PPIA

PROGRAMMER FOR PILOT, PILOT+, VSI, newVSI & VR2 CONTROL SYSTEMS

PROGRAMMING AND DIAGNOSTICS

SK73747/12

TABLE OF CONTENTS

About this manual

This manual is split into 3 chapters which are in turn split into separate sections. Each chapter deals with a specific issue.

Chapter 1 - Programming

This chapter gives an overview of the programmable parameters which the PP1a can adjust.

Chapter 2 - Diagnostics

This chapter deals with Trip Type & Code diagnosis.

Chapter 3 - VR2 Servicing

This chapter deals with serviceable parts of the VR2 Joystick Module.

Chapter 4 - Warning Summary

This chapter gives a summary of all the warnings used within the manual.

Icons

PG Drives Technology will be abbreviated to PGDT throughout this manual.

Throughout the manual icons are used to draw the reader's attention.

The icons used are:

Note - A general point for best practice.

Caution - A point of safety which if ignored could result in damage to the control system or the vehicle.

Warning - A point of safety which if ignored could cause injury to the individual.

CHAPTER I - PROGRAMMING

I Introduction

The main advantage of using programmable control systems is that they can be easily tailored to the specific needs and capabilities of a particular wheelchair while taking into account safe performance characteristics.

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.

It is possible to set up a control system so that it is unsuitable for some uses and possibly even some wheelchairs. Take care when programming a control system and if you need any advice in programming or selecting values please contact PGDT.

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic control systems. Incorrect programming could result in an unsafe set-up of a wheelchair for a user. PGDT accept no liability for losses of any kind if the programming of the control system is altered from factory pre-set values.

I.I Use of a PPIa with Pilot, Pilot+, VSI, newVSI & VR2

In general all PP1a Programmers can be used with Pilot, Pilot+, VSI, newVSI and VR2 control systems. However, depending on the exact version of PP1a you have, then some functions may not be available.

You can identify your PP1a by looking at the type number. This will be D49510/x, where x is the version number.

The following table summarizes the full compatibility between the PP1a versions and the Pilot, Pilot+, VSI, newVSI and VR2 control systems.

Function	Controller Compatibility					PP1a Version
	Pilot	Pilot+	VSI	nVSI(5)	VR2(5)	
Acceleration	Y	Y	Y	Y	Y	All
Deceleration	Y	Y	Y	Y	Y	All
Turn Accel'n	Y	Y	Y	Y	Y	All
Turn Decel'n	Y	Y	Y	Y	Y	All
Forward Speed	Y	Y	Y	Y	Y	All
Reverse Speed	Y	Y	Y	Y	Y	All
Turning Speed	Y	Y	Y	Y	Y	All
Power		Y(2)	Y(3)	Y	Y	7 Onwards
Sleep Timer	Y(1)	Y	Y	Y	Y	5 Onwards
Joystick Throw		Y	Y	Y	Y	5 Onwards
Steer Correct	Y(1)	Y	Y	Y	Y	5 Onwards
Switch Bleep			Y			6 Onwards
Bleep Volume			Y	Y	Y	6 Onwards
Act Selection			Y		Y	6 Onwards
Actuator 1 Speed			Y			6 Onwards
Actuator 1 End Force			Y		Y	7 Onwards
Actuator 2 Speed			Y			6 Onwards
Actuator 2 End Force			Y		Y	7 Onwards
Act. End Stop Bleep					Y	9 Onwards
Invert Joystick				Y	Y	9 Onwards
Spd Adjust Driving			Y	Y	Y	9 Onwards
Rev Driving Alarm			Y	Y	Y	9 Onwards
Profiles		Y	Y	Y	Y	7 Onwards
Torque		Y(4)		Y	Y	8 Onwards
Tremor Damping		Y(4)		Y	Y	8 Onwards
Read Timer		Y	Y	Y	Y	5 Onwards
Read System Log	Y	Y	Y	Y	Y	All
Preset Unit	Y	Y	Y	Y	Y	All

(1) Not Pilots manufactured before June 1998

(2) Not Pilot+ manufactured before February 2002

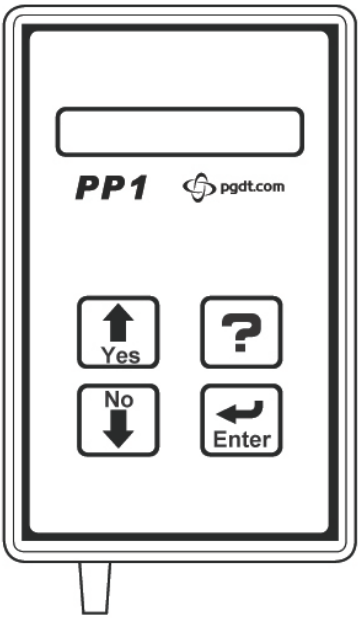
(3) Not VSI manufactured before October 2002

(4) Not Pilot+ manufactured before March 2004

(5) The VR2 and newVSI parameters are only available on PP1A versions 9 onwards.

2 The PPIA Programmer

KEYPAD LAYOUT



	Help Button:	Pressing this button displays information regarding the function you have selected. In menus, HELP tells you what each option does. In options, it tells you what to do next.
	Up / Yes Button:	This button steps up through the menu lists, increases the value of settings and selects functions
	Down / No Button:	This button steps down through the menu lists, decreases the value of settings and de-selects functions
	Enter Button:	This button selects options, settings and function states.

2.1 Important Note

Adjusting the control system's parameters to non-compatible values could damage the control system, the motors, and invalidate any warranties. Contact PG Drives Technology 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.

In addition, the PP1a programmer should not be connected to a control system when the wheelchair batteries are being charged. The high voltages present during charging may damage the programmer.

If you need any advice on programming, please do not hesitate to contact PGDT.

3 Using the PP1a

Please read this guide carefully before using the PP1a Programmer.

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic control systems. Incorrect programming could result in an unsafe set-up of a wheelchair for a user. PGDT accept no liability for losses of any kind if the programming of the control system is altered from factory pre-set values.

3.1 Connection

The PP1a is connected to the control system via the charging socket, it does not matter which charging polarity type you have. The PP1a reacts differently depending on the status of the control system.

For safety reasons. accessing some critical parameters will cause the control system to trip. This is intentional and the control system can be simply reset by switching off then on again.

3.1.1 ... Connecting to a control system when On

If the control system is on and working, and the PP1a is connected, its menu will be displayed and the PP1a may be used to change the programming parameters of the control system. The wheelchair may be driven while the PP1a is connected.

If the controller is on and in a tripped state, and the PP1a is connected, a message relating to the trip will automatically be displayed. Once the message has been read, you can press the ENTER key to display the menu and begin programming the control system.

If a trip occurs when the PPIa is already connected, then no diagnostic information will appear.

3.1.2. Connecting to a control system when Off

If the control system is off and the PP1a is connected, it will display a no connection message. If the control system is now turned on, the PP1a will enter the programming menu.

When the PPIa is connected to a PGDT programmable control system, the electromagnetic compatibility (E.M.C.) performance of the wheelchair may be affected. Disconnect the PPIa as soon as programming is complete and do not use the PPIa in environments which are E.M.C. sensitive.

4 Programming Menu

The 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 acceleration of the wheelchair, in increments of 1. The higher the value the faster the acceleration.

4.2 Deceleration ?

Adjusts the value for forward deceleration (or braking) of the wheelchair, in increments of 1. The higher the value the faster the deceleration.

It is the responsibility of the wheelchair manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the wheelchair will be used. For countries requiring CE marking this is as specified in EN12184.

4.3 Turn Acceleration ?

Adjusts the value for the forward and reverse turn acceleration of the wheelchair, in increments of 1. The higher the value the faster the acceleration.

4.4 Turn Deceleration ?

Adjusts the value for the forward and reverse turn deceleration of the wheelchair, in increments of 1. The higher the value the faster the deceleration.

4.5 Forward Speed ?

This sets the MAXIMUM and MINIMUM forward speed of the wheelchair in increments of 1%. There are two available settings.

Max The maximum value occurs at the control system's maximum speed setting.

Min The minimum value occurs at the control systems minimum speed setting

The value is displayed as a percentage of the wheelchairs total available output. Therefore if the Max value is set to 80% then the wheelchair will be able to drive at up to 80% of the total available speed when the control system's maximum speed setting is reached.

4.6 Reverse Speed ?

This sets the MAXIMUM and MINIMUM reverse speed of the wheelchair, in increments of 1%. There are two available settings.

Max The maximum value occurs at the control system's maximum speed setting.

Min The minimum value occurs at the control system's minimum speed setting

The minimum value is interpreted differently in each control system.

4.6.1 Pilot Reverse Speed

This is automatically scaled in relationship to the forward speed setting and calculated as below.

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

4.6.2 Pilot+.VSI, newVSI & VR2 Reverse Speed

This corresponds to the actual value selected with the PP1a Programmer.

4.7 Turning Speed ?

This sets the MAXIMUM and MINIMUM turning speed of the wheelchair in increments of 1%. There are two available settings.

Max The maximum value occurs at the control system's maximum speed setting.

Min The minimum value occurs at the control systems minimum speed setting

The value is displayed as a percentage of the wheelchairs total available output. Therefore if the Max value is set to 60% then the wheelchair will be able to drive at up to 60% of the total available speed when the control system's maximum speed setting is reached.

4.8 Power

Reduces the power output of the control system.

The parameter is adjustable in steps of 1% between 10% and 100%.

The main purpose is to limit damage to furniture or doorways if the wheelchair is being used indoors. This is particularly useful on wheelchairs designed for children. If this parameter is used with the control system programmed for multiple drive profiles, then indoor and outdoor profiles can be set.

4.9 Sleep Timer ?

A length of time can be set, such that if the control system accepts no valid input for that period of time, it will power down safely.

The time can be set in steps of 1 minute between 0 to 20 minutes.

If the value is set to 0, no power down will occur.

To operate the wheelchair after the control system has entered sleep mode switch the control system off and on again.

In the case of VR2 control systems the controller will turn off rather than go to sleep.

To operate the wheelchair, press the ON/OFF button.

4.10 Joystick Throw ?

This allows you to program the control system so that full speed can be reached with a 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.

This parameter is not present in Pilot controllers.

4.10.1 Manual Adjustment

When the ENTER key is pressed:

- The current setting for joystick throw in the Forward direction will be displayed.
- Displacing the joystick in the Forward direction beyond 25% will display the actual joystick position.
- Pressing of the ENTER key will store the value displayed on the screen.
- Repeat this process for the Reverse, Left and Right positions.

This method can therefore be used to interactively set up the joystick throw with the wheelchair user.

4.10.2 Programming Adjustment

When the ENTER key is pressed:

- The current setting for joystick throw in the Forward direction will be displayed.
- Pressing of the UP or DOWN keys will adjust this setting.
- Pressing the ENTER key will store the setting.

The process is repeated for joystick Reverse, Left and Right positions.

4.11 Steer Correct ?

This factor compensates for any mismatching of motors to 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.

Some Pilot+, VSI & VR2 control systems may be programmed such that this logic is reversed. If in doubt, contact the wheelchair manufacturer or PGDT.

4.12 Switch Bleep ?

Sets whether a bleep occurs when a control system switch is operated. You can set this function to Yes or No.

Yes Means the control system will bleep.

No Means the control system will not bleep.

This function is not present in Pilot. Pilot+, VR2 or newVSI control systems.

4.13 Bleep Volume ?

Adjusts the volume of the bleep if Switch Bleep is set to Yes.

It is adjustable in steps of 1 between 1 and 10. 1 is the quietest, 10 is the loudest.

In the VR2 and newVSI control systems it is adjustable between 0 and 10, where 0 is off.

This function is not present in Pilot or Pilot+ control systems.

4.14 Speed Adjust ?

Sets whether the control system's speed/profile buttons will be active while the wheelchair is driving. You can set this function to Yes or No.

Yes Means the control system's speed/profile buttons will be active while driving

No Means the buttons will only be active when the joystick is in the central position

This adjustment is particularly useful for users who may accidentally operate these buttons while deflecting the joystick.

This function is not present in Pilot or Pilot+ control systems.

4.15 Actuator Selection ?

Sets whether the joystick can be used to select between actuator channels 1 and 2. You can set this function to Yes or No.

Yes Means that when the control system is in actuator mode, then left or right movements of the joystick will select between actuator channels 1 and 2.

No Means that when the control system is in actuator mode, then left or right movements of the joystick will have no effect.

This function is not present in Pilot, Pilot+ or newVSI control systems.

Refer to the wheelchair's operating manual for more information on actuator operation.

4.16 Actuator 1 ?

There are two programmable parameters relating to actuator channel 1.

This function is not present in Pilot, Pilot+ or newVSI control systems. Actuator 1 Speed is not present in the VR2 Control System.

4.16.1 Speed ?

Sets the speed of travel of the actuator connected to channel 1. The speed can be set between 1 and 5. 1 is the slowest, 5 is the fastest.

4.16.2 End Force?

This value should not normally require any adjustment and should not be altered without the permission of the wheelchair manufacturer.

4.17 Actuator 2 ?

There are two programmable parameters relating to actuator channel 2.

This function is not present in Pilot, Pilot+ or newVSI control systems. Actuator 2 Speed is not present in the VR2 Control System.

4.17.1 Speed ?

Sets the speed of travel of the actuator connected to channel 2. The speed can be set between 1 and 5. 1 is the slowest, 5 is the fastest.

4.17.2 End Force ?

This value should not normally require any adjustment and should not be altered without the permission of the wheelchair manufacturer.

4.18 Actuator End Stop Bleep

This allows the use of an Audible bleep to tell you when the Actuator is stalled at its end stop.

This parameter can be set to On or Off.

This function is not present in Pilot. Pilot+, VSI or newVSI control systems.

4.19 Invert Joystick

This parameter inverts the direction of travel when moving the joystick. This parameter can be set to On or Off.

On Deflecting the joystick Forward will result in Reverse drive.

Off Deflecting the joystick Forward will result in Forward drive.

Left and Right deflection of the joystick remain unchanged.

This function is not present in Pilot. Pilot+, VSI or newVSI control systems.

4.20 Speed Adjustment while Driving

This parameter sets whether the speed/profile buttons are active while the wheelchair is being driven.

The parameter can be set to on or off.

On Means the buttons are active while the wheelchair is being driven, so the user can make maximum speed setting adjustments (or select a different profile) while actually moving.

Off Means the buttons are not active while the wheelchair is being driven, so the joystick must be released and the wheelchair at rest before maximum speed setting adjustments (or select a different profile) can be made.

This function is not present in Pilot or Pilot+ control systems.

4.21 Reverse Driving Alarm

Sets whether the control system gives an audible warning while driving in reverse. The parameter can be set to on or off.

On Means there is an audible alarm given.

Off Means there is not.

This function is not present in Pilot or Pilot+ control systems

4.22 Profiles

The Pilot+, VSI & VR2 can operate with single or multiple drive profiles. A drive profile is a collection of programmable parameters comprising of Acceleration, Deceleration, Turn Acceleration, Turn Deceleration, Forward Speed, Reverse Speed, Turn Speed and Power. The number of drive profiles is determined by this parameter.

- If the value is 0, there is one setting for each of the parameters listed previously, and the control system's maximum speed setting can be changed in the normal way.
- If the value is 2 to 5, there is a corresponding number of drive profiles and each listed parameter can be individually set within a profile. The normal method of

maximum speed adjustment can then be used to switch between the available profiles.

Although the value can be set to 1, the operation is the same as setting to 0 but without the ability to change maximum speed settings.

If you are working with a Pilot+ control system, you must ensure the Joystick Module is capable of supporting multiple drive profiles. The wheelchair's manufacturer will be able to advise.

4.23 Torque

The Torque parameter boosts the current to the motors at low speed settings. If the motor is stalled, for example, the wheelchair is stuck against an obstacle, such as a door threshold; then this will be automatically detected and the current to the motors will be increased, allowing the obstacle to be overcome.

Torque can be set between 0% and 100%

A value of 0% means the Torque parameter has no effect. Higher values mean that more current will be permitted in the described stall conditions.

Ensure that the motor compensation is set correctly for the chair, torque will not counter the effects of incorrect compensation settings.

The higher the Torque setting the more responsive the chair becomes to joystick commands. If set too high, the chair can have a jerky or jumpy feel.

This function is not present in Pilot or VSI control systems.

4.24 Tremor Damping

This parameter allows the effects of hand tremor to be reduced. If the user has a condition that results in hand tremor, then increasing the value of Tremor Damping will reduce the effect of the tremor, making the wheelchair more controllable.

Tremor Damping can be set between 0% and 100%

A value of 0% means Tremor Damping has no effect. Note, even at this value, there is inherent damping in the control system. Higher values apply a higher level of damping.

The higher Tremor Damping is set the slower joystick response will become.

When setting Tremor Damping pay particular attention to stopping distances. As the parameter dampens the response to the joystick commands, stopping distance can be affected. To stop the wheelchair with Tremor Damping activated you must release the joystick and allow it to centre. It is the responsibility of the wheelchair manufacturer to ensure requirements on stopping distances are adhered to.

This function is not present in Pilot or VSI control systems.

4.25 Read Timer ?

The Pilot+, VSI ,VR2 and newVSI have 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.

This function is not present in Pilot controllers.

4.26 Read System Log ?

The control systems have a diagnostics log facility which stores the number of occurrences of the last eight trip codes. This allows 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 - trip code 2C00 has occurred once

Line 2 - trip code 3C00 has occurred three times

Only two trip types recorded.

For more in-depth information on Trip codes refer to Chapter 2.

4.27 Preset Unit ?

Selecting this sets all menu parameters to their default values. The default values are stored in the controller by PGDT during manufacture.

CHAPTER 2 - DIAGNOSTICS

1 Introduction

The primary objective of this guide is to assist service personnel in finding the likely area of a detected fault within the whole wheelchair electrical system. It is important to realize that even though the control system is signaling a fault, it may not be the control system itself that is defective. This is because the control system is able to detect problems in other electrical components (motors, batteries, solenoid brakes etc.) or, more importantly, the wiring to them. When a control system has detected a fault a system trip is indicated.

This guide covers diagnostics of wheelchairs fitted with PGDT Pilot, Pilot+, VSI or VR2 control systems. For a basic diagnostic capability it is not necessary to have a programmer to use this guide, as all these control systems have a sophisticated level of on-board diagnostics.

Using this guide, it is possible to define a trip as belonging to one of 12 types. Once this type has been established, there are suggestions as to what the possible cause may be.

The guide should only be used to decide the starting point of your own diagnosis, as it is possible for the controller to indicate a fault in another component even though the controller itself may be defective. Nevertheless, experience has shown that connectors and wiring are the major cause of wheelchair electrical problems, so it is necessary to examine these more vulnerable areas first.

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a wheelchair. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair.

1.1 Diagnostics Process

For efficient and effective diagnosis the following basic steps should be taken.

- Establish the type of control system fitted to the wheelchair.

- Confirm there is a trip, or has been an intermittent trip. Refer to section 2 for Pilot, Pilot+, VSI and VR2 control systems and section 3 for newVSI.
- Establish the trip type. Refer to section 4.
- Refer to the relevant trip table in section 5.
- Refer to the possible cause as indicated by the trip table, and carry out recommended investigative and corrective action. Refer to section 6.

2 Detecting a Trip has Occurred

Firstly observe the control system's TruCharge (battery gauge) display. This will behave as described in one of the following sections.

2.1 Flashing Rapidly

The control system is tripped. To determine the trip type, refer to section 4. Connecting a programmer to the control system while this is happening will give you a trip code.

2.2 Flashing Slowly

No trip is currently detected by the control system. The slow flash is an indication that the batteries require charging.

- A trip may have occurred previously, refer to Chapter 1 section 4.17 for details of how to read the control system's diagnostic log, then section 5 to establish the trip type.

2.3 Display is Steady

No trip is currently detected by the control system.

- A trip may have occurred previously, refer to Chapter 1 section 4.17 for details of how to read the control system's diagnostic log, then section 5 to establish the trip type.

2.4 Display Does Not Illuminate

No power is reaching the control system.

Ensure the batteries are fully charged and that all connections between batteries and the control system are made. If these connections are good, then the control system may be defective, Refer to Section 11.

3 Detecting a Trip has occurred (newVSI)

3.1 Detecting a Trip has occurred

Firstly observe the controller's battery gauge. This will behave as described in one of the following sections.

3.2 All 5 LEDs in the battery display are flashing.

The controller is tripped.

- Connecting a programmer to the controller while this is happening will give you a trip code.
- To determine the trip type, refer to section 3.

3.3 First LED flashing slowly

No trip is currently detected by the controller. The slow flash is an indication that the batteries require charging.

- A trip may have occurred previously, refer to Chapter 1 section 4.17 for details of how to read the control system's diagnostic log, then section 5 to establish the trip type.

3.4 Display is steady

No trip is currently detected by the controller.

- A trip may have occurred previously, refer to Chapter 1 section 4.17 for details of how to read the control system's diagnostic log, then section 5 to establish the trip type.

3.2.4 Display does not illuminate

No power is reaching the controller.

- Ensure the batteries are fully charged and that all connections between batteries and the controller are made.
- If these connections are good, then the controller may be defective, refer to Section 5.

4 Trip Diagnosis

There are two methods of trip diagnosis.

4.1 Trip Diagnosis with the TruCharge

The following diagrams show you how to read the TruCharge battery gauge in the event of a control system trip. Please note that on VSI & VR2 control systems the TruCharge reads left to right, rather than bottom to top.

	1 Bar	Low Battery Voltage
	2 Bar	Left Motor Disconnected
	3 Bar	Left Motor Wiring Trip
	4 Bar	Right Motor Disconnected
	5 Bar	Right Motor Wiring Trip
	6 Bar	Charger Connected
	7 Bar	Possible Joystick Trip
	8 Bar	Possible Control System Trip
	9 Bar	Solenoid Brake Trip
	10 Bar	High Battery Voltage
	7 Bar + Speed	Communications Trip

	8 Bar+ Actuator	Actuator Trip
	Blink	Control System in Sleep Mode
	Charging	Batteries Charging
	Ripple	Joystick Displaced at Power-up

4.2 Trip Diagnosis with the newVSI battery gauge

The following describes how to read the newVSI battery gauge in the event of a control system trip.

If the programmable parameter, Motor Swap has been enabled, then left and right hand references in this table will need transposing.

1 Flash - The battery needs charging or there is a bad connection to the battery. Check the connections to the battery. If the connections are good, try charging the battery.

2 Flashes - The left hand motor has a bad connection. Check the connections to the left hand motor.

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

4 Flashes - The right hand motor has a bad connection. Check the connections to the right hand motor.

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

7 Flashes - A joystick fault is indicated. Make sure that the joystick is in the center position before switching on the controller.

8 Flashes - A controller fault is indicated. Make sure that all connections are secure.

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

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

Charge Step –Batteries charging

4.3 Using a Programmer to Read the Trip Code

If you connect a programmer while there is an active trip, then a four digit code will be displayed. The trip code can be referred to the trip types using the tables in section 5.

You must connect the programmer to the control system after the battery gauge or TruCharge has started flashing. If the programmer is already connected when the flashing commences the trip code will not be displayed.

5 Trip Tables

If any trip code other than those listed in the following tables is experienced, please contact PGDT for further details.

5.1 Pilot Trip Table

Code	Type	Description & Reference
0A00	Blink	Refer to section - 6.11
1500	9	Solenoid Brake Trip – 6.9
1504	9	Solenoid Brake Trip – 6.9
1600	10	High Battery Voltage – 6.10
1E00	6	Charger Connected – 6.6
2C00	1	Low Battery Voltage – 6.1
2F00	User	Refer to sections 6.7 & 6.12
3B00	2	Left Motor Disconnected – 6.2
3C00	4	Right Motor Disconnected – 6.4
3D00	3	Left Motor Wiring Trip – 6.3
3D01	3	Left Motor Wiring Trip – 6.3
3E01	5	Right Motor Wiring Trip – 6.5
3E01	5	Right Motor Wiring Trip – 6.5
All Other Codes	7 or 8	Possible Joystick Trip – 6.7 Possible Control System Trip – 6.8

5.2 Pilot+ Trip Table

Code	Type	Description & Reference
0A00	Blink	Refer to section - 6.11
1504	9	Solenoid Brake Trip – 6.9
1505	9	Left Solenoid Brake Trip – 6.9*
1505	9	Right Solenoid Brake Trip – 6.9*
1600	10	High Battery Voltage – 6.10
1E03	6	Charger Connected – 6.6

1E04	6	Refer to section 6.13
1F01	2	Refer to section 6.23
1F02	2	Refer to section 6.23
2001	4	Refer to section 6.24
2002	4	Refer to section 6.24
2C00	1	Low Battery Voltage – 6.1
3B00	2	Left Motor Disconnected – 6.2
3C00	4	Right Motor Disconnected – 6.4
3D00	3	Left Motor Wiring Trip – 6.3
3D01	3	Left Motor Wiring Trip – 6.3
3E00	5	Right Motor Wiring Trip – 6.5
3E01	5	Right Motor Wiring Trip – 6.5
5400	8	Refer to section 6.14
7100	7	Refer to section 6.14
7101	7	Joystick Module – 8.7
7102	7	Refer to section 6.15
710A	7	Joystick Module – 6.7
710B	7	Joystick Module – 6.7
710C	7	Joystick Module – 6.7
710D	User	Refer to section 6.12
710E	7	Joystick Module – 6.7
710F	7	Joystick Module – 6.7
7110	7	Joystick Module – 6.7
7111	7	Joystick Module – 6.7
7113	7	Refer to section 6.14
7114	7	Joystick Module – 6.7
7115	7	Joystick Module – 6.7
7117	7	Joystick Module – 6.7
7124	7	Refer to section 6.14
7125	7	Refer to section 6.14

7126	7	Refer to section 6.14
7127	7	Refer to section 6.19
7128	7	Refer to section 6.19
7129	7	Refer to section 6.19
712A	Sip/Puff	Refer to section 6.20
712B	7	Refer to section 6.21
712C	7	Refer to section 6.21
712D	7	Refer to section 6.21
712E	7	Refer to section 6.21
712F	7	Refer to section 6.21
7130	7	Refer to section 6.19
7131	7	Refer to section 6.19
7132	7	Refer to section 6.19
7133	7	Refer to section 6.14
7134	7	Refer to section 6.21
7135	7	Refer to section 6.21
7136	7	Refer to section 6.22
7137	7	Refer to section 6.19
7140	7	Refer to section 6.18
7142	7	Refer to section 6.18
7146	User	Refer to section 6.12
714A	7	Refer to section 6.16
714B	7	Refer to section 6.16
714C	7	Refer to section 6.16
714D	User	Refer to section 6.17
714E	7	Refer to section 6.16
714F	7	Refer to section 6.16
7150	7	Refer to section 6.16
7151	7	Refer to section 6.16
7152	7	Refer to section 6.16

7155	7	Refer to section 6.16
7157	7	Refer to section 6.16
All Other Codes	8	Possible Power Module Trip – 6.8

***** The left and right references are dependent on the control system and brake configuration.

5.3 VSI Trip Table

Code	Type	Description & Reference
0A00	Blink	Refer to section - 6.11
1500	9	Solenoid Brake Trip – 6.9
1501	9	Short Circuit in Solenoid Brake Circuit – 6.9
1502	9	Open Circuit in Solenoid Brake Circuit – 6.9
1600	10	High Battery Voltage – 6.10
1E03	Charging	Charger Connected – 6.6
1E04	6	Refer to section 6.25
1E05	Charging	Refer to section 6.26
2C00	1	Low Battery Voltage – 6.1
2F00	7 / User	Refer to sections 6.7 & 6.12
3000	7	Refer to section 6.17
3B00	2	Left Motor Disconnected – 6.2
3C00	4	Right Motor Disconnected – 6.4
3D00	3	Left Motor Wiring Trip – 6.3
3D01	3	Left Motor Wiring Trip – 6.3
3E00	5	Right Motor Wiring Trip – 6.5

3E01	5	Right Motor Wiring Trip – 6.5
4401	8	Refer to section 6.8
7163	8	Refer to section 6.16
7164	8	Refer to section 6.16
716B	8	Refer to section 6.16
716C	8	Refer to section 6.16
716E	8	Refer to section 6.16
716F	8	Refer to section 6.16
7170	8	Refer to section 6.16
7173	8	Refer to section 6.16
7174	8	Refer to section 6.16
7175	8	Refer to section 6.16
7A00	8	Refer to section 6.28
7A02	8	Refer to section 6.29
7A03	8	Refer to section 6.29
All Other Codes	7 or 8	Possible Power Module Trip – 6.7 & 6.8

5.4 VR2 Trip Table

Code	Type	Description & Reference
1320	-	Refer to section - 6.28
1505	9	Short Circuit in Solenoid Brake Circuit – 6.9
1506	9	Open Circuit in Solenoid Brake Circuit – 6.9
1600	10	High Battery Voltage – 6.10
1D05	7	JS Time Exceeded – 6.7
1E03	Charging	Charger Connected – 6.6

1E04	6	Refer to section 6.25
1E05	Charging	Refer to section 6.26
2C00	1	Low Battery Voltage – 6.1
2C02	1	Low Battery Lockout – 6.1
2F00	7 / User	Refer to sections 6.7 & 6.12
3B00	2	Left Motor Disconnected – 6.2
3C00	4	Right Motor Disconnected – 6.4
3D00	3	Left Motor Wiring Trip – 6.3
3D01	3	Left Motor Wiring Trip – 6.3
3E00	5	Right Motor Wiring Trip – 6.5
3E01	5	Right Motor Wiring Trip – 6.5
4401	8	Refer to section 6.8
5400	7 + S(1)	Communications Trip – 6.14
7A02	A Only(2)	Actuator Motor Wiring Trip – 6.27
7100	7	Joystick Trip – 6.7
7101	7	Joystick Trip – 6.7
7102	7	Joystick Trip – 6.7
7103	7	Joystick Trip – 6.7
7104	7	Joystick Trip – 6.7
7107	8	Joystick Trip – 6.7
7147	8	Joystick Trip – 6.7
7902	-	Joystick Trip – 6.29
All Other Codes	7 or 8	Possible Power Module Trip – 6.7 & 6.8

5.5 newVSI Trip Table

Code	Type	Description & Reference
0A00	-	Controller in Sleep Mode - 6.11
1320	-	Timed Foldback Active – 6.30
1500	9	Solenoid Brake Trip – 6.9
1505	9	Left Solenoid Brake Trip – 6.9
1506	9	Right Solenoid Brake Trip – 6.9
1600	10	High Battery Voltage – 6.10
1D05	7	JS Time Exceeded – 6.7
1E03	Charging	Charger Connected – 6.6
2C00	1	Low Battery Voltage – 6.1
2C02	-	Low Battery Lockout – 6.1
2F00	7 / User	Refer to sections 6.7 & 6.12
3B00	2	Left Motor Disconnected – 6.2
3C00	4	Right Motor Disconnected – 6.4
3D00	3	Left Motor Wiring Trip – 6.3
3D01	3	Left Motor Wiring Trip – 6.3
3E00	5	Right Motor Wiring Trip – 6.5
3E01	5	Right Motor Wiring Trip – 6.5
4401	8	Refer to section 6.8
7100	7	Joystick Trip 6.7
7821	-	Thermal Foldback Active 6.31
7825	-	Thermal Cut-out Active 6.31
All Other Codes	7 or 8	Possible Power Module Trip – 6.7 & 6.8

6 Trip Types and their Possible Causes

Once the trip type has been established, refer to the relevant section below for further information.

6.1 Trip Type 1 - Low Battery Voltage

This occurs when the control system detects that the battery voltage has fallen below 16V. Check the condition of the batteries and the connections to the control system.

If the trip is still present after the batteries and connections have been checked, then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Power Module.

2C02 **The VR2 and newVSI control system's are making a log of the times that the Low Battery Lockout has been initiated.**

6.2 Trip Type 2 - Left Motor Disconnected

This occurs when the control system detects that the left hand motor has become disconnected. Check the left hand motor, motor connectors and wiring.

If the trip is still present after the above checks have been made, then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Power Module.

Some Pilot+, VSI or VR2 control systems may be programmed to exchange the left and right motor outputs. In this instance, this section will refer to the right hand motor. Consult the wheelchair manufacturer for more details.

6.3 Trip Type 3 - Left Motor Wiring Trip

This occurs when the control system detects a fault in the wiring to the left hand motor, in particular if a motor connection has short-circuited to a battery connection. Check the left hand motor connectors and wiring.

If the trip is still present after the above checks have been made, then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Power Module.

Some Pilot+, VSI or VR2 control systems may be programmed to exchange the left and right motor outputs. In this instance, this section will refer to the right hand motor. Consult the wheelchair manufacturer for more details.

6.4 Trip Type 4 - Right Motor Disconnected

This occurs when the control system detects that the right hand motor has become disconnected. Check the right hand motor, motor connectors and wiring.

If the trip is still present after the above checks have been made, then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Power Module.

Some Pilot+, VSI or VR2 control systems may be programmed to exchange the left and right motor outputs. In this instance, this section will refer to the left hand motor. Consult the wheelchair manufacturer for more details.

6.5 Trip Type 5 - Right Motor Wiring Trip

This occurs when the control system detects a fault in the wiring to the right hand motor, in particular if a motor connection has short-circuited to a battery connection. Check the right hand motor connectors and wiring.

If the trip is still present after the above checks have been made, then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Power Module.

Some Pilot+, VSI or VR2 control systems may be programmed to exchange the left and right motor outputs. In this instance, this section will refer to the left hand motor. Consult the wheelchair manufacturer for more details.

6.6 Trip Type 6 - Charger Connected

This occurs when the control system detects that an off-board charger is connected.

Check that the battery charger is disconnected. If the trip is still present after the charger has been disconnected then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Joystick Module.

6.7 Trip Type 7 - Possible Joystick Trip

If you are working with a Pilot, VSI & newVSI control system, this occurs if the control system detects a problem within its own joystick. The joystick can only be replaced by an authorized person. Refer to Section 9.

If you are working with a Pilot+ control system, this occurs if there is a problem detected in the Joystick Module, or there is a communications error between the Joystick Module and Power Module.

A communications error is indicated by the green LEDs below the TruCharge display flashing.

This flash pattern may only occur for a few seconds before the system automatically powers down. The pattern can be re-observed by powering up the system again.

- If these LEDs are flashing then the most likely cause of the problem is the cable between Joystick Module and Power Module. The cable should only be repaired by an authorized person. Refer to Section 11.
- If the LEDs are not flashing, then the most likely cause of the problem is the Joystick Module. The Joystick Module can only be repaired by an authorized person. Refer to Section 11.

If you are working with a VR2 control system, this occurs if the control system detects a problem within its own joystick, or there is a communications error between the Joystick Module and Power Module. The joystick can only be replaced by a person authorized by the wheelchair manufacturer.

If you are not an authorized person then refer to Section 9.

1D05 Joystick Stationary Time exceeded - This occurs when the joystick has been held stationary for an excessive period of time. The controller will stop drive to prevent possible damage to the wheelchair's motors.

7100 Loss of comms to the joystick, check the joystick cable and, if you have authorization the joystick ribbon cable, connections and mating sockets.

7101 Loss of comms to the joystick, check the joystick cable and, if you have authorization the joystick ribbon cable, connections and mating sockets.

7102 Loss of power to the joystick, check the joystick cable and, if you have authorization the joystick ribbon cable, connections and mating sockets.

7103 Internal trip, if you have authorization check the joystick ribbon cable, connections and mating sockets. Ensure the cable is connected correctly to both the joystick and the PCB.

7104 Internal trip, if you have authorization check the joystick ribbon cable, connections and mating sockets. Ensure the cable is connected correctly to both the joystick and the PCB.

7107 Primary Joystick Displaced at Power-up -Refer to section 8.12.

7147 Dual Joystick Displaced at Power-up -Refer to section 8.12.

Refer to Chapter 3 for details on removal, fitting and calibration of the joystick.

If the trip is still present after the appropriate checks have been made then the Joystick Module may be defective. Refer to Section 9.

6.8 Trip Type 8 - Possible Control System Trip

If you are working with a Pilot, VSI & newVSI control system, this occurs if the control system detects a problem within itself. The Pilot or VSI can only be repaired by an authorized person. Refer to Section 9.

If you are working with Pilot+ & VR2 control systems, this occurs if the Power Module detects a problem within itself. The Power Module can only be repaired by an authorized person. Refer to Section 9.

6.9 Trip Type 9 - Solenoid Brake Trip

This occurs when the control system detects a problem in the solenoid brakes or the connections to them. Check these connections and the solenoid brakes.

If the trip is still present after the above checks have been made, then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Power Module.

6.10 Trip Type 10 - High Battery Voltage

This occurs when the control system detects that the battery voltage has risen above 35V. The most common reasons for this are overcharging of the battery or bad connections between the control system and the batteries. Check the batteries and the connections to them.

If the trip is still present after the batteries and connections have been checked, then the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 systems, the term control system refers to the Power Module.

6.11 Sleep Mode

This condition is indicated by the TruCharge display blinking on once every 2.5 seconds.

In the case of the newVSI this is indicated by the Status Indicator blinking on once every 2.5 seconds.

It is not a trip condition, but an indication that the control system has gone to sleep. To awake the system, switch off and on again.

The control system goes to sleep after a programmed period of time. If you want to adjust this time or remove the function altogether, refer to Chapter 1 section 4.8.

6.12 Joystick Displaced at Power-up

The most common cause of this trip is if the joystick is deflected away from center before the control system is switched on. When the control system is

switched on, the battery gauge will blink for a short time. Check that the user is not deflecting the joystick before the blink finishes.

If the problem persists, trip type 7 must be assumed.

6.13 Inhibit

The Pilot+ control system can be inhibited via pin 3 of the charger socket. This inhibit signal can originate from devices such as on-board battery chargers or seat height switches. The polarity of the signal depends on the programming of the Power Module. Refer to the wheelchair operating manual to ascertain the polarity of the inhibit signal then check the output of the device from which it originates.

If the trip is still present after these checks then the Power Module may be defective. Refer to Section 9.

6.14 Communications Error

On a Pilot+ control system, a communications error is signaled by it's trip type flash code and the flashing of the maximum speed indicator LED's.

This flash pattern may only occur for a few seconds before the system automatically powers down. The pattern can be re-observed by powering up the system again.

The most likely cause of a communications error is a defective cable between the Power Module and the Joystick Module. The cable should be checked for continuity, and replaced if found to have a fault.

On a VR2 control system, the most likely cause of a communications error is a defective cable between the Power Module and the Joystick Module. The cable should be checked for continuity, and replaced if found to have a fault. The Joystick Cable can only be replaced by a person authorized by the wheelchair manufacturer, Refer to Chapter 3 for the replacement procedure.

If you are not an authorized person then refer to Section 9.

If the problem persists then either the Power Module or the Joystick Module could be defective. Refer to Section 9.

6.15 Power Loss

This can be caused by a defective cable or a defective Joystick Module. Check the cable for continuity. If the cable appears to be in working order, then the Joystick Module must be assumed to be defective. Refer to Section 9.

6.16 Dual Attendant Module Trip

The Dual Attendant Module is defective. Refer to Section 9.

6.17 Dual Joystick Displaced at Power-up

The most common cause of this trip is if the joystick in the Pilot+ Dual Attendant Module is deflected away from center before the control system is switched on. When the control system is switched on, the battery gauge will blink for a short time. Check that the user is not deflecting the joystick before the blink finishes.

If the problem persists, a problem within the Dual Attendant Module must be assumed. Refer to Section 9.

6.18 Dual Communications Trip

There is a communications error between the Joystick Module, the Dual Attendant Module and the Power Module. Check each cable for continuity. If the cables appear to be in working order, then the Dual Attendant Module must be assumed to be defective. Refer to Section 9.

6.19 Omni+ Trip

The Omni+ Module is defective. Refer to Section 9.

6.20 Sip and Puff Out Of Calibration

The Omni+ requires calibration of its Sip and Puff input. This can be easily performed by referring to Omni+ Technical Manual.

6.21 Omni+ Input Device

The Omni+ is not receiving a valid signal from the user input device. Refer to the Omni+ Technical Manual for the electrical specifications for input devices.

Refer also to the operating instructions for the input device type in use.

6.22 Omni+ Analog Input Out of Calibration

The Omni+ requires a calibration its analog input. This can be easily performed by referring to Omni+ Technical Manual.

6.23 Right Motor Feedback

This trip type is only present in Pilot+ Brushless Motor Power Modules (BLPM). It is most likely to be caused by defective wiring from the right motor's motor sensors to the BLPM, or by a defective sensor within the right motor.

6.24 Left Motor Feedback

This trip type is only present in Pilot+ Brushless Motor Power Modules (BLPM). It is most likely to be caused by defective wiring from the left motor's motor sensors to the BLPM, or by a defective sensor within the left motor.

6.25 Inhibit 2 Active

In the case of a VSI, Inhibit 2 input is active. The Inhibit 2 input is via the blue 2 way connector and is normally associated with actuator functions. The operation of Inhibit 2 will depend upon the programmed settings of the VSI and the wheelchair on which it is being used.

Check all wiring and switches connected to Inhibit 2. If these appear to be in working order, then the control system may be defective. Refer to section 9.

In the case of a VR2, Inhibit 2 input is active. The Inhibit 2 input is via the INH-2 way connector and is normally associated with speed limit or actuator inhibit functions. The operation of Inhibit 2 will depend upon the programmed settings and the wheelchair on which it is being used.

Check all wiring and switches connected to Inhibit 2. If these appear to be in working order, then the Power Module may be defective. Refer to section 9.

6.26 Inhibit 3 Active

In the case of a VSI, Inhibit 3 input is active. The Inhibit 3 input is via the 3 way onboard charger (OBC) and is normally associated with this function. The

operation of Inhibit 3 will depend upon the programmed settings of the VSI and the wheelchair on which it is being used.

Check all wiring, switches and OBC (if fitted) connected to Inhibit 3. If these appear to be in working order, then the VSI may be defective. Refer to Section 9.

In the case of a VR2, Inhibit 3 input is active. The Inhibit 3 input is via the 3 way onboard charger (OBC) and is normally associated with this function. The operation of Inhibit 3 will depend upon the programmed settings and the wheelchair on which it is being used.

Check all wiring, switches and OBC (if fitted) connected to Inhibit 3. If these appear to be in working order, then the Power Module may be defective. Refer to section 9.

6.27 Actuator Motor Wiring Trip

This occurs when the control system detects a fault in the wiring to either actuator motor. Check the motor connectors and wiring.

If the trip is still present after the above checks have been made, then the control may be defective. Refer to Section 9.

6.28 Current Limit Active

This occurs when the control system operates above the Current Limit Threshold for a period of time greater than the Current Limit Time.

This has been designed to notify the Healthcare Technician that the control system has operated outside of its programmed range.

6.29 High Temperature

This occurs when the control system reaches its Temperature Threshold and thus becomes too hot. The controller goes out of drive into standby to allow the controller to cool down.

An entry is made in the system log each time the controller gets too hot and goes out of drive.

6.30 Timed Foldback Active

This occurs when the controller is in Timed Foldback, i.e. the current has been reduced in order to protect the motors.

Check the motors are in good condition and are allowed to rotate freely. In particular, check the brakes are releasing fully.

6.31 Thermal Foldback/Cut-out Active

This occurs when the controller is in Thermal Foldback, i.e. the current has been reduced in order to protect the controller. There are two trip codes associated with this condition.

7821 The current has been reduced.

7825 The current has been cut completely.

Check the motors are in good condition and are allowed to rotate freely. In particular, check the brakes are releasing fully.

7 Other Conditions

This section covers conditions that are not displayed as trip codes or on the TruCharge display. This may be because; either the control cannot switch on, the condition is not considered critical enough to force a trip or the control system cannot detect the condition.

7.1 Control System Will Not Switch On

Check the battery connections to the control system. If these appear to be good, then in the case of the Pilot and VSI the control system may be defective. Refer to Section 9.

In the case of Pilot+ & VR2 control systems, check the cable between the Power Module and the Joystick Module. If this appears to be good, then either module may be defective. Refer to Section 9.

7.2 Wheelchair Drives Slowly

This could be caused by one of the following.

- The control system has been incorrectly programmed.
- A speed limiting function is active, e.g. seat in a raised position on Wheelchair's fitted with lifting seats.
- Defective motor or defective brake.

7.3 Wheelchair Will Not Drive in a Straight Line

This could be caused by a defective motor or defective brake.

7.4 One Motor or Brake becomes Very Warm

This could be caused by a defective motor or defective brake.

7.5 Batteries Discharge Very Quickly

The batteries can discharge very quickly for several reasons, these are described below.

- Worn or damaged batteries - check battery condition.

- Charger defective or incorrect charger being used - check charger operation. (Refer to wheelchair's operating manual).
- Incorrect batteries being used - refer to wheelchair manufacturer's instructions for correct battery types.
- One motor or brake jamming.

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the wheelchair's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading.

8 Basic Tests

After a repair has been completed, the following tests should be carried out. These are minimum recommendations, depending on the nature of the original trip then additional tests may be required.

These tests are a minimum recommendation only. It is the responsibility of the service person(s) to perform other tests relevant to the original trip and wheelchair type. Refer to the wheelchair's Technical Manual for exact information of other tests. PGDT accept no liability for losses of any kind arising from the carrying out of the described tests or from not carrying out additional relevant tests.

These tests should be conducted in an open space and a restraining device such as a seat belt should always be used. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition.

8.1 General Inspection

Make sure all connectors are securely mated.

- Check the condition of all cables and connectors for damage.
- Check the thin rubber gaiter or boot around the base of the joystick shaft for damage. Check visually only, do not handle the gaiter.
- Make sure that all components of the control system are securely mounted.
- Do not over-tighten any securing screws.

8.2 Brake Test

These tests should be carried out on a level floor with at least one meter clear space around the wheelchair.

- Switch on the control system.
- Check the TruCharge display remains on, or flashes slowly, after one second.
- Push the joystick slowly forwards until you hear the parking brakes

operate. The wheelchair may start to move.

- Immediately release the joystick. You must be able to hear each parking brake operate within 2 seconds.
- Repeat the test a further three times, pushing the joystick slowly backwards, left and right.

8.3 Drive Test

With the maximum speed control in the minimum position, drive the wheelchair in all directions, ensuring the drive is comfortable and easy to control for the user.

Repeat the above but with the speed control set to maximum.

8. 4 Gradient Test

Before carrying out this test ensure another person is present to prevent the wheelchair from tipping backwards.

Drive the wheelchair forwards up its maximum rated gradient. While on the gradient release the joystick and ensure the wheelchair comes to rest and the brakes are applied without the front wheels lifting of the ground.

Deflect the joystick forwards and continue driving up the slope. Ensure the pick-up is smooth and positive.

Stop the wheelchair and reverse down the gradient. While on the gradient release the joystick and ensure the wheelchair comes to rest and the brakes are applied without the front wheels lifting of the ground.

9 Servicing of Defective Units

There are no serviceable parts in any of the PGDT control systems. Consequently, any defective units must be returned to PGDT or a PGDT approved service organization for repair.

Opening or making any unauthorized adjustments or modifications to a control system or its components will invalidate any warranty and may result in hazards to the vehicle user, and is strictly forbidden.

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustments or modifications to a any component of a control system.

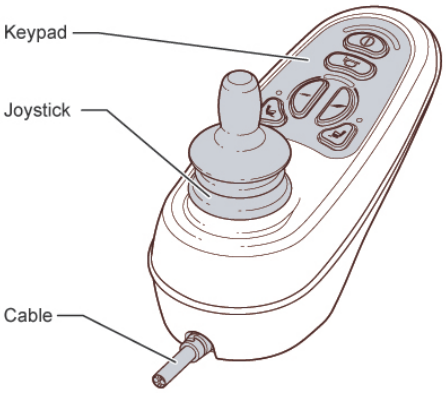
CHAPTER 3 – VR2 SERVICING

I Introduction

The VR2 Joystick Module has been designed and constructed to allow field replacements of some key components.

The replaceable components are:

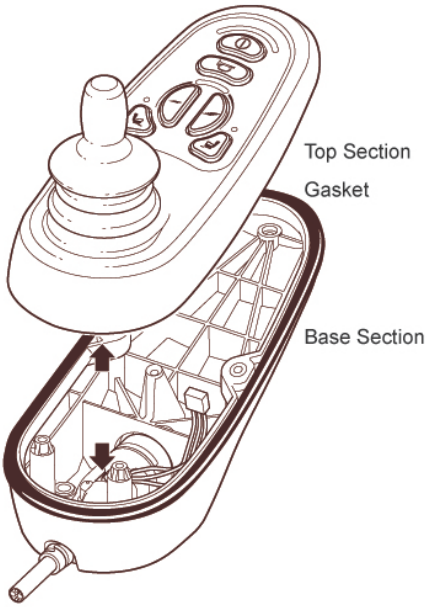
- The Joystick
- The Joystick Cable
- The Keypad

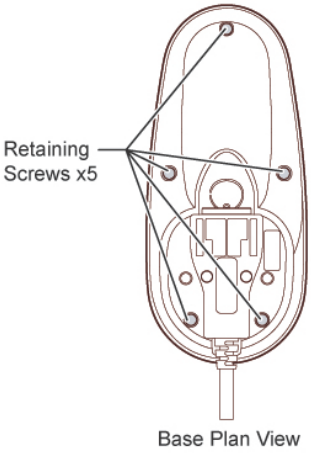


Any replacement work carried out without the wheelchair manufacturer's permission will invalidate the control system's warranty. PGDT accepts no liability for losses of any kind if the procedure and safety guidelines are not followed. These operations should only be carried out by a trained Healthcare Technician.

While performing the following operations. the technician should use anti static protection such as the RadioShack 276-2397 or Farnell 8247056 anti static wristbands. PG Drives Technology recommends anti static protection to specification IEC 61340-5-2. Failure to use the correct anti static protection could cause damage to the control system. PGDT accepts no liability for losses of any kind if the correct anti static protection measures are not followed.

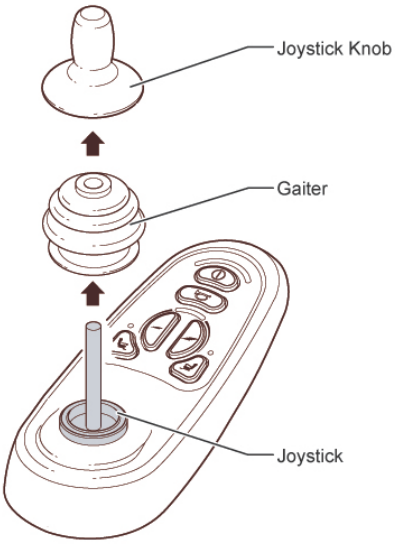
2 Joystick Replacement

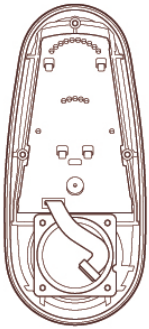




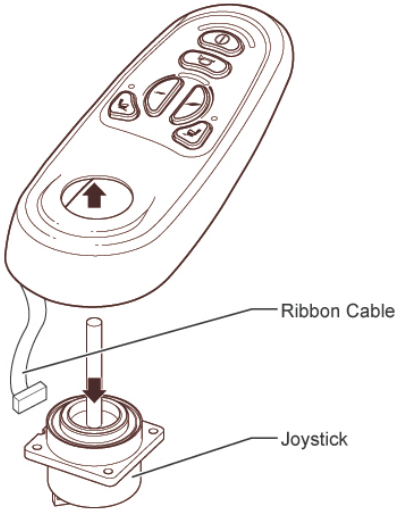
2.1 Joystick Removal

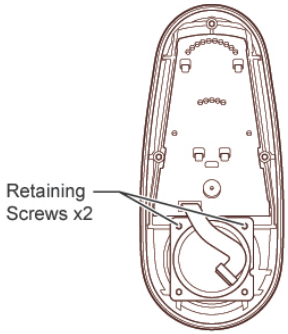
- Isolate the Joystick Module by disconnecting the Joystick Cable from the Power Module.
- Remove the 5 retaining screws from the underside of the Joystick Module.
- Disconnect the Ribbon Cable from the joystick.
- Remove the Joystick knob.
- Remove the 2 retaining screws from the joystick base.
- Slide joystick out through the Top Section.
- Remove the Gaiter/Rubber-Boot





Top Plan View





Top Plan View

2.2 Fitting a Joystick

- Ensure Gaiter/Rubber-boot is positioned with the flange firmly against the underside of the Top Section.

- Ensure the joystick is in the correct orientation. The notch on the joystick plate should line up with the Key in the Top Section.

- Slide joystick up through the Top Section.
- Check the seal of the Gaiter/Rubber-boot and secure using the 2 retaining screws. Tightening to 0.8Nm, 7 inch/lbs.
- Connect the Joystick Cable to the Power Module.
- Power up the VR2 with the Joystick Ribbon Cable disconnected. The VR2 should flash the left most speed LED.
- The VR2 will now enter the Calibration sequence.
- Connect the Ribbon Cable and make sure the joystick is centered.
- Press the horn key until the VR2 bleeps.
- The 2 left most speed display LEDs will flash.
- Push and hold the joystick fully forward and press the horn key until the VR2 bleeps.
- The 3 left most speed display LEDs will flash.
- Push and hold the joystick fully to the left and press the horn key until the VR2 bleeps.
- The 4 left most speed display LEDs will flash.
- Push and hold the joystick fully to the right and press the horn key until the VR2 bleeps.
- All 5 speed display LEDs will flash.
- Pull the Joystick fully back and press the horn key until the VR2 bleeps.
- The speed display will go out and the TruCharge display will flash all 10 LEDs.
- Turn the VR2 off. Isolate the Joystick Module by disconnecting the Joystick Cable from the Power Module.

- Reassemble the joystick module, ensuring the rubber gasket is correctly positioned, and replace the 5 retaining screws. Tightening to 0.8Nm, 7 inch/ lbs.

Incorrect fitting of the Gasket could seriously affect the Joystick Module's resistance to moisture ingress.

- Turn the controller on again.

If the replacement or the calibration sequence has been unsuccessful the TruCharge display will flash 7 bars. Refer to Diagnostics Chapter.

If the Joystick does not operate correctly, or if the calibration sequence does not appear, then run through the following:

- Check that Joystick Module is receiving power from the Power Module.

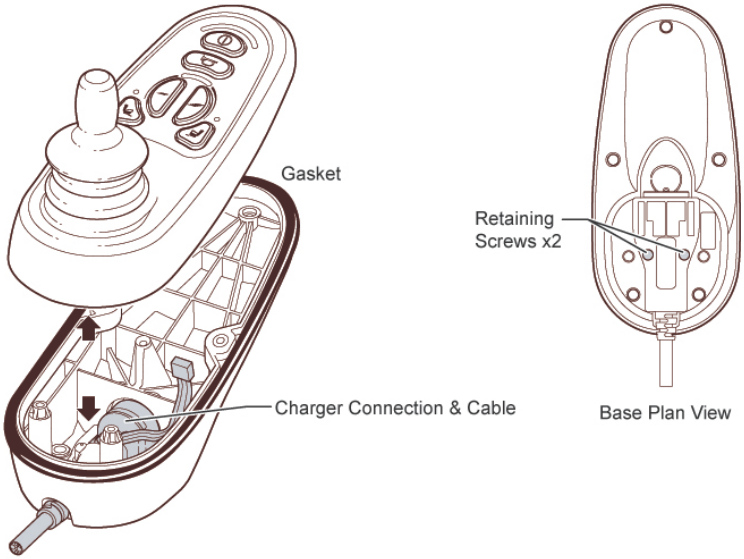
- The LEDs should light up

- Repeat the replacement procedure, ensuring that all the cables are securely connected and that the connectors are clean, clear and not damaged.

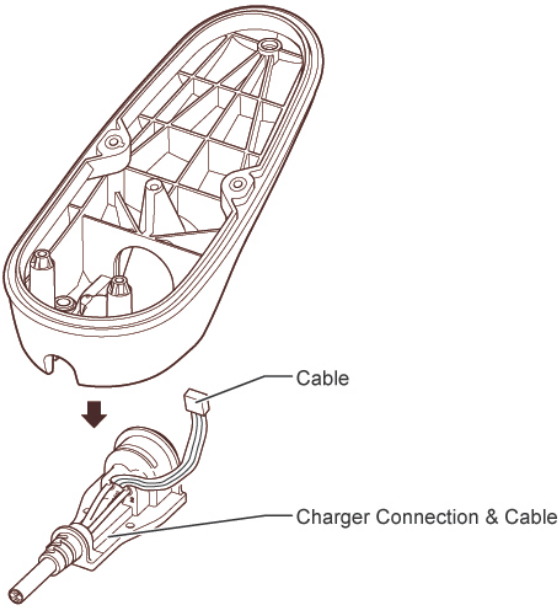
- Repeat the calibration procedure.

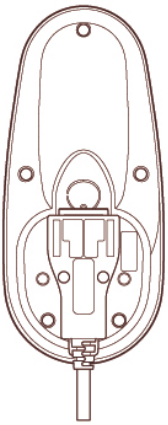
3 Joystick Cable Replacement

3.1 Joystick Cable Removal



- Isolate the Joystick Module by disconnecting the Joystick Cable from the Power Module.
- Remove the 5 retaining screws from the underside of the Joystick Module.
- Disconnect the Serial Cable from the PCB.
- Remove the 2 retaining screws holding the Charger Socket and Cable.
- Slide the Charger Socket and Cable out of the plastic base.





3.2 Fitting a Joystick Cable

- Insert the new Charger Socket and Cable into the plastic case.
- Attach the cable from the new Charger Socket onto the PCB.
- Secure the Charger Socket and Cable with the 2 retaining screws.
- Reassemble the Joystick Module, ensuring the rubber gasket is correctly positioned, and replace the 5 retaining screws.

Incorrect fitting of the Gasket could seriously affect the Joystick Module's resistance to moisture ingress.

- Connect the Joystick Cable to the Power Module.
- Turn the controller on.

If the replacement sequence has been unsuccessful the TruCharge display will flash 7 bars. Refer to the Diagnostic Chapter.

At this point:

- Check all connections.
- Repeat the procedure.
- Should the procedure fail twice try a new cable.

4 Keypad Replacement

- Disconnect Joystick Cable from the Power Module
- Gently lift the top corner of the keypad, with a scalpel.
- Remove the damaged keypad.
- Ensure surface area is clear, clean and free of adhesive.
- Place the new keypad into position, ensuring there are no gaps around the edges, and press firmly to stick.
- Re-connect Joystick Cable to the Power Module
- Turn the control system on and check the operation of the buttons.

If trouble is experienced activating any of the buttons ensure that the pad is correctly positioned and firmly adhered to the joystick module's surface.

Incorrect fitting of the Keypad could seriously affect the Joystick Module's resistance to moisture ingress.

CHAPTER 4 – WARNING SUMMARY

1 Introduction

This section summarizes all of the very important warnings that appear throughout the text of this manual. Do not operate the programmer without reading, understanding and observing the following warnings. Failure to observe these warnings could result in UNSAFE CONDITIONS for the user of a wheelchair or affect the reliability of the controller. PG Drives Technology accepts no liability for losses of any kind arising from failure to comply with any of the conditions in the warnings listed below.

2 Warnings

2.1 Introduction

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic control systems. Incorrect programming could result in an unsafe set-up of a wheelchair for a user. PGDT accept no liability for losses of any kind if the programming of the control system is altered from factory pre-set values. Chapter 1, Section 1.

2.2 Using The PPIa

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic control systems. Incorrect programming could result in an unsafe set-up of a wheelchair for a user. PGDT accept no liability for losses of any kind if the programming of the control system is altered from factory pre-set values. Chapter 1, Section 3.

2.3 Deceleration ?

It is the responsibility of the wheelchair manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the wheelchair will be used. For countries requiring CE marking this is as specified in EN12184. Chapter 1, Section 4.2.

2.4 Torque

The higher the Torque setting the more responsive the chair becomes to joystick commands. If set to high. the chair can have a jerky or jumpy feel. Chapter 1, Section 4.23.

2.5 Tremor Damping

The higher Tremor Damping is set the slower joystick response will become.

When setting Tremor Damping. pay particular attention to stopping distances. As the parameter dampens the response to the joystick commands. stopping distance can be affected. To stop the wheelchair with Tremor Damping activated you must release the joystick and allow it to centre. It is the responsibility of the wheelchair manufacturer to ensure requirements on stopping distances are adhered to. Chapter 1, Section 4.24.

2.6 Introduction

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a wheelchair. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair. Chapter 2, section 1.

2.7 Batteries Discharge Very Quickly

The ambient temperature has a significant effect on battery capacity. Therefore. if the temperature is lower than normal the wheelchair's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading. Chapter 2, Section 4.7.

2.8 Basic Tests

These tests are a minimum recommendation only. It is the responsibility of the service person(s) to perform other tests relevant to the original trip and wheelchair type. Refer to the

wheelchair's Technical Manual for exact information of other tests. PGDT accept no liability for losses of any kind arising from the carrying out of the described tests or from not carrying out additional relevant tests.

These tests should be conducted in an open space and a restraining device such as a seat belt should always be used. PGDT accepts no liability for losses of any kind arising from failure to comply with this condition. Chapter 2, Section 8.

2.9 Servicing of Defective Units

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustments or modifications to a any component of a control system. Chapter 2, Section 9.

2.10 VR2 Servicing - Introduction

Any replacement work carried out without the wheelchair manufacturer's permission will invalidate the control system's warranty. PGDT accepts no liability for losses of any kind if the procedure and safety guidelines are not followed. These operations should only be carried out by a trained Healthcare Technician. Chapter 3, Section 1.