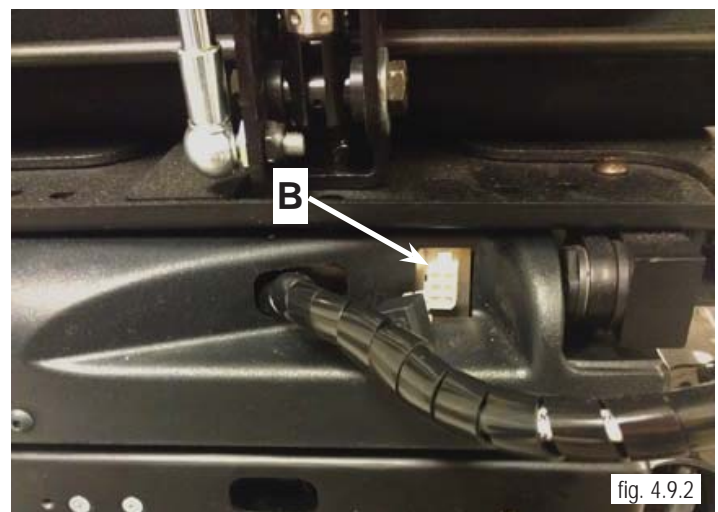
1. Tilt the seat all the way back and observe the hand control or Omni to see if the turtle symbol (A) is displayed.

2. If the turtle is displayed (figure 4.9.1), when seating is horizontal, contact Sunrise Technical Service for assistance. The programming for the power chair is incorrectly set.



3. If the turtle is not shown when the the seat is at full tilt, Use the hand control and tilt the seating system just beyond 20 degrees.

4. Locate the 6-pin connector (B) on the rear of the tilt (figure 4.9.2)



5. Disconnect the 6-pin connector leading to the control module by pressing down on the top of connector as shown in (figure 4.9.3)



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6. Test the micro-switch with the following test.
 - a. Ensure that the tilt is beyond 20 degrees tilt.
 - b. Use Multimeter and measure continuity between the indicated pins (figure 4.10.1) on the 6-pin connector mounted on the tilt. When seat is tilted the indication should be open (figure 4.10.2).
 - c. If it is closed, check parts manual for availability of the micro-switch assembly. Refer to Micro-Switch Removal, and Tilt Actuator removal subsections in section 7 of this manual.
 - d. Retest as necessary.

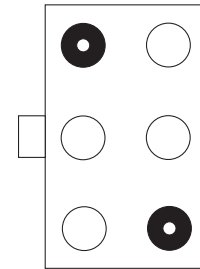


fig. 4.10.1



fig. 4.10.2

Tilt/Lift Will Not Operate

The tilt actuator used in the tilt system receives power through a 6-pin connector located at the rear of the tilt See "B" (Figure 4.8.2). The actuator also contains micro-switches that open at the end of their stroke to prevent stressing of the tilt system. Around these micro switches are diodes that allow reverse power to flow to the actuator when reversing direction.

1. Select tilt on the hand control (figure. 4.10.3). Operate the joystick and listen closely to the control module for a click. This click indicates that the control module is closing the power relay inside and supplying power to the tilt actuator. If no click is heard, replace the control module. Refer to Control Module Removal in section 7 of this manual. Retest as necessary. If click is heard proceed to step 3.
2. Verify that tilt is selected on the hand control. Operate the joystick and listen closely to the tilt actuator. If the actuator appears to be running but the tilt is not moving, replace the tilt actuator. Refer to Micro-Switch Removal and Tilt Actuator removal section of this manual. Retest as necessary.
3. If tilt will still not operate, locate the 6-pin connector on the rear of the tilt See "B" (figure 4.8.2).
4. Disconnect the 6-pin cable leading to the control module.
5. Select tilt on the hand control and place a rubber band around the joystick to hold it displaced (figure 4.10.4).



fig. 4.10.3



fig. 4.10.4

Section 4



Warning: Use caution in the next step. Do not short the leads of the Multimeter together or damage may occur to the control module.

6. At the 6-pin connector on the cable leading to the control module, verify that battery voltage is present between the indicated pins (figure 4.11.1). Note: The polarity of the voltage is not important since it reverses when the opposite direction is selected.

7. If voltage is not present, replace the cable leading to the control module. If this does not solve the problem, replace the control module. Refer to Control Module Removal section of this manual. Retest as necessary.



fig. 4.11.1

8. At the 6 pin connector (B) (figure 4.11.2) on the rear of the tilt, check continuity between the indicated pins (fig. 4.11.3).

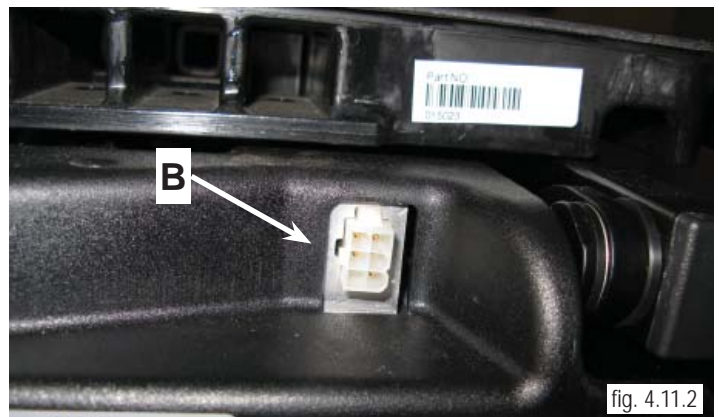


fig. 4.11.2

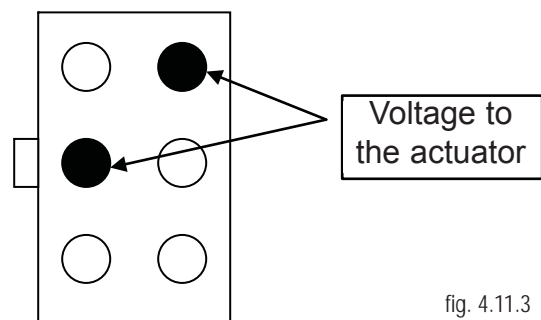


fig. 4.11.3

Section 4

Note: If the tilt actuator does not operate, it is only possible to check for one condition. Pick the condition below that best describes the position of the tilt system.

9. **Example 1, Tilt in mid-stroke.** Measure continuity between the pins indicated (figure 4.12.2) this is the resistance through the actuator motor windings (Figure 4.12.1). If this reading is not correct, replace the tilt actuator and retest.

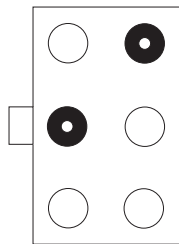


fig. 4.12.2



fig. 4.12.1

Note: The value recorded in one direction is the forward resistance through a diode and will vary with the type of Multimeter used. This value is not important, as long as there is continuity in one direction only. The value recorded in the other direction is across the open contact of the end of stroke micro-switch and should be open.

10. **Example 2, Tilt in full down position** (Figure 4.12.3). If the readings are not correct, replace the tilt actuator. Refer to Tilt Actuator and Micro-Switch Removal section this manual. Retest as necessary.

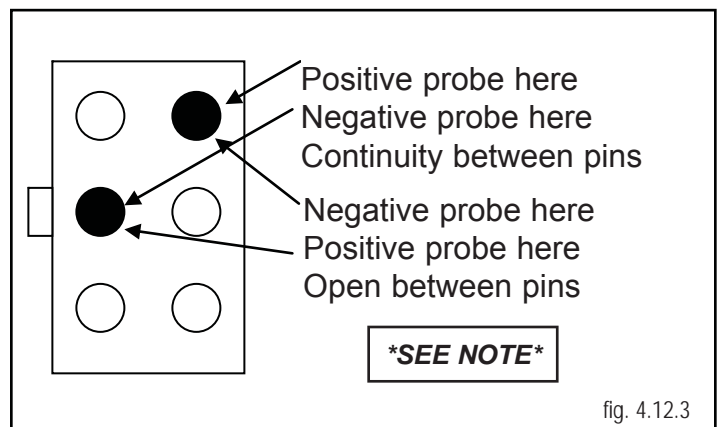


fig. 4.12.3

Note: The value recorded in one direction is the forward resistance through a diode and will vary with the type of Multimeter used. This value is not important, as long as there is continuity in one direction only. This value may even be high. The value recorded in the other direction is across the open contact of the end of stroke micro-switch and should be open.

11. **Example 3, Tilt in full up position** (figure 4.12.4). If the readings are not correct, replace the tilt actuator. Refer to Tilt Actuator and Micro-Switch Removal section this manual. Retest as necessary.

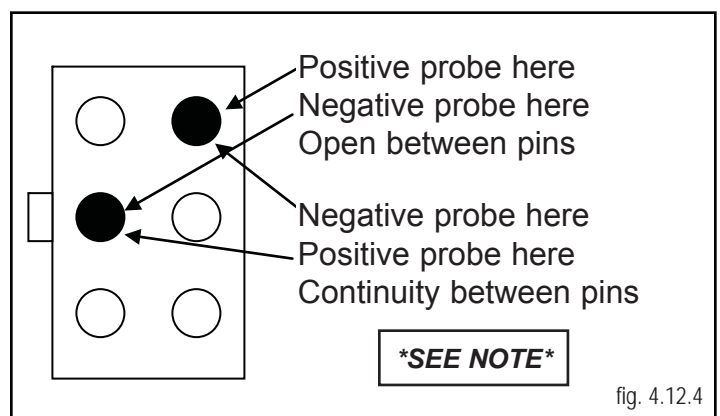


fig. 4.12.4

Section 5

Battery Testing

Note: The QM-710 power chair uses either (2) 22NF, or GRP 24 batteries connected in series. The circuit is protected by a non-serviceable fusible link in each battery harness. Prior to performing any test, the battery terminals should be clean and tight. For Access to the Batteries, Refer to Section 7: Battery Access/Removal.

1. Check for initial battery voltage at the joystick using the battery charger connector. Connect the Multimeter to the two outside pins (figure 5.1.1). Pin 1 is positive (+) and pin 2 is negative (-). Fully charged batteries are typically 25.6 VDC for the pair, or 12.8 VDC each. Discharged batteries are 24 VDC or less for the pair.
2. Load test the batteries using either a commercial load tester or the following procedure.



Note: Voltage greater than 26 to 28 VDC indicates the batteries are either over-charged, or have just been disconnected from the battery charger, and contain a surface charge. If the batteries are not freshly charged and voltage is excessive, inspect battery charger.



Warning: Failure to disengage the gearbox in the next step can cause unexpected operation of the power chair.

To use the power chair's motors as a load tester, complete the following steps:

- a. Disengage the motor/gearbox so the motors can run in freewheel (figure. 5.1.2).
- b. Connect the Multimeter to the joystick and record the voltage (figure. 5.1.3). If the voltage indicates a surface charge, run the motors for a few minutes to dissipate the surface charge. Note: in this example, a small surface charge is present.
- c. After the voltage has stabilized, record the voltage. Typical value for a fully charged pair of batteries is 25.6 VDC (12.8 VDC each).



Section 5

d. Operate the power chair at high speed by operating the joystick in a high-speed profile. The motors should put approximately a 5 to 10 amp load on the batteries.

e. Continue to operate the motors for 60 seconds. Record the readings and compare them to the following:

- i. During the first 5 seconds, normal voltage drop should be approximately .5 to .6 VDC.
- ii. During the remaining portion of the 60 seconds, the voltage should stabilize, dropping no more than an additional .1 to .2 VDC.
- iii. At the end of the 60 seconds, release the joystick.

f. At the end of a 5 minute rest, note the voltage recorded on the Multimeter. Normal indication at the end of a 5 minute rest is typically the starting voltage, or no more than .1 VDC less.



fig. 5.2.1

Notes:

- A rapid drop of approximately 1.5 or more during the first 5 seconds indicates a shorted cell in one or both of the batteries. The battery terminals should be checked to ensure that they are tight and clean, and then the test should be repeated. If the terminals are tight, the batteries should be replaced. Refer to Battery Removal section of this manual.
- A slow drop of more than .8 volts during the first few seconds indicates a weakened pair of batteries. Evaluate the age of the batteries and the use they have received, and consider replacing them.
- If the voltage does not return to .1 VDC of the starting voltage at the end of the 5 minute test, evaluate the age of the batteries and the use they have received, and consider replacing them.

Section 5

3. The individual voltage of each battery may also be checked using a Multimeter. Connect the Multimeter to the battery connector (figure 5.3.1). Note: Refer to Battery Removal (Section 7).

Compare the values to the following.

- a. 12.8 VDC indicates a fully charged battery.
- b. The battery readings should be similar. Newer batteries typically read within .1 to .2 VDC.
- c. 13 VDC or more indicates an overcharged battery, or one that has a surface charge from being recently removed from the charger. Verify correct operation of the battery charger if the batteries have not recently been removed from charge.
- d. 11.9 to 12 VDC indicates a discharged battery. Recharge as necessary.
- e. Less than 11.9 VDC indicates an excessively discharged battery.
- f. Values larger than 13 VDC indicate either an overcharged battery or one that has just been removed from charge, as in the example (figure 5.1.1)



fig. 5.3.1

Section 6

Motor/Gearbox Inspection

Note: This procedure may be done with or without removing the motor from the power chair. If the motor/gearbox is to be removed from the power chair, refer to Motor and Gearbox Removal, Section 7 of this manual. Consider replacing any motor/gearbox assembly that does not pass the following inspections.

1. Inspect the output shafts for signs of grease leakage (figure. 6.1.1).
2. Inspect the the gearbox release arm to the motor/gearbox assembly. Ensure that it is tight and not damaged (figure. 6.1.2).
3. Manually operate each gearbox release lever to ensure that they operate easily and fully engage and/or disengage
4. Locate the motor brush access on both sides of the motor (figure 6.1.3)



Caution: Use care not to damage the brush cap with excessive force in the next step.

Note: When removing the brush assemblies, remove one brush assembly at a time. Note its orientation so that it can be inserted into the brush holder the same way it was removed.

5. Remove the brush by using a common screwdriver to unscrew the plastic cap. Be careful not strip out the slot (figure. 6.1.4).



fig. 6.1.1



fig. 6.1.2



fig. 6.1.3



fig. 6.1.4

Section 6

Motor Brush Inspection

Note: Disconnect the motor connector from the control module first, if the motor/gearbox assembly is undergoing the following procedure.

Note: When replacing brush assemblies, always replace the brushes on both motors. Break in the brush assemblies prior to delivering the power chair to the customer by releasing the gearbox assembly and operating the motor for 20 to 30 minutes, alternating between forward and reverse.

6. Inspect the brush assembly (figure. 6.2.1). Replace any brush assembly less than $\frac{1}{4}$ inch long. Ensure that the lead to the brush and spring has not over heated and that the ends of the brush are sharp and clean. Note the taper of the brush (figure 6.2.2) for re-installation.



Fig 6.2.2



fig. 6.2.1

7. Inspect the motor's commutator (figure 6.2.3). Verify that it is clean, not overheated, and does not show signs of excessive arcing. Normal color is bright copper to dull brown copper. Contact Sunrise Medical Technical Service if in doubt of its condition.



fig. 6.2.3

8. Inspect the motor connector at both the motor end and the control module end for signs of overheating (figure. 6.2.4).



fig. 6.2.4

Section 6

Measure Resistance

9. Measure the resistance of the park brake assembly by connecting a Multimeter to the small pins of the 4-pin connector (figure. 6.3.1). Normal resistance is approximately 12 to 15 ohms.



fig. 6.3.1

10. Measure the resistance through the motor brush assembly and motor by connecting a Multimeter to the large pins of the 4-pin connector (figure. 6.3.2). Normal resistance is approximately .5 to .9 ohms.



fig. 6.3.2

Note: New brush readings may be different than those recorded above. The new brush assemblies should be run-in prior to measuring their resistance. Contact Sunrise Technical Service if the readings are either significantly higher or lower than those recorded above.

Section 7

Removal Procedures

Battery Access/Removal

1. For Access to Batteries, locate the left and Right thumbscrews that hold the seating assembly to the base (figure. 7.1.1) . Remove the thumbscrews. Lift and pivot the Seating system rearward.



Please refer to, and follow the Health and Safety Section for Battery safety and handling procedures in in front of this Service manual

2. Remove cushion and Pivot the entire Seat/ Back frame assembly to the flat working surface for access to battery cover under the front of the seat (figure. 7.1.2)

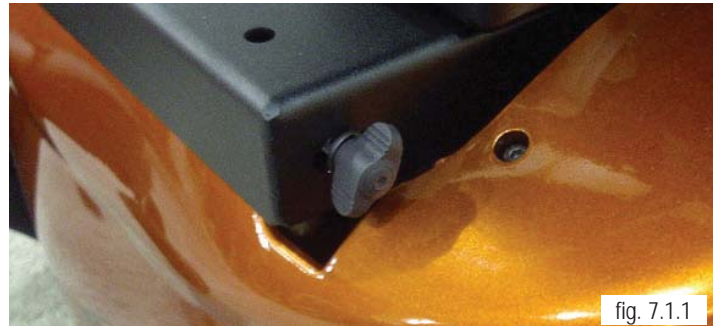


fig. 7.1.1



fig. 7.1.2

3. To Expose the Batteries, Lift and pivot the battery access cover under the front of the seat Frame assembly. (figure. 7.1.3)



fig. 7.1.3

4. Disconnect the 2 Batteries as shown in (figure 7.1.4). Disconnect the main Battery lead from the power base. You may now lift the batteries out of the battery box by using the attached lifting strap (*Remember to use proper lifting techniques, the batteries are heavy.). To remove the harness from the battery posts, use an open end wrench.



fig. 7.1.4

Section 7

Battery Installation

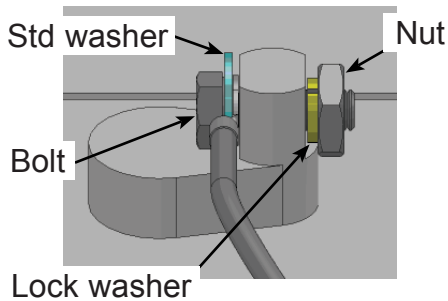
5. Re-attach the harness to the Battery posts with an open end wrench as shown in (figure 7.2.1). It is recommended to tighten the Battery Harness hardware to a maximum torque of 60in-lbs

6. It is important to follow the basic hardware stackups shown below when re-attaching the harness to the battery posts for a reliable connection.

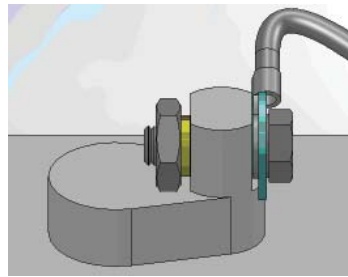


fig. 7.2.1

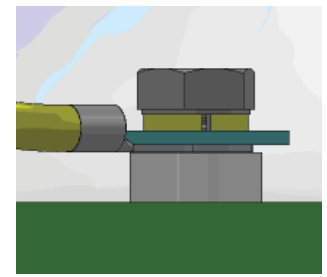
Option 1 Post on top



Option 2 Post on top



Option 3 Flat top



7. Lift the batteries into the battery box and reconnect the Batteries to each other as shown in (figure 7.2.5). Then reconnect the Battery harness to the power base. (A) (figure 7.2.6)

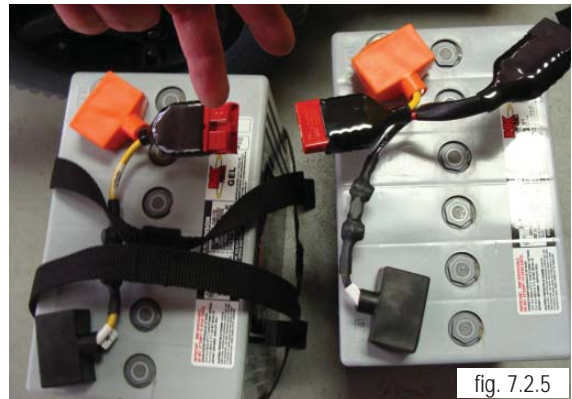


fig. 7.2.5

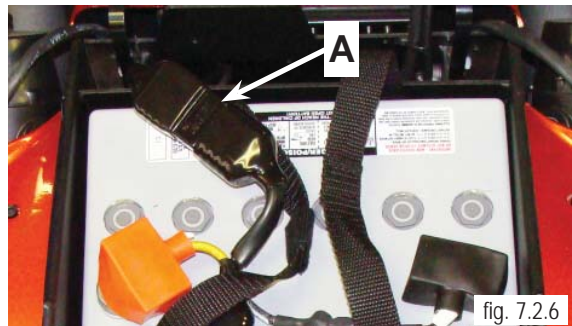


fig. 7.2.6



Batteries installed incorrectly can blow the fuse for this system. Pay careful attention to install the battery harness across both batteries instead of to each of the batteries individually. Refer to Battery Wiring Diagram in Section 2 for reference.

Section 7

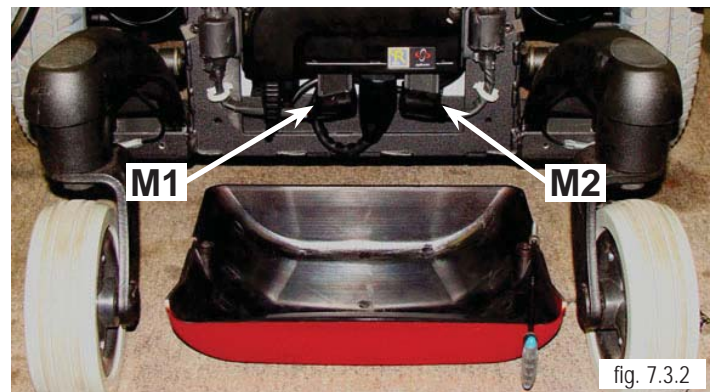
Motor and Gearbox Removal

1. The Motor must be disconnected from power before removal. For controller access, remove the controller cover/shroud from the back of the chair with an M4 Hex Key locating the two attachment screws. (figure.. 7.3.1).



2. Locate and disconnect main power from the control module by disconnecting the power harness from the batteries.

3. Locate and disconnect the appropriate Motor Lead, from the control module. (M1 , M2 or both) (figure.. 7.3.2).



4. Remove the wheel assembly by using a 5/8" deep socket wrench to remove the 3 bolts that hold the wheel and rim in place (fig. 7.3.3).



5. To separate the Motor from the Motor Bracket, use a 5mm Hex key to remove the 6 M6 Socket head Cap screws shown in (figure. 7.3.4) .



Section 7

Removal for units with Mechanical Brake

1. The process for units with a Mechanical Brake is exactly the same as the standard configuration, except there are 2 brackets located with the motor, the mechanical brake bracket, shown in (figure 7.4.1) and the standard motor bracket. The mechanical brake bracket is removed first by taking out the 3 longer screws next to the wheel and then the remaining 3 screws holding the motor to the motor bracket are removed.



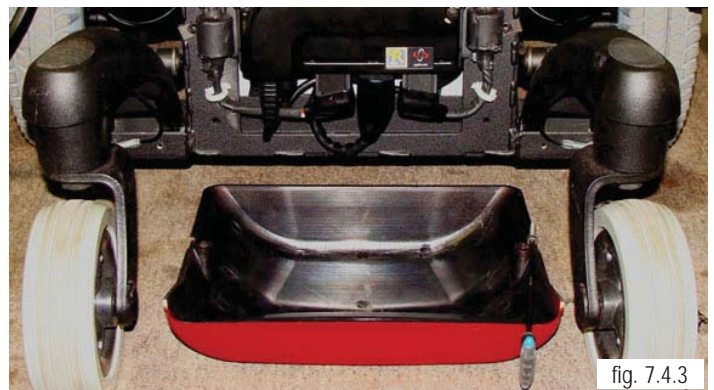
Caution: Make sure the Main power is disconnected by disconnecting main battery harness before performing the next set removal procedures.

Control Module Removal

1. For controller access, remove the controller cover/shroud from the back of the chair with an M4 Hex Key locating the two attachment screws. (figure 7.4.2).



2. Locate and carefully disconnect all Power, Plugs, and/or connectors that are attached to the controller. (figure 7.4.3).



Section 7

3. Use 4 mm Hex Key to remove left and right screws/washers attaching the controller to the Battery Box (figure 7.5.1).



4. Once all bolts and washers have been removed, Separate the module from the backing plate and remove it. (figure 7.5.2)



5. To re-install the controller reverse the previous steps. (figure 7.5.3)



Section 7

Front and Rear Caster Wheel Removal

1. Use a 17 mm socket to remove the Locknut holding the wheel to the caster shaft, and remove the wheel (figure 7.6.1, and 7.6.2).



Front and Rear Caster Stem Removal

1. To remove or replace the Caster Stem, Use a Flat Head Screwdriver to remove the Caster cap as shown in (figure 7.6.3)



2. Using a 24mm Socket for the Locknut on top of the stem, and an open end 24mm wrench for the bottom of the stem assembly, remove the locknut, washer, and caster stem from the Caster Arm. (figure 7.6.4)



Section 7

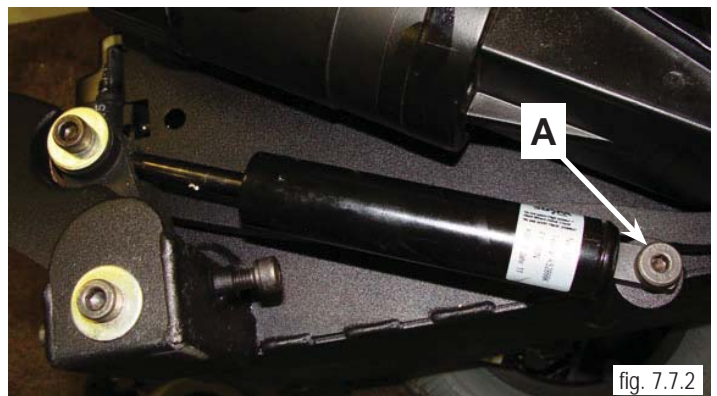
Gas Spring Removal

Note: The shocks used in this power base are pre-adjusted at the factory. Please refer to Section 9- Suspension overview.

1. Remove the wheel assembly by using a 5/8" deep socket wrench to remove the 3 bolts that hold the wheel and rim in place (figure 7.7.1). Before removing the Gas Spring, raise the center of the chair with a lift so that the suspension can come all of the way down.



2. For Gas Spring Removal, Remove the Lower holding bolt (A). using a 5mm Hex key (figure 7.7.2)

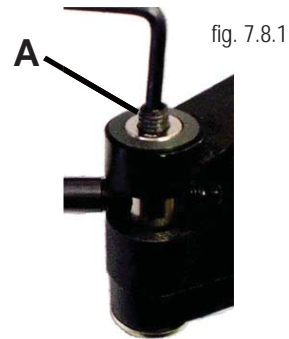


3. Remove the top holding Bolt with a 6mm hex (figure 7.7.3)



Section 7

4. Once the top holding bolt is removed, loosen the set screw (A) as shown by using a 4mm Hex wrench (figure 7.8.1)

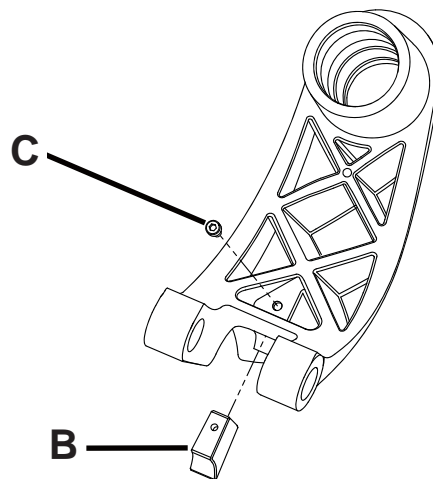


5. Once set screw is loosened, the gas spring shaft can be unscrewed and removed from the securing point as shown in (figure 7.8.2)

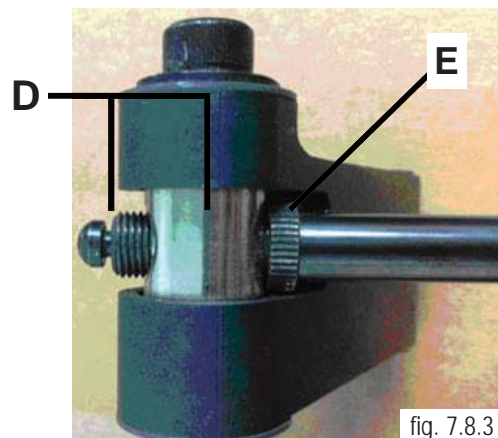


Note: A Gas spring replacement kit is available. Those Parts should be used in the following steps. Be sure to replace any screws or bolts that have been loosened and/or removed, especially threaded items that include a patch.

6. Remove the Bronze Anti Pitch Insert (B). Using an M5 Hex wrench, remove the Socket Head Cap Screw (C) in the Rear Caster Arm. The insert can be pushed out from the back by using a hole that has been created in the part. Be sure to replace with a new part from the Kit before re-assembly.



7. To re-install the Gas Spring, Reverse the previous procedures. Be sure to adjust the the Gas Springs threaded shaft to the correct distance of 12-13mm for required installation clearance (C) as shown in (figure 7.8.3). and then tighten the Jam Nut (D) to secure the shaft at the correct distance, and replace the gas spring insert.



Section 7

Tilt Actuator Removal

1. Remove the seating system to expose the actuator. Disconnect the 6-pin connector by Pushing down on tab (figure 7.9.1)



Caution: The actuator wires are fragile. Use caution when removing. Do not remove the bullet connector

2. Note the connections leading to the Tilt Actuator, Separate and label the those wires. Reverse the procedures to replace it and retest as necessary. (figure 7.9.2).

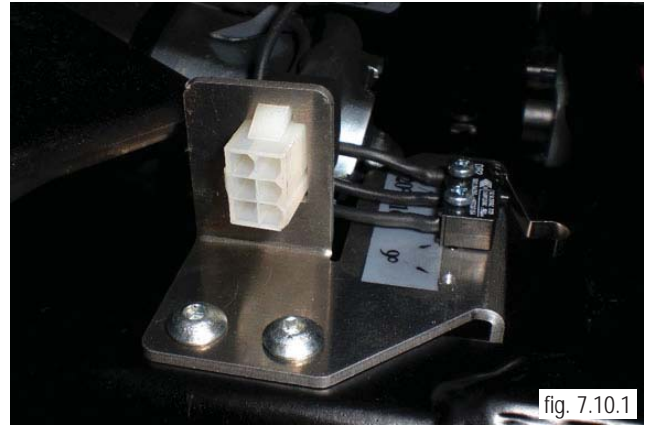


3. Use two 13 mm wrenches and remove the nuts at both ends of the actuator. See (figure 7.9.3). which shows one end. Remove both pins from the tilt actuator.



Section 7

4. Remove the actuator and micro-switch assembly as one part if the entire assembly is to be replaced (figure 7.10.1).



5. Reverse the previous procedure to install the actuator and micro-switch assembly. Retest as necessary.

Recline Actuator Removal

Note: In order to remove either the recline or the shear actuator, the ISM box and mount must be removed. The gas strut must also be unbolted on one end, and swung out of the way. Complete the following steps in order to remove and replace the recline actuator.

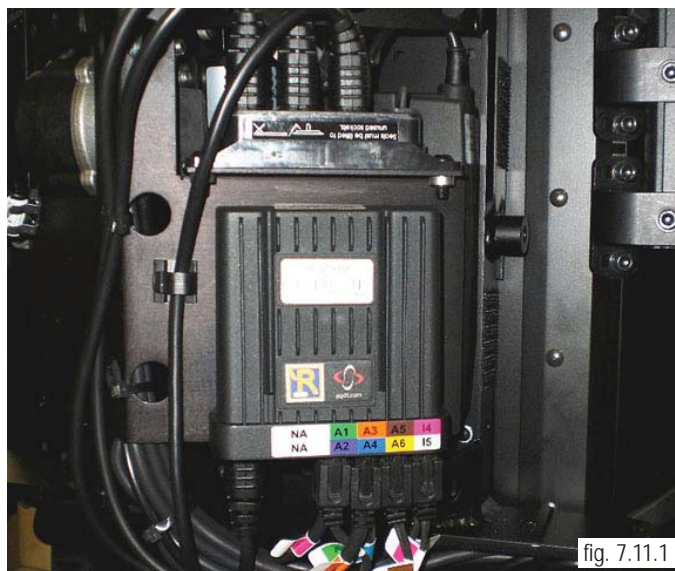


1. Locate and Remove the rear shroud (figure 7.10.2) by using a flat head screw driver to lift the small head of the fasteners (F) (figure 7.10.3)



Section 7

2. Remove the rear Recline shroud. This will allow access to the ISM control Module. (figure 7.11.1)



3. Use a 9/64" Hex wrench to remove the socket head cap screws that attach the ISM mount to the recline structure (figure 7.11.2).



4. Use the same wrench to loosen (Do not Remove) the bottom two socket head cap screws. (figure 7.11.3)



Section 7

5. Locate and disconnect the two main leads to the actuators (figure 7.12.1)

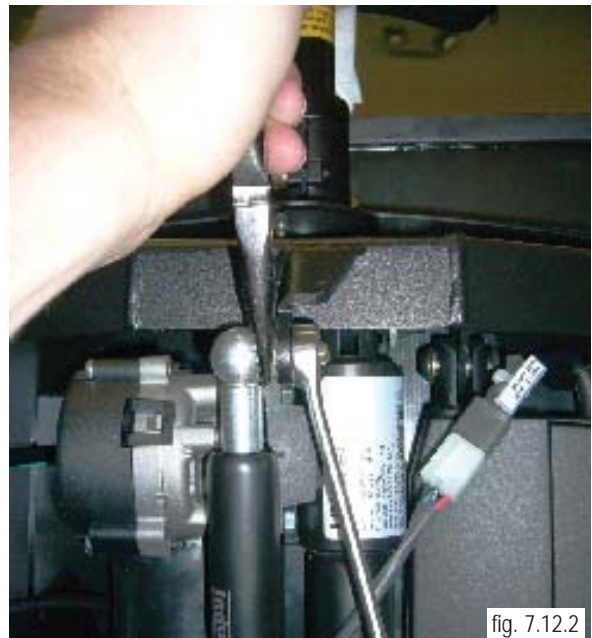
Recline Actuator lead is shown on left, and Shear actuator lead is shown on Right.



Caution: During the next steps, the gas strut will be detached. It is under pressure. Once the recline actuator is detached from its mount, the gas strut will be allowed to fully extend.

Gas Strut Removal

6. Locate the top Gas Strut attachment bolt (figure 7.12.2) Use a pair of needle nose pliers and a 1/2" box-end wrench to remove the gas strut from its upper mount. (figure 7.12.2)



Note: You do not have to fully disconnect the gas strut. Once the top mount is disconnected, rotate the gas strut down and out of the way to work on the other components.

Section 7

7. Prior to removal of the recline actuator, observe the position of the top and bottom bracket to ensure that it is mounted in the same position during re-assembly. One side of the top bolt for the Recline actuator is accessed as shown in (figure 7.13.1). The nut and washer are found on the other side as shown in (figure 7.13.2)



fig. 7.13.1



fig. 7.13.2

8. Use a 1/4" Hex wrench and a 9/16" open-end wrench and remove the top bolt that holds the recline actuator to the back structure. (figure 7.13.3)



fig. 7.13.3

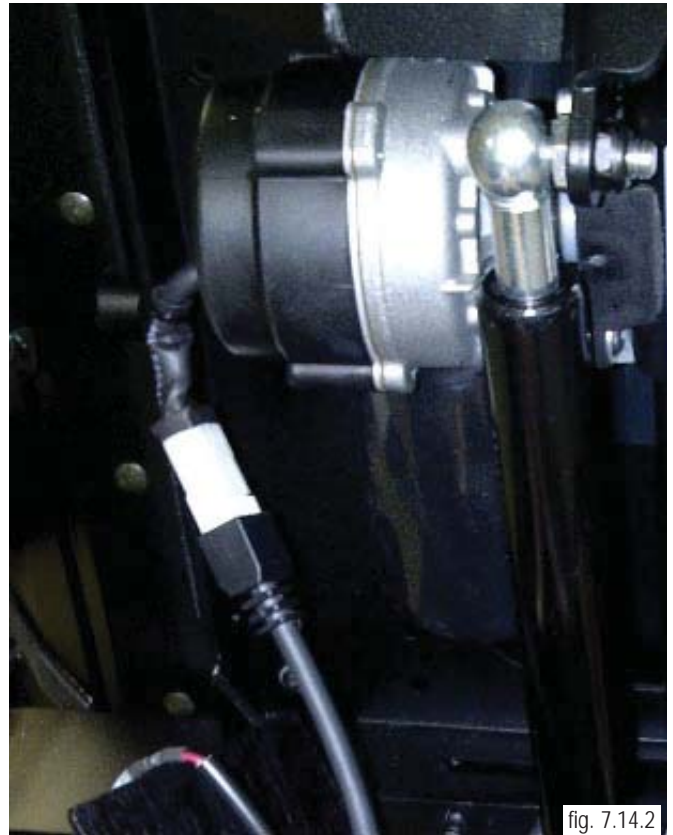
Section 7

9. Use a 9/16" socket and ratchet to remove the bolts that attach the bottom of the recline actuator (figure 7.14.1)



10. Once the bolt is removed, the same technique may be used to remove the lower recline actuator mount.

10. Unplug all of the connectors to the recline actuator (figure 7.14.2)



11. The recline actuator can now be replaced with a new actuator.

12. To reinstall the Recline Actuator, the gas strut must be reattached before the bottom recline actuator bolts are re-installed. Once the gas strut is connected, pull on the back to compress the gas strut to position the end of the recline actuator. Insert the bolts and nuts and tighten. To complete the installation of the Recline actuator, reverse the previous steps.



Caution: Attaching the recline actuator may require 2 people, one to compress the gas strut and one to insert the bolts into the bottom recline actuator mount.

Section 7

Shear Actuator Removal

Note: In order to remove the Shear actuator, the Gas strut and Recline actuator must be removed first. Refer to the previous pages for details.

1. Once the recline actuator is removed, locate the ISM control box on the back of the chair and disconnect it by unplugging the 6-Pin connector. (figure 7.15.1)
2. Using a 7/16" open-end wrench and a 3/16" hex wrench, remove the top and bottom mounts (figure 7.15.1)
3. Lift the actuator out of the back shroud by pulling the top mount out towards the back of the chair, and then remove the Shear Actuator from the bottom mount. (figure 7.15.2)
4. Reverse the process to reinstall a new Shear Actuator.



fig. 7.15.1



fig. 7.15.2

Elevate Actuator Removal

1. Locate the ISM control box on the back of the chair and disconnect all of the wires that connect to the Lift Module. (figure 7.15.3) Remove/unattach the the lift module from the base.

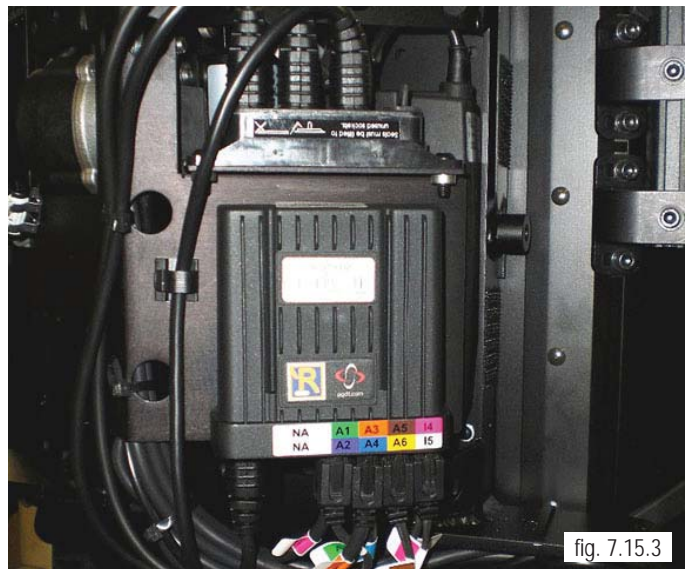


fig. 7.15.3

Section 7

2. To remove the actuator, (figure 7.16.1) there are 2 sets of attaching hardware, remove both sets of bolts. A 3mm key is utilized or ratchet to remove plate (figure 7.16.2)

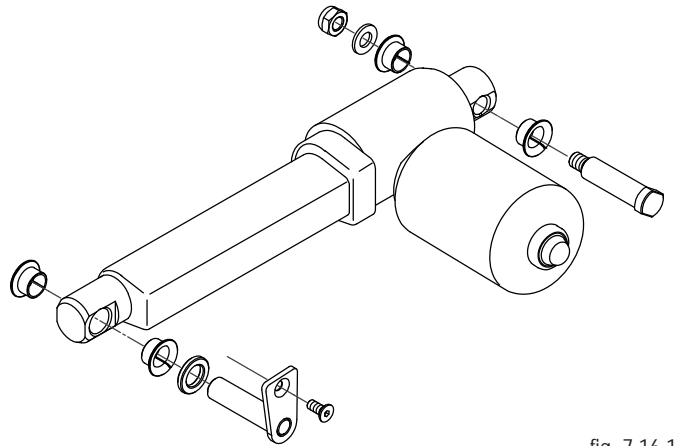


fig. 7.16.1



fig. 7.16.2

3. The Second actuator bolt can be located as shown in (figure 7.16.3) To remove, use a 13mm open end wrench on nut and slip bolt out of assembly.



fig. 7.16.3

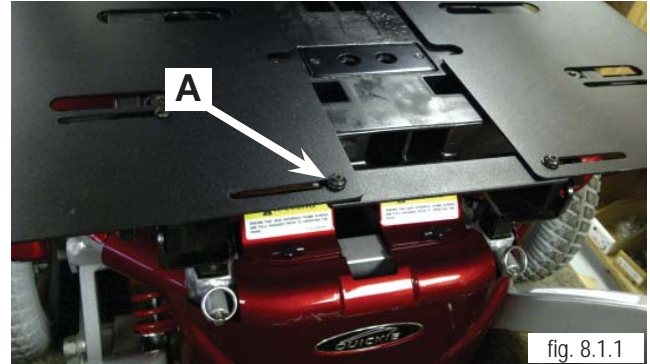
Section 8

Adjustment procedures

Seat/Back Width adjustment

Note: The same procedure is used for the 18" - 22" wide seating system

ASAP II Seating 16" - 20" wide is shown. The ASAP II seating system is fully adjustable to allow changes from 16" to 20" or 18" - 22". This requires a frame weldment and seat pan plates adjust for seat growth. The picture shown in (figure 8.1.1) has a seat width of 20". This detail shows how easy it is to change back to 16" wide.



To make seating width adjustments follow the following steps:

1. Have 3mm – 4mm – and 5mm Hex keys available for the adjustments.
2. Loosen (do not remove) all of the M5 Button Head Cap bolts (A) (figure 8.1.1). with a 4mm Hex key, or a T-handle Hex key so that the plates can slide for adjustment.
3. Using a 5mm Hex key, remove the socket head cap screws (figure 8.1.2) that attach the left and right wings to the seat frame.
4. Remove the 5mm socket head bolts with a Hex key that are used to hold the bottom of the seat pan in place (figure 8.1.3) – totally remove from its position so that seat pan plates can slide for adjustment.



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5. Remove the nut, and bolt that secures the rear towel bar using a 4mm Hex Key and a 13mm open end wrench or ratchet as shown in (figure 8.2.1).



6. Loosen the Back bracket on the chair to allow for changes to the seat width. (figure 8.2.2).



NOTE: It is recommended to use the back width to accommodate the user, for example – 16 with 16 wide – 18 with 18” wide. If, however there is a $\frac{1}{2}$ “ adjustment needed, the brackets in (figure 8.2.2) show that a $\frac{1}{2}$ ” change equals a 1” accomadation to the user .

7. Using a 5mm Hex Key and either a 13mm open end wrench or ratchet., Remove the nuts and bolts from the back bracket attached to the back cane assembly (figure 8.2.3) and adjust as necessary.



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8. After checking alignment, symmetry, and measurement of the final adjustment change, (figure 8.3.1) the nuts and bolts can be re-tightened in the reverse order of the steps listed. Make sure all bolts are tightened to appropriate specifications.



Legrest adjustment

Long or Short Center-Mount adjustment

1. To perform a Legrest adjustment (figure 8.3.2) the following tools are required: A 5mm Hex Key, and a 13mm open end wrench and/or ratchet.



2. Loosen all 3 sets of bolts/nuts as shown in (figure 8.3.2) and (figure 8.3.3) using the 5mm hex key and 13mm open-end wrench or ratchet. Move the footrest extension, and calf pads to the desired fit locations. Double-check fit with client before fully tightening the hardware.



Section 8

3. There are 5 sets of holes as seen on the front bars (A), and 6 sets of holes as seen on the centerpost (B) (figure 8.4.1) Bolts can go through any of these holes to give adjustability of up to 6 inches from top to bottom. To extend the front arms further, simply loosen 5mm size SHCS screws and move the bars further forward, then retighten.

4. Once desired height is achieved, Reset placement of bolts then tighten with 5mm Hex key and 13mm wrench. Tighten to correct torque specifications (figure 8.4.1)



Caution: Allow at least 2" of Ground Clearance when making adjustments to the legrest, and footplate assembly.

Powered Center-Mount Legrest adjustment

1. To perform Legrest adjustments (figure 8.4.2) Operation of the 4-way switch is detailed below.



NOTE: It is also possible to perform these operations with the thru Drive using the joystick.

2. Right Command (2) - Controls the raising and lowering of the leg on the center mount.

3. Reverse Command (3) - Operates both raising and lowering Center Mount, plus extension of the legrest (figure 8.4.3)



Section 8

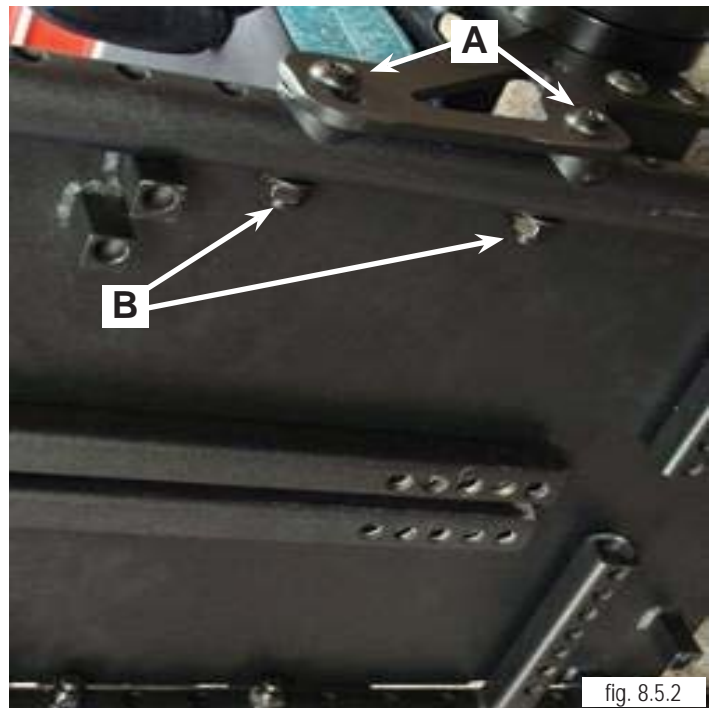
4. Left Command (4) - Operates extension of leg outward and inward. Actuator is shown, (fig 8.5.1)



Back-rest Angle Adjustment

1 Make sure you have the right tools- 5mm Hex Key, and 13mm open end wrench and/or ratchet.

2. Loosen the 2 BHCS bolts (A) (figure 8.6.1) with a 5mm Hex key and use 13mm open end Wrench for the nuts (B).



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Note: Take care not to lose the saddles, or plastic washers between Bracket and seat rail while performing the next step.

3. To make a small angle change to one of four possible settings, (-4°, 0°, 4°, 8°) pull bolt out and change the position of the front edge bracket. (figure 8.6.1) Then re-attach the nut and tighten bolt into place. make sure plastic saddles and washers are in place behind the bracket.



Seat-Height Adjustment

Front Bracket Seat height adjustment

1 The QM-710 has 4 Seat-height positions. Use a 6mm Hex Key or 6mm socket to remove a single threaded bolt (A) on each side and adjust the seat height. (figure 8.6.2)



Note: Please reference "Seat Height Adjustment Matrix" in Section 9 of this manual for correct adjustment of both the Front and Rear Brackets.

2. Once you have the correct seat height re-insert the threaded bolt. Make sure that the other front bracket has been adjusted the same amount before tightening the bolts. (figure 8.6.3)



Section 8

Rear Bracket Seat height adjustment

1 The adjustment can be done by removing the rear shroud (See rear shroud removal section 8) and the Bluetooth module, if present.

The rear bolts are inserted on the inside of brackets and are adjusted to 1" increments. (figure 8.7.1)

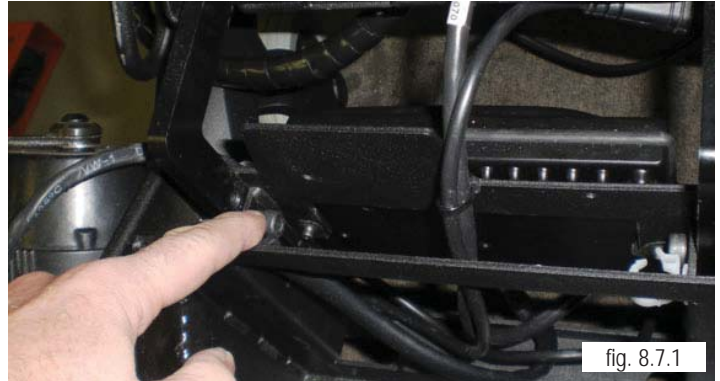


fig. 8.7.1

2. Once you have the correct seat height, on both sides, re-insert the threaded bolt and tighten (figure 8.7.2)

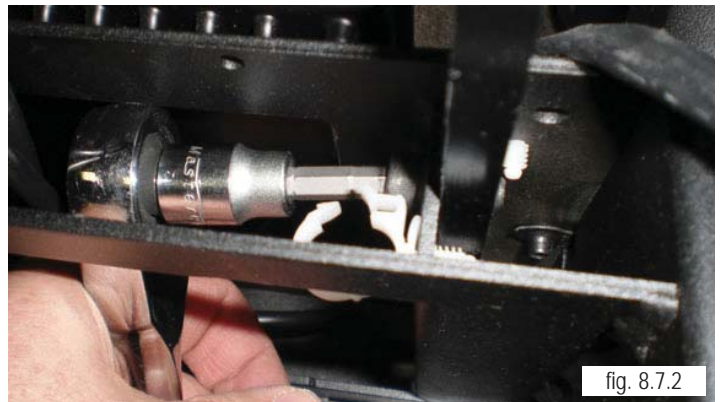


fig. 8.7.2

Recline - Adjustments and Procedures

Seat-back Angle adjustment

1 The upright seat-back angle is set by the programming. To adjust the upright Seat-back angle, request a programming file from Sunrise Technical Services. No mechanical procedures are required.

Pivot point adjustment

1 The pivot point (seat/back height) may be moved up in the seat/back bracket. The factory setting is 4" measured from the top of the seat-pan to the pivot point. This may be adjusted up in 3/4" increments (figure 8.7.3)

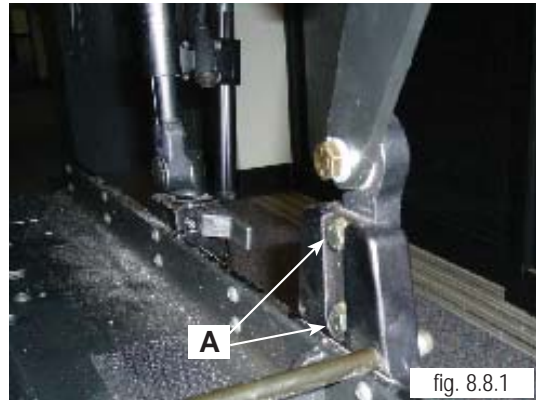


fig. 8.7.3

Note: If the pivot point is raised, the gas strut and Recline actuator must be raised an equal amount, refer to step 4.

Section 8

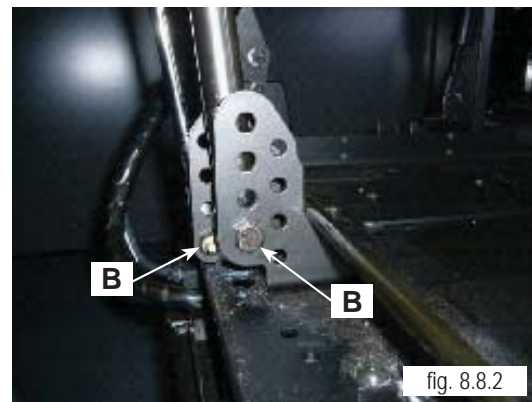
2. Use a 7/16" socket and ratchet to remove the bolts holding pivot point (A). Raise it to the desired location.(figure 8.8.1)



Note: If the pivot point is raised, it is suggested to replace the back pan with a larger pan to decrease the gap from the bottom of the back to the seat-pan.

3. Re-insert and tighten the bolts securing the pivot point. (figure 8.8.1)

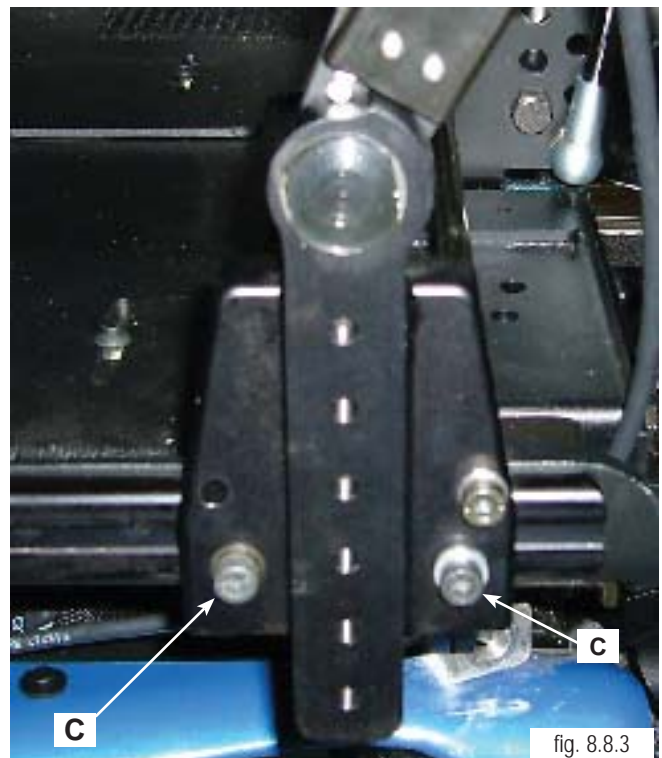
4. As the pivot point is raised, the recline actuator and gas strut must be raised an equal amount. Do this by removing the mounting bolts (B) to raise the units. (figure 8.8.2)



Seat-back depth adjustment

6. Seat-back depth is adjusted by moving the mounting brackets to the front or the rear, in the seat-pan track. (figure 8.9.1)

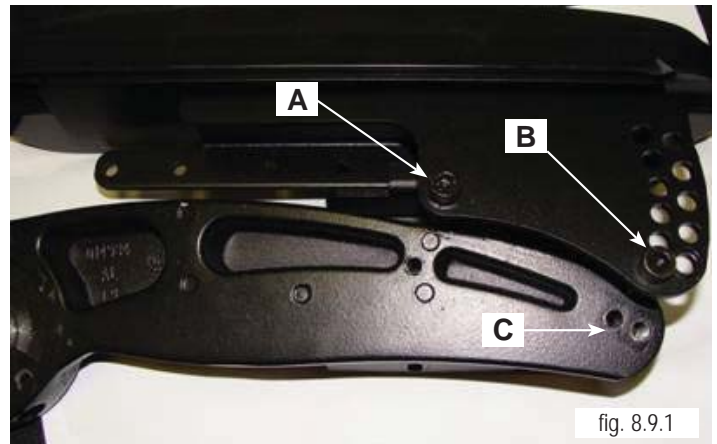
7. Loosen the two mounting bolts (C) and slide the bracket to the desired location. There are recessed holes in track for Seat depth as well. (figure 8.8.3)



Section 8

Cantilevered Armrest adjustments

1. The Kids Cantilevered Armrest angle adjust range is from 0° to 40° in 5° increments. To adjust the armrest angle up or down, loosen the pivot bolt (A) and unscrew the 5mm bolt (B) using a Hex key (figure 8.9.1) Adjust as necessary, using either the inside or outside bolt hole (C) and then re-tighten bolts to specifications.



2. Height adjustment for the armrest also utilizes the 5mm Hex Key. Loosen the bolt as shown in (figure 8.9.2) and move the armrest up or down. Once desired height is achieved, re-tighten the bolts on both sides to specifications



3. For User-in-chair angle adjustments, Loosen the set screw with a 5mm Hex Key as shown in (figure 8.9.3). adjust the armrest angle and then tighten the set screw at desired angle. (figure 8.9.4.

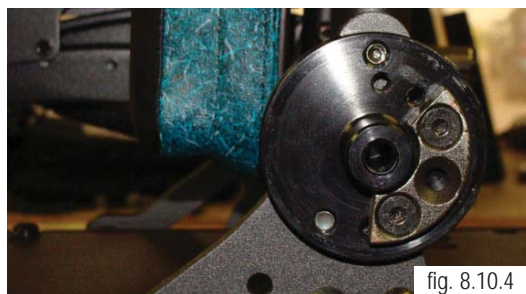


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3. For Extreme angle adjustments, remove the outside shell of the armrest casing using a 7mm Hex Key on the bolt as shown in (figure 8.10.1) and (figure 8.10.2)



4. For Extreme angle adjustments, remove the outside shell of the armrest casing using a 7mm Hex Key on the bolt as shown in (figure 8.10.3)



5. Remove the flathead socket screws holding the insert block in place and adjust as shown. The block can be set from 17° forward, or 15° rearward. Block placement in (figure 8.10.4), yields the result seen in (figure 8.10.5)



Section 9

Reference and Options

Non-expandable 3-Axis controls

1. 2-Axis box 4.5 and 7.0 AMP box used for Lift and Tilt (figure 9.2.1)



fig. 9.2.1

2. 3-Axis 7.0 AMP box used for Tilt and power legrests (figure 9.2.2)



fig. 9.2.2

3. 3-Axis 4.5 AMP box used for Lift and power legrests, and for HD Tilt (figure 9.2.3)



fig. 9.2.3

Section 9

Powered elevating or articulating legrest

VR2/R-Net Control

The actuator buttons can operate any factory approved actuator. Operation is dependent on what options are fitted to your wheelchair. To operate the legrests, seat tilt, seat lift or back rest recline follow the following steps

1. For VR2, Push one of the actuator buttons that has the seat icon on it to select actuator mode
2. Operate the joystick in the forward or rearward direction to move the desired actuator up or down.
3. Release the joystick when the desired angle is reached.
4. To return to drive mode press the actuator button again or Mode for R-Net.

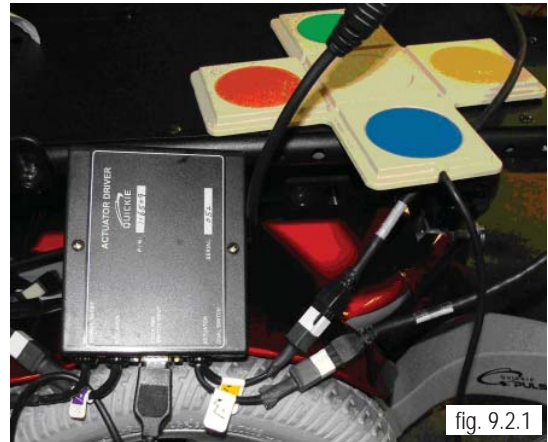


fig. 9.2.1



fig. 9.2.2

The Multi Axis box

(figure 9.2.1) has 3 settings available – with Toggling occurring in each of these settings. On this example below hitting the blue will cause combined legrest to extend – hitting yellow button will extend left mounted actuator and orange for right mounted actuator. Simply touch the switch for Right Leg and the leg will either extend outward or retract inward – once fully extended or retracted it is recommended to let go of switch.

(figure 9.2.2) shows all connectors to actuator are 6 pin molex connectors. The lead (A) going back for power connects to the control module as shown below via OBCport (figure 9.2.3)

The test for power can be done quite simply by removing connector from actuator and hooking up Multi meter to pins shown. (figure 9.2.4) connection prior to depression of switch.

(figure 9.2.5) shows depression switch and what meter will read.

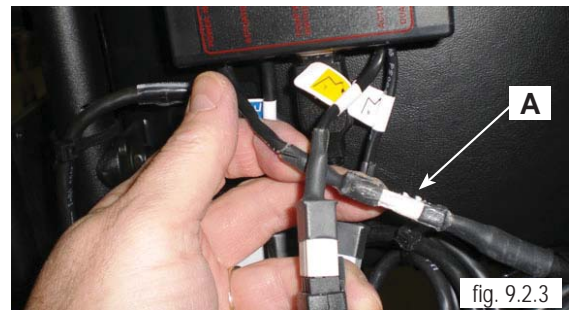


fig. 9.2.3



fig. 9.2.4

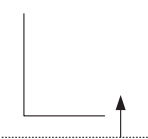
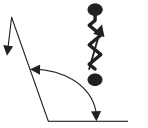
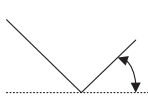



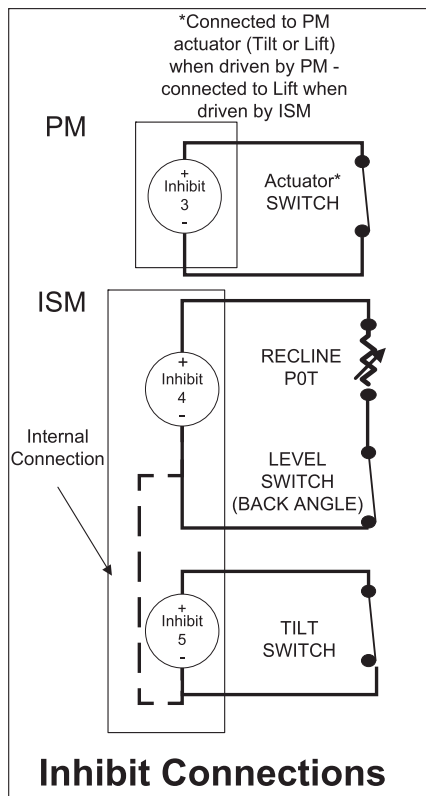
fig. 9.2.5

Section 9

Reference: Inhibit scheme













INHIBIT SCHEME

	Drive Inhibits			R-net PM driven Tilt or Lift Actuator Inhibits	ISM Actuator Inhibits			
	VR2	R-net w/o ISM	R-Net with ISM		Tilt	Recline	Shear	Lift
Lift Switch 	Inhibit 3 Inhibit when switch opens (Band 3)	Inhibit 3 Inhibit when switch opens (Band 3)	Inhibit 3 Inhibit when switch opens (Band 3)	None	Inhibit 3 Away Inhibit when switch opens (Band 3)	Inhibit 3 Away Inhibit when switch opens (Band 3)	Inhibit 3 Away Inhibit when switch opens (Band 3)	None
Recline Angle Pot / Level Switch 	N/A	N/A	Inhibit 4 Inhibit when angle > stability threshold and/or level switch opens (Band 2 or Band 3)	N/A	Inhibit 4 Away Inhibit when angle > away limit and/or level switch opens (Band 3)	Inhibit 4 Away Inhibit when angle > away limit and/or level switch opens (Band 3) Home Inhibit when angle <= Home limit (Band 0)	Inhibit 4 Away Inhibit when angle > away limit and/or level switch opens (Band 3)	Inhibit 4 Away Inhibit when angle > home and/or level switch opens (Band 1, Band 2 or Band 3)
Tilt Angle Switch 	Inhibit 3 Inhibit when switch opens (Band 3)	Inhibit 3 Inhibit when switch opens (Band 3)	Inhibit 5 Inhibit when switch opens (Band 3)	None	None	None	None	Inhibit 5 Away Inhibit when switch opens (Band 3)
SHORTING PLUG (7.5 KOhm) 	None	Inhibit 3 Inhibit if not installed. (Band 1 or Band 2) Required only if no actuator connected	Inhibit 3 Inhibit if not installed. (Band 1 or Band 2) Required only if no actuator connected Inhibit 5 Inhibit if not installed. (Band 1 or Band 2) Required only if no tilt connected	Inhibit 3 Away Inhibit if not installed. (Band 1 or Band 2) Required only if no actuator connected	Inhibit 3 - None Inhibit 5 Away Inhibit when installed. (Band 1 or Band 2) Required only if no tilt connected	None	None	Inhibit 3 Away Inhibit if not installed. (Band 1 or Band 2) Required only if no Lift connected
Drive inhibit value dependent on user weight. The inhibit scheme on following pages for details.								



Section 9

Reference: R-NET Joystick & Omni Display Symbols

 Restart	When the control system requires a reboot this system will be flashing. Recycle power
 Motor Temperature	This symbol is displayed when the control system has intentionally reduced power to the motors in order to protect them against heat damage. (thermal rollback)
 Control System Temperature	This symbol is displayed when the control system has intentionally reduced its own power in order to protect itself against heat damage.
 Timer	This symbol is displayed when the control system is changing between different states. An example of this would be entering into programming mode. This symbol is animated to show the sands falling.
E-Stop  E-Stop	If the control system is programmed for latch drive or actuator operation, then it is normal for an emergency stop switch to be connected into the external profile switch jack (user switch). If the emergency stop switch is operated or disconnected, this symbol will flash.
 Environmental	This icon will appear when the environmental mode is entered.
 BlueTooth	This icon will appear when Bluetooth mode is entered.
 In Focus	When the control system contains more than one method of direct control, such as a secondary joystick module or a dual attendant module, then the module that has control of the wheelchair will display the Focus symbol.
 Speed Limit	If the speed is being limited, for example by a raised seat, then this symbol will be displayed.
 Latched	When the control system is operated in a latched condition this symbol will be displayed.
 Sleep	This symbol is displayed when the R-net has gone into sleep mode.
 Control System Locked	The control system can be locked in one of two ways. 1. using a physical key 2. using a key sequence How the control system is locked depends on how the chair is programmed.

Section 9

Reference: Seat Height Adjustment Matrix

CHAIR			Configuration	STFH Position											Seat Frame Angle (deg)	
				Low			+1			+2			+3			
				STFH (in)	Front/Rear Post Position	Packer Bracket Position	STFH (in)	Front/Rear Post Position	Packer Bracket Position	STFH (in)	Front/Rear Post Position	Packer Bracket Position	STFH (in)	Front/Rear Post Position		Packer Bracket Position
ASAP II																
QM710	QM715	QM720	No Module	17.3	1 / A	1st hole	18.3	2 / B	1st hole	19.3	3 / C	1st hole	20.3	4 / D	1st hole	0°
X	X	X	Tilt Module	18.3	1 / A	N/A	19.3	2 / B	N/A	20.3	3 / C	N/A	21.3	4 / D	N/A	
X	X	X	Tilt Module - HD	18.6	1 / A	N/A	19.6	2 / B	N/A	20.6	3 / C	N/A	21.6	4 / D	N/A	
X	X	X	Lift Module	18.8	1 / A	N/A	19.8	2 / B	N/A	20.8	3 / C	N/A	21.8	4 / D	N/A	
X	X	X	Lift/Tilt Combo	21.2	1 / A	N/A	22.2	2 / B	N/A							
X	X	X	No Module	18.3	2 / A	1st hole	19.3	3 / B	1st hole	20.3	4 / C	1st hole	21.3	5 / D	1st hole	
X	X	X	Tilt Module	19.3	2 / A	N/A	20.3	3 / B	N/A	21.3	4 / C	N/A				
X	X	X	Tilt Module - HD	19.6	2 / A	N/A	20.6	3 / B	N/A	21.6	4 / C	N/A				
X	X	X	Lift Module													
X	X	X	Lift/Tilt Combo													6°
X	X	X	No Module	19.3	3 / A	1st hole	20.3	4 / B	1st hole	21.3	5 / C	1st hole				
X	X	X	Tilt Module													
X	X	X	Tilt Module - HD													
X	X	X	Lift Module													
X	X	X	Lift/Tilt Combo													
X	X	X	No Module	20.3	3 / A	2nd hole	21.3	4 / B	2nd hole							9°
X	X	X	Tilt Module													
X	X	X	Tilt Module - HD													
X	X	X	Lift Module													
X	X	X	Lift/Tilt Combo													
Power Recline Seating																
QM710	QM715	QM720	No Module	16.1	2 / B	1st hole	17.1	3 / C	1st hole	18.1	4 / D	1st hole	19.1	5 / E	1st hole	0°
X	X	X	Tilt Module	17.1	1 / A	N/A	18.1	2 / B	N/A	19.1	3 / C	N/A	20.1	4 / D	N/A	
X	X	X	Tilt Module - HD	17.4	1 / A	N/A	18.4	2 / B	N/A	19.4	3 / C	N/A	20.4	4 / D	N/A	
X	X	X	Lift Module	17.6	1 / A	N/A	18.6	2 / B	N/A	19.6	3 / C	N/A	20.6	4 / D	N/A	
X	X	X	Lift/Tilt Combo	20.0	1 / A	N/A	21.0	2 / B	N/A	22.0	3 / C	N/A				3°
X	X	X	No Module	17.1	3 / B	1st hole	18.1	4 / C	1st hole	19.1	5 / D	1st hole	20.1	6 / E	1st hole	
X	X	X	Tilt Module	18.1	2 / A	N/A	19.1	3 / B	N/A	20.1	4 / C	N/A	21.1	5 / D	N/A	
X	X	X	Tilt Module - HD	18.4	2 / A	N/A	19.4	3 / B	N/A	20.4	4 / C	N/A	21.4	5 / D	N/A	
X	X	X	Lift Module													6°
X	X	X	Lift/Tilt Combo													
X	X	X	No Module	18.1	4 / B	1st hole	19.1	5 / C	1st hole	20.1	6 / D	1st hole	21.1	6 / D	2nd hole	
X	X	X	Tilt Module													
X	X	X	Tilt Module - HD													
X	X	X	Lift Module													
X	X	X	Lift/Tilt Combo													9°
X	X	X	No Module	19.1	4 / B	2nd hole	20.1	5 / C	2nd hole	21.1	6 / D	2nd hole				
X	X	X	Tilt Module													
X	X	X	Tilt Module - HD													
X	X	X	Lift Module													
X	X	X	Lift/Tilt Combo													

