INVACARE®

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CONTENTS

INTRODUCATION

This manual is intended for use by trained and approved Service Agents to repair Invacare powered wheelchairs. Models covered in this manual are-

Sufficient trouble-shooting information in provided to allow servicing to major component level. Brief descriptions of operation and motor construction are included a background information. However, it is recommended that faulty battery chargers and motors are returned to Invacare for replacement. Controllers should be returned to Penny & Giles as per the recommended procedure.

APPLICATION

Invacare power chairs enable those who have an impaired mobility to lead a full and independent life. They are designed to give safe and reliable service when used under normal use (as instructed in the Owner's Manual).

Careful use, dry storage and regular maintenance will contribute to long and reliable service. Prolonged exposure to, or operation in, harsh weather conditions is not recommended.

For further application information, consult the Owner's Manual. There are also several user adjustments explained in the Owner's Manual.

SAFETY FEATURES

Invacare power chairs have a high level of features designed to increase safety, including:-

Electronic/Dynamic Braking

The power chair will brake the motor and charge the battery automatically when decelerating or going downhill. Excessive speed while coasting downhill is therefore prevented and range maximized.

Fail-Safe Solenoid Brakes

Whenever the power chair is stationery or switched off, the brakes are automatically applied. They operate promptly when the joystick is released and returned to the central position. They will reduce roll-back on ramps and hills to a minimum.

WARRANTY

Warranty terms and conditions and recommended procedures are outlined in this Technical Service Manual. Individually applied warranties are included in the User Manual.

RECOMMENDED SERVICE PROCEDURE

At 6 month period

The following schedule should be used in conjunction with Service Programme Sheet.

1 Upholstery

Check seat fittings and screw fasteners on back, seat and armpad assemblies and for upholstery wear.

2 Control Module

On/Off Switch:	Press switch down and up several times, making sure the display is illuminated and switch is operating smoothly.
Output Wiring:	Check the output socket is located into the control module and is secure. Visually check output cable for damage or incorrect route through framework.
Speed Control:	Inspect speed control knob and fixing. Operate speed control making sure output speed of motors is proportional to switch position.
Joystick Control:	Visually inspect the joystick control knob, shroud and gaiter. Operate the joystick through all the driving modes.
Mounting	Make sure control module is correctly fitted to armrest. Check position of joystick to customer requirements.
Warranty Seal	Inspect the control module to see if the manufacturer's seals are intact.

3 CASTORS

Stem Bearings	Check stem bearings for free play and end float. adjust as necessary.
Wheel Bearings	Rotate wheel and check bearings for excessive play or noise.
Fork & Axle	Check axle bolts and nuts for tightness. Inspect fixing of fork to stem.
Tyres	Inspect for damage or foreign objects. Test pressure (pneumatic) as indicated or tyre wall.

4 FRAME

Foot/Legrests:	Check chrome or paint finish. Inspect action of cam lock and fittings. Adjust and tighten footrest position. Check hinging of footplates. Apply WD4O. inspect operation of legrest elevation and calf pad movement.
Anti-Tip Levers:	Check fixing and operation. Make sure wheel is in position on stop bar. Apply WD4O.
Armrests:	Inspect all fittings and screws. Ensure arm locates into sockets smoothly. Check operation of locking devices. Ensure controller moves freely in slide tube. Check for correct position of stop screw. Check sidepanels for correct position and wear.
Semi-reclining Backs	check fittings and forward folding/detachable operation. On powered reclining backs check function and mounting of actuator. Inspect cable and hand unit. Check backpost mounting brackets for tightness. Ensure both sides are in same position.

5	BATTERIES	
	Battery Box	Inspect battery box and lid, ensure lid is secure.
	Batteries:	Check battery terminals are tight, clean and apply silicon grease or petroleum jelly.
	Junction Box if fitted (Powered actuators)	Check mounting of junction box to battery box. Inspect wiring harness form junction box to actuator module. Inspect drive plug for function and fit. Check operation of circuit breaker. Check motor socket fittings.
	Control Main Module (Remote):	Check mounting of controller output module to battery box tray. Check multi-pin connector for fit. Make visual inspection of main module for damage. Inspect warranty seal. Check rear battery tray fittings, ensure secure mountings.
6	MOTORS	
	Mountings:	Isnpect motor mountings and fittings. Check function of detach facility and securing of release knob.
	Armature Brakes	Lift rear of chair and mount on blocks. With the drive engaged run motors, return control lever to the central position and Observe operation of brakes. Blow out dust from brake lining.
	Wiring & Connections	Check connections to battery box, make sure the latches are holding the sockets and plugs in position inspect wiring and attachment to frames.
	Brushes	Remove brush cover from sides of motors, observe position of brush in holder. Re-locate in same position. Run motors with drive disengaged and observe brush contact with armature. Blow out carbon deposits.
7	FINAL DRIVE	
	Disengage Mechanism	With wheels raised from the ground engage and disengage final Drive, check for positive re-engagement of drive. Lubricate.
	Drive Shaft:	Revolve wheel assembly with drive disengaged and check for excessive endfloat and bearing wear.
	Wheel Runout	Revolve wheels, checking for excessive ‘tow in and excessive side movement of rims. Check for rim damage,
	Tyres	Check tyres for damage and foreign objects. Test pressure (pneumatic) as indicated on the tyre wall.
8	KERB CLIMBER	
	Operation	Check kerb climber on its mounting on the chair, and cam lock operation. Operate forward and return position. Ensure climbing foot is clear of the ground in normal parked position.
	Mounting	Locate the kerb climber to the locating pins, check the locating pin is locking the kerb climber into position. Lubricate with WD4O.
9	CHARGER	
	Mains Plug	Check for any damage to pins or case, inspect cable and entry into charger. Check correct fuse rating (5 amp)

	Jackplug	Inpect plug and lead for damage. Check entry into charger.
	Charging Function	Connect the jackplug into the charging socket, plug the mains plug into the normally used mains socket. Switch mains supply on, and check that the 'mains on light illuminate. The green 'charging light will come on some seconds after this. Because of the length of time involved in the full charging sequence, it is not possible to check the complete charging function. As the owner whether the charger has been completing its charge programme, through to the red charge complete light illuminating.
10	TEST RUN	A short test run should now be carried out to test the driving functions of the chair. If a kerb climber is fitted this also should be tested.

RECOMMENDED SERVICE PROCEDURE.

At 12-18 month period

The following schedule should be used in conjunction with the Service Programme Sheet and Technical Manual.

1 Upholstery

Check seat fittings and screw fasteners on back, seat and armpad assemblies and for upholstery wear.

2. Control Module

On/Off Switch	Press switch down and up several times, making sure the display is illuminated and switch is operating smoothly.
Output Wiring	Check the output socket is located into the control module and is secure. Visually check output cable for damage or incorrect route through framework.
Speed Control	Inspect speed control knob and fixing. Operate speed control making sure output speed of motors is proportional to switch position.
Joystick Control	Visually inspect the control lever knob. Shroud and gaiter. Operate the joystick through all the driving modes.
Mounting	Make sure module is correctly fitted to armrest. Check position of joystick to customer requirements.
Warranty Seal	Inspect the control module to see if the manufacturer's seals are intact.

3. CASTORS

Stem Bearings	Check stem bearings for free play and end float. Replace upper and lower bearing each side.
Wheel Bearings	Rotate wheel and check bearings for excessive play or noise.
Fork & Axle	Check axle bolts and nuts for tightness. Inspect fixing of fork to stem.
Tyres	Inspect for damage or foreign objects. Test pressure (pneumatic) as indicated on tyre wall. Replace is excessive wear.

4. FRAME

Foot/Legrests.	Check chrome or paint finish. Inspect action of cam lock and fittings. Adjust and tighten footrest position. Check hinging of footplates. Apply WD4O to moving parts. Inspect operation of legrest elevation and calf and movement.

Anti-Tip Levers	Check fixings and operation. Make sure wheel is in position. Replace if missing or damaged.
Armests	Inspect all fittings and scews. Ensure arm locates into sockets smoothly. Check operation of locking devices. Ensure controller moves freely in slide tube. Check for correct position of stop screw. Check sidepanels for correct position and wear.
Semi-reclining Backs	Check Fittings and forward folding/detachable operation. On powered reclining backs check function and mounting actuator, inspect cable and hand unit. Check backpost mounting brackets for tightness. Ensure both sides are in same position.
Crossbar: Check Crossbar	Centre fixing is not overtightened. Lubricate at hinge points to sideframe using WD4O.

5. BATTERIES.

Batteries:	Check batteries for capacity. Replace if below specification.
	Check battery terminals are tight. Apply silicon grease or petroleum jelly to terminals.
Battery Box	Inspect battery box and lid. Ensure lid is secure.
Junction Box if Fitted (Powered actuators)	Check mounting of junction box to battery box. Inspect wiring harness from junction box to actuator module. Check operation of circuit breaker. Check motor socket fittings.
Control Main Module (Remote)	Check Mounting of Controller output module to battery box tray. Check multi-pin connector for fit. Make visual inspection of main module for damage. Inspect warranty seal. Check battery tray fittings, ensure secure mountings. Check programme is correct.

6. MOTORS

Mountings	Inspect motor mountings and fittings. Check funtion of detach facility and securing of knob. Lubricate sliding contact.
Armature Brakes	Life rear of chair and mount on blocks. With drive engaged run motors return control lever to the central position and observe operation of brakes. Blow out dust from brake lining.
Wiring & Connections	Check connections to battery box, make sure the latches are holding the sockets and plugs in position. Check for discolouration and burning of contacts (evidence of poor contact replace if burning excessive). Inspect wiring and entry to motor brake up.
Brushes	Remove brush covers from sides of motors, observe position of brush in holder. Re-locate in same position. Run motors with drive disengaged and observe brush contact with armature. Blow out carbon deposits, replace brushed if less than 8mm in length.

7. FINAL DRIVE

Disengage Mechanism	With wheels raised from the ground engage and disengage final drive, check for positive re-engagement of lever

	Drive Shaft	Revolve wheel assembly with drive disengaged and check for excessive endfloat and bearing wear.
	Wheel Runout	Revolve wheels checking for excessive 'tow in and excessive side movement of rims. Check for rim damage.
	Tyres	Check tyres for damage and foreign objects. Test pressure (pneumatic) as indicated on the tyre wall. Replace if treadless. **CAUTION**: Split rim wheel.
8.	KERB CLIMBER	
	Operation	Check kerb climber on its mounting on the chair and cam lock operation. Apply WD4O. operate forward and return position. Replace rubber feet if excessively worn. Ensure foot is clear of the ground in normal parked position.
	Mounting	Locate the kerb climber to the locating pins, check the locating pins is locking the kerb climber into position.
9.	CHARGER	
	Mains Plug	Check for any damage to pins or case. Inspect cable and entry into charger. Check fuse rating fitted to plug (5amp). Check fuse rating at rear of charger.
	Charger Plug	Inspect plug and lead for damage. Check entry into charger. Replace if loose in socket. (check for contact discolouration).
	Charging Function	Connect the charger plug into the charging socket, plug the mains plug into the normally used mains socket. Switch mains supply on and check that the mains on light illuminates. The green charging light will come on some seconds after this. Because of the length of time involved in the full charging sequence, it is not possible to check the complete charging function. Ask the owner whether the charger has been completing its charge programme, through to the red 'charge complete' light illuminating.
10.	TEST RUN	A short test run should now be carried out to test the driving functions of the chair. If a kerb climber is fitted this also should be tested.

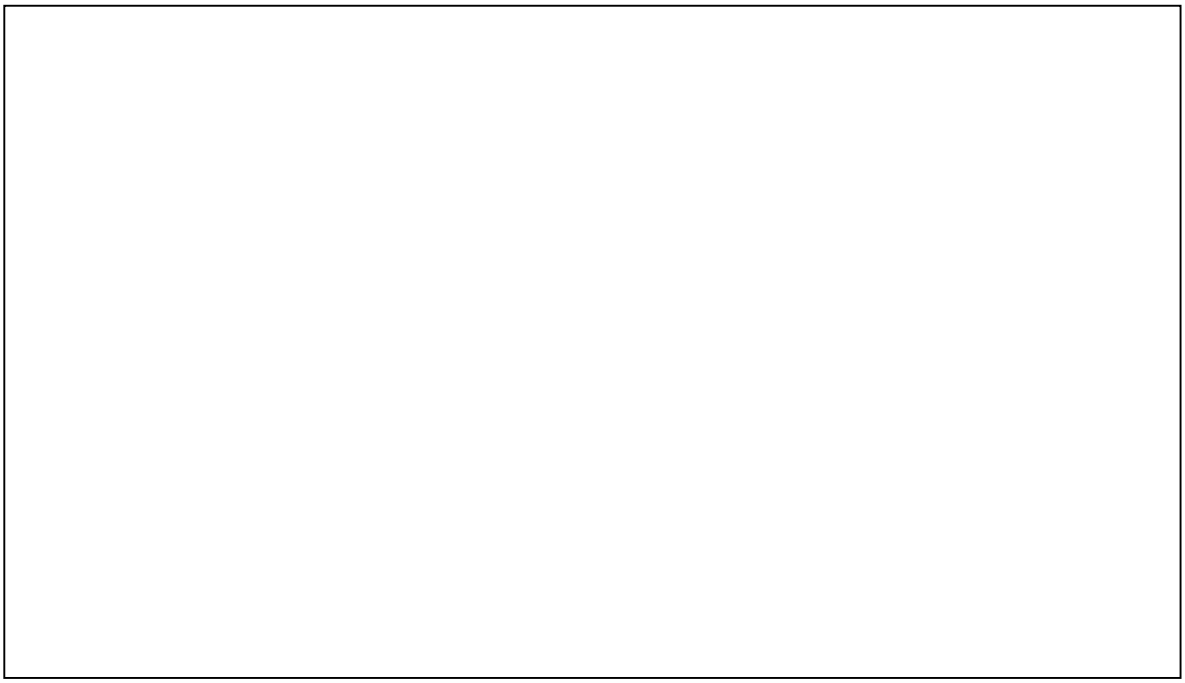
Invacare UK Limited Service Procedure	Serivce Programme
Dealer Name Address Customer (Mr/ Mrs / Miss Tel No. Type Of Serivce – Period Date Of Serivce Product Serial No. Comments/Recommendations Parts Replaced Qty Part Part No Cost Engineer Please Print Engineers Signature Customers Signature Date Start Time Finsh Date Parts Cost Approved Service Time 120	1. Uphlostery Back Seat Armpads Side Panels Safety/Calf Strap 2. Control Moudles On/Off Display Output Wiring Speed Control Joystick Mounting Warranty Seal Charger Socket 3. Castors Stem/Bearing Wheel Bearings Fork & Axle Cross Brace 4. Frame Foot / Leg –Rests Anit – Tip Wheels Armrests / Supports Folding / Rec Back Corss Brace 5. Batteries Batteries/Terminals Battery Box Battery Leads Motor Sockets Output Leads 6. Motors Mountlings Armature Brakes Wiring & Connections Brushes 7. Final Drive Disengage Mechansim Freewheel Wheel Runout Rim Tyres – Pneumatic 8. Kerb Climber Mountlings Return Position Rubber Feet 9. Charger Mains Plug Charger Plug Charging Function 10. Function Run Test Run Information To Customer

DRIVE WHEEL REMOVAL

To remove the rear drive wheel for puncture repairs carefully follow these instructions.

Release the four bolts shown as A in the diagram. Check the tyres for wear and excessive, replacement is recommended.

The wheel is a split rim. It is important that the bolts securing the rims together are NOT released if the tyre pneumatic and INFLATED.



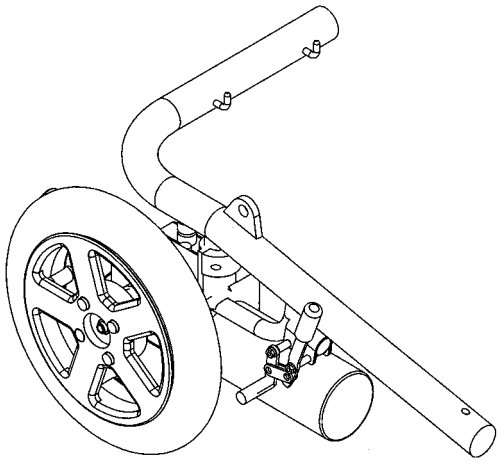
Upon re-assembly tighten the fixing bolts securely. The wheel is alloy. O not over tighten as this may damage the wheel rim.

If the tyre is being inflated with the wheel on the chair, ensure the wheel is off the ground during inflation the tyre slowly to recommended pressure, ensuring a even fit around the rim.

Drive Wheel-Locks – (Manual Brakes)

When transferring to and form the chair ensure the wheel locks are firmly ON and the motor drive is in the engaged position.

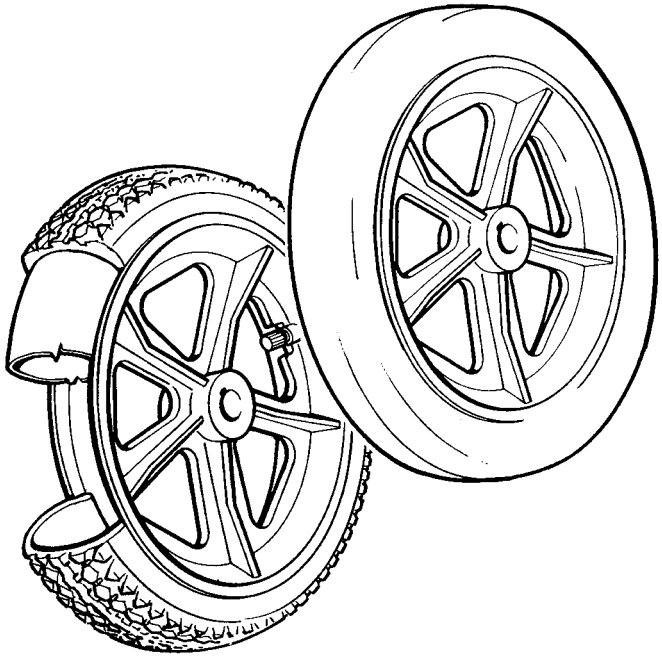
When transporting the complete chair in a vehicle, it is important that motor drive is engaged and the wheel-locks are firmly ON. This will aid the use of the chair restraints and protect the motor/gearbox from possible damage



REAR WHEEL AND TYRES

PARTS:

1. Tyre
2. Inner Tube
3. Wheel Centre
4. Solid Tyre Wheel
5. Screw
6. Washer



TOOLS REQURIED:

Spanner 13mm
Mallet
Tyre Levers
Pressure Gauge
Pump
Vice
Talcum Powder
Valve Remover
Flat Bladed Screwdriver

INSPECTION

STEP 1
Check wheel is not buckled or physically damaged. Replace if required.

STEP 2
Check tyres for wear and correct inflation. Both wheels should allow the same degree of wear (see side of tyre for pressure rating)

DISMANTLING

STEP 1
Jack up one of the gearboxes to life one wheel off the floor.

STEP 2
Remove the M8 wheel bolt with 13mm spanner.

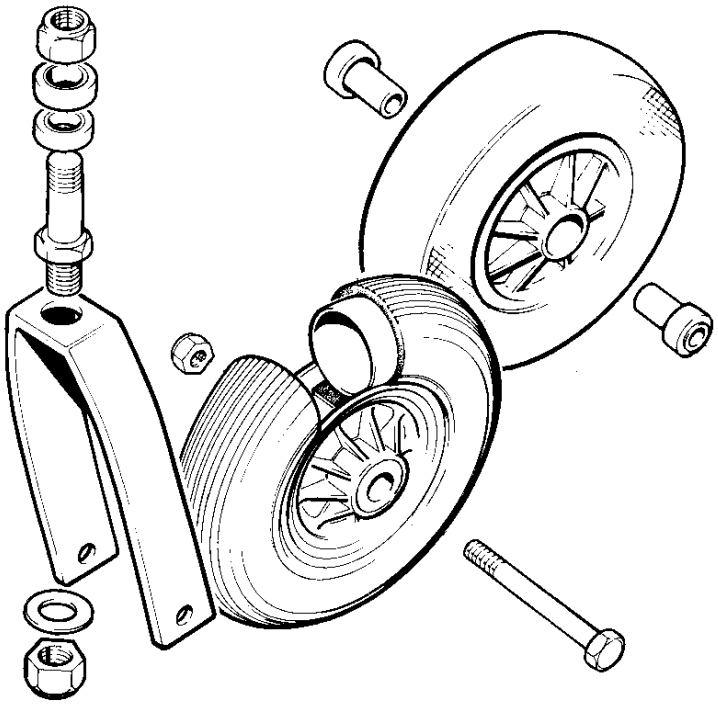
STEP 3
Gently tap the wheel centre with a mallet and pull the wheel off the gear box shaft (take care not to loose the key located in the gearbox shaft).

STEP 4 SOLID TYPE TYRE.

Visually inspect condition and wear of the tyre also inspect condition of the wheel center. If either are showing signs of excessive wear and damage, replace immediately. We recommended that you do not repair.

CASTOR WHEEL AND FORK

PARTS



1. Castor fork
2. Washer
3. Nyloc Nut
4. Axle Bolt
5. Nyloc Nut
6. Pneumatic Castor
7. Bearing
8. Trye
9. Inner Tube
10. Hub Centre
11. Castor Wheel
12. Fork Stem
13. Bearings

TOOLS REQUIRED

19mm Socket Spanner X 2
Flat Bladed screwdriver
Mallet
Pressure Gauge.
Tyre Levers
Pump Drift

INTRODUCTION

STEP 1
Check castor wheels are not bucked for physically damaged. Replace if required.

STEP 2
Check that the wheel bearings run freely without excessive play.

STEP 3
Check that the castor wheel and fork nuts are tight.

STEP 4
Check that the castor forks are bent or damaged.

STEP 5
Check the crown/castor fork bearings for wear and correct adjustment,

STEP 6
Check tyres for wear and correct inflation. Both wheels should show the same degree of wear (see side of tyre pressure rating) for tyre fitment see rear tyre section.

CASTOR WHEEL AND FORK

DISMANTLING

STEP 1
Remove castor socket cap with flat bladed screw driver, hold the lower fork stem nut secure with 19mm spanner and remove the upper fork stem nut,

STEP 2
Gently tap the threaded end to the fork stem with a mallet taking care not to damage the threads. Remove the castor fork assemblies.

STEP 3
Leave out the top fork bearings carefully, using the fork stem as a lever. Take care not to damage the threads.

STEP 4
Remove the castor fork bearings using a drift and a mallet, tapping gently to avoid damaging the castor socket and bearing.

STEP 5
To remove the castor wheels undo the axle nut with a 13mm spanner using a second spanner at the other end of the axle to lock against rotation. Remove the axle both and remove the wheel from the fork.

STEP 6
Remove the bearings by hand.

To reassemble reverse step 6 & 7, but adjust tightness of nut until the wheel runs freely to a gradual halt.

a) If the wheel stops abruptly, loosen the castor axle nut.
b) If the wheel wobbles (sideplay) tighten the castor axle nut enough to allow free spinning without sideplay.

TO RE-ASSEMBLE.

STEP 1
Insert the fork stem bearings using a mallet and drift across the bearing to prevent damage.

STEP 2
Start at the bottom and place the threaded and of the fork stem through both bearings and in the castor fork socket.

STEP 3
Locate fork stem out on the threaded with a 19mm spanner just enough to allow the fork to swivel freely.

STEP 4
To check for correct tightness, perform the following test:

a) Tip chair backwards and rest the push handles on the floor (remove the battery boxes first).

b) Raise castor wheel towards ceiling, then gently push downward to either side. The wheel and fork should freely rotate down and hang straight towards the floor after a pendulum- type swing>

NOTE
IF THE WHEEL STOPS ANGLED TO ONLE SIDE, LOOSEN THE FORK STEM NUT SLIGHTLY. IF THE WHEEL CONTINUES TO SWING TO BOHT SIDES (LIKE A PENDULUM), TIGHTEN THE FORK STEM NUT SLIGHTLY. CHECK BEARINGS FOR EXCESSIVE PLAY BY A GENTLY ROCKING THE FORK ASSEMBLY.

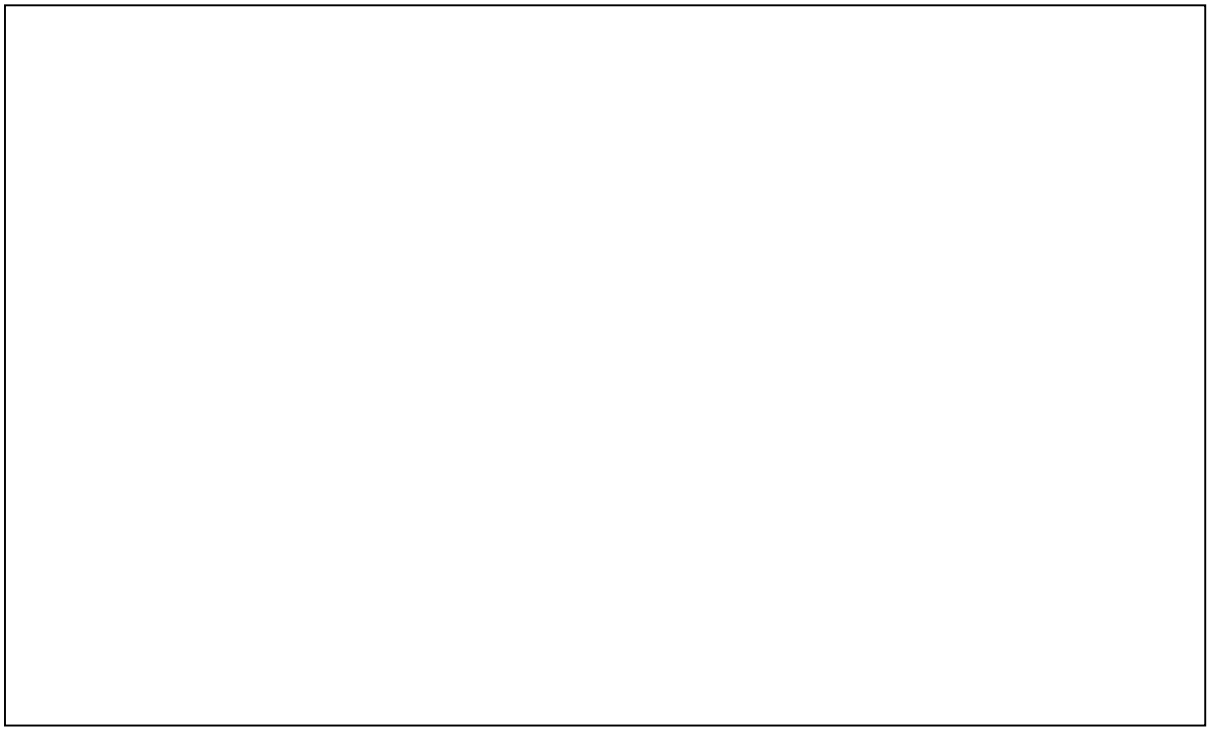
DETACHABLE MOTORS

For practical purposes and ease of operation, it is advisable to detach the motors as the last component of the chair to be dismantled and to re-attach first.

PLEASE NOTE: Assistance may be required while this operation is carried out.

STEP 1:
Unscrew the knurled locking knob A. This can be unscrewed completely and still be retained in position.

STEP 2:
Support the weigh of the chair on the side the motor is being detached. Pull the motor assembly towards of the chair, taking care to hold the motor assembly when it becomes detached. Repeat operation for both sides.



SPECIAL NOTE: Care must be taken when stowing the detached parts for transportation to ensure that no damage occurs, particularly to the brake housing and gearbox unit.

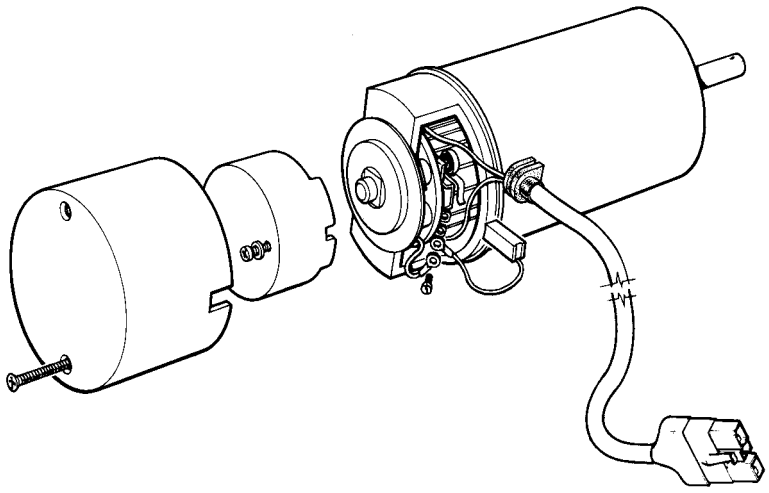
To re-attach the motor assemblies, align the bottom tube rail with the tube of the motor assembly and push firmly home. Ensure the locating pins B are aligned correctly and re-tighten fully the knurled locking knob A. Do the same for both sides.

For ease of operation, is advisable to re-attach the motor assemblies as the first operation in the re-assembly of the wheel chair after transportation.

NOTE: The disassembly and re-assembly of the motor assemblies can be handled and attached more easily if the chair is carefully tipped into the front, taking into account that the leg rests are not attached.

The chair can be transported disassembled safely in a suitable vehicle. Reversing the above procedures will make your chair ready at your destination.

MOTOR ASSEMBLY



PARTS:

1. Electro-magnetic Brake
2. Brush
3. Motor Plug
4. Motor Complete
5. Commutator
6. Motor End Cap

TOORLS REQUIRED

No 1 Philips Screwdriver
Flat Headed Screwdriver
Soldering Iron
Multi Meter
3mm Allen Key

INSPECTION

STEP 1
Check motor assembly for damage.

STEP 2
Set multimeter to continuity test.

STEP 3
Test continuity of motor leads and elector-magnetic brake leads (motor-lead shows in diagram). Brake resistance should read 50 ohms – 80 ohms.

STEP 4
Check all joints for bad connection, cracked or dry solder joints and oxidation.

STEP 5
Check that all the brushes can move freely in the brush guides with no obstruction (this can be easily done by pulling on the free brush feeder wire).

STEP 6
Check that all the brushed are not chipped, cracked or worn.

STEP 7
Check that the brush spring is positioned to the center of the brush body to apply even force. Also check the brush spring tension.

STEP 8
Check the condition of the brush feeder wire and check that the termination screws are secure.

STEP 9
Visually inspect the commutator for carbon deposits and remove with a soft brush.

NOTE:
ENSURE ALL THE SEGMENTS OF THE COMMUTATOR ARE NOT BRIDGED WITH CONDUCTIVE MATERIALS (I.E. CARBON OR COPPER)

Dismantling

STEP 1
Remove the motor end via the two Phillips screws.

STEP 2
Remove the two/three electro magnetic brake fixing screws and remove the brake.

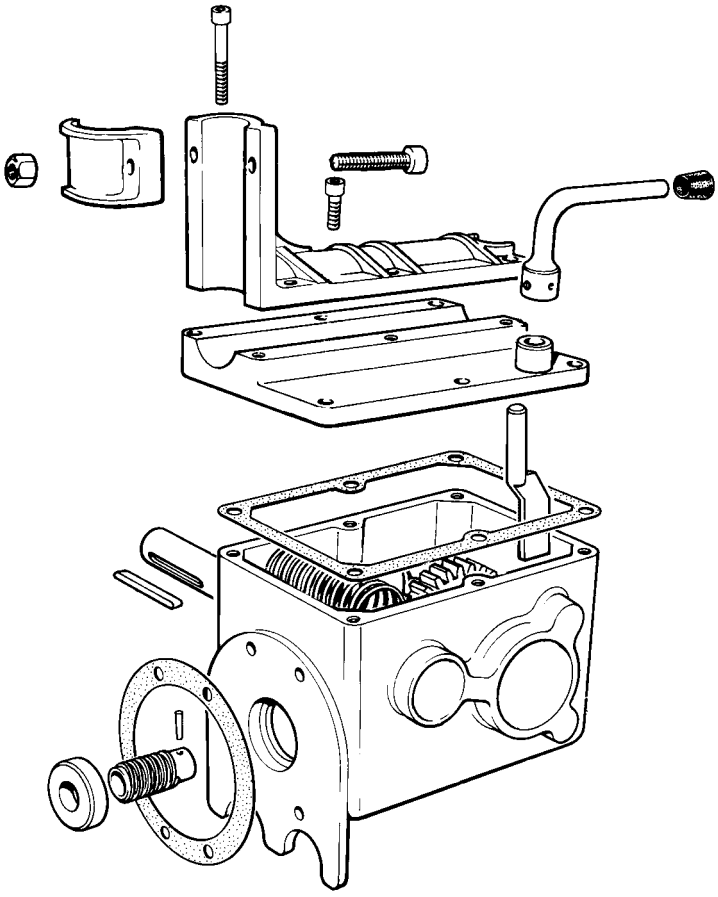
STEP 3
Remove the brush feeder wire termination screws, release the brush springs and remove brushes.

To reassemble reverse the step 1 to 4, taking care not to damage the brushes and ensure correct alignment of the electro-magnetic brake.
Should there be fitting, scoring or wear then replace the Motor Unit.

NOTE:
WHEN REFITTING MOTORS, PLEASE ENSURE THAT BOHT SUPPLY WIRES ARE FASTENED TO THE CONTROLLER IN SUCH A WAY THAT THE RIGHT HAND MOTOR CANNOT BE ACCIDENTLY CONNECTED TO THE LEFT AND VISA VERSA.

GEARBOX ASSEMBLY

PARTS



1. Motor Gearbox Clamp Nut
2. Gearbox Gasket
3. Declutching Lever Lower
4. Declutching Lever Upper
5. Gearbox Lid Screw
6. Motor Gearbox Clamp Screw
7. Lid to Gearbox Screw
8. Clamp
9. Key

TOOLS REQUIRED

5mm Allen Key
Pin Hammer
Punch
3mn Allen Key
Pliers
Vice
Spanner
8mm Spanner

INSPECTION

STEP 1
Check Casing for cracks or damage or leakages.

STEP 2
Check Gearbox for noises (gears and bearings).

STEP 3
Check the declutching lever and mechanism engages and disengages correctly.

STEP 4
Check that the output shaft of the gearbox is not damaged or bent. Remove the rear wheel and inspect the key and keyway for wear and correct fitting.

DISMANTLING

STEP 1
Remove the rear wheel from the gearbox.

STEP 2
Unplug the motor from the main control box. Loosen and remove the six gearbox lid securing screws. The lower half of the gearbox will now detach from the top half, whilst still attached to the side frame of the chair.

STEP 3
To dismantle the declutching lever upper and lower parts, remove the allen screw and knock out the fixing pin using a pin hammer and punch, separate the two halves.

STEP 4
To detach the gearbox from the motor, degrease the gearbox, remove the four fixing screws with an 8mmm spanner, taking care not to deface or damage any gear teeth. Separate the gearbox and motor assembly.

To reassemble reverse steps 1 to 4 ensuring correct motor to gearbox alignment is achieved. Replace both gasket and re-pack the gearbox with 'Shell Albida' Grease (approx. 200g)

NOTE:
TO REFIT THE DECLUTCHING LEVER THE GEARBOX TOP MAY NEED TO BY REMOVED FROM THE CHAIR AND A VICE USED TO CLAMP THE UPPER AND LOWER LEVERS IN PLACE.

SEAT AND BACKREST ADJUSTMENT

Before, sitting in the chair, make sure it is NOT switched ON. If it is ON, the battery condition indicator (10 Bar display) will be illuminated..

Seat Depth Adjustment – 35 Mm Depth Adjustmen

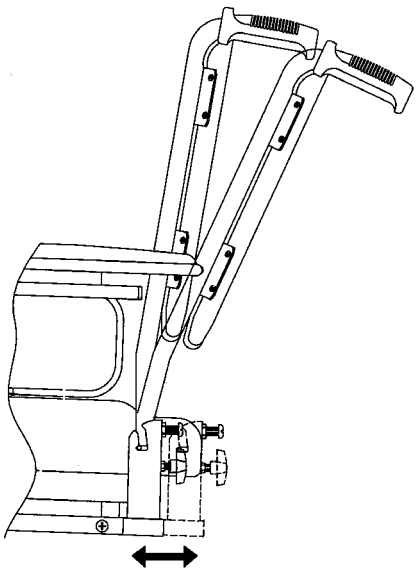
The individual fitting of the seating allows the seat depth to be adjusted by 25mm (1½") The adjustment, which is usually only done once, is carried out as follows, you will need a large cross-headed screwdriver and a 13mm spanner.

1. Prise off plastic cap at point A, unscrew and remove the screw and nut, repeat each side.
2. Move the backrest mounting bracket backwards to the extended position. Replace the nut and screw into the selected hole and firmly fasten, replace plastic cap, repeat each side.

Backrest Angle Adjustement

The backrest angle can be adjusted from 90° rearwards through 12°. The adjustment, which is normally only required to be done once, is carried out in the following sequence (see diagram) with the aid of the 12mm spanner and cross-headed screwdriver. Do the same adjustment for both sides.

1. Release the lock nut B located on the cross-headed screw
2. Unscrew the locking hand-wheel C partially out.
3. Screw the cross-headed screw in out to give the desired position. Adjust position of hand-wheel as necessary.
4. Position to lock B up to the mounting bracket and fully tighten.
5. Re-tighten the hand wheel C fully, ensure backrest assembly is secure.

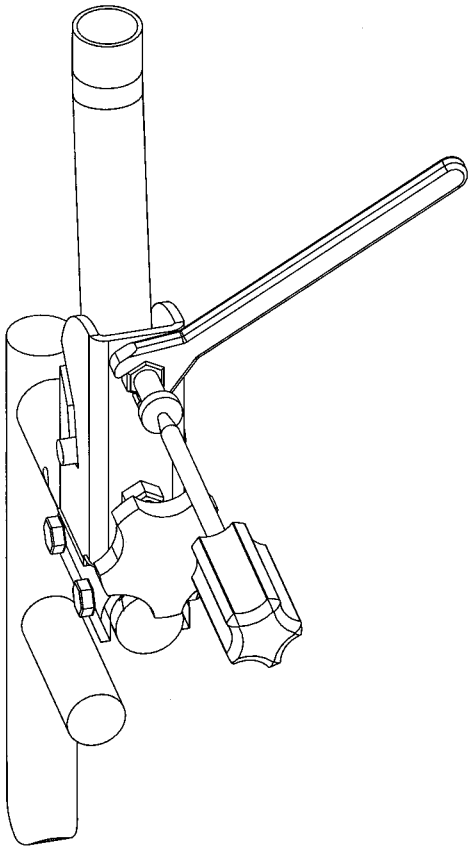


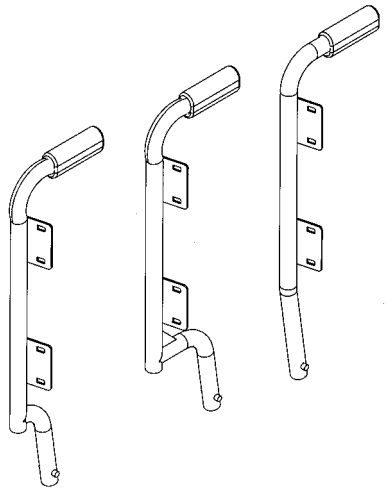
Please note: Each backrest tube must be positioned in the same plane or the backrest will be twisted. The backrest can be either folded down or detached from the chair base.

Follow these additional instructions:-

1. Unscrew the hand-wheel C approximately five full turns. Lift the backrest upwards and then fold forwards into the seat. Adjust armrest width to accommodate if required.
2. To detach, unscrew the hand-wheel an additional three to four turns. Dot not loosen the cross-headed screw.
3. Push the backrest slightly forward and lift upwards.
4. To re-locate the backrest assembly, ensure the pins are correctly aligned into the slots of the mounting bracket, fully re-tighten the hand wheel on both sides.

SEAT DEAPTH/BACK ANGLE ADJUSTMENT





SEAT DEPATH ADJUSTMENT (can be adjusted by 35 mm).
Tools required: 2 x 10mm spanners

1. unscrew and remove bolts and nuts (a) from the backrest mounting bracket
2. Move the backrest back to the extended position. Replace the bolts and nuts into the mounting bracket and sideframe and tighten securely.

Seath Depth Adjustment

1. STANDARD

2. SINGLE SWAN – NECK

3. DOUBLE SWAN - NECK

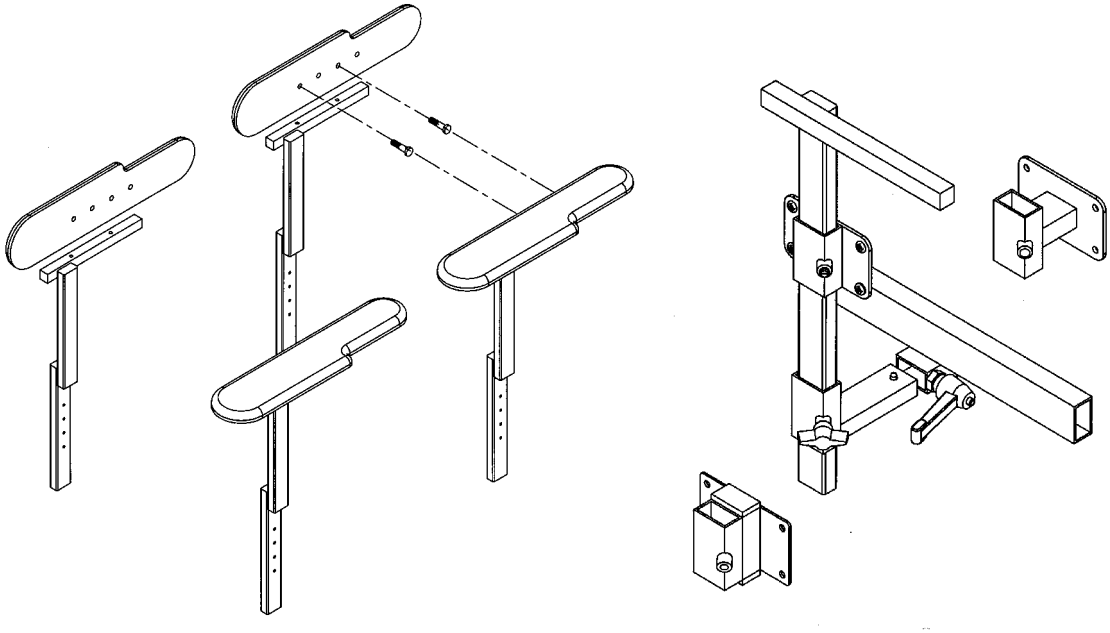
OVERALL SEAT DEPATH ADJUSTMENT 350 mm to 535 mm =185mm

BACKREST ANGLE ADJUSTMENT (can be adjusted from 9odeg. Rearwards through 12deg.)
Tools required: 1x13mm Spanner, medium cross head screw driver.

1. Release lock nut (b) located on the cross-headed screw.
2. Screw the handwheel (c) partially out under normal hand pressure.
3. Screw the cross headed screw in or out to give the required back angle position. adjust the position of the handwheel as necessary.
4. Position the locknut up to the mounting bracket and fully tighten
5. Re-adjust the handwheel (c) fully, ensuring the backrest assembly is secure.

NOTE: Each backrest tube must be positioned in the same plane as each other or the backrest will be twisted.

ARMREST SUPPORT ASSEMBLY



Armrest Support Assembly Replacement

I. Remove armrest from chair.

II. Remove panel mounting bracket (1b, 2, or 3) by releasing M.8 grub screw (c).

III. End plug (d & e) may be prised from the tube using a thin blade etc.

Re-assembly is the reverse of the above procedure. If suitable, gently tap and bungs (d & e) back into position.

Upholstered Armpad Replacement – Adjustment

The armrest pad can be located on the armrest support assembly to achieve the most suitable forward or rear position for the occupant. (Ref. to above diagram).

The armrest can also be and crossed over to account for the variations and reduction width.

To remove, loosen the two M.5x35 bolts (f) fixing the armrest pad to the support tube. Tighten to secure. Do not overtighten as this will result in the T-unit insert becoming ineffective.

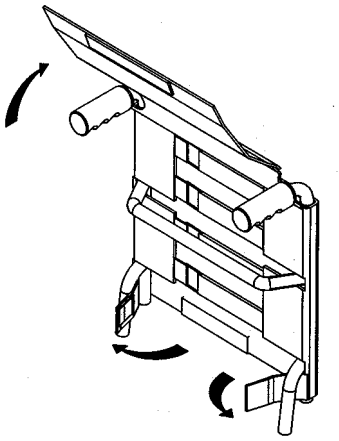
When the double/treble panel mounting bracket (2 or 3) is fitted to reduce the overall seat width, crossover the armpads from side to side if required.

TENSION ADJUSTEABLE BACKREST

The backrest upholstery tension can be adjusted to achieve the desired comfort for individual user requirements.

To achieve this, lift the backrest upholstery cover by peeling the Velcro fastening and fold clear. Adjust the individual straps to the occupants comfort.

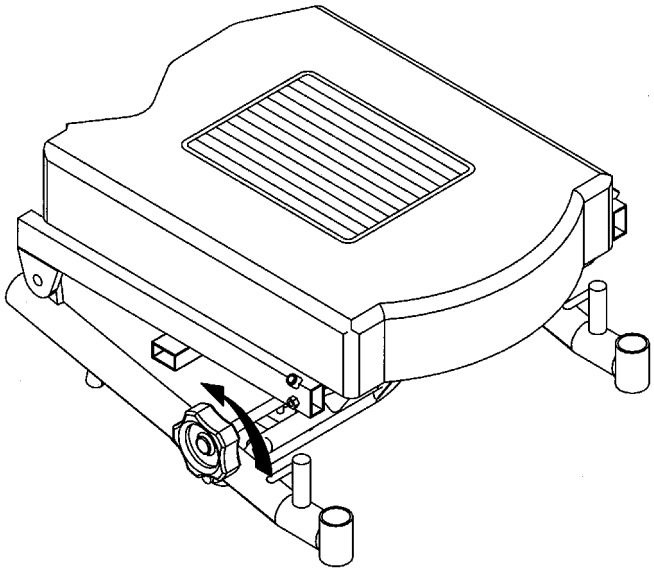
Ensure the straps are correctly positioned and replace the backrest cover, attaching securely by the Velcro fastening.



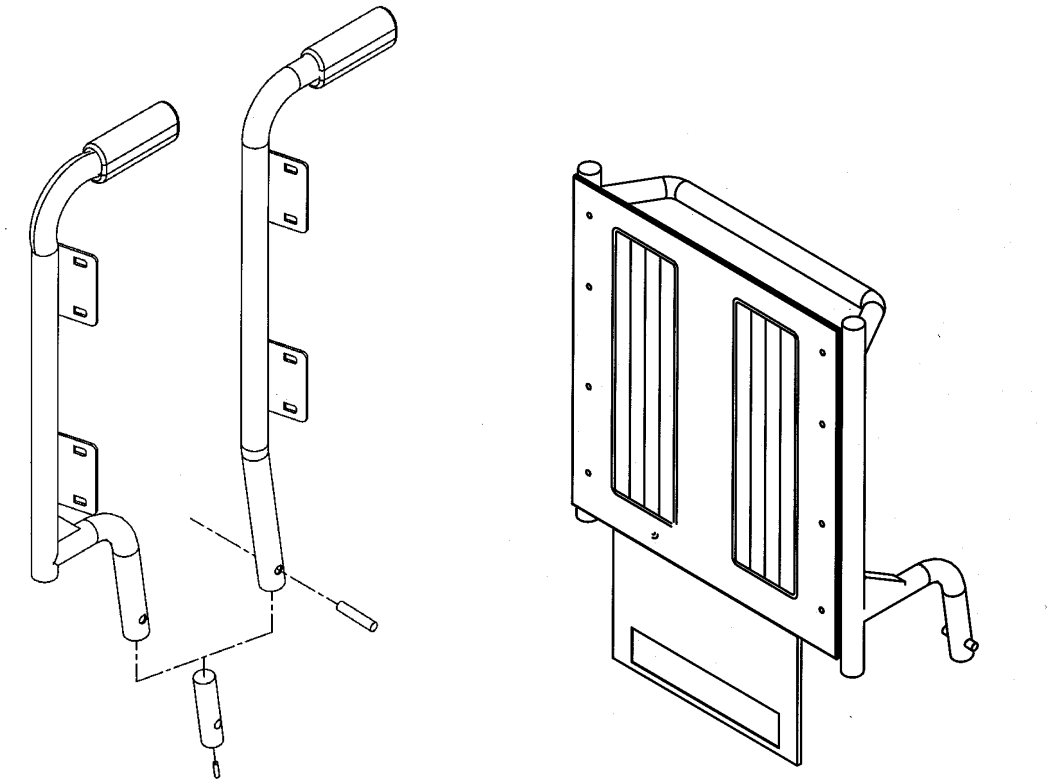
MANUAL TILT-IN-SPACE

To operate the manual tilt-in-space to allow the complete seat/backrest section to tilt backwards, turn the large hand-wheel A until the desired sitting position is achieved. Rotating the hand-wheel in the opposite direction will lower the seat/backrest section.

TAKE CARE: WHEN DRIVING THE POWER CHAIR WITH THE TILT-IN-SPACE OUTDOORS, THE SEAT TILT MUST BE RETURENED TO THE NORMAL LOWERED POSITION BEFORE ATTEMPTING KERB CLIMBING OR ASCENDING AND DESCENDING SLOPES. THIS ALSO APPLIES TO THE OPTIONAL POWERED TILT-IN-SPACE OR POWERED RECLINING BACKREST



BACKREST SUPPORT ASSEMBLY



Single And Combined Backrest Support (Standard, Swan-Neck And All Variations)

The backrest support can be folded down or detached for improved portability. (Refer to the User Manual for this procedure).

Replacement

Replacement backrest assemblies are supplied complete with handgrips and locating components, if the hand grips require, cut through with a sharp blade and peel off.
The replacement handgrips must be secured with a recommended adhesive (e.g.3 M's Scotchgrip). Thoroughly check to ensure that the handgrip does not rotate or slide on the backpost handle.

If the locating components require replacement follow this procedure:-
Loosen grub screw (a) and tap out locating cross pin (b), reinforcing plug (c) can now be removed.
Replacement/re-assembly is the reverse procedure. Insert reinforcing plug (c) and line up locating holes. Screwlock and securely tightened into the cross pin.

VINYL UPHOLSTERY

Care And Maintenance Of Vinyl Upholstery.

This is the approved recommended care supplied by the material manufacturers.

To maintain the appearance of PVC coated fabrics, they should be cleaned regularly to remove fatty substances in soiling which may reduce their serviceable life. A soft cloth and soapy water should be used to clean the surface of the material. Mild soap of soap flakes are recommended and residual soap removed using cold water. The surface should then be dried with a clean soft cloth. If the dirt is ingrained, the surface can be lightly scrubbed with a soft brush.

Solvent cleaners, wax polish, strong detergents and patent chemical cleaners should not be used. The use of these substance is likely to be harmful to PVC coated fabrics and repeated use can result in the removal of the plasticiser from the PVC coating which will result in hardening and subsequent cracking of the material's surface. The result of these conditions cannot be covered under the standard terms and conditions of the warranty agreement.

PVC coated fabrics are resistant to most mild acids, and household stains. Some substances such as ball-point pen ink, lipstick, newsprint and food colouring may be absorbed by the vinyl and cause permanent staining. This can be minimised by immediate cleaning with a damp, soapy cloth or sponge.

Ultra-violet light can also reduce the life of upholstery coating material. This is a normal ageing process and cannot be covered under the standard terms and contidions of the warranty agreement. Necessary precautions should be taken to guard against periods of long term exposure to ultra-violet light.

During scheduled service and maintenance checks, inspect the condition of the upholstery edging to ensure that, due to impact damage etc. no sharp edges or staples are protruding which may cause injury.

LATERAL SUPPORT

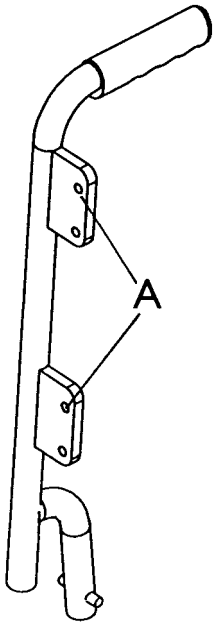
Fitting Instructions

THE LATERAL SUPPORTS CAN ONLY BE FITTED TO THE FIRM UPHOLSTERED BACKREST ASSEMBLY (VISCOUNT SEATING).

To attach the lateral supports to the back of the backrest assembly follow these instructions.

Remove the existing pan-head screws from the top of each flange shown in Fig 1 Marked (A). The lower screws of each flange remain in place.

Fig.1



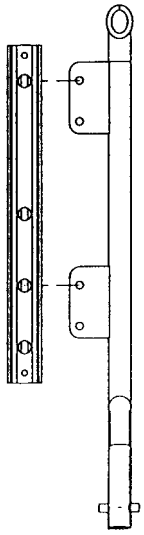
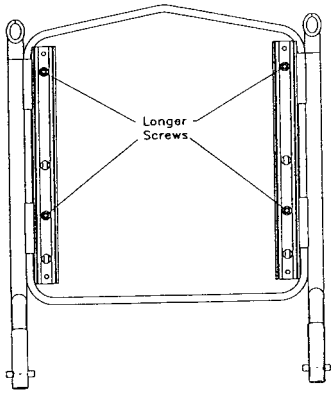
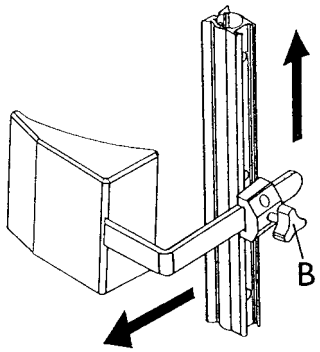


Fig.2
Line up the support rail with the holes in the backrest as shown In Fig.2

With the longer screws provided attached the support rail to the backrest through the flanges into the screw inserts Do not screw securely, but do not overtighten as this may damage the screw threaded inserts



With the support rails secured, slide the lateral support into the support rail from the bottom. Adjust to occupant's requirements and firmly tighten the hand wheel (B).



FOOTRESTS

REMOVEL : Standard

Release winged screw A and slide the complete assembly from the seat frame. Ensure the winged screw is fully tightend when the footrest assembly is replaced.

REMOVAL: Swing – Away

Release the locking lever, swing footrest to the side, or lift up and off. Do this before sitting in the chair.
CAUTION: it is recommended that both footrests are firmly locked in place when seated in the chair (particularly when driving the chair). NEVER stand on the footplates. If the weight of the body is placed on the footplates, damage may occur and the chair may tip forward.

ADJUSTMENT

To extend the footrest laterally, release the winged screw A, pull the footrest forward, re-tighten when the desired position is achieved.

It is not necessary to release the grub screw B. this should remain permanently in position.

To adjust the footrest length, loosen the hex nut C on the extension tube, use twisting motion when sliding the telescopic tube in and out. Be sure to re-tighten the nuts securely when the desired height is achieved.

THE LOWEST PART OF THE FOOTREST MUST BE AT LEAST 6cm (2½') FROM THE GROUND FRO CLEARANCE.

ELEVATING LEGRESTS

To raise or lower, release the lock by moving the lever forward as shown.
When lowering the leg-rest, support the weight of users leg then release the lock, keep it from dropping too quickly, keep in mind that the lowest part of the footplate must 6cm (2 ½') from the ground.

FOOT REST

PARTS:

1. Hanger assembly
2. Extension assembly
3. Bumper rubber

4. Footplate
5. Bumper rubber screw
6. Extension tube
7. Extension adjustment screw
8. Tube end plug

TOOLS REQUIRED

No1 Philips Screwdriver
Spanner 13mm
Flat bladed screwdriver
Mallet

INSPECTION

STEP 1
Check that the footplate fits securely and operates correctly.

STEP 2
Check the operation of the Footplate extension, clamping and adjustment bolt.

STEP 3
Check the footrest for damage.

STEP 4
Check for damage and distortion to the footrest hanger paying particular attention to the securing tabs that clamp the extension (welds, flanges etc).

DISMANTLING

STEP 1
Operate the quick release mechanism and detach the footrest assembly.

STEP 2
Remove the extension clamping screw with a 13mm spanner and detach the footrest extension from its hanger.

STEP 3
Remove the bumper rubber screw and pull out the bumper rubber.

STEP 4
To change the tyre and tube, unscrew the inner tube valve plug and deflate the tyre.

STEP 5
Grip bottom of the tyre in a vice, on the side opposite the valve until the tyre is pushed into the bottom of the wheel centre.

STEP 6
Using the tyre lever, pull one of the tyre outwards, starting at the valve side.

STEP 7
Push the wheel center towards the inside of the tyre.

STEP 8
Withdraw the inner tube.

STEP 9
Withdraw the inner tube.

STEP 10.
Coat edges of the tyre with talcum powder to ease removal.

STEP 11
Pull one of the wheel center and push the tyre to remove it completely, once the tyre and centre are separated remove from vice.

OPERATING THE CHAIR OUTDOORS – KERB CLIMBING

Always remember to use the safety belt when operating the chair outdoors. Ensure the footrests are locked in position.

KERB CLIMBING – Centre Mounting

It is important to follow the instructions detailed in 'going up a kerb' described.

REMOVAL: (Please note that left or right hand are identified as through being seated in the chair.)

To deatch the kerb climber for transportation follow these simple instructions.

Remove the locking assembly towards you away from the right hand retaining socket. The kerb climber is now detached. Stow carefully.

REASSEMBLY:

Locate the assembly into the right hand retaining bracket. Push the assembly up into the left hand bracket and refit the locking pin A.. Ensure the pin is correctly fitted firmly into place.

GOING UP A KERB:

Adjust the speed control to the maximum position
to allow full power to the motors.
Approach the kerb head-on (90°), do not charge
at the kerb.
With the front of the kerb climber at about 2.5cm
(1") from the edge of the kerb. Push the joystick
fully forward and continue the climb in one movement.
Do not pause or attempt to steer during this movement.

If the kerb climb is un-achievable do not continue the manoeuvre, move away from the obstacle and if possible find an alternative location.

GOING DOWN A KERB:

Approach the ege of the kerb square on. Drive forward down the kerb at a moderate speed. Kerbs of 7.5cm (3") or more may tip the chair into the foot plates. It is advisable to go down the kerb backwards to overcome this problem. The kerb climbing device will return to the climbing position after each manoeuvre.
NOTE: Climbing kerbs in excess of 10cm (4") will be restricted if the foot plates are in the fully extended position.

TRANSPORTING THE CHAIR

DIS-ASSEMBLING THE CHAIR FOR TRANSPORATION

To enable the chair be carried in the boot of most cars, follow these instruction:-

Step 1: Disconnect the Motor/battery connector from the control box and remove the armrests. Release the locking lever as shown.

Step 2: Remove the calf strap from the footrests. This is simply attached by Velcro fastening. Remove the footrests completely by releasing the cam latch situated on the inside of the footrest frame hanger.

CAUTION; Do not drive the chair with the footrests in the unlatched position.

Step 3: Remove the kerb climber assembly (if fitted) as described.

Step 4: Detach the seat and backrest assembly as previously shown. When replacing the seat assembly, ensure the brackets are locate correctly on the seat frame tube.

Step 4: Disconnect the motor leads and the connecting cables from the battery boxes. Carefully lift the battery boxes clear of the frame by the straps provided. Remove the battery tray. When refitting the battery it is important that it is correctly located on the support pins.

Step 6: Remove the detachable motors as described.

The disassembled chair is now ready to be loaded safely in a suitable vehicle. Reversing the procedure will allow the chair to be re-assembled at your destination.

SPECIAL NOTE: care must be taken when stowing the detached parts for transportation to ensure that no damage, particularly to the motor assemblies and controller units. Due to the weight of the battery boxes, consideration must be given to their secure positioning in the event of emergency braking.

EXTREME CARE MUST BE TAKEN WHEN LIFTING THE HEAVIEST COMPONENTS I.E.BATTERY BOXES, FRAME AND MOTOR UNITS. ASSUME THE CORRECT LIFTING POSITION. SEEK ASSITANCE IF IN DOUBT.

TRANSPORTATRION OF WHEELCHAIRS IN VEHICLES RECOMMENDED RESTRAINT MEHODS

For additional information, consult your authorized supplier.

For transportation purpose other than disassembly the spectra pus may be used in vehicles which have been modified specifically for the purpose. The power chair must be secured using these recommended restraint methods.

- The power chairs are not designed or manufactured to be replacements for purpose built vehicle seating.
- The occupant must be secured to the vehicle separately in addition to any wheelchair restraints. See Fig. No.2.
- Manually operate drive wheel-locks (refer to page 21) must be used whilst the power chair is being transported.
- Fig.No.1 shows the route of the battery restraint strap and the position of the Velcro fastening.

The power chair was tested to ISO 7176-19 Unwins Webbing Restraints with Tongue and Buckle Straps. Unwins Part No.WNR/ATF/R. The system comprises of two pairs of non-adjustable webbing straps to secure the front and adjustable straps at the rear of the chair. the straps are secured at the specified points shown in Fig No.2, Both positions are labeled "TIE DOWN POINT"

The diagram (Fig No.2.) Shows the headrest arrangement which must be fitted and the occupant's intertia seat belt which also must be used.

Recommended alternative headrests may be used without affecting the CE marking of the power chair, provided a full risk assessment has been carried out by those who have recommended the headrest to be safe for use with the power chair.

TRAY ASSEMBLY
FITTING – OPERATION INSTRUCTIONS

IMPORTANT: ENSURE THAT THE JOYSTICK CONTROL UNIT IS SWITCHED OFF BEFORE FITTING, REMOVING OR ADJUSTING THE TRAY ASSEMBLY.

The tray assembly comes ready assembled and is designed to fit to either the left or right hand side of the wheel chair.
The cut-out section is to accommodate the joystick control unit and determines which side the tray is fitted i.e joystick control fitted to he right hand side, therefore the tray fixings will be fitted to the left hand side, and visa-versa.

Follow these simple instructions to fit:-

1. Remove the two screws A holding the arm pad to armrest support tube B.
2. Fit the slide mounting tube C beneath the armrest support tube using the existing screws, (see diagram). Tighten the screws securely, (do not over tighten as this will damage the T-nut inerts within the arm pad.
3. Loosen the wing screw D and slide the tray support tube extension into the slide mounting tube-C.
4. With the occupant seated in the chair, adjust the tray to a comfortable working position, tighten wing screw D.
5. Side to side lateral adjustment can be achieved by loosening the 4 screws E and sliding the tray surface to the required position.

6. Ensure the tray is firmly positioned level and central to the occupant's requirements.

OPERATION – REMOVAL (Switch OFF the Controller)

The tray can be placed to the side or removed completely to allow the occupant to get in and out of the chair safely.

To do this, loosen the wing screw D, lift the tray and place to the side of the chair or remove Do not attempt to drive the chair with the tray placed to the side as this may be hazardous to the occupant and other people.

PILOT+DIGITAL POWERCHAIR CONTROL SYSTEM

1. 0 Introduction.

The relevant content of this chapter should be included in the wheelchair operating guide. Futher copies are available from Penny & Giles in both written or disk (Word for Window) format. Copies should not be made without the express permission of Penny & Giles.

The operation of the Pilot+ Wheelchair control system is simple and easy to understand. The control system incorporates state of the art electronics, the result of many years of research, to provide you with ease of use and a very high level of safety. In common with other electronic equipment, correct handling and operation of the unit will ensure maximum reliability.

Please read this chapter carefully-it will help you to keep your wheelchair reliable and safe.

2.0 General

A Pilot+ control systems comprises of two three modules-joystick module, Power Module and Actuator and Lighting Module (ALM). The ALM is only required if the wheelchair is fitted lights or seat adjustment actuators. The diagram below shows the modules and the connections between them.

2.1 Handling

Avoid knocking your control system and especially the joystick. Be careful not to strike obstacles with the control system or joystick when you drive. Never drop the control system.

When transporting your wheelchair, make sure that the control system is well protected. Avoid damage to cables.

2.2 Operating Conditions.

Your control system uses industrial grade components throughout ensuring reliable operation in a wide range of conditions. However, you will improve the reliability of the control system if you keep exposure to extreme conditions to a minimum.

Do not expose your control system or its components to damp for prolonged periods. If the control system becomes contaminated with food or drink clean it off as soon as possible,

2.3 Cleaning

Clean the control system and the joystick with a cloth dampened with diluted detergent. Be careful when cleaning the joystick.

Never use abrasive or spirit based cleaners.

3.0.Controls

The Pilot+ system has tow versions of Joystick Module-with and without lighting control-refer to page 1:4 see which type your have fitted to your wheel chair. Most of the controls are common to both modules, however, the lighting, turn indicator and hazard warning controls are only included on the joystick module with lighting control. Each of the controls is explained below:

3.1 On/Off Switch and Battery Gauge.

The on/off switch applies power to the control system electronics, which in turn supply power to the wheelchair's motors. Do not use the on/off power switch to stop the wheelchair n unless there is an emergency. (if you do, you may shorten the life of the wheelchair drive components).

The battery gauge shows you that the wheelchair is switched on. It also indicates the operating status of the wheelchair. Details are given in section 8.0.

When the wheelchair is switched on, each of the LEDs on the joystick module will briefly illuminate. If any of the LEDs do not illuminate, contact your service agent.

3.2 Security Key

The security key can be used to lock the wheelchair unauthorized use. To lock the wheelchair it must be switched on, the key should then be inserted into and withdrawn from the battery charging socket, the wheelchair will now be locked.

To unlock the wheelchair, firstly switch it on. The maximum speed indicator will ripple up and down but driving will not be possible. The key should now be inserted into and withdrawn form the battery charging socket, the wheelchair can now be driven.

Joystick Module Details

Joystick Module without Lighting

Joystick Module with Lighting

Controls

ON/OFF SWITCH

BATTERY GAUGE

MAXIMUM SPEED INDICATOR

MODE SWITCH

HORN SWITCH

ACTUATOR INDICATOR

LIGHTS SWITCH AND LED

LEFT TURN INDICATOR SWITCH AND LED

RIGHT TURN INDICATOR SWITCH AND LED

HAZARD WARNING SWITCH AND LED

3.3. Joystick

The joystick controls the speed and direction of the wheelchair. The further you push the joystick form the center position the faster the wheelchair will move. When you release the joystick the brakes are automatically applied.

3.4.Maximum Speed Indicator

This is a guage shows the maximum speed setting of the wheelchair. There are five speed settings- step 1 is the lowest and step 5 is the highest speed. For details of how to change the maximum speed setting see section 3.5.

3.5. Mode Switch

The mode switch is used to make maximum speed changes and to change between wheelchair operation modes.

If the mode switch is operated whilst you are driving the maximum speed setting will be increased by one step. Each successive operation of the mode switch will increase the setting. When the setting is at 5 the next mode switch operation will put the setting to 1. The diagram below explains this action.

If the mode switch is operated when the joystick is centered, the control system operation mode will be changed. There are three modes drive, speed adjustment and actuator adjustment. The diagram below explains this action.

3.5.1 Speed Adjustment Mode

When the control system is in this mode the maximum speed indicator will flash. The maximum speed can be adjusted be left or right movements of the joystick. Left will decrease the speed setting, right will increase it. Forward or reverse movements of the joystick will take you back into drive mode.

Operating the mode switch will put the control system back into drive mode or, if seat adjustment actuators are fitted, actuator adjustment mode.

3.5.2 Actuator Adjustment Mode

When the control system is in this mode the actuator indicator will be illuminated. The section the wheelchair symbol that is illuminated shows the actuator that is selected for adjustment. To change the selected actuator move the joystick left or right. To make an actuator adjustment move the joystick forwards or backwards.

Operating the mode switch will put control system back into drive mode.

3.6. Horn Switch

The horn will sound whilst this switch is depressed.

3.7. Lights Switch and LED

To turn on the wheelchair's lights operate this switch, the associated LED will Illuminate.

3.8 Left Turn Indicator Switch and LED

To turn on the wheelchair's left turn indicator operate this switch, the associated LED will flash at the same rate. If the LED flashes rapidly, one of the right turn indicator bulbs is defective, contact your service agent.

3.10 Hazard Warning Switch and LED

To turn on the wheelchair's hazard warning lamps operate this switch, the associated LED will flash at the same rate. The left and right turn indicator LEDs will also flash.

4.0 Getting Ready to Drive.

Operate the on/off switch. The battery gauge will blink then turn on after a second.

Check that the maximum speed control is set to a level which suits you.

Push the joystick to control the speed and direction of the wheelchair.

Please note that if you push the joystick before or just after you switch the control system on, the battery gauge will ripple up and down and the wheelchair will not be allowed to move. You must release the joystick to resume normal position. If you dot not release the joystick within five seconds the wheelchair will not be able to move, even if you release the joystick and push it again. The battery gauge will then flash rapidly. You can rest this condition by switching the control system off and on again.

If you do not push the joystick as your switch the wheelchair on and the battery gauge flashes rapidly, when there may be a fault. Refer to section 8.4.for details.

5.0 Tips for Using Your Control System

5.1 Driving - General

Make sure that the control system is mounted securely and that the joystick position is correct. The hand or limb you use to operate the joystick should be supported, for example bye the wheel chair are pad. Do not use the joystick as the sole support for your hand or limb. Wheelchair movements and bumps could upset your control.

5.2 Driving Technique

The control system interprets your joystick movements and produces appropriate movements of your wheelchair. You will need very little concentration to control the wheelchair which is especially useful if you are inexperienced. One popular technique is to simply point the joystick in the direction your want to go. The wheelchair will "home-in" on the direction you push the joystick.

The further you push the joystick away from the rest position, the faster the wheelchair will go.

The intelligent speed control system minimizes the effects of slopes and different types of terrain.

6.0 Precautions for Use

Note: In the event of the wheelchair moving in an unexpected way release the joystick. This action will stop the wheelchair under any circumstances.

6.1 Hazards

Do not drive the wheelchair:

I. Beyond restrictions indicated in your wheelchair user manual, for example maximum inclines, curb height etc.

II. In places or on surfaces where a loss of wheel grip could be hazardous, for examples on wet grassy slopes.

III. If you know that the control system or other crucial components require repair.

WARNING: Although the Pilot+ control system is designed to be extremely reliable and each unit is rigorously tested during manufacture, the possibility of a system malfunction always exists (however small the probability). Under some conditions of system malfunction the control system must (fro safety reasons) step the chair instantaneously. If there is any possibility of the user falling out of the chair as a result of a sudden braking action, it is possibility that a restraining device such as a seat belt motion. Penny & giles accept no liability for losses of any kind arising from the unexpected stopping of the wheelchair, or arising from the improper use of the wheel chair or control system.

7.0 Safety Checks

The electronic circuits in your control system have been designed to be extremely safe and reliable. The no-board microcomputer carries out safety checks at up to 100 times per second. The supplement this safety monitoring you should carry out the following periodic checks.

If the control system fails any these checks, do not use the wheelchair and contract your service agent.

7.1. Daily Checks

Joystick: with the control system switched off, check that the joystick is not bent or damaged and that it returns to the center when you push and release it. If there is a problem do not continue with the safety checks and contact your service agent.

7.2 Weekly Checks

Solenoid (Parking) Brake: This test should be carried out on a level floor with at least one metre clear space around the wheelchair.

I. Switch on the Control System

II. Check that the battery remains on, or flashes slowly, after on second.

III. Push the joystick slowly forwards until you hear the parking brakes operate. The chair may start to move.

IV. Immediately release the joystick. You must be able to hear each parking brake operate within a few seconds.

V. Repeat the test a further three times, pushing the joystick slowly backwards, left and right.

Connectors: Make sure that all connectors are securely mated.
Cables: Check the condition of all cables and connectors for damage,

Joystick Gaiter: Check the thin rubber gaiter or boot, around the base of the joystick shaft, for damage or splitting. Check visually only, do not handle the gaiter.

Mounting : Make sure that all the components of the control system are securely mounted. Do not over-tighten any securing screws.

7.3 Servicing

To ensure continued satisfactory service, we suggest you have your wheelchair and control system inspected by your service agent after a period of 1 year from commencement of service. Contact your service agent for details when the inspection id due.

8.0 Status Indication

The battery gauge will indicate the status of the control system.

Please note that a number of supposedly faulty control systems returned to us are subsequently found to operate correctly. This indicate that many faults are due to the wheelchair problems rather than the control system.

8.1 Battery Gauge Steady

This indicate that all is well.

8.2 Battery Gauge Flashes Slowly

The control system is functioning correctly, but you should charge the battery as soon as possible,.

8.3 Battery Gauge Blinks once Every 2.5. Seconds

The control system has "gone to sleep" because the joystick has not been operated for a period of time. The time period depends on the programming of the system. To-re-start, switch the system off and on again.

8.4. Battery Gauge Flashes Rapidly (even with the joystick released)

The control system safety circuits have operated and the control system has been prevented from moving the wheelchair.

This indicates that there is fault. please follow this procedure:

1. Switch off the Control System.
2. Make sure that all connectors on the wheelchair and the control system are mated securely.
3. Check the condition of the battery.
4. If you can't find the problem, try using the self-help guide given in section 8.5.
5. Switch on the control system again and try to drive the wheelchair. If the safety circuits operate again, switch off and do not try to use the wheelchair. Contract your service agent.

8.5. Self Help Guide.

If a fault occurs, you can find out what has happened by counting the number of bars on the battery gauge that are flashing.

Here is a list of self-help actions. Try to use this list be before you contact your service agent. Go to the number in the list which matches the number of flashing bars and follow the instructions.

1 bar: The battery needs charging or there is a bad connection to the battery. Check the connections to the battery and the check the power module battery connector, this is the 2 pole connector situated between the two motor connectors. If the connections are good, try charging the battery.

2 bars: The left hand motor has a bad connection. Make sure that the motor is connected properly and the power module connector M1 is secure.

3 bars: The left hand motor has a short circuit to a battery connection. Contact your service agent.

4 bars: The right hand motor has a bad connection. Make sure that the motor is connected properly and the power module connector M2 is secure.

5 bars: The right hand motor has a short circuit to a battery connection. Contact your service agent.

6 bars: The battery charger is preventing the control system from driving the wheelchair. Disconnect the charger from the wheelchair.

7 bars: A joystick Module fault is indicated. Make sure that the joystick is in the rest position before switching on the control system.

8 bars: A Power Module fault is indicated. Make sure that all Power Module connections are secure.

9 bars: The parking brakes have a had connection. Check the parking brake and motor connections. Make sure the control I system connections are secure.

10 bars; An excessive voltage has been applied to the control system. This is usually caused by a poor battery connection. Check the battery and Power Module connections.

If the problem persists after you made the checks described above contact your service agent.

8.6. Slow or sluggish movement

If the wheelchair does not travel at full speed or does not respond quickly enough, and the battery condition is good, check the maximum speed setting, if a adjusting the speed setting does not remedy the problem then there may be a non-hazardous fault.

Contact your service agent.

9.0 Battery Gauge.

The battery gauge is included to let you know how much charge is left in your batteries. The best way fro you to use gauge is to learn how is behaves as you drive the wheelchair. Like the fuel gauge in a car, it is not completely accurate, but is will help you avoid running out of “fuel”.

The battery gauge works in the following way:

When you switch on the control system, the battery gauge shows an estimate of the remaining battery charge.

The battery gauge gives you a more accurate reading about a minute after your start driving the wheelchair .

NOTE: When you replace worn out batteries, fit the type recommended by the wheelchair manufacturer, if your use another type the battery gauge may be inaccurate.

The amount of charge in your batteries depends on a number of factors, including the way you use your wheelchair, the temperature of the batteries, their age and the way they are made, these factors will affect the distance you can travel in your wheelchair. All wheelchair batteries will gradually lose their capacity as they age.

The most important factor that reduces the life of your batteries is the amount of charge your take from the batteries before your recharge them. Battery life is also reduced by the number of times you charge and discharge the batteries.

To make your batteries last longer, do not allow them to become completely flat. Always recharge your batteries promptly after they are discharged.

If your battery gauge reading seems to fall more quickly than usual, your batteries may be worn out.

9.1 How to Read a TruCharge battery Gauge

If the battery gauge shows red, yellow and green, the batteries are charged.

If the battery gauges show just red and yellow, then you should charge the batteries as soon as you can.

If the battery gauge shows just red, either steady or flashing slowly, then you should charge the batteries immediately.

10.0 Battery Charging

To charge the wheelchair batteries connect the charger plug into the battery-charging socket on the joystick module. You will not be able to drive the wheelchair when the charger is connected.

WARNING: Use only the battery charger that has been supplied with your wheelchair. The use of incorrect chargers could damage the batteries, wheelchair or charger itself.

11.0 Programming

If you find that you cannot find a maximum speed control setting that suits you, the control system can be programmed to meet your needs.

The PPI is a small hand-held unit which can be plugged into your control system to alter the program. A PPI may be included with your wheelchair. If a PPI is not included, your wheelchair distributor or service agent or wheelchair manufacturer will be able to program your control system for you.

If you have a PPI, read the PPI use guide before you use it.

If you re-program your control system, make sure that you observe any restrictions given in your wheelchair user manual. Note any changes you make for further reference.

WARNING: Programming should only be conducted by healthcare professionals with in-depth knowledge of Penny & Giles electronic control system. Incorrect programming could result in an unsafe a set-up of a wheelchair for a user. Penny & Giles accept no liability for losses of any kind if the programming if the control system is altered from factory pre-set values.

12.0 Joystick Knobs

The knob fitted to your joystick is suitable for most applications. If you would prefer another type, there is a range of alternatives available. Please contract your wheelchair distributor or manufacturer for advice. Do not replace the joystick knob with any unauthorized item- it may cause hazardous operation.

13.0 Servicing

All repairs and servicing must be carried out by authorized service personnel. Opening or making any unauthorized adjustments or modifications to the control system or its components will invalidate any warranty and may result is hazards to yourself or other people, and is strictly forbidden.

WARNING: Penny & Giles accept no liability for losses of any kind arising from unauthorized opening, adjustment or modifications to the Pilot+ control system.

PILOT+DIGITAL POWERCHAIR CONTROL SYSTEM CHAPTER PROGRAMMING

1.0 Programming For Wheelchair Control System

The main advantage for using programmable control system is that they can be easily tailored to the specific needs and capabilities of a particular wheelchair user while taking into account the safe performance characteristics of the wheelchair being used. This means that wheelchairs fitted with a Penny & Giles Pilot+

control system can be readily programmed to be safe under normal driving conditions and also feel secure and comfortable to the user.

The Programmable control system achieves this great flexibility by referring to a set of internal parameters which govern factors such as the wheelchair's speed, acceleration and braking. These parameters can be changed over a wide span to suit different wheelchairs and users, using a simple hand held programmer. Minimum and maximum limits can be applied to these parameters, thereby ensuring the wheelchair can only be programmed within a certain operating envelope. These limits can only be altered with the agreement of the wheelchair manufacturer and Penny & Giles.

All programmable values are stored within the Power Module, therefore, if you change Joystick Module or ALM there is no need to re-program the system.

1.1 Important Note

It is possible to set up a control system so that it is unsuitable for users and possibly even some wheelchairs. Take care when programming a control system and if you need any advice in programming or selecting values, please do not hesitate to contact Penny & Giles.

WARNING: Programming should only be conducted by healthcare professionals with in-depth knowledge of Penny & Giles electronic control system. Incorrect programming could result in an unsafe a set-up of a wheelchair for a user. Penny & Giles accept no liability for losses of any kind if the programming if the control system is altered from factory pre-set values.

2.0.PPI Programmer

The PPI is the handheld programmer that Penny & Giles supply for their Pilot+ Control Systems. Primarily intended for the specialized design and test requirements of wheelchair manufacturers and engineers, the PPI take full advantage of the complete programmability of the Pilot+ offering functions not available with less sophisticated control system designs.

The PPI is a menu-driven programmer which plugs directly into the Pilot + battery Charging Socket, and is available in two configurations, suited to different applications.

2.1.Basic PPI Programmer (PP1a)

The most basic programmer version- the PP1a is intended for general purpose use. It can set all of the key control system speed, acceleration and braking characteristics, and allows different settings to be tried out while the programmer is still plugged into the control system. A context-sensitive help function is available to guide users through the menus and the PPI can also display error message from the Pilot + control system, allowing any problem with the wheelchair electrical system to be identified and corrected quickly, in addition the Pilot + fault log and elapsed time indicator can be red with the PP1a.

2.2. Engineering PP1 Programmer (PP1b)

The engineering version – the PP1b offers all the PP1a features but also includes a suite of advanced functions for designers, such as matching the control system to the motor impedance. Setting maximum drive current and enabling front or rear wheel drive algorithms. Clearly, the PP1b is a very powerful tool for prototype design work. However, users who program parameters incorrectly do run the risk of damaging control system or motors, so it should only be used experts in wheelchair electrical systems.

2.3. PP1 Specifications

FUNCTIONS	NOTES	PP1a	
Acceleration	Vary from 0 (or factory set min) to 100 (or factory set max)	Unit Steps	Unit Steps
Deceleration	Vary from 0 (or factory set min) to 100 (or factory set max)	Unit Steps	Unit Steps
Turn Acceleration	Vary from 0 (or factory set min) to 100 (or factory set max)	Unit Steps	Unit Steps
Turn Deceleration	Vary from 0 (or factory set min) to 100 (or factory set max)	Unit Steps	Unit Steps
Forward speed	Vary from 0 (or factory set min) to 100 (or factory set max)	1 % Steps	1 % Steps
Reverse Speed	Vary from 0 (or factory set min) to 100 (or factory set max)	1 % Steps	1 % Steps
Turn Speed	Vary from 0 (or factory set min) to 100 (or factory set max)	1 % Steps	1 % Steps
Sleep Timer	Period of time before control system" goes to sleep". (1 to 10 mins.)	1 min. steps	1 min. steps
Joystick Throw	Joystick deflection for full speed (20 % to 100%)	1 % steps	S % Steps
Steer Correct	Veer compensation for mis-matched motors	-9 to +9	-9 to + 9
Read Timer	Displayed hours wheelchair in use	Yes	Yes
Read Fault Log	Displayed fault code history	Yes	Yes
Preset Control system	Set drive functions to factory preset values	Yes	Yes
Help Mode	On-line help text	Yes	Yes
Diagnostic	Reads fault code from Pilot+	Yes	Yes
Soft Reverse	Prevents wheels digging in when braking in reverse down a slope. Perecantage of forward brake rate (25% to 100%)		1 % Steps
Current Limit	Maximum and minimum current outputs (20A to 80A)		A1 Steps
Foldback Temp	Reduce current at this temperature (25°C to 70°C) then decrease current linearly until shit down temperature is reached.		1°C steps`
Compensation	Match motor impedance for precise control (0 to 1).		5m Steps
Battery Menu	Match Tru Charge Display to loom resistance.(0 to 25m).		1m steps

Park Brake Trip	For Chairs without brakes		YES/NO
Front Drive	Select algoritham for front wheel drive		YES/NO
Fast Brake Rate	Slam braking by pulling joystick in reverse (0 to 100%)		1 % Steps
Soft Stop	Controlled braking if control system switched off whilst driving		YES/NO
Inhibit	Polarity and latched operation of speed limit input		Low/High & Yes/No
Profiles	Set power Module to operate with drive profiles (1 to 5)		1.2.3.4 or 5
Swat Motors	Exchanges left and right motor outputs		YES/NO
Brake Voltage	Solenoid brake voltage (12/24v)		12 V or 24V
Min. Accel'n %	Vary from 0% to 100%		1 % Steps
Min Decel'n %	Vary from 0% to 100%		1 % Steps
Min Turn Acc. %	Vary from 0% to 100%		1 % Steps
Min Turn Dec.%	Vary from 0% to 100%		1 % Steps
Clear Timer	Reset elapsed timer		Yes/No
Erase Fault Log	Erases fault code history		Yes
Preset Engineering Values	Set engineering to factory preset values		Yes

2.4. Important Note

Resetting parameters to non-compatible values could damage control system and motor, and invalidate any warranties. Current Limit should never be set to a value greater the values recommended for the Power Module you, have and Park Brake Trip should only be disabled on those chairs without solenoid brakes. Contact Penny & Giles if there is the slightest doubt. On a more general note, it is possible to set up a control system so that it is unsuitable for some users or even some wheelchairs. If you need any advice on programming, please do not hesitate to contact Penny & Gilies.

3.0 Using the PP1

Please read this guide carefully before using the PP1 Programmer. Setting parameters to incorrect values could damage control systems and motors, and invalidate any warranties. In particular, Current Limit should never be set to a value than the recommended control system maximum.

3.1. PP1b Kepad Layout & Description

3.2 Connection

To program, you can connect the PP1 to the Pilot+, via the charging socket on the Joystick Module, if the system is either on or off. You can also driver with the PP1 connected.

Please note, for safety reasons, accessing some critical parameters will cause the control system to trip. This is indicated by the Tru Charge display rippling up and down. This is international and the control system can be simply reset by switching off then or again.

To use the PP1 to view fault codes and message, connect it to the control system when the control system has tripped, Note, if a trip occurs when the PP1 is already connected, then no diagnostic information will appear.

If you wish to program but the PP1 is showing diagnostic information, press the ENTER key and the PP1 will go into programming mode.

4.0 Root Menu

The ROOT menu, which included in both the PP1 and PP1 B contains all the parameters which set the normal drive characteristics of the wheelchair. It is also possible to read the fault log and elapsed timer. Each parameter is explained in the following paragraphs.

4.1 Acceleration?

Adjusts the value for forward and reverse acceleration of the wheelchair from 0 to 100 in steps of 1.A higher value gives faster acceleration. This programmed value of acceleration occurs when the joystick Module has speed setting 5 selected. It value other settings depends on the value of the Min Accel's % parameter, see section 5.15.

Some Power modules may be factory programmed to limit the value of this parameter. If you want to set the value to be higher than this limit contact Penny & Giles.

4.2. Deceleration?

Adjusts the value for forward and reverse deceleration (or braking) of the wheelchair from 0 to 100 in steps of 1.A higher value gives faster deceleration. This programmed value of deceleration occurs when the joystick module has speed setting 5 selected. Its value at other settings depends on the value of the Min Decel'n & parameter, see section 5.16.

Some power modules may be factory programmed to limit the value of this parameter. If you want ot set the value to be higher than this limit. Contact Penny & Giles.

4.3 Turn Accel'n?

Adjust the value for turning acceleration of the wheelchair from 1 to 100 in steps of 1 .A. higher value gives faster acceleration. This programmed value of acceleration occurs when the joystick module has speed 5 selected. Its value at other settings depends on the value of the Min Turn Acc % parameter, see section 5.17.

Some Power modules may be factory programmed to limit the value of this parameter. If you want to set the value to be higher than this limit contact Penny & Giles.

4.4 Turn Decel'n?

Adjusts the value for turning deceleration (or Braking) of the wheelchair, from 0 to 100 in steps on 1.A. higher value gives faster deceleration. This programmed value of deceleration occurs when the joystick module has speed setting 5 selected. Its value at other settings depends on the value of the Min Turn Dec% parameter see section 5.18.

Some Power modules may be factory programmed to limit the value of this parameter. If you want to set the value to be higher than this limit contact Penny & Giles.

4.5. Forward Speed?

Adjusts the minimum and maximum values for forward speed of the wheelchair from 0 to 100% in steps of 1% A higher value gives a faster speed. The minimum value occurs when the joystick module has speed setting 1 selected and the maximum value occurs at speed setting 5.

Some Power modules may be factory programmed to limit the value of this parameter. If you want to set the value to be higher than this limit contact Penny & Giles.

4.6. Reverse Speed?

Adjusts the minimum and maximum values for Reverse speed of the wheelchair from 0 to 100% in steps of 1% A higher value gives a faster speed. The minimum value occurs when the joystick module has speed setting 1 selected and the maximum value occurs at speed setting 5.

Some Power modules may be factory programmed to limit the value of this parameter. If you want to set the value to be higher than this limit contact Penny & Giles.

4.7. Turning Speed?

Adjusts the minimum and maximum values for turning speed of the wheelchair from 0 to 100% in steps of 1% A higher value gives a faster speed. The minimum value occurs when the joystick module has speed setting 1 selected and the maximum value occurs at speed setting 5.

Some Power modules may be factory programmed to limit the value of this parameter. If you want to set the value to be higher than this limit contact Penny & Giles.

4.8 Sleep Timer?

Sets the period of time before the control system will " go to sleep" if the joystick is not operated. The time can be set between 1 and 10 minutes in steps of minute. If the time is set to 0 the system will never "go to sleep".

4.9. Joystick Throw?

This allows you to program the control system so that full speed can be reached with reduced joystick movement (throw). This is particularly useful for wheelchair users with limited hand or arm movement.

The adjustment can be made manually or by programming actual values.

4.9.1 manual Adjustment

When the ENTER key is pressed the current setting for joystick throw in the forward direction will be displayed. If the joystick is displaced in the forward beyond 15% then the actual joystick position will be displayed. Operation of the ENTER key will store value displayed on the screen. The method can therefore be used to interactively set up the joystick throw with the wheelchair user.

The process is repeated for joystick reverse, left and right positions.

4.9.2 Programming Adjustment

when the ENTER key is pressed the current setting for joystick throw in the forward direction will be displayed. Operation of the UP or Down keys will change this setting operation of the ENTER key will store the setting.

4.10 Steer Correct?

This factor compensates for any mismatching of motors of ensure that the wheelchair drives directly forward when the control system's joystick is being pushed directly forward.

It is normally set to zero but may be varied from –9 to +9 in increments of 1. if the chair is veering to the left, you should increase the setting, if the chair veers to the right, decrease the setting, if Swap Motors, is set, this logic will be reversed, see section 5.13.

4.11 Read timer?

The Pilot+ has a timer which records how long the wheelchair is in use. The timer runs whenever the joystick is moved away from the center position, and stops when the joystick is returned. The timer records the number of hours the wheelchair has been in use.

To reset the timer see section 5.19.

4.12 Read Fault Log?

The Pilot+ has a fault log facility which stores the number of occurrences of the last eight faults.

This allows you to view the contents. The display format is a below.

1. Code 2C00, # 1
2. Code 3C00, # 3

No more entries.

This reads line by line as.

Line 1 – fault code 2C00 has occurred once
Line 2 – fault code 3C00 has occurred three times
Only two fault types recorded.

To clear the fault log refer to section 5.21

4.13 Preset Unit?

Selecting this sets all ROOT menu parameters to their default values. These default values are decided between Penny & Giles and wheelchair manufacturer.

5.0 Engineer Menu?

Selection of this Enters the Engineering menu and allows you to adjust the technical performance parameters of functions of the control system. Each parameter or function is described below.

5.1.Soft Reverse?

This sets the reverse braking rate. Reverse braking is normally 70% of forward braking to prevent the chair's tendency to topple when stopping is reverse on a gradient.

You can set the reverse braking between 25% and 100% of forward braking.

5.1 Current Limit?

This sets the maximum and minimum current output for the control system. The current output is dependent on the internal temperature of the Power Module. Graph A (below) shows the relationship.

Pilot+ Power Modules are available in two power ratings – 50A and 80A. The table below shows the recommended maximum to minimum relationships.

Max. Current Limit	Min. Current Limit
50A	40A
80A	60A

You can set the maximum and minimum current outputs between 20A and the maximum permitted upper value in steps of 1A.

5.3. Temp. Foldback?

This is the internal Power Module temperature at which the current starts to reduce, see Graph A. The Table below show the maximum value of temperature for each power module type.

Max. Current Limit	Min. Current Limit
50	55°C
80A	55°C

IMPORTANT- the temperature value should never be set to more than the maximum possible for each control system type. Doing so will invalidate the warranty and affect the long term reliability of control system.

5.4. Timed Foldback?

This function allows a measure of protections for motors when they get into a stalled condition. You can set a stall time of between 5 seconds and 10 minutes in 5 second increments after which time the maximum current limit is reduced to a percentage of the maximum current. This percentage (Foldback %) my be set between 25% and 100% of the current limit maximum 1& steps.

After a fixed reset period of 5x (Stall Time) the current limit will be allowed to return to the current limit maximum ,if demanded. This reset period is to allow the motor (s) sufficient time to cool.

e.g. Power Module has current limit of 80A, stall time of 15 seconds and foldback % of 25%. This means that, if the motors are stalled after 15 seconds the current output of the Power Module will reduce to 25% of 80A=20A. After 5x15s=75s, the current output will return to 80A.

5.5. Compensation?

This matches the control system to different motor types in order to achieve optimal performance and control. Penny & Galis recommend that you set this value to not more than 70% of the resistance of the motor armature and all cables and connectors to it.

IMPORTANT- never set to greater than 70%

Motor manufacturers should be able to supply figures for armature resistance, and typical cable and connectors would be about 40m.

5.6. Battery Menu?

5.6..1 Battery Cable?

This sets the value of cable and connector resistance between the control system and the batteries. The value corresponds to the total resistance in both the positive and negative paths.

You can set this between 0m and 25m in steps of 1m.

5.6.2 Gauge Cal?

This allows further fine calibration of the TruCharge battery gauge. This is normally set at the factory and should not need adjustment. Please contact Penny & Giles if you are considering altering this factor.

5.6.3. Back to E Menu?

This returns you to the ENGINEER Menu

5.7 Park Brake Trip?

This tells the control system whether or not to trip if one or both of solenoid brakes become disconnectec or are not fitted. You can turn this function on or off.

IMPROTANT- this function should only ever be turned off if there are no solenoid brakes fitted to the wheelchair.

5.8 Front Drive?

This selects special front wheel drive control software. You can turn this on or off.

It is possible for wheelchair manufacturer, in conjunction with Penny & Gailes, to change to driving character tics of the front wheel drive software, please contract Penny & Giles for further details.

5.9 fast Brake Rate?

This sets the decleration rate for fast braking. Fast braking is when the joystick is pulled to the reverse position to effect a faster stop. You can set the fast brake rate between 0 and 100. if this value is set lower than the normal Deceleration rate. Then the latter rate will be used.

5.10 Soft Stop?

This selects whether the soft-stop facility is enable. Soft –stop means that if you switch the control system off whilst driving the wheelchair will steadily decelerate to standstill.

You can turn this function on or off.

IMPROTANT – if this function is on, you must ensure that the emergency stopping distance is within the distance specified for the country which the wheelchair will be used. TUV Product Service (Germany) specify the distance to be as stated in prEN12184.

5.11 Set Inhibit?

This sets the operation of the speed limit input. This input can also be used as an inhibit input if the inhibit speed limit. Value is set to zero, see chapter section 3.5.for more details.

There are two options associated with this function. Polarity and latching.

Active low- This is the polarity of the input. It can be set to yes or no. The table below shows the effect of the input on wheelchair for the two settings.

Speed Limit Input Resistance	Inhibit Polarity Low (active low=yes)	Inhibit Polarity High (active low+no)
Short circuit	Inhibit Speed	Normal Speed
22K□± 10%	Slow Speed	Mid Speed
100 K□± 10%	Mid Speed	Slow Speed
Open Circuit	Normal Speed	Inhibit Speed

Latched- this determines whether the control system trips when an inhibit signal (inhibit speed=0) is received. It can be set to yes or no. Yes gives a trip condition and the system must be switched off and on again to rest. No means that drive can be resumed as soon as the inhibit signal is removed.

The setting for inhibit, slow and Mid speed limits are factory programmable, if you want to alter these values please contact Penny & Galies.

5.12. Profiles?

This function can only be used with customer specific Joystick Modules which support drive profiles. The Pilot+ generic Joystick Modules are not designed to operate with drive profiles, consequently, this value should be set to 0. For further information, please contact Penny & Giles.

5.13. Swap Motors?

This swaps the motor output connections, M1 and M2 on the Power Module. Normally M1 is for the left Motor and M2 for the right motor.

You can select between yes and no. If set to yes, M1 will be for the right Motor and M2 for the left motor. If set to no the normal condition will apply.

Note. if you swap the motor connections the Trucharge motor diagnostic information will need to be interpreted differently, see chapter 1 section 8.5 The function of Steer Correct will also be reversed, see section 4.10.

5.14 Brake Voltage?

This sets the voltage output from the Power Module to the Solenoid brakes. You can select either 12V or 24V.

WARNING: It is essential that the control system is programmed for the correct brake voltage. If it is not damage may occur to the brakes or the drive performance of the wheelchair may be affected.

5.15. Min Accel'n %?

Adjusts the minimum value for forward and reverse acceleration of the wheelchair. It is programmed in increments of 1% of the Acceleration value. This percentage of the Acceleration value occurs when the joystick module's speed is at 1. For example: if Acceleration is set at 80 and Min Accel'n % is set at 25% the when the speed setting is 1, acceleration will be 25%x80=20, and when the speed setting is 5, the acceleration will be 80. Speed settings 2,3 and 4 will interpolate linearly between 20 and 80-i..e acceleration values of 25,50 and 65 respectively. If Min Accel'n % is set at 100% then acceleration will not vary as the speed is changed.

Some power Modules may be factory programmed to limit the value of this parameter. If you want to set the value outside these limit, Contact Penny & Giles.

5.16 Min Decel'n %?

Adjusts the minimum value for forward and reverse deceleration (or braking) of the wheelchair. It is programmed in increments of 1% of the Deceleration value. This percentage of the Deceleration value occurs when the joystick Module's speed setting is at 1. For Example: if Deceleration is set at 80 and Min Decel'n % set at 25% then when the speed setting is 1, deceleration will be 25%x80=20 and when the speed setting is 5, deceleration will be 80. Speed settings 2,3 and 4 will interpolate linearly between 20 and 80-i.e. deceleration values of 35, 50 and 65 respectively. If Min decel'n % is set at 100% then deceleration will not vary as the speed setting is changed.

Some power Modules may be factory programmed to limit the value of this parameter. If you want to set the value outside these limit, Contact Penny & Giles.

5.17 min Turn Acc.%?

Adjusts the minimum value for turn acceleration of the wheelchair. It is programmed in increments of 1% of the Turn Accel'n value. This percentage of Turn Accel'n value occurs when the joystick Module's speed setting is at 1. For example: if Turn Accel'n is set at 80 and Min Turn Acc% is set at 25% then when the speed setting is 1, acceleration will be 25%x80=20, and when the speed setting is 5, the acceleration will be 80. Speed Setting 2,3 and 4 will interpolate linearly between 20 and 80-i.e. turn acceleration values of 35,50 and 65 respectively. If min Turn Acc.% is set at 100% then acceleration will not vary as the speed setting is changed.

Some power Modules may be factory programmed to limit the value of this parameter. If you want to set the value outside these limit, Contact Penny & Giles.

5.18 Min Turn Dec.%?

Adjusts the minimum value for turn acceleration (or braking) of the wheelchair. It is programmed in increments of 1% of the Turn Decel'n value. This percentage of Turn Decel'n value occurs when the joystick Module's speed setting is at 1. For example: if Turn Accel'n is set at 80 and Min Turn Dec.% is set at 25% then when the speed setting is 1, acceleration will be 25%x80=20, and when the speed setting is 5, the acceleration will be 80. Speed Setting 2,3 and 4 will interpolate linearly between 20 and 80-i.e. turn acceleration values of 35,50 and 65 respectively. If min Turn Acc.% is set at 100% then acceleration will not vary as the speed setting is changed.

Some power Modules may be factory programmed to limit the value of this parameter. If you want to set the value outside these limit, Contact Penny & Giles.

5.19 Clear Timer?

This allows you to clear the fault log after a successful repair.

5.21 Preset Eng Values?

Selecting this seta all ENGINEER menu parameters to their default values.

5.22 Back to root?

This takes you back to the ROOT menu.

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Penny + Giles Drivers Technology Pilot+Chin Module User information Sheet

PILOT+CHIN MODULE

Refer to the wheelchair manufacturer's documentation for detailed operating and service instructions.

Control and Connections

On/Off Switch

This is a pushbutton which turns the control system on and off. Do not use this switch to stop the wheelchair, except in an emergency.

Battery Gauge.

This is a ten segment illuminated display which indicates if the control system is turned on and also gives the state of charge of the battery. Additionally, any faults in the wheelchair's electrical system are indicated by this display. Refer to the wheelchair's documentation for more details.

Joysitck

This control's the speed and direction of the wheelchair. Push the joystick in the direction you wish to go. The further you push it, the faster the speed. Releasing the joystick stops the wheelchair and automatically applies the brakes.

Maximum Speed Indicator

This is a gauge which shows the maximum speed setting for the wheelchair. There are five speed settings. Step 1 is the lowest speed and step 5 is the highest speed. For details of how to change the maximum speed setting, see Mode Switch section.

Mode Switch

This is a push-button which is used to make maximum speed setting changes and to change between wheelchair operating modes. Refer to Pilot+ Operation and installation guide for further details.

If the mode switch is operated while you are driving the maximum speed setting will be increased by one step.

If the Mode switch is operated while the joystick is centered then speed adjust mode will be entered. The maximum speed indicator will flash and maximum speed setting can be changed with left and right movements of the joystick, Operating the switch again will take you back to drive mode or to actuator adjustment mode, if the wheelchair is fitted with seat adjustment actuators.

In actuator adjustment mode, left and right joystick movements select the actuator for adjustment forward and reverse joystick movements adjust the position. Operating the Mode switch again will take you back to drive mode.

Communications Connector.

This is connects the Chin Module to the Pilot+ Power Module. Ensure this connector is firmly in place.

Charger Socket

You may charge the wheelchair through this 3 pin socket. This socket may also be used for re-programming the controller using a PP1 Programmer, should this be necessary. The socket can also be used to lock the wheelchair, refer to Pilot+ Operation and installation guide for further details.

Adjustments

Switch Height Adjustment

The heights of the On/Off and Mode switches can be independently adjusted. Loosen the switch height locking screw and slide switches to the correct heights for the user. Re-tighten the switch height locking screw. It is not necessary to open the Chin Module to male any of these adjustments.

Joystick Orientation

The joystick orientation can be adjusted to suit individual users. The following steps should be taken.

Ensure unit is switched off.

Hold down the Mode switch and displace the joystick from centre, then switch the unit on. The battery indicator will ripple up and down and you should continue to hold the Mode switch and displace the joystick until the battery indicator flashes 7 bars, this happens after approximately 5 seconds.

Release the joystick and operate the Mode Switch again, the battery indicator will rapidly ripple up and down and 1 light will flash on the maximum speed indicator.

Now fully deflect the joystick to the desired forward position and operate the Mode switch. The battery indicator will continue to ripple but the maximum speed indicator will show 2 lights.

Now fully deflect the joystick to the desired left position and operate the Mode switch. The battery indicator now flash 9 bars and the maximum speed indicator should show 1 light To drive unit should switched off and on again.

If the sequence has been unsuccessful, instead of 9 bars flashing on the battery indicator just 2 bars will flash. In this instance, switch off the unit and repeat the sequence.

It is not necessary to open the Chin Module to male any of these adjustments.

PILOT + DUAL ATTEDANT MODULE

Refer to the wheelchair manufacturer's documentation for detailed operating and service instructions.

Connection

Connect the Dual Attendant Moduloe into the Pilot + control system as shown above.

Controls

Joystick

This controls the speed and direction of the wheelchair, push the joystick in the direction you wish to go. The further you push it, the faster the speed. Releasing the joystick stops the wheelchair and automatically applies the brakes.

Control Switch

This transfers drive control of the wheelchair between the user's joystick Module and the Dual Attendant Module.

Control Indicator

This shows which joystick has control. If the red wheelchair light is on, the user's joystick has control. If the green attendant light is on, the Dual Attendant's joystick has control.

Speed Switch

This sets the maximum speed of the wheelchair when the Dual Attendant Module has control.

Maximum Speed Indicator

This shows the maximum speed setting of the wheelchair when the Dual Attendant Module has control. There are five speed settings – step is the lowest speed and step 5 is the highest speed. The speed setting is changed with the speed switch.

Communications Connectors

These connect the Dual attendant Module to the Power Module and the joystick Module. Ensure both connectors are firmly in place.

IMPORTANT : Precautions for Use

The Pilot + control system has been designed with the user's safely as the prime consideration. It incorporates many sophisticated self-test features which search for potential problems at a rate of 100 times per second. If the control system detects a problem either in its own circuits, or in the wheelchair's electrical system, it may decide to halt the wheelchair depending on the severity of the problem. The Pilot+ is designed to maximize the user's safety under all normal conditions.

In spite of its sophistication, the Pilot+ cannot take into account circumstances which put the wheelchair or the control system outside of their specified operating conditions, and so it is important that the user follows the following precautions:-

1) Do not drive the wheelchair:

   a) beyond restrictions indicated in the wheelchair user manual, for example maximum inclines, curb height etc.
   b) in places or on surfaces where a loss of wheel grip could be hazardous, for example on wet grassy slopes.
   c) If the control system or other crucial components are known to require repair.

In the even of the wheelchair moving in an unexpected way release the joystick. This action will stop the wheel chair under any circumstances.

2) although the Pilot+ control system is designed and manufactured to be extremely reliable and each unit rigorously tested, possibility of a system malfunction always exists (however small the probability) Under some conditions of detected system malfunction, the control system must (for safety reasons) stop the chair instantaneously. If the physical impairments of the user are such that a sudden braking action could result in a fall from the chair, it is imperative that a restraining device such as seat belt be purchased and installed with chair. Restraining devices should be used at all the times when the wheelchair is in motion.

WARNING: Penny & Giles accepts no liability for ;losses for any kind arising from unexpected stopping of the wheelchair or improper programming of the control system or improper use of the wheelchair or control system.

JOYSTICK CONTROL KNOB OPTIONS

FITTING AND REMOVAL

The control knob option available are recommended and supplied by Penny & Giles. Do not use non-approved alternatives.

The joystick knob should fit tight onto the stem. Check to ensure that the knob cannot be easily removed. It should not be possible for the knob to become detached if the joystick is pushed hard fully forward.

If this does happen it will be necessary to fit the tolerance ring (8).

To Change a knob. Gently press down on the rubber gaiter below control knob and pull up with the other hand. Insert the tolerance ring and push into shaft gently but firmly.

Take care not to apply extreme force, which may damage the unit internally.

Check to conform selected option is suitable for user's requirements.

WARNING: Programming should be only carried out by trained engineering/healthcare professional with in-depth knowledge of power chair electric controllers. Incorrect programming could result in an unsafe set up for a wheel chair user. Scandinavian Mobility UK Limited accepts no liability for losses for an kind of the programming of the controller is altered form the recommended factory pre-set values.

PILOT SERIES POWERCHAIR CONTROLLER

1.0 Introduction

The operation of the Pilot series of wheelchair controller is simple and easy to understand. The Controller incorporates state of the art electronics result of may years of research, to provide ease of use an a very high level of safety. In common with other electronic equipment, correct handling and operation of the unit will ensure maximum reliability.

Please read this user chapter carefully – it will help to keep the wheelchair reliable and safe.

2.0. General

2.1 Handling

Avoid knocking the controller and especially the joystick & careful not strike obstacles with the controller or joystick when you drive. Never drop the controller,

When transporting the wheelchair, make sure that the controller is well protected. Avoid damage to cables.

2.2. Operating Conditions

The controller uses industrial-grade components throughout, ensuring reliable operation in a wide range of condition. However reliability of the controller will be improved if exposure to extreme conditions is kept to a minimum.

Do not expose the controller or its components to damp for prolonged periods, if the controller becomes contaminated with food or drink clean it off as soon as possible.

2.3. Cleaning

Clean the controller and joystick with a cloth dampened with washing up liquid mixed with water. Be careful when cleaning the joystick.

Never use abrasive or spirit based cleaners.

3.0. Controls

There are three main controls.

3.1 Main Power Switch and Power Indicator

The main power switch applies power to the controller electronics, which is turn supply power to the motors. Do not use the main power switch to stop the wheelchair unless there is an emergency. (if you do, you may shorten the life of the wheelchair drive components.)

The battery gauge that the controller switched on. It also indicates the operating status of the wheelchair. Details are given in sections 8.

3.2 Joystick

The joystick controls the speed and direction of the wheelchair. The further you push the joystick from the rest position the faster the wheelchair will move. When you release the joystick the brakes are applied automatically.

3.3. Speed Control

This control sets the maximum speed of the wheelchair. Turn the knob clockwise to increase the speed or anit-clockwise to decrease the speed.

The speed control is programmable. Refer to section 10 for details.

4.0 Getting Ready to Drive

Check that the speed control is turned to a position which suits the user.

Press the main power switch. The battery gauge will blink and then turn on after a second.

Push the joystick control the speed and direction of the wheelchair.

Please note that if you push the joystick just after you turn on the controller, the battery gauge illumination will 'ripple' up and down and the wheelchair will not be allowed to move. You must release the joystick to resume normal operation. If you do not release the joystick within five seconds the wheelchair will not be able to move, even if you release the joystick and push it again. The battery gauge will then flash rapidly. You can clear this condition by switching the controller off and on again.

If you do not push the joystick when you switch on the controller and the battery gauge flashes rapidly. Then there may be fault. Refer to section 8 for details.

5.0 Tips for Using the Controller

5.1 Driving – General

Make sure that the controller is mounted securely and that the joystick position is correct. The hand or limb that is used to operate the joystick should be supported. For example by the wheelchair arm pad. Do not use the joystick as the sole support for the hand or limb. Wheelchair movements and bumps could upset the control.

5.2. Driving Technique

The Controller interprets the joystick movements and produces appropriate movements of the wheelchair. You will need very little concentration to control the wheelchair, which is especially useful if you are inexperienced. One popular technique is to simply point the joystick in the direction you want to go. The wheelchair will "home-in" in the direction you push the joystick.

The further you push the joystick away from the rest position, the faster the wheelchair will go.

The intelligent speed control system minimises the effects of slopes and different types of terrain.

6.0 Precautions for use

Note: In the event of the wheelchair moving in an unexpected way release the joystick.

This action will stop the wheelchair under any circumstance.

6.1 Hazards

Do not drive the wheelchair:

a) beyond the restrictions indicated in the wheelchair user manual, for example maximum inclines, kerb height etc.
b) in places or on surfaces where a loss of wheel grip could be hazardous, for example on wet grassy slopes.
c) If you know that the controller or other crucial components require repair.

WARNING: Although the Pilot controller is designed to be extremely reliable and each unit is rigorously tested during manufacture, the possibility of a system malfunction always exists (however small the probability) Under some conditions of system malfunction the controller must (for safety reasons) stop the chair instantaneously. If there is an possibility of the user falling out of the chair as a result of a sudden braking action, it is imperative that a restraining device such as a belt is supplied with the wheelchair and that it is in use at all times when the wheelchair is in motion. Penny & Giles accept no liability for losses of any kind arising from the unexpected stopping of the wheelchair. Or arising from the improper use of the wheelchair or controller.

7.0 Safety Checks

The electronic circuits in the controller have been designed to be extremely safe and reliable. The on-board microcomputer carries out safety checks at up to 100 times per second. To supplement this safety monitoring you should carry out the following periodic checks.

If the control system fails any these checks, do not use the wheelchair.

7.1 Daily Checks

Joystick: With the controller switched off, check that the joystick is not bent or damaged and that it returns to the centre when you push and release it, if there is a problem do not continue with the safety checks and contact a service agent.

7.2 Weekly Checks

Parking brake. This test should be carried out on a level floor with a at least one meter clear space around the wheelchair.

a) Switch on the controller
b) Check that the battery gauge remains on, flashes slowly, after one second.
c) Push the joystick forward until you hear the parking brakes operate. The chair may start to move.
d) Immediately release the joystick. You must be able to hear each parking brake operate within a few seconds.
e) Repeat the test a further three times, pushing the joystick slowly backwards, left and right.

Connectors: Make sure that all connectors are securely mated.

Cable: Check the condition of all cables and connectors for damage.

Joystick gaiter: Check the thin rubber gaiter or boot, around the base of the joystick shaft, for damage or splitting. Check visually only, do not handle the gaiter.

Mounting: Make sure that all the components of the control system are securely mounted. Do not over tighten any securing screws.

7.3 Servicing

to ensure continued satisfactory service, we suggest that the wheelchair and control system inspected by the service agent after a period of 1 year from commencement of service.

8.0 Status Indication

The battery gauge will indicate the status of the controller.

Please note that a number of supposedly faulty controllers returned for repair are subsequently found to operate correctly. This indicates that many faults are due to the wheelchair problems rather than the controller.

8.1 Battery Gauge Steady

This indicates that all is well.

8.2 Battery Gauge Flashes Slowly

The controller is functioning correctly, but should charge the battery as soon as possible.

8.3 Battery Gauge Flashes Rapidly –(even with the joystick released)

The controller safety have operated and the controller has been prevented form moving the wheelchair.

This indicates that there is a fault. Please follow this procedure:

a) Switch off the controller.
b) Make sure that all connectors on the wheelchair and the controller are mated securely.
c) Check the condition of the battery
d) If you can find the problem, try using the self-help guide given in section 8.4.
e) Switch on the controller again and try to drive the wheelchair. If the safety circuits operate again, switch off and do not try to use the wheelchair.

8.4. Self-Help Guide.

If a fault occurs, you can find out what was has happened by counting the number of bars on the battery gauge that are flashing.

Here is a list of self-help actions. Go to the number in the list which matches the number of flashing bars and follow the instructions.

1 bars. The battery needs charging or there is bad connection to the battery. Check the connections to the battery and the check the controller power connector. If the connections are good, try charging the battery.

2 bars. The left hand motor has a bad connection. Make sure that the motor is connected properly and the controller connectors are secure.

3 bars. The left hand motor has a short circuit to a battery connection.

4 bars The right hand motor has a bad connection. Make sure that the motor is connected properly and the controller connectors are secure.

5 bars. The right hand motor has a short circuit to battery connection.

6 bars. The battery charger is preventing the controller from driving the wheelchair. Disconnect the charger from the wheel chair.

7 bars A joystick fault is indicated. Make sure that the joystick is in the rest position before switching on the controller.

8 bars. A controller fault is indicated. Make sure the controller connections are secure.

9 bars. The parking brakes have a bad connection. Check the parking brake and motor connections. Make sure the controller connections are secure.

10 bars. An excessive voltage has been applied to the controller. This is usually caused by a poor battery connection. Check the battery and controller connections.

8.5. Slow or sluggish movement

If the wheelchair does not travel at full speed or does not respond quickly enough, and the battery conditions good, check the position of the speed control. If adjusting the speed control does not the problem then there may be a non-hazardous fault.

9.0 Battery Gauge.

The battery gauge is included to indicate how much charge is left in the batteries. The best way to sue the gauge is to learn how to behaves as you drive the wheelchair. Like the fuel gauge in a car, it is not completely accurate, but it will help you avoid running out of "fuel".

The battery gauge works in the following way:

When you switch on the controller, the battery gauge shows an estimate of the remaining battery charge.

The battery gauge gives you a more accurate reading about a minute after you start driving the wheelchair.

Note: when replacing batteries, fit the recommended by the wheelchair manufacturer. If you another type the battery gauge may be inaccurate.

The amount of the charge in the batteries depends on a number of factors. Including the way the wheelchair is used, the temperature of the batteries, their age and the way they are made. These factors will affect the distance the wheelchair can travel. Al wheelchair batteries will gradually lose their capacity as they age.

To make the batteries last longer, do not allow them to become completely flat. Always recharge the batteries promptly after are discharged.

If the battery gauge reading seems to fall more quickly than usual, the batteries may be worn out.

10.0 Programming

If you find that you cannot find a position of the speed control that suits the user, the controller can be programmed to meet their needs.

The PP1 is a small hand-held unit which can be plugged into the controller to alter the program. The wheelchair distributor or service agent or wheelchair manufacturer will be able to program the controller.

If your have a PPI , read the PPI use guide before you use it.

If you re-program the controller, make sure that observe any restrictions given in the wheelchair user manual. Note any changes you make for future reference.

WARNING: Programming should only be conducted by Healthcare professionals with in-depth knowledge of Penny & Giles electronic controller. Incorrect programming could result unsafe set-up of a wheelchair for a user. Penny & Giles accept no liability for losses of any kind if the programming of the controller is altered from factory preset values.

11.0 Joystick Knobs

The Knob fitted to the joystick is suitable for most applications. If the user would prefer another type, there is a range of alternatives available. Please contact the wheelchair distributor or manufacturer for advice. Do not replace the joystick know with any unauthorized item. It may cause hazardous operation.

12.0 Servicing

All repairs and servicing be carried out by authorized service personnel. Opening or making any unauthorised adjustments or modifications to the controller or its components will invalidate any warranty and may result in hazards to the user or other people, and is strictly forbidden.

WARNING: Penny & Gales accept no liability for losses of any kind arising from unauthorised opening. Adjustment or modifications to the Pilot controller.

PILOT SERIES DIGITAL POWERCHAIR CONTROLLER

CHAPTER 2 : PROGRAMMING

1.0 Programming for Wheelchair Controllers

The main advantage using programmable controllers is that they can be easily tailored to the specific needs and capabilities of a particular user while taking into account the safe performance characteristics of the wheelchair being used. This means that powered wheelchair configured with Penny & Giles Pilot controllers can be readily programmed to be safe under normal driving conditions and also feel secure and comfortable to the user.

1.1. Important Note

It is possible to set up a controller so that it is unsuitable for some users and possibly even some chair. Take care when programming a controller and if you need any advice in programming or selecting values, please do not hesitate to contact Penny & Giles.

WARNING: Programming should only be conducted by healthcare professionals with in-depth knowledge of Penny & Giles electronic controllers. Incorrect programming could result in an unsafe set up a wheelchair for a user. Penny & Giles accept no liability for losses of any kind if the programming of the controller is altered from factory per-set values.

2.0 PP1 Pilot Programmer

The PP1 is the handheld programmer that Penny & Giles supply for their Pilot series of wheelchair controller Primarily intended for the design and test requirements of wheelchair manufacturers and engineers , the PP1 takes full advantage of the complete programmability of the Pilot., offering functions not available with less sophisticated controller design.

2.1 Basic PP1 Programmer

The most basic programmer version – the PP1a is intended for general purpose use. It can set upper and lower limits for all of the key controller speed and acceleration characteristics, and allows different settings to the tried out while the programmer is still plugged into the controller. A context sensitive help function is available to guide users through the menus and the PP1 can also display error message from the Pilot controller allowing any problem with the wheelchair electrical system to be identified and cored quickly.

2.2. Engineering Version

The Engineering version (PP1b) offers all of the PP1a features but also includes a suite of advanced functions for designers, such as matching the controller to the motor impedance, setting maximum drive current, and enabling front or rear wheel drive algorithms, clearly, the PP1b is a very powerful tool for prototype design work. However, users who program parameters incorrectly do run the risk of damaging controllers or motors, so it should only be used by experts in wheelchair electrical systems.

2.3. PP1 Specifications

FUNCTIONS	NOTES	PP1a	
Set Acceleration	Vary from 0 to 100	Unit Steps	Unit Steps
Set De-acceleration	Vary from 0 to 100	Unit Steps	Unit Steps
Set Turn Acceleration	Vary from 0 to 100	Unit Steps	Unit Steps
Set Turn De-acceleration	Vary from 0 to 100	Unit Steps	Unit Steps
Set forward speed	Vary from 0 to 100	Unit Steps	Unit Steps
Set Reverse Speed	Vary from 0 to 100	Unit Steps	Unit Steps
Set Turn speed	Vary from 0 to 100	Unit Steps	Unit Steps
Read Fault Log	Display fault code history	Yes	Yes
Preset Controller	Set drive functions to factory preset values	Yes	Yes
Help Mode	On-line help test	Yes	Yes
Diagnostics	Read fault log code from Pilot Controller	Yes	Yes
Steerting Correction	Compensate for mis matched		-9 to +9
Set Soft Reverse	Prevents wheels digging in when braking in reverse down a slope. Percentage of forward brake rate (25% to 100%)		1 % Steps
Set Current Limit	Maximum and minimum current outputs (20A to 40A)		1A Septs
Set Folback Temp.	Reduce current at this temperature (25°C to 70° C), then decrease current linearly until shut down temperature is reached.		1°C Steps
Set Foldback Time	Reduce current (25% to 100%) after stall time (5s to 10 mins to protect motors.		1 % Steps & 5s Steps
Set Compensation	Match motor impedance for precise control (0 to 10).		5m steps
Set battery Menu	Math Tru Charge display to loom resistance (0 to 255m).		1m steps
Set Brake Trip Disable*	For chairs without brakes.		YES/NO
Set Front Wheel Drive	Select algorithm for front wheel drive		YES/NO
Min. Acceleration	Vary from 0% to 100%		1 % Steps
Min De. acceleration	Vary from 0% to 100%		1 % Steps
Min. Turn Acceleration	Vary from 0% to 100%		1 % Steps
Min. Turn De-acceleration	Vary from 0% to 100%		1 % Steps
Erase Fault Log	Erase Fault Code history		Yes
Preset Engineering Values	Set engineering functions to factory preset values.		Yes

2.4. Important Note (*)

Resetting these parameters to non-compatible values could damage controllers and motors, and invalidate any warranties. Current limited should never be set to a value greater than the recommended controller maximum and Brake Trip should only be disabled on those chairs without brakes. Contact Penny & Giles if is there is the slightest doubt. On a more general note, it is possible t set up a controller so that it is unsuitable for some users or even some chairs. It you need any advice on programming, please do not hesitate to contact Penny & Giles.

3.0. Using the PP1b

Please read this guide carefully using the PP1b programmer. Setting parameters to incorrect values could damage controllers and motors, and invalidate any warranties. In particular. Currant limited should never be set to a value greater than the recommended controller maximum and park brake trip should only be disabled on chairs without brakes.

3.1 PP1b Keypad Layout & Description

3.2. Connection

The PP1 reacts differently depending on status to the controller when the PP1 is connected.

i) If the controller is on and working, simply plug the PP1 into the controller. It ROOT menu will be displayed and the PP1 may be used to change the programming parameters of the controller. Provided no engineering functions are altered, then the chair may be driven with the programmer still attached. If any engineering functions are altered, then the controller will be inhibited from driving the controller has been turned off and then on.

ii) If the controller is on and in a 'tripped state' plug the PP1 in. The fault message relating to the trip will automatically be displayed. Once the message has been read, you can select the Enter Key to display the ROOT menu and begin programming the controller.

iii) If the controller if off – plug the PP1 in and it will display a 'no connection" message. If the controller is now turned on, the PP1 will enter its ROOT menu.

IMPORTANT – When the PP1 is connected to the Pilot, the electromagnetic compatibility (EMC) performance of the wheelchair may be affected. Disconnect the PP1 as soon as programming is complete and do not use the PP1 in environments which are EMC sensitive.

4.0 Root Menu

The ROOT menu contains all the parameters which set the normal drive characteristics of the wheelchair. Each parameter is explained in the following paragraphs.

4.1. Acceleration?

Adjusts the value for forward and reverse acceleration of the wheelchair in increments of !%. This value occurs when the controller's speed control potentiometer is fully clockwise. Its value at other settings of the speed control depends on the setting of the Min. Acceleration parameter (see later).

4.2. Deceleration?

Adjusts the value for forward and reverse deceleration of the wheelchair, in increments of 1%. This value occurs when the controller's speed control potentiometer is fully clockwise. Its value at other settings of the speed control depends on the setting of the Min. Deceleration parameter (see later).

4.3. Turn Acceleration?

Adjusts the value for forward and reverse turn acceleration of the wheelchair, in increments of 1%. This value occurs when the controller's speed control potentiometer if fully clockwise. Its value at other setting of the speed control depends on the setting of the Min. Turn Acceleration parameter (see later).

4.4. Turn Deceleration?

Adjusts the value for forward and reverse turn deceleration of the wheelchair, in increments of 1%. This value occurs when the controller's speed control potentiometer if fully clockwise. Its value at other setting of the speed control depends on the setting of the Min. Turn Deceleration parameter (see later).

4.5. Forward Speed?

Adjusts the minimum and maximum values for forward speed of the wheelchair, in increments of 1%. The maximum value occurs when the controller's speed control clockwise. The minimum value is automatically scaled in relationship to the forward speed setting and calculated as below.

$$\text{Min. rev} = \text{max reverse} \times \frac{\text{min forward}}{\text{Max forward}}$$

4.7. Turing Speed?

Adjusts the minimum and maximum values for turning speed of the wheelchair, in increments of 1 %. The maximum value occurs when the controllers speed control potentiometer is fully clockwise, and the minimum occurs when the speed control potentiometer is fully anti-clockwise.

4.8. Read Fault Log?

The Pilot has a fault log facility which stores the number of occurrences of the last eight faults. This allow you to view the contents. The display format is as below.

1: Code 2C00, # 1
2. Code 3C00, # 3
No more entries

This reads line by Line as.

Line 1- fault code 2C00 has occurred once.
Line 2 –fault come 3c00 has occurred three time.
Only two fault types recorded

4.9 Preset Unit?

Selecting this sets all ROOT menu parameters to their default values.

5.0 Engineer Menu?

Selection of this enters the engineering menu and allows you to adjust the technical performance parameters or functions of the controller. Each parameter or function is described below.

5.1 Steer Correct?

This factor compensates for any mismatching of motors to ensure that the wheelchair drives directly forward when the controller's joystick is being pushed directly forward.

5.2. Soft Reverse?

This sets the reverse braking rate. Reverse braking is normally 70% of forward braking ot prevent the chair's tendency to topple when stopping in reverse on a gradient.

5.3. Current Limit?

This sets the maximum and minimum current output for the controller. The current output is dependent on the internal temperature of the controller. Graph A (below) shows the relationship.

Pilot controllers come in two different maximum output families – 25A and 40A. The table below shows the recommended maximum to minimum relationship.

Max. current limit	Min. current limit
25A	25A
40A	30A

You can set the maximum and minimum current outputs between 20A and the maximum permitted upper value in steps of 1A.

5.4. Temp Foldback?

This is the internal controller temperature at which the current output starts to reduce, see Graph A. The table below shows the maximum value of the temperature for each controller type.

Max. current limit	Temp. Foldback
25A	55°C
40A	55°C

IMPORTANT the temperature value should never be set to more than the maximum possible for each controller type. Doing so will invalidate the warranty and affect the long term reliability of the controller.

5.5. Timed Foldback?

This function allows a measure of protection for motors when they get into a stalled condition. You can set a 'Stall Time' of between 5 seconds and 10 minutes in 5 second increments after which time the maximum current limit is reduced to a percentage of the maximum current. This percentage (Foldback %) may be set between 25% and 100% of the current limit maximum in 1% steps.

After a fixed Rest Period of 5 x (Stall Time), the current limit will be allowed to return to the current limit maximum, if demanded. This reset period is to allow the motor (s) sufficient time to cool.

5.6. Compensation?

This matches the controller to different motor types in order to achieve optimal performance and control. Penny & Giles recommended that you set this value to not more than 70% of the resistance of the motor armature and all cables and connectors to it.

IMPROTANT - never set to greater than 70%

Motor manufacturers should be able to supply figures for armature resistance and typical cable and connectors would be about 4m.

5.7. Battery Cable?

This sets the value of cable and connector resistance between the controller and the batteries. The value corresponds to the total resistance in the both the positive and negative paths.

You can set this between 0m. And 255M in steps of 1m.

5.7.2 Gauge Cal?

This allows fine calibration of the TruCharge battery gauge. This is normally set at the factory and should not need adjustment. Please contact Penny & Giles if you are considering altering this factor.

5.7.3 Back to E Menu?

This returns you to the ENGNEER Menu

5.8. Park Brake Trip?

This tells the controller whether or not to trip if the solenoid brake is disconnected or not f fitted. You can turn this function on or off.

IMPORTANT- This function should only ever be turned off if there are no solenoid brakes fitted to the wheelchair.

5.9. Front Drive?

This selects special front wheel drive control software. You can turn this on or off.

5.10. Min.Accel'n % ?

Adjusts the minimum value for forward and reverse acceleration of the wheelchair. It is programmed in increments of 1 % of the Accel' n value. This percentage of Accel'n value occurs when the controller's speed control potentiometer is turned fully anti-clockwise. For example: if Accel'n is set at 90 and Min.Accel'n is set at 50% then when the speed control is turned completely anti-clockwise, acceleration will be 50%x90=45, when the speed control is turned fully clockwise, the acceleration will be 90. Intermediate position of the speed control will interpolate linearly between 45 and 90, if Min. Accel'n is set at 100% then acceleration will not vary as the speed control's setting is changed.

5.11 Min. Decel'n %?

Adjusts the minimum value for forward and reverse deceleration of the wheelchair. It is programmed in increments of 1 % of the Decel' n value. This percentage of Decel'n value occurs when the controller's speed control potentiometer is turned fully anti-clockwise. For example: if Decel'n is set at 90 and Min.Decel'n is set at 50% then when the speed control is turned completely anti-clockwise, acceleration will be 50%x90=45, when the speed control is turned fully clockwise, the acceleration will be 90. Intermediate position of the speed control will interpolate linearly between 45 and 90, if Min. Decel'n is set at 100% then Deceleration will not vary as the speed control's setting is changed.

5.12 Min. Turn Accel'n % ?

Adjusts the minimum value for turn acceleration of the wheel chair. It is programmed in increments of 1 % of the Turn Accel'n value. This percentage of Turn Accel'n value occurs when the controller's speed control potentiometer is turned fully anti-clockwise. For example : if Turn accel'n is set at 90 and Min.Turn Accel'n is set at 50% then when the speed control is turned completely anti.clockwise, turn acceleration will be 50%x90-45 when speed control is turned fully clockwise, the turn acceleration will be 90. Intermediate position of the speed control will interpolate linearly between 45 and 90. if

Min.Turn Accel'n is set at 100% then turn acceleration will not vary as the speed control's setting is changed.

5.13. Min. Turn Decel'n?

Adjusts the minimum value for turn deceleration of the wheelchair. It is programmed in increments of 1% of the Turn Decel'n value. This percentage of Turn Decel'n value occurs when the controller's speed control potentiometer is turned fully anti-clockwise. For Example : if Turn Decel'n is set at 90 ad Min Turn Decel'n is set at 5% then when the speed control is turned completely anti-clockwise, turn deceleration will be 50%x90=45, when the speed control is turned fully clockwise, the turn deceleration will be 90. intermediate positions of the speed control will interpolate linearly between 45 and 90. if Min Turn Decel'n is set at 100% then turn deceleration will not vary as the speed control's setting is changed.

5.14. Erase Fault Log?

This allows you to clear the fault log after a successful repair.

5.15. Preset Eng. Values

Selecting this sets all ENGINEERING menu parameters to their default values.

5.16 Back to root?

This takes you back to the ROOT menu.

CONTROLLER WITH INTEGRAL JOYSTICK

REMOTE (DL, 40)

Tools

No.1 Philips Screw Driver
No.2 Philips Screw Driver

PARTS

1. Bumper/Guard
2. DL40 Controller
3. Joystick Knob
4. Speed Control
5. Fixing Screw
7. Support Bracket
8. Harness

METHOD OF REMOVAL

STEP 1
Disconnect motor and battery feed wires, Unfasten cable ties from chassis.

STEP 2
Undo Controller mounting bracket Fixing, Unplug motor connectors Controllers will then be free from the chair.

INSPECTION

STEP 1
Check for any physical damage to the outer casing.

STEP 2
Inspect the rubber gaiter around the joystick knob for any cracks, splits or perishing. This would enable water or moisture to access the unit. This would cause serious damage to the controller.

STEP 3
Check speed control knob is secure and its action is free and easy in rotation. To adjust the needle pointer, remove the end cap with a knife by sliding it down between the small gap at the knob. Using a No.1 Philips Screw Driver loosen off the fixing screw. The knob can then be removed. Turn the potentiometer shaft fully clockwise, re-fit the knob into the potentiometer shaft and position the needle pointer on the cap to apx. 11 o 'clock and tighten up firmly.

NOTE: CHECK THAT: MAX SPEED IS @ 11 O'CLOCK
MIN SPEED IS @ 2.00 O'CLOCK

TO REASSEBLME REVERSE STEPS 1 TO 3

READ THE FOLLOWING CAREFULLY INFORMATION IS DESIGNED TO HELP US UNDERSTAND HOW THE CONTROL SYSTEM FUNCTIONS

GENREAL FEATURES

The DP PWC has the following general features:
Radio frequency interference compatible to 20 Volts/meter
Ergonomic on-off switch
Audible on-off switch feedback and low battery charge warning.
True state of charge battery gauge with three colour display.

-Digital motor control
-Built in diagnostics with fault display and fault logging
-Complies with ISO7176, part 14 when correct installed
-Load compensation (described below)
SAFETY AND PROTECTION FEATURES.

The DL has the following safety and protection features:
-Soft top or controlled speed reduction to a stop if a fault is detected or the controller switched off.

-Protected against external faults such as reverse battery connection. Overloaded motors or park brakes and external short circuits.

-Joystick out of neutral at power up detection with drive inhibit.
-Over voltage shut down
-Detection of open circuit motors
-Detection of open or short circuit park brake outputs.
-Battery under voltage protection with battery saver to prevent battery damage through over discharge.
Thermal overload protection with progressive motor current roll back and automatic recovery.
Driving inhibit when a battery charger is connected to the built in charger socket.

THE BATTERY DISCHARGE INDICATOR.

The three colour battery Gauge gives an indication of the amount of charge in the batteries. The display also provides an on or off status indication for the controller and diagnostic information in the event of a fault (Diagnostics are described in section 8)

WHAT TO DO IN THE EVENT OF A FAULT

SYMPTON	CHECK/ACTION
ON/OFF button pressed to ON. lamp does not light up wheelchair does not move	Is the man cable loom plug properly inserted into the rear of the controller.?
	Are the batteries completely flat?
	Have you left the battery charge plugged in?
ON/OFF lamp lights up, wheelchair does not move or behaves erratically, controller is hard to click	Are one or both motors disengaged (freewheel mode)?
	Are the batteries discharged to the critical level?
Battery: Charge indicator flashing slowly, Wheelchair moves, but with reduced speed And sluggish response.	Are the batteries discharged below The critical safety level?
Battery Charge indicator flashing quickly (twice per second) wheelchair not moving	
Batteries will not accept charge	Possible charger fault
	Is the charger fuse blown? (screw cap on the rear of the controller)

DIAGNOSTICS

THE DL.40 CONTROLLER HAS FULL ON BAROD DIAGNOSTICS WHICH WILL IN THE EVEN OF A SYSTEM MALFUNCTION, IDENTIFY FAULTS QUICKLY EASILY.

Diagnostic information is provided to enable a fault in the system to be identified and localized to a major component: eg; motor the following system diagnostics are provided:

1) Low Battery voltage fault	Flash code sequence
2) High battery voltage fault	
3) Left motor (or connection) fault.	
4) Right motor (or connection) fault	
5) Left or right park brake (or connection) fault	
6) Controller fault	
7) Motor stalled or joystick out of neutral time out	

In the event of system fault, the diagnostic are displayed by the battery gauge flashing. Fault are encoded As one (for low battery voltage fault) to seven (for a motor stalled or joystick out of neutral time out fault) and displayed by flashing all LED's the number of time give by the fault code. The flash sequence (one to seven) is following by a long of periods (2 seconds)

TROUBLESHOOTING

The following is a check list to assist with diagnosing an electrical fault on a wheelchair. If after consulting the check list the person persists then an authorized service agent should be contracted.

PROBLEM	CHECK/ACTION
0. The status indicator/Battery Gauge does not light when the controller is switched on	1. check the battery connector to the controller is securely plugged into the connector from the battery. 2. Check the batteries themselves are battery terminals 3. Check the batteries are not flat. 4. Check the battery supply fuse or circuit breaker.
1. Low battery voltage fault	1. Check the battery connector to controller is securely plugged into the connector from the battery.
2. High battery voltage fault	1. Check the battery charger. Is it over charging the batteries? Is the battery charger the right type?

PROBLEM	CHECK /ACTION
3. Left Motor (or connection) fault in. right damage.	1. Check the left and right motor/park brake connectors are securely plugged 2. Check the contacts in the left and motor connectors for corrosion or 3. Check the left and right motors using a ohmmeter disconnect the motors resistances at the motor resistances at the motor connectors. If the resistance is more than 1 Ohms or less than 100 mili Ohms the motor is probably faulty. (if the motor seems OK sometimes and not others when rotated then the motors brushed or commutator are is/faulty. 4. Check the resistance of the motor to its housing. Using an ohmmeter measure the resistances of either motor contact to the motor housing. If the resistance is

		less than 1 Meg Ohms the motor is probably faulty. (if the motor seems OK and not others when rotated then the motors brushes may be touching the housing as the commutator is rotated) 5. Disconnect both motors (and park brakes). Turn the controller off and on leaving the joystick in neutral. If a motor fault is still indicated then the fault is actually with the controller. N.B Due to limitations of the diagnostics a fault in the controller output electronics may be indicated as motor fault
4.	Right Motor (or connection) fault	As above
5.	Right Motor (or connection) fault connectors are.	1.Check the motor/park brake securely plugged in 2. Check the contacts in the connectors or damage. 3. Check the park brakes. Using an ohmmeter disconnect each park brake and measure the the resistance at the connector. If the r resistance is less than 20 ohms the park is less than 20 ohms the park brake is probably fault

PROBLEM	CHECK/ACTION
6. Controller fault brakes).	1. Disconnect with motors (and park Turn the controller off and on leaving the joystick in neutral. If a controller fault is still indicated then the controller fault is confirmed. 2. Disconnect both motors (and park
brakes).	Turn the controller off and on leaving the joystick. If the controller relay clicks twice and a left motor fault is now indicated then the controller is OK. If another fault other than the left motor is indicated and the relay does not click then a controller fault is confirmed.
7. Motor stalled or joystick out of neutral time out	1. Check joystick is released and in neutral when controller is switched on. 2. Check wheelchair is able to move and is not blocked by an obstacle. 3. Check motors and gearboxes are OK by releasing the ref wheeling hubs. Deflecting the joystick forward and observing the hubs to see if both left and right hubs turn.
8. The battery Gauge is on and control box is are heard to “Click” but chair does not move or of	1. Check the both free wheeling hubs engaged? With the controller off. Push

steering in erratic	pull the wheelchair to ensure both left and right wheel do not free wheel.
9. The wheelchair turns in circle or does not drive straight by deflecting turn.	1.Check motors and gearboxes are OK releasing the free wheeling hubs, the joystick forward and observing the hubs to see if both left and right hubs 2. Check both free wheeling hubs engaged. With the controller off, push or pull the wheelchair to ensure both left and right wheel do not free wheel. 3. Check if one park brake is dragging. Does one or both park braked get hot after driving? The park brake should be able to be touched without any discomfort.
10. Batteries not charging	1. Check the battery charger is plugged switched on. 2. Check the charger is the correct type. 3. Check the charger operation. 4. Check the fuse next to the power connector on the charger. Warning: Disconnect charger from both the mains socket before checking the fuse.

BATTERY BOX ASSEMBLY – FRONT

BATTERIES – LID REPLACEMENT

It is advisable to obtain the battery box lid assembly factory wired for safety and reliability. It is of the utmost importance to pay attention to ensuring all connections are tightened correctly.

1. Remove battery box assembly from the chair following instructions in the User Manual.

2. Release the lid from the retaining lugs, both sides, open lid sufficiently to gain easy access.

3. Dis-connect battery terminals, taking note of wire, connections, it is advisable to tie the wires together to ensure correct re-assembly (RED to+) and (BLUE to-)

   DO NOT ALLOW TOOLS FOR CABLES TO SHORT OUT ACROSS BATTERY TERMINALS

4. Reconnect replacement batteries in the reverse order, ensuring the correct cable are fitted to the correct terminals and fully tightened. Refer to the circuit diagram which is situated on the inside of the lid.

5. Check the condition of the circuit breaker (a) , ensuring the button locks positively. Replace only with identical value i.e. 30 amp etc. Check the terminal connections are tight and in good condition.

   Ensure lid is securely located on retaining lugs.

BATTERY BOX ASSEMBLY – REAT

BATTERIES – LID REPLACEMENT

It is advisable to obtain the battery box lid assembly factory wired for safety and reliability. The following instructions apply if this is not practical.
It is of the utmost importance to pay attention to ensuring all connections are tightened correctly.

1. Remove battery box assembly from the chair following instructions in the User Manual

2. Release the lid from the retaining lugs, both sides, open lid sufficiently to gain easy access.

3. Dis-connect battery terminals, taking note of wire connections (RED to +) and BLACK to-)

   DO NOT ALLOW TOOLS OR CABLE TO SHORT OUT ACROSS BATTERY TERMINALS

4. Reconnect replacement batteries in the reverse order, ensuring the correct cables are fitted to the correct terminals and fully tightened. Refer to the circuit diagram which s situated on the inside of the lid.
   Lightly grease all terminals with petroleum jelly (Vaseline).

5. Check the condition of the circuit breaker (a), ensuring the button locks positively. Replace only with identical value i.e. 30 amp etc.

   Check the terminal connections are tight and in good condition.

   Ensure the lid is securely located on retaining lugs.