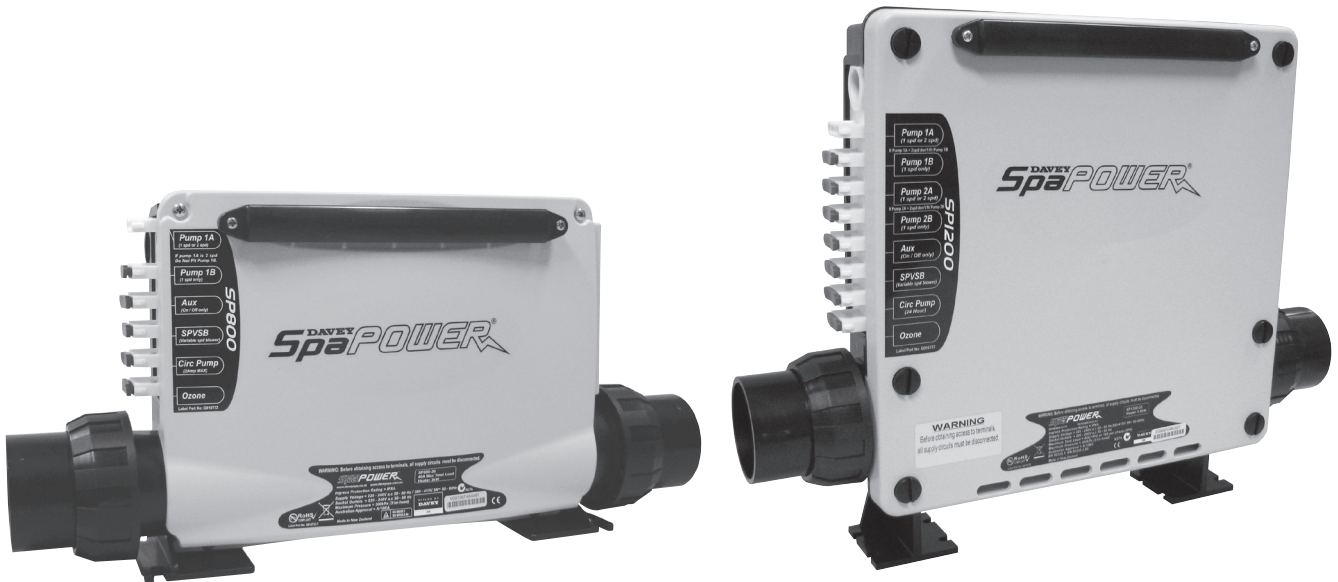


DAVEY® *Spa*POWER®

SP800 & SP1200 Installation & Service Manual

SP800 (2.0kW & 3.0kW)
SP1200 (3.5kW, 4.5kW & 6.0kW)



The SP800 and SP1200, mid to high end range of spa pool control systems can be installed and configured in many ways for many different pool configurations. Information describing the systems, their initial setup and installation options, troubleshooting and after sales service is provided here for use by spa pool system integrators and approved service agents.

For further information please contact your representative or Davey Water Products.

DEPEND ON
DAVEY
WATER PRODUCTS

Davey Water Products Pty Ltd
Member of the GUD Group
ABN 18 066 327 517

AUSTRALIA
Head Office and Manufacturing
6 Lakeview Drive,
Scoresby, Australia 3179
Ph: +61 3 9730 9222
Fax: +61 3 9753 4100
Website: davey.com.au

Customer Service Centre
Ph: 1300 2 DAVEY
(1300 232 839)
Fax: 1300 369 119
E-mail: sales@davey.com.au

NEW ZEALAND
7 Rockridge Avenue,
Penrose, Auckland 1061
Ph: +64 9 570 9135
Fax: +64 9 527 7654
E-mail: sales@daveynz.co.nz
Website: daveynz.co.nz

Customer Service Centre
Ph: 0800 654 333

REST OF WORLD
6 Lakeview Drive,
Scoresby, Australia 3179
Ph: +61 3 9730 9121
Fax: +61 3 9753 4248
E-mail: export@davey.com.au
Website: davey.com.au



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PART ONE - INSTALLATION

1 System Description

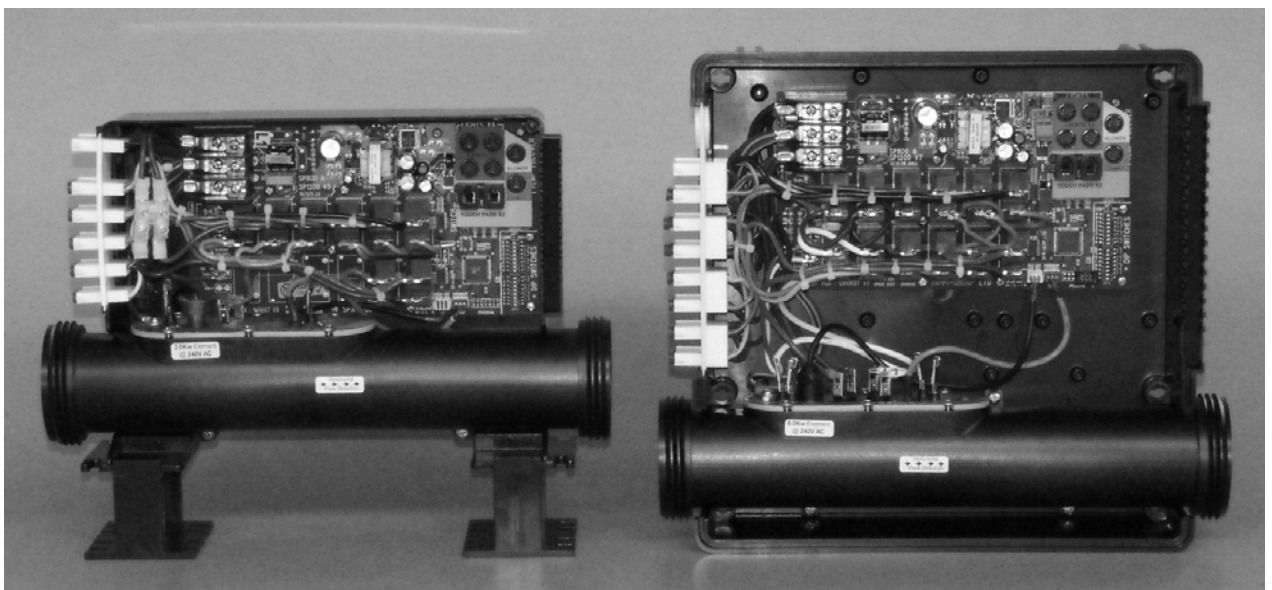
The SP800 and SP1200 spa pool control systems are capable of implementing all the control features of a mid level (SP800) or a high end (SP1200) spa pool, up to a maximum system current of 40Amps single phase or 16Amps per phase, three phase.

The SP800 and SP1200 systems consist of the following parts. (See below for more details).

- SP800 or SP1200 Control Box
- Poolside Touchpad (either oval or narrow oval)
- Secondary Poolside Touchpad (small oval) (optional)
- In Pool Temperature Sensor (optional)

1.1 Spa Power 800/1200 Control Box

The SP800/SP1200 control box contains the main control circuitry and switchgear. It is splash proof while also being vented to allow cooler running and reliable operation. It has waterproof AMP connectors on the outside for connecting pumps, blowers, ozonators etc and other connectors on the inside for connecting the touchpad, in pool temperature sensor, LED light etc. Slots are provided so these cables can enter the splash proof box without being damaged or causing leaks.



1.1.1 Pool Water Heater

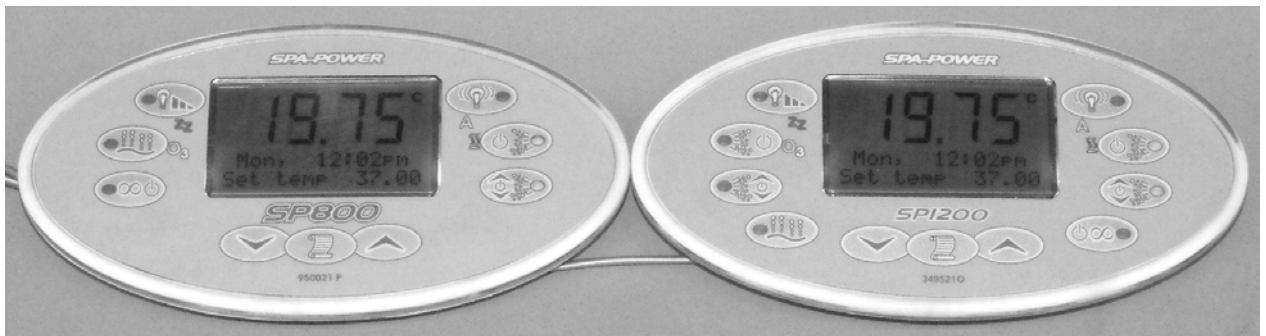
The Pool Water Heater is integrated with the control box, inside an engineering plastic heater tube for easy plumbing in line with the water circulation pump. The heating element is coated with a tough protective flouropolymer coating for long life. It includes one (SP800) or two (SP1200) heating element legs, one (SP800) or two (SP1200) over temperature cut-out devices, an optical water sensor and a digital water temperature sensor. Models are available with heater ratings of 2.0kW or 3.0kW (SP800) and 3.5kW, 4.5kW or 6.0kW (SP1200).

1.2 Poolside Touchpad

The poolside touchpad provides all the user controls for the SP800 and SP1200 control systems. These include buttons for pump, blower and light control as well as temperature settings, time settings and other adjustments. A four digit LCD display shows temperature readings, time settings, and various configuration settings. This display also includes two lines of text which explain the system functions as they happen. This text can be displayed in one of seven different languages. A beeper provides button push feedback and alarm sounds. One or two touchpads may be connected directly to the control box. The second touchpad can be the smaller secondary touchpad model. Refer to the User's Guides for details of how to operate the touchpads.

1.2.1 Oval Touchpad

The oval touchpad is the default touchpad (sometimes called a switch). It incorporates attractive built in multicolour LED backlighting for easy night time use. It features a new, tough yet flexible, polyester membrane for excellent crack resistance and is filled with water repellent silicone gel for extra protection from water ingress.

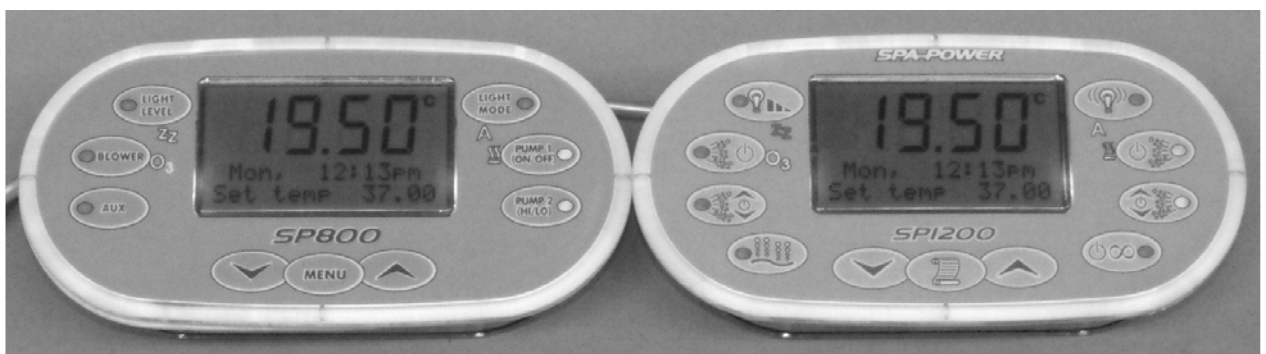


1.2.2 Rectangular Touchpad

The rectangular touchpad is now discontinued and is not available for new designs. It was offered as an alternative to the oval model. It has the same outer dimensions as the oval touchpad but looks larger due to its rectangular shape. It is functionally identical to the oval model but has not been updated to have the new silicone gel potting.

1.2.3 Narrow Oval Touchpad

The narrow oval touchpad is now offered as an alternative to the oval model. It is slightly smaller and fits on pool shells that cannot accommodate the larger oval model. It is functionally identical to the larger oval model with the same superior water protection features.



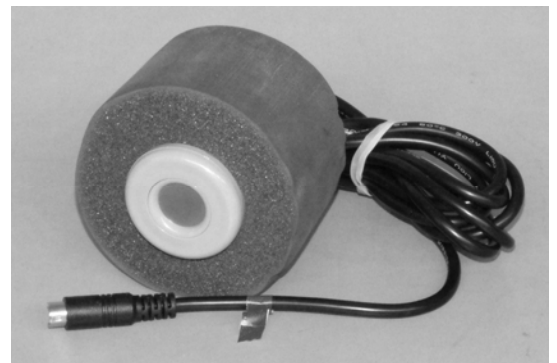
1.2.4 Secondary Touchpad

The secondary touchpad is offered as an additional, reduced function, touchpad. It does not have the LCD display or associated adjustment controls but does have six buttons for manual control of pumps, blowers and lights. It also has the same superior water protection features. This touchpad is intended for use by a second pool occupant or for use as the main user's control on a commercial installation where important pool settings should not be accessible. In this case one of the main touchpads can be mounted in an inaccessible location for pool setting maintenance, with a secondary touchpad on the poolside.



1.3 In Pool Temperature Sensor

The In Pool Temperature Sensor is a recommended upgrade over the standard in heater temperature sensor. It comes as standard with SP1200 models but is also recommended for SP800 models. If used, it will give better control over the pool temperature and thermostat cycling operation as well as a more accurate readout of the pool water temperature. It is mounted in the pool shell under the water level and connected inside the control box.



1.4 Additional Loads

In addition to their integrated single or dual pool heaters the SP800 & SP1200 can control the following additional pool equipment:

- 2 x Single speed pumps OR 1 x two speed pump
- Additional 2 x Single speed pumps OR 1 x two speed pump (SP1200 only, not SP800)
- Single speed blower OR extra single speed pump, etc
- Variable speed blower
- Small 24hr circulation pump *
- Pool Ozonator *
- Up to 4 Single or Variable Colour LED pool lights with optional daisy chained point lights
- 12Vdc LED light

* These are controlled entirely automatically so no user controls are provided.

1.5 Control Box Model Variations

Different models are provided with different heater power ratings. This limits the number of base models to two SP800s and three SP1200s as follows:

Q800-20	SP800 controller with 2.0kW Heater
Q800-30	SP800 controller with 3.0kW Heater
Q1200-35	SP1200 controller with 3.5kW Heater
Q1200-45	SP1200 controller with 4.5kW Heater
Q1200-60	SP1200 controller with 6.0kW Heater

Each base model is available with a choice of different touchpads. The oval touchpad comes as standard. An "R" is added to the part number when a rectangular touchpad (discontinued) is included instead of oval. An "N" is added to the part number when a narrow oval touchpad is included instead of the oval.

Some additional customer specific models also exist. These mainly differ in customer specific colours and labelling.

The design of the SP800 and SP1200 means that all possible output sockets are included in every model. Each model can be configured to control a wide variety of additional loads by setting the DIP switches inside the controller, e.g. to enable an output (e.g. ozone) or to change its setting (e.g. one or two speed pump).

2 System Configuration Guide

The SP800 and SP1200 Spa Pool control systems are designed to be very adaptable. Before starting system installation it is important that the pool designer understands the capabilities of the control system, so as to put together a system which meets his needs and gives the maximum trouble free operating life.

This involves making several decisions to select the desired controller model and other components. Then checking that all the parts will work properly together, in the intended combination, and ensuring the systems maximum operating current load is within safe limits.

2.1 System Configuration Checklist

The checklist below is intended as a guide to help the system integrator work through the questions of what equipment is needed to make up the system.

SP8/1200 Spa Pool Controller System Configuration Checklist		Tick
1	<p>What model of Control Box is needed?</p> <p>Consider the pool size, number of pumps and other loads, whether three phase supply will be used and the desired maximum current load of the system.</p>	<p>Q800-20 Q800-30 Q1200-35 Q1200-45 Q1200-60</p>
2	<p>Which Touchpad model is preferred?</p> <p>Do you prefer the Standard Oval or Narrow Oval model.</p>	<p>Oval Narrow Oval</p>
3	<p>Do you want the optional Secondary Touchpad?</p> <p>Do you want pump control from a second seat in the spa or is this pool for a commercial installation?</p>	<p>Yes No</p>
4	<p>What Temperature sensor option is preferred?</p> <p>Cheaper and easier in element sensor only or better performing in pool sensor (standard with SP1200).</p>	<p>In Element In Pool</p>
5	<p>Is a single speed or two speed main pump required? (PUMP1A)</p> <p>Consider max total load implications, target market, cost.</p>	<p>1 Speed 2 Speed</p>
6	<p>Is a second single speed pump required? (PUMP1B)</p> <p>This pump can only be used if PUMP1A is single speed. Consider max total load implications, target market, cost.</p>	<p>Yes No</p>
7	<p>Is another 1spd or 2spd pump required? (PUMP2A) - SP1200 only</p> <p>Consider max total load implications, target market, cost.</p>	<p>1 Speed 2 Speed</p>

8	Is another single speed pump required? (PUMP2B) – SP1200 only This pump can only be used if PUMP2A is single speed. Consider max total load implications, target market, cost.	Yes No
9	Is an additional Auxiliary load to be fitted? (AUX) This load can be a pump, blower, light or other load, e.g. a stereo.	1 Spd Pump 1 Spd Blower Other
10	Is a variable speed blower to be used? (SPVSB) This blower gives full speed control and ramping options from the poolside touchpad.	Yes No
11	Is a 24Hr circulation pump wanted? (Circ Pump) Consider target market, extra cost versus quiet running, use of flow directors.	Yes No
12	Is a Spa Ozonator desired? (Ozone) A spa ozonator can improve sanitation and reduce chemical use.	Yes None
13	Is a Davey Spa LED light wanted? Up to four lights can be fitted. A Variable Colour Light (SPVCL) – emits many different colours. A Variable Colour RD SPVCL with optional daisy chained point lights The Single Colour Light (SPCL) – emits blue only.	X 1,2,3 or 4? SPVCL RDSPVCL SPCL No
14	Is a 12Vdc LED light to be used? Third party on/off controlled 12Vdc LED lighting systems can be accommodated if necessary.	Yes No

2.2 Maximum Outlet Loading Guide

SP800 & SP1200 Maximum Outlet Loadings	
Pump 1A	220-240V, AC, 50-60Hz, 10A
Pump 1B	220-240V, AC, 50-60Hz, 10A
Pump 2A – SP1200 Only	220-240V, AC, 50-60Hz, 10A
Pump 2B – SP1200 Only	220-240V, AC, 50-60Hz, 10A
Aux	220-240V, AC, 50-60Hz, 10A
SPVSB	220-240V, AC, 50-60Hz, 7.5A
Circ Pump	220-240V, AC, 50-60Hz, 2.5A
Ozone	220-240V, AC, 50-60Hz, 2.0A

Note that you cannot load all outlets to their maximum ratings simultaneously or the maximum total load will be exceeded. Use the loading calculator spreadsheet to check the system in question.

2.3 Loading Calculator Spreadsheets

Once the desired equipment is selected it is important to check that the pump and heater ratings used, and the other equipment connected, will not overload the system. Two loading calculator spreadsheets are available to help to determine this, one for the SP800 and one for the SP1200. To use these spreadsheets you will need the Microsoft Excel (or free OpenOffice Calc) spreadsheet application. To get a copy of the spreadsheets please contact Davey Spa by email.

To use the spreadsheet simply select the loads you have chosen from the lists provided and select the correct DIP switch settings (see below). The spreadsheet will then calculate if this is an acceptable combination of loads. If there is a problem you can adjust the loads selected until a suitable combination is reached. A sample of the spreadsheet is shown here for illustration purposes but to get the proper results it must be used on screen in a spreadsheet application. Note that the Loading Calculator Spreadsheets are a guide only and all chosen configurations should be trialed using real equipment to confirm all is well.

Microsoft Excel - SP800 Loading Calculator V1.xls [Read-Only]

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SP800 Loading Calculator

This calculator is an estimate only. Figures must be verified using real equipment.

Instructions

- 1) Enter your system parameters in the green boxes below. (Click on the box and select a value)
- 2) The resulting controller loading will be automatically estimated and the results displayed.
- 3) Please take note of any comments in red if they appear. They are a warning that the system is overloaded.
- 4) Change any parameter to refine your system's design further.
- 5) Hover the mouse over red triangles to read additional notes, ie :
- 6) All results should be verified using a real pool and equipment.
- 7) The Dip switch settings are shown in the yellow box.

Mains supply voltage	230V	Electrical load information																																																
Mains circuit breaker	32A																																																	
Element wattage	3.0kw																																																	
Connected Loads		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2"></th> <th colspan="2">Standard</th> <th colspan="2">High Speed</th> </tr> <tr> <th colspan="2"></th> <th>W</th> <th>A</th> <th>W</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>Pump 1A</td> <td>1 or 2spd</td> <td>506</td> <td>2.2</td> <td>1500</td> <td>6.52</td> </tr> <tr> <td>Pump 1B</td> <td>Don't use</td> <td>-</td> <td>0</td> <td>-</td> <td>0</td> </tr> <tr> <td>Aux</td> <td>1 spd only</td> <td>1500</td> <td>6.52</td> <td>1500</td> <td>6.52</td> </tr> <tr> <td>SPVSB</td> <td>Blower Variable (SPVSB)</td> <td>943</td> <td>4.1</td> <td>943</td> <td>4.1</td> </tr> <tr> <td>Circ pump</td> <td></td> <td>-</td> <td>0</td> <td>-</td> <td>0</td> </tr> <tr> <td>Ozone</td> <td></td> <td>-</td> <td>0</td> <td>-</td> <td>0</td> </tr> </tbody> </table>			Standard		High Speed				W	A	W	A	Pump 1A	1 or 2spd	506	2.2	1500	6.52	Pump 1B	Don't use	-	0	-	0	Aux	1 spd only	1500	6.52	1500	6.52	SPVSB	Blower Variable (SPVSB)	943	4.1	943	4.1	Circ pump		-	0	-	0	Ozone		-	0	-	0
		Standard		High Speed																																														
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Circ pump		-	0	-	0																																													
Ozone		-	0	-	0																																													
Controller DIP switch settings																																																		
1 Touchpad Count	One	OFF																																																
2 Controller type	SP800	OFF																																																
3 Circ pump fitted	Not fitted	OFF																																																
4 Pump 1 Type	1 x 2spd	OFF																																																
5 Not used		OFF																																																
6 Not used		OFF																																																
7 Aux pump fitted	Fitted	ON																																																
8 Ozone fitted	Not fitted	OFF																																																
9 Ozone on while pool used	No	OFF																																																
10 Load shed level	2	OFF																																																
11		ON																																																
12		OFF																																																
13 Not used		OFF																																																
14 Not used		OFF																																																
15 Not used		OFF																																																
16 Not used		OFF																																																
System current draw																																																		
		(Check on a real pool)																																																
Auto mode - not heating		2.2 A																																																
Auto mode - heating		14.2 A																																																
Max load		25.0 A																																																

Load shedding information

Htr1 load shed count 3

Load shed option 3

Load shed option 2

Load shed option 1

Microsoft Excel - SP1200 Loading Calculator V2.xls

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SP1200 Loading Calculator

This calculator is an estimate only. Figures must be verified using real equipment.

Instructions

- 1) Enter your system parameters in the green boxes below. (Click on the box and select a value)
- 2) The resulting controller loading will be automatically estimated and the results displayed.
- 3) Please take note of any comments in red if they appear. They are a warning that the system is over loaded.
- 4) Change any parameter to refine your system's design further.
- 5) Hover the mouse over red triangles to read additional notes, ie :
- 6) All results should be verified using a real pool and equipment.
- 7) The Dip switch settings are shown in the yellow box.

Mains supply voltage	230V	Electrical load information		W	A	
Mains circuit breaker	40A		Leg 1	2755	12.0	
Element wattage	6.0kw		Leg 2	2755	12.0	
			Standard			
			(low speed)	High Speed		
			W	A	W	A
			575	2.5	1800	7.83
			-	0	-	0
			2100	9.13	2100	9.13
			2100	9.13	2100	9.13
			-	0	-	0
			943	4.1	943	4.1
			-	0	-	0
			50	0.22	0	0

Connected Loads		
Pump 1A	1 or 2spd	Pump 2spd 575/1800 Wat
Pump 1B	Don't use	-
Pump 2A	1 or 2spd	Pump 1spd 2100 Watts
Pump 2B	1spd only	Pump 1spd 2100 Watts
Aux	1spd only	-
SPVSB		Blower Variable (SPVSB)
Circ pump		-
Ozone		Ozone 50 Watts

Controller DIP switch settings		Dip switch	
1 Touchpad Count	Two		OFF
2 Controller type	SP1200		ON
3 Circ pump fitted	Not fitted		OFF
4 Pump 1 Type	1 x 2spd		OFF
5 Pump 2 fitted	Fitted		ON
6 Pump 2 type	2 x 1spd		ON
7 Aux pump fitted	Not fitted		OFF
8 Ozone fitted	Fitted		ON
9 Ozone on while pool used	No		OFF
10 Load shed level	6		ON
11			ON
12			OFF
13 Not used			OFF
14 Not used			OFF
15 Not used			OFF
16 Not used			OFF

System current draw	(Check on a real pool)	
Auto mode - not heating		2.7 A
Auto mode - heating		26.7 A
Max load		33.1 A

Load shedding information	
Htr1 load shed count	2
Htr2 load shed count	3

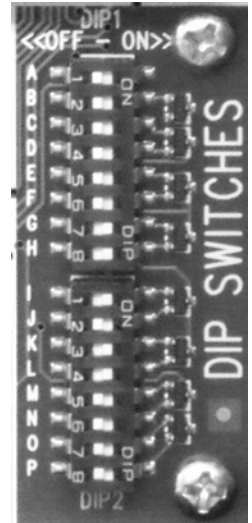
SP1200 loading calculator

2.4 Dip Switch Settings

Once the desired range of equipment is finalised, the SP800 or SP1200 control box must be configured to operate correctly with this equipment. This is done by setting the DIP switches inside the control box to the correct settings to match the equipment used. These settings can be worked out with the help of the loading calculator spreadsheet and must be set on every individual control box used.

These settings give the controller a lot of adaptability and allow the pool builder to use the same model of controller in a range of different spa pool models with different configurations. The pool builder must therefore take responsibility for correctly setting these DIP switches to match the actual set up of the pool.

There are a total of 16 DIP switches and these are used to configure the controller's outputs etc. Some of the switches are only relevant to the SP1200, as the Printed Circuit Board (PCB) used in the SP1200 has slightly more features. For a quick guide refer to the setup guide label on the inside of the controller lid.



Switch A Touchpad Count

This sets the control box for how many touchpads are connected.

- ON – One touchpad connected
- OFF – Two touchpads connected

Switch B Model Selection – Factory set.

This tells the microcontroller on the PCB if it is installed in an SP1200 model or an SP800 model. The SP1200 is able to control a dual heater assembly as well as having more outputs for pumps.

- ON – SP1200 model
- OFF – SP800 model

Switch C Circ Pump

This switch tells the controller if a small 24hr water circulation pump is connected. If fitted this must be the pump that circulates water through the heater and filter. Without a 24hr circ pump fitted, Pump 1A is automatically controlled to circulate the water through the heater and filter. With the circ pump fitted Pump 1A will revert to an on/off pump under user control.

- ON – Circ pump fitted
- OFF – Circ pump not fitted

Switch D Pump 1 type

This tells the controller what type of pump is connected to the Pump 1A socket, either one speed or two speed. A two speed pump uses two relays on the controller PCB, whereas a one speed only requires one. For this reason Pump 1 can be set up either as a single two speed pump or a pair of one speed pumps. A single one speed pump can be connected but must be plugged into the Pump 1A socket so the controller links this pump to the heater function (the same follows for the two speed pump – see lid label).

- ON – 2 x one speed pumps
- OFF – 1 x two speed pump

*****IMPORTANT: Do not install a two speed pump if the DIP switch is set for 2x single speed pumps, this can power both high and low speed windings simultaneously and damage the pump.*****

Switch E Pump 2 Fitted - Only applicable to the SP1200 model. Leave in OFF position on SP800 models. This tells the controller to turn the Pump 2 outputs on. This is used in conjunction with Switch F, which sets up Pump 2 to be either two speed or one speed.

- ON – Pump 2 fitted
- OFF – Pump 2 not fitted

Switch F Pump 2 type - Only applicable to the SP1200 model. Leave in OFF position on SP800 models. Like Pump 1, Pump 2 can be set up to be either a single two speed pump or a pair of one speed pumps. Again, a single one speed pump can be connected. Note that the two speed pump must be fitted to the Pump 2A socket (see lid label) but a one speed pump can be fitted to either.

- ON – 2 x one speed pumps.
- OFF – 1 x two speed pump

Switch G Aux fitted

This is used to tell the controller if an Auxiliary load is fitted. This output is on/off control only and can be used to switch a one speed pump, single speed blower, light or other load (e.g. a stereo).

- ON – Aux fitted
- OFF – Aux not fitted

Switch H Ozone fitted

This switch is used to enable the ozone output. If an ozonator is installed, the controller will associate it with the pump that is circulating water through the heater tube (24hr Circ Pump or Pump1A), and only operate the ozone when the pump is on.

- ON – Ozone fitted
- OFF – Ozone not fitted

Switch I Ozone off when spa in use

If ozone is fitted (Switch H is ON), this switch will tell the controller to turn the ozone off when the spa is being used. If a button on the touchpad is pressed then the controller will turn the ozone unit off and wait 30 minutes before turning it back on.

- ON – Ozone unit will stay on
- OFF – Ozone will turn off when the spa is in use

Switch J, K, L Load shedding settings

Load shedding is the automatic turning off of the heater when other loads are turned on, in order to limit the total load to a safe level. These three switches set the load shedding characteristics of the controller. The tables below show the possible combinations for the SP800 and SP1200 respectively. See the relevant Setup Guide and Loading Calculator for more details. Note that loadshedding can generally be switched off when using a three phase power supply connection.

Load shed settings			Load Shedding
DIP Switch J L/S option 3	DIP Switch K L/S option 2	DIP Switch L L/S option 1	SP800 HTR 1
OFF	OFF	OFF	-
OFF	OFF	ON	4
OFF	ON	OFF	3
OFF	ON	ON	2
ON	OFF	OFF	1
ON	OFF	ON	1
ON	ON	OFF	1
ON	ON	ON	1

Number = Number of pump/aux/blower loads switched ON to load shed the heater element. 2 speed pumps on low and circulation pump are ignored in the load count.
 SPVSB ON any speed counts as one Load.

Load shed settings			Load Shedding	
DIP Switch J L/S option 3	DIP Switch K L/S option 2	DIP Switch L L/S option 1	SP1200 HTR 1	HTR 2
OFF	OFF	OFF	-	-
OFF	OFF	ON	6	-
OFF	ON	OFF	5	-
OFF	ON	ON	4	-
ON	OFF	OFF	3	5
ON	OFF	ON	3	4
ON	ON	OFF	2	3
ON	ON	ON	1	2

First number = Number of pump/aux/blower loads switched ON to load shed the first heater element (Htr1).
 Second number = Number of pump/aux/blower loads switched ON to load shed the second heater element (Htr 2).
 2 speed pumps on low and circulation pump are ignored in the load count.
 SPVSB ON any speed counts as one load.

Switch M 12Vdc LED Light Fitted

This switch is used to enable the controlled 12Vdc LED Light output: When enabled the controller will reconfigure its button functions so the top left Light Mode button provides on/off control of this light output.

- ON – 12Vdc LED light fitted
- OFF – 12Vdc LED light not fitted

Switch N 12Vdc Timeout Enabled

This switch is used to enable the automatic timeout of the controlled 12Vdc LED Light output: When enabled the controller will automatically turn the light off after 30 minutes of no button push activity.

- ON – 12Vdc LED Light Timeout Enabled
- OFF – 12Vdc LED Light Timeout Disabled

Switches O & P Not Used - Leave in OFF position

2.5 Touchpad Configuration

Once the pool configuration is worked out and set up as described above there are a lot of detailed configurations which can be made on the touchpad. These are described in more detail in the User's Guides and most of them will be fine if left at the default settings. Some of the main settings which should be reviewed for suitability when commissioning a pool are listed below.

Temperature Setting	– Default = 37°C – See User's Guide section 7.2
Clock Setting	– Needed for correct Sleep operation – See User's Guide section 7.4
Sleep Time Settings	– Default is 11:00pm to 7:00am daily – See User's Guide section 7.6
Filtration Settings	– Default is 10 minutes every hour – See User's Guide section 7.9

2.5.1 Loading Factory Defaults

In order to ensure that no unsuitable setting have been made on a system, it may be desirable to reload the factory default settings before setting any intended variations from these. This can be done using the display menu system. See User's Guide section 7.10.

2.5.2 Maintenance Timers

Maintenance timers are a tool provided to allow pool suppliers to set up prompts for the user to seek maintenance/service for the pool when required. Their use is entirely optional but may be helpful in promoting after sales service of the pool. See User's Guide section 7.7.

2.5.3 Touchpad LCD Contrast

The touchpad display may appear too dark or too light for clear visibility, especially in extreme temperature conditions. If so then the display contrast can be adjusted by holding down the top left light button, and either the up or down buttons, until the display looks correct. See User's Guide section 8.4.

2.5.4 Language Selection

The SP800 and SP1200 controllers are intended for an international market and so have been designed to be able to display the LCD user interface text in several different languages. The default language is English but ENGLISH, FRENCH, GERMAN, DUTCH, JAPANESE, SPANISH or PORTUGUESE can be selected by first holding the down button for four seconds to enter the language selection menu, then selecting the desired language using the up and down buttons and finally setting this language by pressing the scroll button. See User's Guide section 8.6.

2.5.5 Using a Touchpad to Transfer Settings

The SP8-1200 touchpads have the ability to copy the controller's settings from one controller to another. This function is intended for spa manufacturers who want all their spas to go out with known settings. The settings which are copied are the user changeable settings such as sleep times etc as listed below:

Set Temp	Yes
User Timer	No
Clock Setting	No (Controller handles the time functions)
User Alarms 1 to 9	Yes
Sleep Times 1 to 9	Yes
Maintenance Timers	Yes
Misc Options	Yes
Advanced Options	Yes
Load Defaults	No (Used to restore settings back to factory default)



2.5.5.1 Reading

To load the required settings into a touchpad, first set all the required settings on a controller, then connect a standard touch pad to the controller to be read from and power up the controller while holding down the Light Level Button on the touchpad. See Fig 1 above. This will put the touch pad into COPY SETUP mode.

To read the controller's settings into the touch pad, press the down button. You will be asked to "Confirm Read" if you wish to read push the up button to select yes, once yes has been selected press the scroll button to save the settings into the touchpad's non volatile memory.

The touch pad will display if it is reading the controller data and if all is ok, then the touch pad will save the data internally and revert to the screen shown above in Fig 1. Note: Do not disconnect the touch pad until it has finished reading and reverted to the screen shown in Fig 1.

2.5.5.2 Writing

Connect a standard touch pad, containing the required settings (see above), to the controller to be written to and power up the controller while holding down the Light Level Button on the touchpad. See Fig 1 above. This will put the touch pad into COPY SETUP mode as before.

To write the settings stored in the touch pad into the controller, press the scroll button. You will be asked to "Confirm Write" if you wish to write push the up button to select yes, once yes has been selected press the scroll button to save the settings into the controller's non volatile memory.

The touch pad will display that it is writing the data to the controller, if the data is ok then the touch pad will display so and revert to the screen shown above in Fig 1. Note: Do not disconnect the touch pad until it has finished writing and reverted to the screen shown in Fig 1.

2.5.5.3 Verifying

To verify that the controller's settings match the touchpad's settings, press the up button. The display will read "Verifying Data" then display "Verify Ok" if the data matches. If the controller's data does not match the touch pads data then the touch pad will display "Verify Failed" and revert to the screen shown in Fig 1.

The copy set up screen will exit after 2 minutes or alternatively turn the power off to the controller to exit.

Note: To clear all changes made you can Load the Factory Default Settings as described in the User's Guide, section 7.10.

3 System Installation

3.1 System Specifications

SP800 and SP1200 Specifications	
SP800 dimensions	360mm x 220mm x 95mm
SP1200 dimensions	360mm x 310mm x 95mm
Heater tube pipe diameter	50mm
Ingress Protection Rating	IPX4
Heater pressure, max (head of water)	300kPa (30m)
Temp – max controlled	41.5°C
Temp – thermal cut outs	50°C +/- 3°C
Temp – max ambient	40°C
Poolside Touchpad – oval & rectangular face	172mm x 91mm x 5mm
Poolside Touchpad – narrow oval face	155mm x 78mm x 5mm
Poolside Touchpad – body	135mm x 65mm x 18mm
Poolside Touchpad – recommended touchpad hole	135mm x 65mm - see diagram
Poolside Touchpad – touchpad lead length	3m (10m also available)
Secondary Touchpad – small oval face	112mm x 49mm x 4mm
Secondary Touchpad – body	88mm x 22.5mm x 19mm
Secondary Touchpad – recommended touchpad hole	90mm x 25mm - see diagram
Secondary Touchpad – touchpad lead length	3m (10m also available)
In Pool Temp Sensor – round face	45mm Diameter x 4mm Deep
In Pool Temp Sensor – body	34mm Diameter x 44mm
In Pool Temp Sensor – recommended mounting hole	35mm Diameter
In Pool Temp Sensor – lead length	2.5m (10m also available)
Power Supply Requirements (Maximum total loading)	
SP800-20 2.0kW SP800-30 3.0kW SP1200-35 3.5kW	220-240V, AC, 50-60Hz, 40A. Or 3-Phase + Neutral, 380-415V, AC, 50-60Hz, 16 Amps per phase.
SP1200-45 4.5kW SP1200-60 6.0kW	220-240V, AC, 50-60Hz, 40A.

3.2 General Installation & Safety Notes

3.2.1 Electrical

1. When installing, refer to the appropriate local wiring rules. In particular refer to AS/NZS3000:2007 (AS/NZ) or EN60364 (EU).
2. The system must be permanently connected to fixed wiring. Means for disconnection must be provided in the fixed wiring in accordance with the wiring rules.
3. We recommend that the spa be connected to a dedicated circuit with it's own Residual Current Device (RCD) rated at 30mA or less.
4. Parts containing live parts must be inaccessible to a person in the spa, except parts supplied with safety extra-low voltage not exceeding 12V (e.g. touchpads and LED lights).

5. It is recommended that the steel reinforcing in any concrete base on which the pool is sitting be equipotential bonded to the earth conductor in the supply to the spa. This is to protect against the possibility of low voltage shocks caused by differential earth voltages. Refer to the appropriate local wiring rules, e.g. AS/NZS3000:2007 Sections 5.6 & 6.3 or EN60364.
6. It is recommended that signal and power wiring be separated to prevent interference and that the unit is supplied from a dedicated power circuit.
7. Loop wires before they enter the unit to prevent condensation running down them and into the unit.
8. Check all connections are correct and tight.
9. Check that the unit and supply are not overloaded. Use the loading calculator for details.
10. A 20mm water proof cable gland or waterproof conduit system is recommended to connect the power cable in to the control box.

3.2.2 Plumbing

1. The heater should be plumbed so the water flows past it from left to right when horizontally mounted and bottom to top when vertically mounted. **IMPORTANT:** If vertically mounted, the water sensor **MUST** be at the top.
2. When connecting pipe work to the heater, make sure the 'O' rings are properly seated in the mac union fitting. Hand tighten only. Using tools may distort the fittings. Care must be taken to ensure that all joints are inline, otherwise leaks may occur.
3. Make sure the controller is mounted securely so that vibration is minimised.
4. It is recommended that the pipe work have shut off valves so the controller and pumps can be removed for service without needing to empty the pool.
5. Pressure test the installation to check for leaks.
6. Support all pipe work to prevent sagging and to prevent movement when pumps turn on or off.
7. Insulate all pipe work to reduce heat loss.

3.2.3 General

1. This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
2. In order to avoid the possibility of hyperthermia (heat stress) occurring, it is recommended that the average temperature of spa pool water should not exceed 40°C.
3. The floor or base on which the pool is installed has to be capable of supporting the expected load.
4. Precautions should be taken to ensure that spa pool water is disposed of appropriately.
5. An adequate drainage system should be provided to deal with overflow water.
6. Precautions should be taken to avoid damage due to water freezing in the pipes and fittings.
7. Precautions should be taken to avoid damage when the pool is left empty for an extended period.

3.3 Power Supply Connection Guide

IMPORTANT: Only a qualified electrician should make these connections.

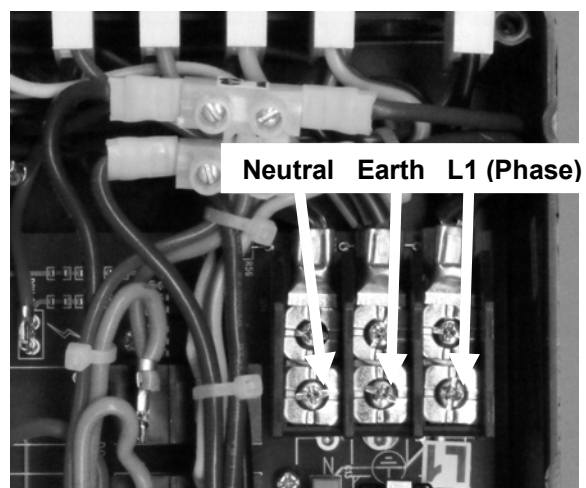
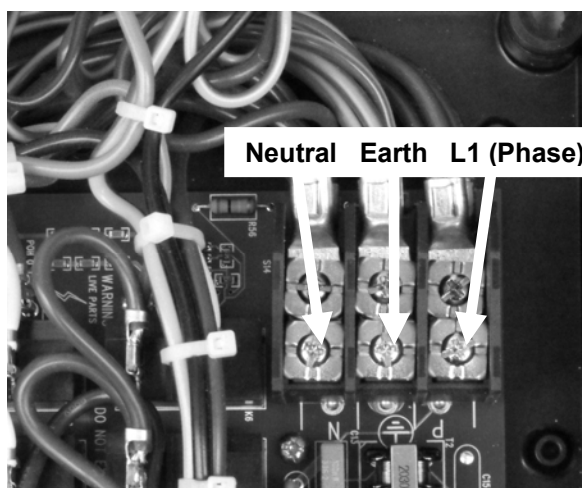
All models are designed to be supplied with a single phase 220-240V, 50-60Hz, AC, 40Amp power supply. Models Q800-20, Q800-30 and Q1200-35 are currently being upgraded to add the option of using a Three Phase + Neutral, 380-415V, 50-60Hz, AC, 15 or 16 Amp per phase power supply instead. These models will be able to use either power supply option depending on power supply availability at any particular site. See ratings label pictures below.



There are currently no firm plans to add the three phase option to models Q1200-45 and Q1200-60.

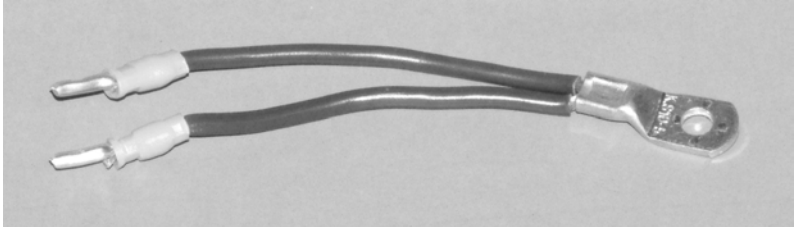
3.3.1 Single Phase Connections

The default wiring of all models is for single phase and is the same for all models, with or without the three phase option. The picture below on the left shows the single phase connections on a controller without the three phase option and the one on the right shows the single phase connections on a controller with the three phase option.

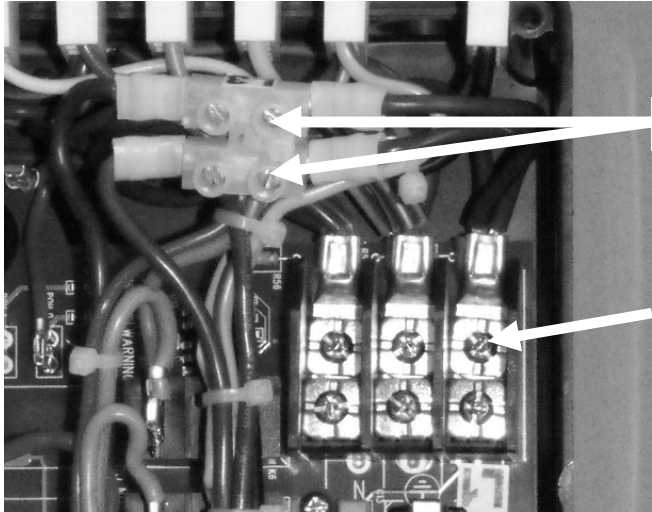


3.3.2 Three Phase Connections

For connection of models Q800-20, Q800-30 and Q1200-35 to a three phase supply, first remove the brown jumper leads (pictured below) by loosening screws 1, 2 & 3. Screw 3 will need to be taken right out and then replaced and retightened. It is very important that this screw be replaced and retightened properly so that the other wires that it secures remain firmly connected and there is no danger of a loose connection here burning out later under load.



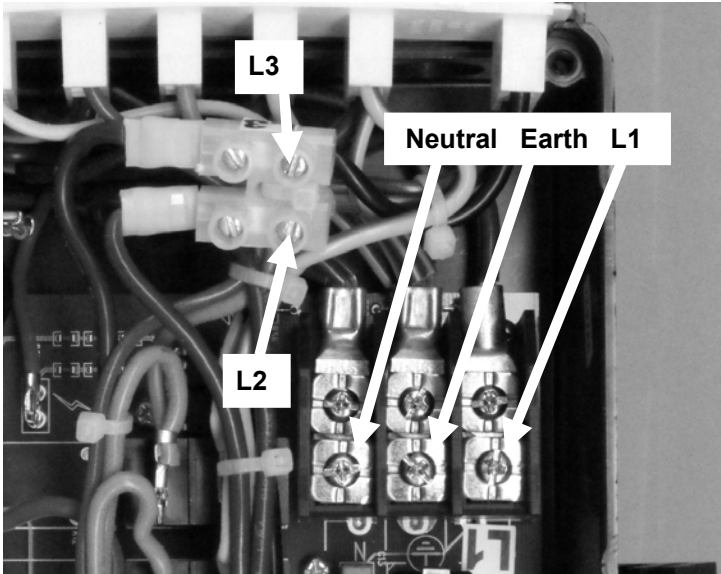
Jumper Leads
To be removed for
three phase
operation



Screws 1 & 2

Screw 3 - Must be
properly retightened

After the brown jumper leads have been removed, the three phase connection will be as pictured below. Note that there is no special requirement for phase sequencing as each phase will power single phase loads only and there are no three phase motors or similar equipment to consider.



3.4 Control Box Installation

The SP800 or SP1200 control box should be mounted inside the (IPX5) cabinet of the spa in a position where it will be protected from the weather and water splashes or drips, but will be easily accessible for the connection of loads etc to the external AMP connectors and internal connectors. Ensure the box is securely mounted so it will not vibrate in transit or in use. For best water ingress protection and vent operation the box should be mounted vertically with the main lid labels readable the right way up, the AMP connectors on the left and low voltage cable entries on the right.

External mounting feet and brackets are provided so the control box can be screwed to a suitable piece of timber work.

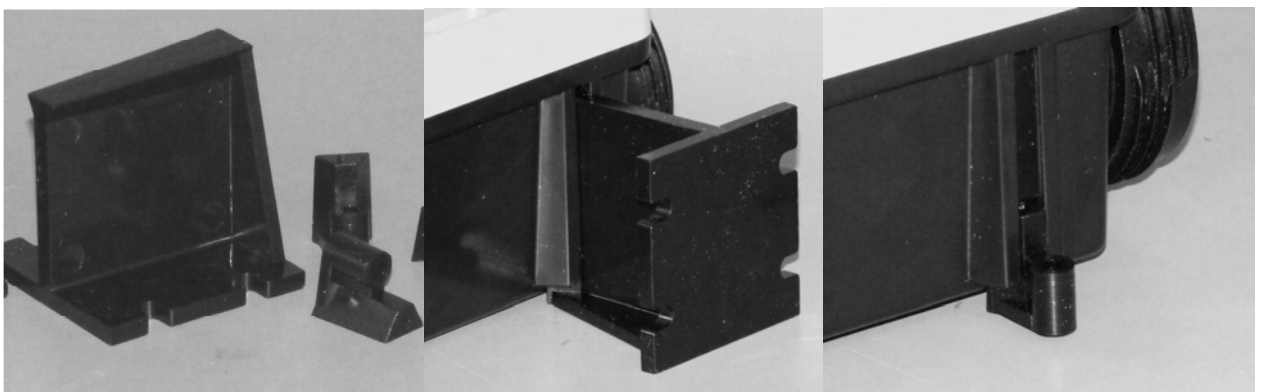
3.4.1 SP800 Mounting Feet

The SP800 comes with feet integrated onto its enclosure, ready for screwing down to the timber frame or base of the spa pool. These are shown on the left below. Extension feet (part number Q6926) are also available separately, which slide over the existing feet and raise the controller up to a higher position which may be more convenient for plumbing to a pump. These are shown on the right below.



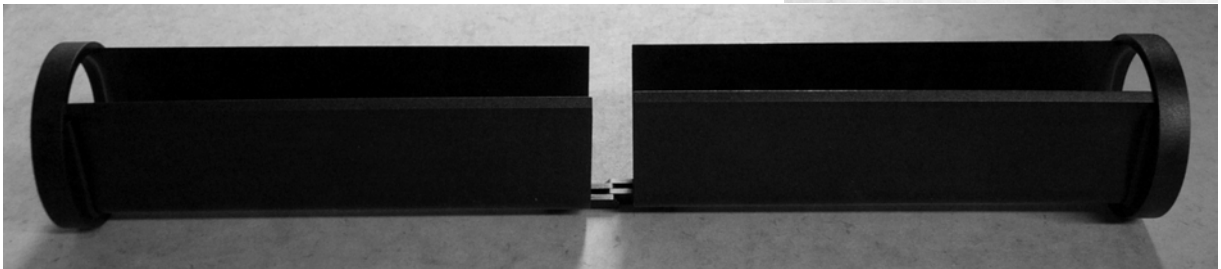
3.4.2 SP1200 Mounting Feet and Brackets

The SP1200 is supplied with two mounting feet and four mounting brackets. These feet or brackets should be glued into the slots provided on the outside of the controller enclosure using PVC pipe cement or similar adhesive. The feet are suitable for securing the controller to a timber base or floor and the brackets are suitable for securing the controller to a timber wall. A combination of the two feet and the top two brackets can be used if desired.



3.4.3 Flow Directors

Flow directors (part number Q6927) are available separately for insertion into the in line heater tube. These are intended for use with small 24Hr circulation pumps and have the effect of concentrating and speeding up the water flow over the heating element and sensors. This improves the water cooling of the element and the temperature sensing accuracy. They reduce the likelihood of problems due to low flow rates, such as air collection and element overheating.

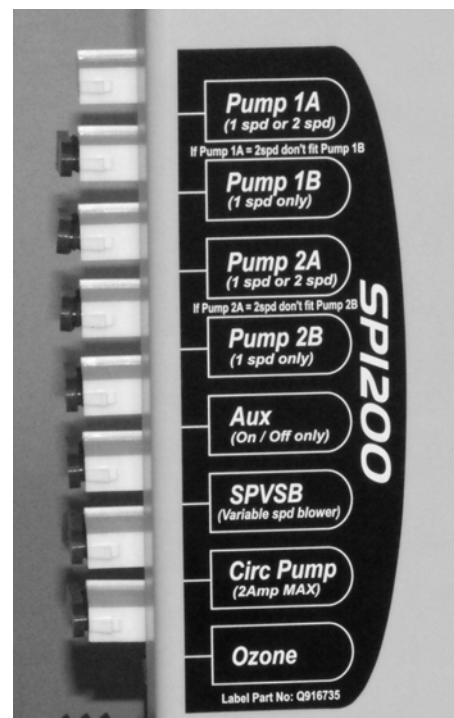
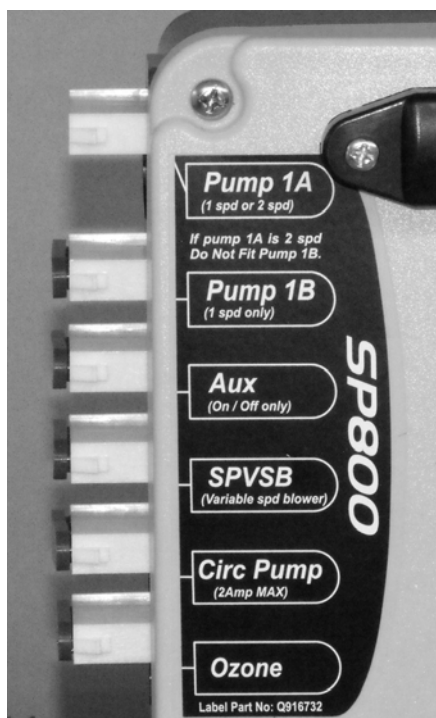


3.4.4 Control Box Connections

IMPORTANT: Disconnect the power to the control box before removing the lid. Otherwise there is a risk of electrocution from the bare terminals.

When installing and configuring the system, the pool equipment must all be correctly connected to the control box and the correct DIP switch settings selected inside the control box to match the connected equipment.

All 220-240Vac equipment is connected to the external AMP connectors, e.g. pumps, blowers & ozonators. These connectors are waterproof and allow a lot of connections to be made in a small space. AMP connectors which are not used should have a blue silicone bung fitted to keep them waterproof and prevent access to the terminals. See pictures below.



All low voltage (SELV) equipment is connected to the sockets provided inside the control box, e.g. touchpads, in pool temperature sensor & LED lights. In order to connect these, the lid must be removed using a suitable tool. The cables for the SPVCL, Blower and In Pool Temp Sensor are all the same type but they are colour coded with coloured tape to match the coloured label inside the control box. This makes it easier to ensure the plugs are correctly connected. Slots are provided in the edge of the box for the cables to pass through safely while maintaining the splash proof nature of the box. Take care when replacing the lid that the cables are correctly located in the slots.

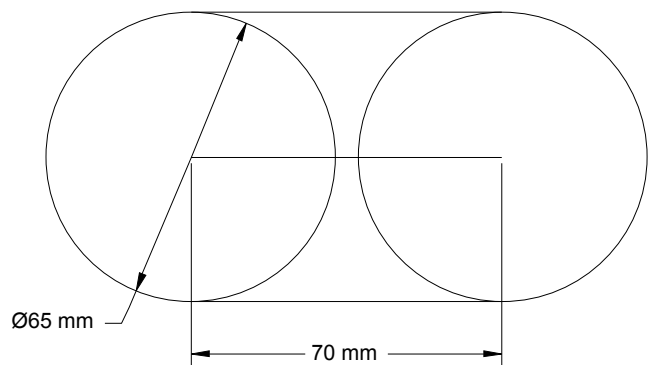


3.5 Poolside Touchpad Installation

The poolside touchpad cable plugs into either of the two rectangular connectors inside the control box labelled "TOUCH PADS X2" and colour coded gray, see picture above.

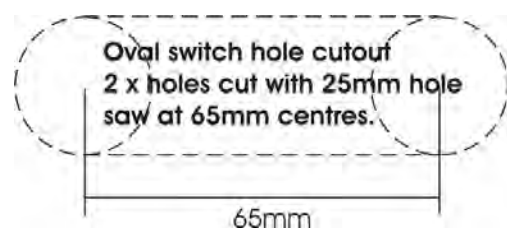
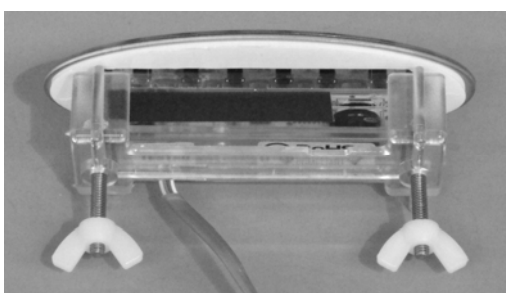
3.5.1 Main Touchpad

The recommended mounting cut out size for the oval or narrow oval touchpad is shown on the right. The touchpad is secured by the supplied sticky foam gasket. Peel the protective paper from the gasket before fitting the touchpad in the hole and pressing down firmly. Alternatively seal the touchpad in place using silicone sealant. Do not use solvents to clean up the silicone sealant as they may damage the plastic of the touchpad.

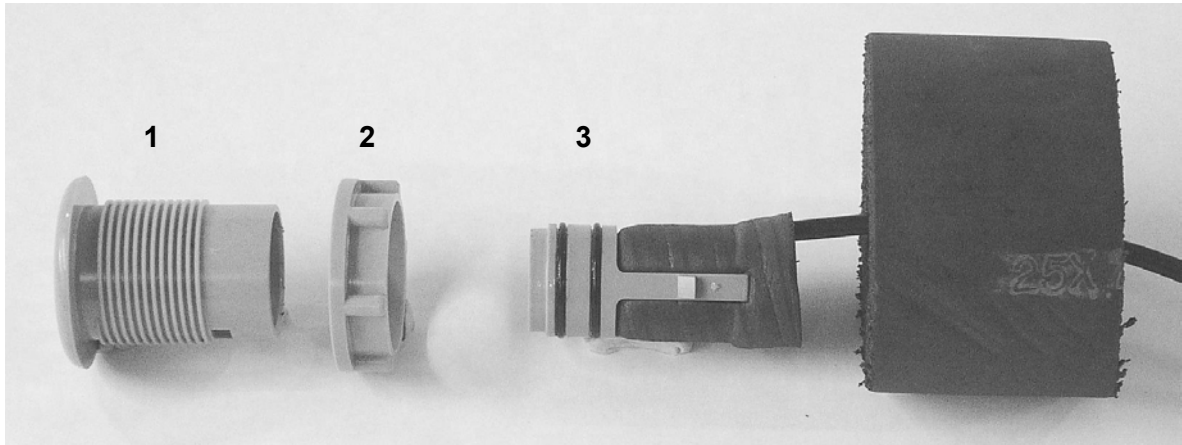


3.5.2 Secondary Touchpad

The recommended mounting cut out size for the small oval secondary touchpad is shown below. The touchpad is secured by the supplied sticky foam gasket and/or the rear mounting bracket. Peel the protective paper from the gasket before fitting the touchpad in the hole and pressing down firmly. Optionally secure the touchpad by fitting the rear mounting bracket over the two long screws and holding in place with the two wing-nuts.



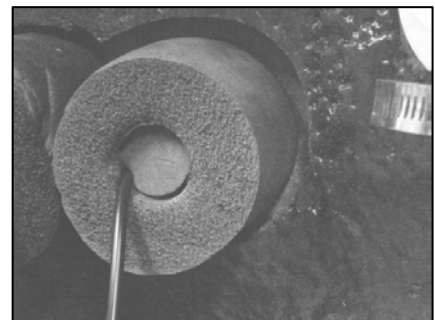
3.6 In Pool Temperature Sensor Installation



The in Pool temperature sensor (number 3 in the photo) clips into the body (1) which mounts into a 35mm hole in the pool shell and is secured with the locking ring (2). Use silicone or similar for a water proof seal. Slide in the sensor slug (3) into the body, there should be enough silicone grease to ensure the O-rings slide in easily and make a water tight seal. It is important that the foam plug is pushed as far as it will go into the body. Fit the large foam insulation over the entire assembly. The finished installation should look like the picture below on the right, with the sensor insulated from the air temperature inside the pool cabinet. This will help give an accurate measurement of the pool water temperature, and ensure good water temperature control. The sensor can be changed for service, without emptying the pool, by covering the front of the sensor with a drain plunger, or similar, while withdrawing the sensor (3) from the body (1) and replacing it with a new sensor. This can be done with minimal spillage of water.

The in pool temperature sensor cable plugs into the mini DIN connector inside the control box labelled "TEMP" and colour coded red, see picture in section 3.4.4.

NB: In the SP800 and SP1200 controllers both temperature sensors should be connected at the same time. The in heater sensor should remain connected when the in pool sensor is used (unlike the SP601 controller).



3.7 Installation of Additional Loads

The main additional loads are pumps, blowers and ozonators which are connected to the AMP connector outlets on the side of the control box. Some loads also connect to the internal low voltage connectors inside the control box.

3.7.1 Pump 1 (A & B)

Pump 1A can be either a 1 speed pump or a 2 speed pump and must be connected to the AMP socket marked "Pump 1A". The 'Pump 1 Type' DIP switch (DIP switch D) must be set according to the type of pump fitted, see section 2.4. This pump must be plumbed to circulate water through the heater, filter and ozone injector (if fitted), unless a 24Hr circ pump is used (see below), in which case it should be plumbed to circulate water through the pool jets as desired.

Pump 1B must not be fitted if a two speed pump is used in the Pump 1A position. If a one speed pump is used for Pump 1A however, another one speed pump can be connected to the Pump 1B outlet. This pump should be plumbed to circulate water through the pool jets as desired. It should not circulate water through the heater, filter or ozone injector. Davey Spa recommends our QB series of spa pumps which are available as single or two speed models in a range of sizes.

3.7.2 Pump 2 (A & B) (SP1200 only)

Pump 2 (A & B) control is only available on the SP1200 controller. Use of these outlets is optional so the 'Pump 2 fitted' DIP switch (DIP switch E) must be set to tell the controller whether to enable these outlets, see section 2.4

Pump 2A can be either a 1 speed pump or a 2 speed pump and must be connected to the AMP socket marked "Pump 2A". The 'Pump 2 Type' DIP switch (DIP switch F) must be set according to the type of pump fitted, see section 2.4. This pump should be plumbed to circulate water through the pool jets as desired.

Pump 2B must not be fitted if a two speed pump is used in the Pump 2A position. If a one speed pump is used for Pump 2A however, another one speed pump can be connected to the Pump 2B outlet. This pump should be plumbed to circulate water through the pool jets as desired.

3.7.3 Aux Pump or Blower (Single Speed)

Use of this outlet is optional so the 'Auxiliary fitted' DIP switch (DIP switch G) must be set to tell the controller whether to enable this outlet, see section 2.4. This load can be a single speed pump or blower or other mains load suitable for on/off control. It must be connected to the socket marked "Aux". This pump or blower should be plumbed to feed jets or injectors as desired. When installing blowers, be sure to follow the blower's installation guide to ensure that enough air flow is maintained and no water can get into the blower. Davey Spa recommends our single speed QB pumps or Q5601-AMP single speed blower.

3.7.4 Variable Speed Blower (SPVSB)

The Davey Spa SPVSB (pn Q5602-AMP) is optional but the controller automatically detects its presence so no DIP switch setting is required. The SPVSB must be connected to the AMP socket marked "SPVSB". This socket is always powered (except when in an error condition) and so can only be used for a Spa Power Variable Speed Blower (SPVSB). The blower's speed control cable must also be plugged in to the Mini Din connector inside the control box labelled "BLOWER" and colour coded yellow, see picture in section 3.4.4. This blower should be plumbed to feed injectors as desired. When installing blowers, be sure to follow the blower's installation guide to ensure that enough air flow is maintained and no water can get into the blower.



3.7.5 24Hr Circ Pump

A small 24Hr circulation pump can be installed to circulate water through the heater, filter and ozone injector (if fitted). It must be connected to the AMP socket labelled "CIRC PUMP". This will be used instead of Pump 1 to automatically heat and filter the pool water. If this pump is installed, the 'circ pump fitted' DIP switch (DIP switch C) must be set to enable this outlet. NB: If this pump is fitted then this pump and NOT Pump 1A must be plumbed to circulate water through the heater, filter and ozone injector. See section 3.4.3 on the use of flow directors with small 24Hr circulation pumps. See section 8 for more recommendations on the use of 24Hr Circ Pumps.

3.7.6 Ozonator

Use of a pool ozonator is optional so the 'Ozone fitted' DIP switch (DIP switch H) must be set to tell the controller whether to enable this outlet, see section 2.4. The ozonator must be connected to the socket marked "Ozone". The ozone injector should be plumbed into the water flow from the 24Hr circ pump, if one is fitted. Otherwise it should be plumbed into the flow from Pump1A. Care must be taken to ensure a suitable water flow rate through the injector and hence a suitable air flow rate through the ozonator. See section 9 for more recommendations on the use of ozonators. Davey Spa recommends our model Q5000-AMP Ozonator shown on the right.



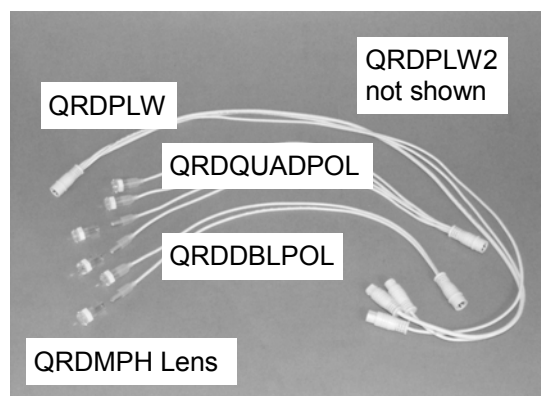
3.7.7 Davey Spa Single or Variable Colour LED Light

Up to four Davey Spa LED lights can be connected to the four mini DIN connectors inside the control box labelled "LIGHTS X4" and colour coded blue, see picture in section 3.4.4. Either single colour (pn Q3709) or variable colour (pn Q3708) lights should be used, not a mixture. The controller will detect if lights are connected and whether they are single colour or variable colour models. It will automatically configure its operation to suit so no DIP switch setting is necessary. These lights fit in a 63mm (2.5") hole in the pool shell.



3.7.8 Davey Spa Variable Colour LED Light with Daisy-Chained Point Lights

Larger Davey Spa LED lights are available which can have daisy chained point lights slaved off of them. Up to four of these can be connected to the four Mini-DIN connectors inside the control box labelled "LIGHTS X4" and colour coded blue, see picture in section 3.4.4. Up to 60 point lights can also be fitted. Generally one large light will be used with point lights fitted around the perimeter of the pool. The controller will detect if these lights are connected and will automatically configure its operation to suit, so no DIP switch setting is necessary. The picture below on the left shows the larger light next to the SPVCL light for comparison. The black plug connects to the controller and the white connector is for the daisy chained point lights. The larger light lens fits in a 95mm (3.75") hole in the pool shell and the point lights fit in 12mm (0.5") holes. The daisy chained point lights are shown on the right.



3.7.9 Third Party 12Vdc LED Lights

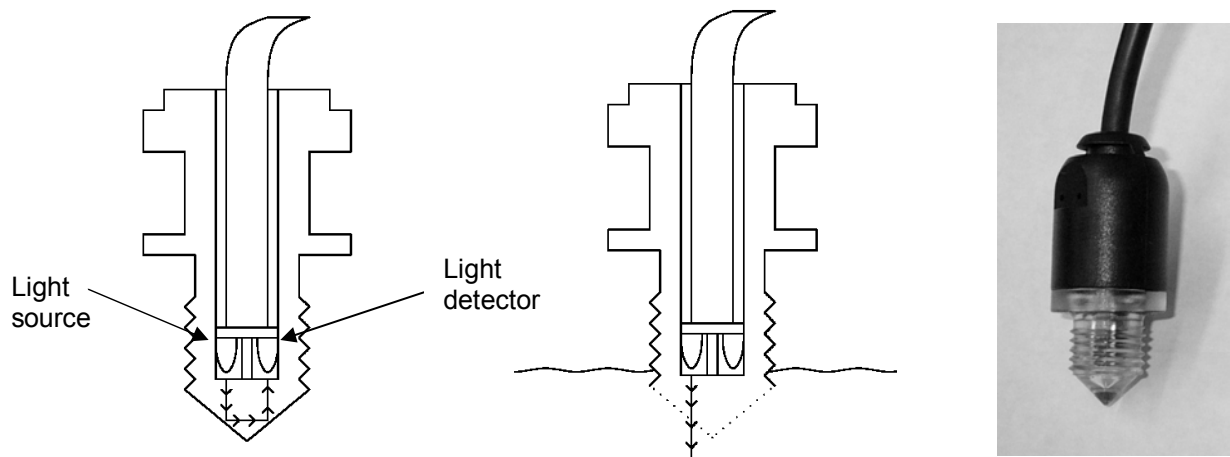
A controlled 12Vdc output is provided for the connection of third party 12Vdc LED pool lights. This output is available on the terminal block marked "SWITCHED 12VDC" just to the left of the four mini DIN connectors inside the control box labelled "LIGHTS X4", see picture in section 3.4.4. The maximum allowed current draw from this output is 1Amp when no other LED lights are fitted. Note that incandescent bulbs must not be connected to this output, even if they are rated at 1A or less. This is because their inherent inrush current at turn on exceeds the output rating and may cause a 12V power supply over-current shut down.

PART TWO - SERVICE

4 Components Explained

4.1 Water Sensor

A water detection system is used to tell the controller when the heater tube is flooded with water and therefore when it is safe to turn the water heating element on. Water detection is achieved by an optical water sensor mounted in the element. Inside the optical sensor are an Infra red light source and detector.



When the tip of the water sensor is surrounded by air the light emitted by the light source is reflected back to the light detector at the boundary between the plastic and the air due to the phenomena of total internal reflection. This occurs when the refractive index of the two materials is sufficiently different, as is the case when the sensor is in air.

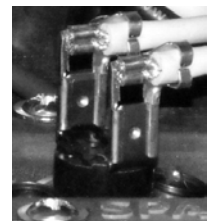
When the tip of the water sensor is in water the difference in refractive index between the plastic lens and the water is not enough to cause total internal reflection to occur and the light escapes from the sensor without being reflected back to the detector.

The optical water sensor has many advantages over traditional pressure switches and flow switches; there are no moving parts or adjustments required. It is very robust and offers a long service life. The optical water sensor is also less sensitive to collecting hair and debris. However care must be taken to ensure that air is not trapped in the heater tube during normal operation. This is especially important when low flow rate 24Hr circulation pumps are used as they may not produce sufficient water flow to clear air from the heater tube. See section 8 for more information.

The water sensor is connected to the controller PCB. In normal operation the PCB continually checks that the water sensor is connected and is functioning correctly. If it is not then an Error 4 condition occurs.

4.2 Thermal Cut-out(s)

Each control box contains one (SP800) or two (SP1200) thermal cutout devices (sometimes called Klaxons). These are electro-mechanical devices which act as a switch. When they are heated above $50^{\circ}\text{C} \pm 3^{\circ}\text{C}$ they switch off creating an open circuit. When they cool below 40°C they switch back on again. These are placed in series with the heating elements and thermally coupled to the brass element boss. The elements will then be switched off if the brass element boss gets too hot.



There is also an associated electronic detection circuit that is used to sense if power is getting to the element. If a thermal cutout has operated this circuit will sense a lack of power and the controller will enter an Error 6 condition. The controller will not attempt to recover from this condition but will need to be reset manually to clear the fault once the thermal cutout has cooled below 40°C . This means that if a thermal cut-out operates the controller will not restart the heater without manual intervention.

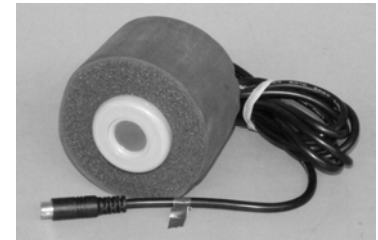
4.3 Temperature Sensors

Each controller comes with a water temperature sensor built into the heating element assembly, which communicates with the controller via a digital data link. This temperature sensor is sealed into a tubular pocket that extends into the heater tube's water flow and plugs into the controller PCB. This sensor configuration is known as 'in-heater' temperature sensing. 'In-heater' temperature sensing is the most convenient method of sensing the pool's water temperature as it is built into the controller, however it is not the most accurate. It will generally provide good temperature regulation of the pool if used in conjunction with a high flow rate pump and good pool insulation.



The pump and heater are turned on when the sensed temperature is below the target temperature by the hysteresis amount and turned off when up to temperature. A large hysteresis is required for the in heater sensor because the water in the heater will cool down, when the pump is off, at a faster rate than the main body of water in the pool. If the pipe work is poorly insulated the system can cycle rapidly (thermally) resulting in the pump & element turning on and off frequently, thus shortening equipment life and irritating the user. If the pipe work or pool cabinet is well insulated so the heater does not cool down much below the pool temperature this can result in poor temperature control of the pool.

A better method exists. It is called 'in-pool' temperature sensing. In this method a temperature sensor is mounted in the pool shell so that it is able to directly sense the pool water temperature. This is a far more accurate method of detection and allows the use of tighter hysteresis in the temperature control software. It is much less affected by differing insulation designs and ambient temperatures. For both types of temperature sensor, the amount of hysteresis can be altered using the touchpad menu system. See section 7.9.1 in the User's Guide.

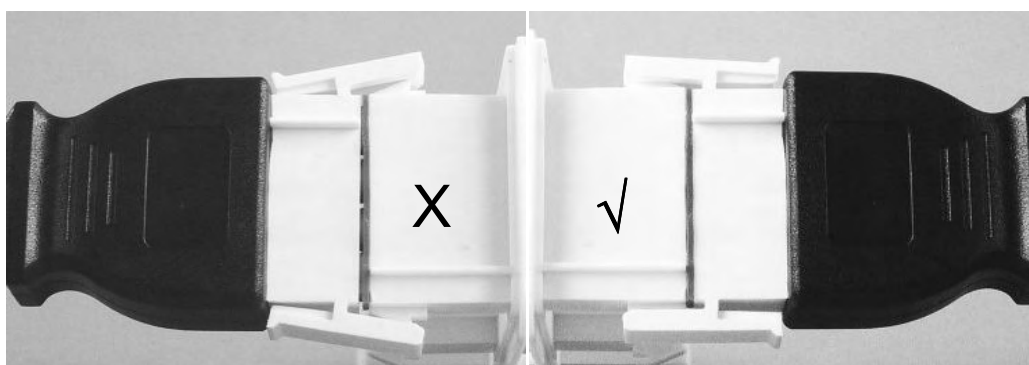
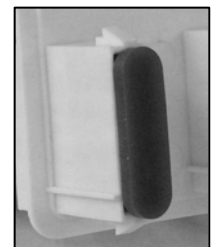


'In-pool' temperature sensors use the same digital temperature sensing device as the 'in-heater' sensors. For accurate sensing of the pool water the digital sensor in the 'in-pool' sensor needs to be tightly coupled (thermally) to the pool water and insulated from any other temperature effects i.e. from the air temperature inside the pool cabinet. This is achieved by mounting the sensing device to a stainless steel disk in the front of the sensor and then packing the case of the sensor with insulation. Additional closed cell foam insulation (supplied) must then be placed around the back of the sensor when mounted in situ.

In normal operation the PCB continually checks that the temperature sensors are connected and functioning correctly. If they are not then an Error 8 condition occurs. The sensor can be changed, without emptying the pool, by covering the front of the sensor with a drain plunger, or similar, while withdrawing the sensor from the body and replacing it with a new sensor. This can be done with minimal spillage of water.

4.4 AMP Plugs

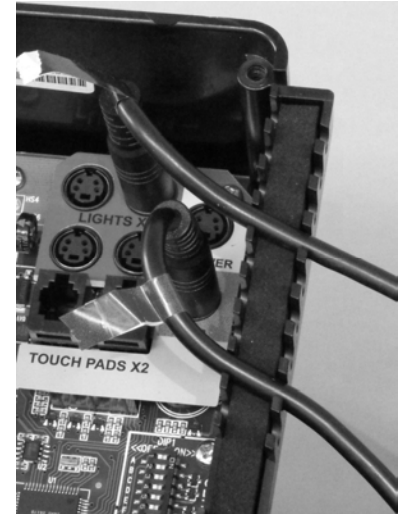
All SP601, SP800 and SP1200 controllers are fitted with AMP style connectors. All peripheral equipment can be ordered with AMP cordsets for use with these controllers. Each cordset will have an identifying label on the side. It is important that the locking mechanism is engaged on the AMP plug to secure the connection and to protect against mechanical vibration and water ingress. The plug is pushed home and the plastic tabs engage onto the socket as shown below on the right. All plug and socket pairs should have a silicone gasket seal to protect against water and any socket without a plug should have a bung fitted as shown in the picture on the right.



4.5 Cable Entries

Both the SP800 and SP1200 are normally supplied without glands for the mains power supply into the unit. Different setups and installations will require different types of glands/fittings. It is the installer's responsibility to ensure that the cable entry gland and/or conduit meets at least IPX4 requirements. A 20mm round hole is provided for the cable entry, suitable for a range of different glands and conduit systems.

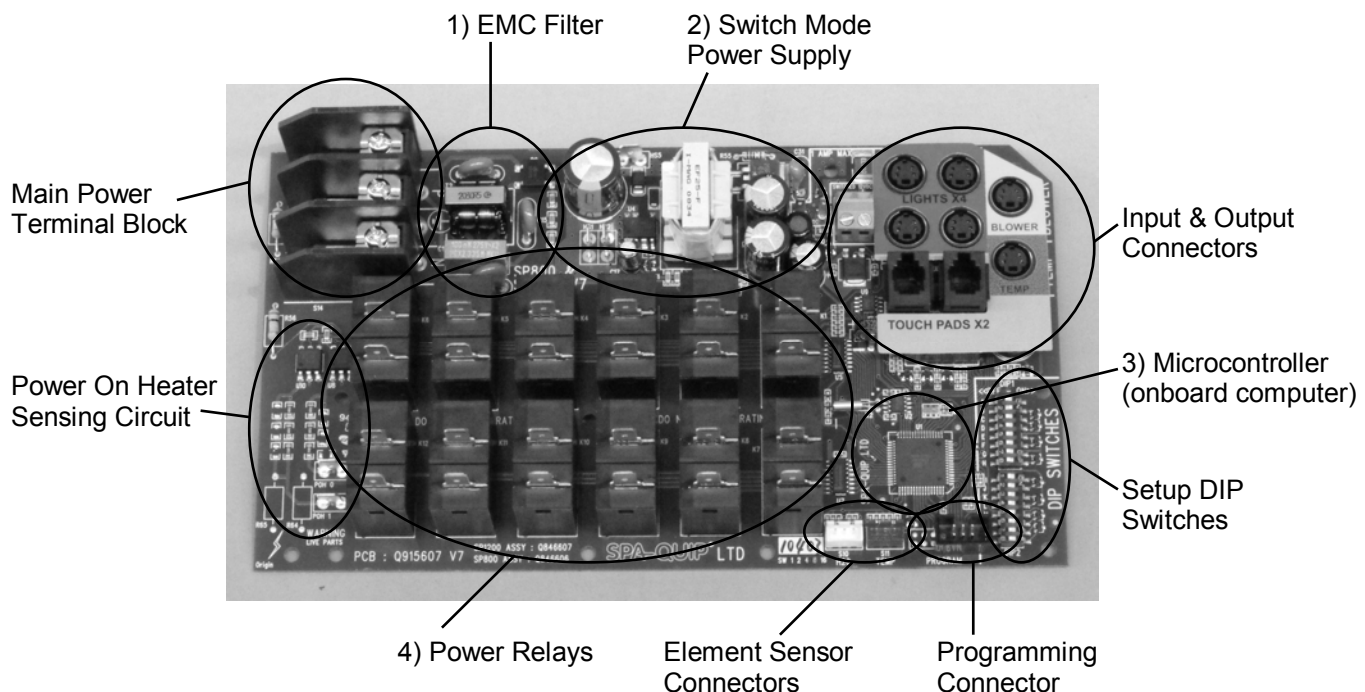
Both the SP800 and SP1200 have slots provided on the right hand side for the entry of low voltage cables for touchpads, LED lights, blower speed control and temperature sensors. These slots are sealed with two strips of insulating foam to allow them to achieve the required IPX4 water ingress protection.



4.6 Printed Circuit Board (PCB)

The PCB assembly is the heart of the whole system and the product of much development effort by Davey Spa. The SP800 and SP1200 assemblies are very similar, with the main difference being the omission of four relays on the SP800 assembly. Each PCB includes the following features:

- 1) EMC Filter: This helps to ensure that the system is not affected by electrical interference and does not cause any electrical interference. The system complies with stringent European standards for EMC (Electro-Magnetic Compatibility) for both emissions and susceptibility.
- 2) Switch Mode Power Supply: The SP8-1200 uses modern, isolated, low voltage power supply technology like that used in computers, rather than the more basic systems used in most other models of controller. This provides safety isolated power for the microcontroller and touchpad etc.
- 3) Microcontroller: The heart of the PCB assembly is the microcontroller, which is a complete small computer on a chip. The operation of the whole system is defined and controlled through software stored and run on this chip. This software is proprietary intellectual property developed and maintained by Davey Spa. This software is a complete solution in itself and does not rely on any third party operating system for its reliable operation.
- 4) Power Relays: 8 (SP800) or 12 (SP1200) high power relays are included on the PCB. These are the main interface between the microcontroller and the high power loads, allowing the full range of pumps, heaters, blowers, etc to be controlled from software.



5 Reprogramming

5.1 Required Programmer

The SP800 and SP1200 controllers have the ability to be reprogrammed with new software in the field or service lab. Occasionally this may be desirable to upgrade a controller's features or overcome some operational problem. In order to reprogram a controller a special hardware programmer, preloaded with the new software, is needed. Many such programmers exist but the type used by Davey Spa is the FISP programmer available from 4D Electronics at www.4d-electronics.co.nz. The recommended model is the FISP-AVR-P06-USB. FISP loader software for Windows can also be downloaded from the 4D Electronics website to allow the FISP programmer to be loaded with the required new software. This way any serviceman can purchase a programmer and load it with new software received from Davey Spa by email. The programmer can then be used to (re)program multiple controllers. Alternatively, preloaded FISP programmers may be available from Davey Spa.

If receiving software by email for loading into the FISP programmer it is essential that the both the *.hex program file and the *.4dx project files are received and loaded into the FISP. The *.4dx file is needed to set a lot of microcontroller setup options to the correct values. Without it the controller may not work correctly after reprogramming. It is a simple matter of putting the two files together in a folder and opening the *.4dx file with the FISP loader software. This then calls up the correct settings and correct program file.

5.2 Programming Procedure

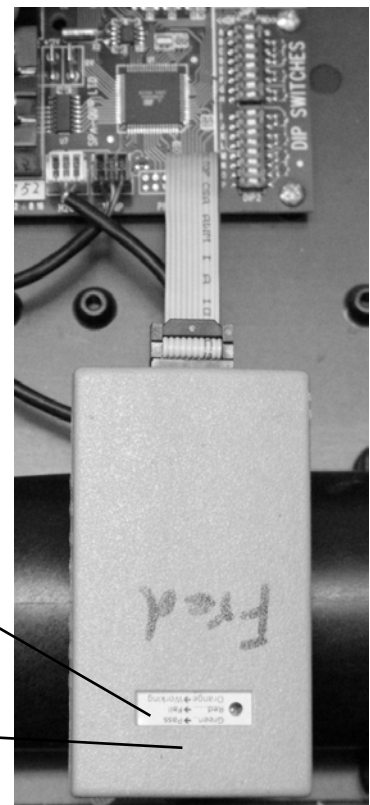
- 1) Load the new software into the FISP as described above or use a preloaded FISP.
- 2) Turn off power to the controller and remove the lid.
- 3) If the FISP is a P06 model with 6 pin output connection, connect it directly to the 6 pin programming connector on the controller PCB as shown below. If it is a P10 model with 10 pin output connection, then an adapter cable is needed. NB both FISP types have 10 pins externally and look the same.
- 4) Turn on power to the controller.
- 5) The controller will power the programmer which will reprogram the controller. The LED on the programmer will flash orange for a time and then turn green to indicate successful programming.
- 6) Turn off power to the controller.
- 7) Disconnect the programmer and replace the lid on the controller.
- 8) Turn on power to the controller and check the new software version as described in section 7.1

Alternatively a battery box can be used between the controller and FISP to power the programming operation but this is nonstandard equipment and would need to be made specially.

Older controllers did not have the programming connector fitted to the controller PCB. These can still be reprogrammed in the same way except that some other method of connecting the programmer is needed. A 6 pin header can be soldered onto the PCB to allow connection as described above, or a special spring loaded connector can be held in place against the PCB. However this is custom equipment and would need to be made specially.



FISP Programmer
Model FISP-AVR-P06-USB
From www.4d-electronics.co.nz



6 Error Diagnostics

The SP800 and SP1200 controllers have extensive self-diagnostic capabilities. In the event of a problem they will sound an alarm (beep) and indicate an error number according to the nature of the problem. E.g. for error 4 they will beep four times repeatedly, for error 5, five times and so on, so that the error number can be heard as well as seen on the display. Pushing the scroll button will mute the alarm but if left alone it will stop by itself after four minutes so as not to cause a nuisance. The error numbers and their meanings are listed below.

6.1 Error 1 = PRIME FAILED

This is a special case in that it is not a latching error. It does not indicate a problem with the controller but means that no water is being detected in the heater. The LCD display will show three options on the bottom line of text: Retry: Mute: Demo. Pressing the Down button (Retry) will run the pump associated with the heater (Pump1 or Circ Pump) for 10 or 60 seconds respectively, to try to flood the heater tube. Normal operation will resume if successful. If unsuccessful, Error 1 (H2O) will be indicated again.

- *Check valves and jets are open correctly, filter is not blocked, and pumps are working and that there is enough water flow through the heater tube.*
- *Check that air is not trapped in the heater tube. See the 'Circulation Pump' section.*
- *Check for leaks (water or air) in pipe work, O-rings, seals and loose fittings. If there is air around the water sensor the controller will think the heater is empty. This may occur if there is a small leak so that the water drains out of the heater over time.*
- *If there is water flow then the water sensor may be dirty or faulty. Remove and inspect, replace if necessary. Check the water sensor to circuit board connection for water, corrosion or fouling.*
- *When all other options have been exhausted change the circuit board.*

6.2 Error 2 - not used.

Error 2 is not used but Errors 3 to 8 are used. These are latching errors. If these occur the controller will enter a safe error state with all loads turned off. Operation will stop and will not continue until the controller is reset by simultaneously pushing the top four buttons on the touchpad (light level, light effect mode, pump 1A and pump 2A) See User's Guide Section 9. For improved safety the error state is not reset by cycling the power, which may occur due to an accidental power interruption, but is retained in non volatile memory until the manual reset operation is performed.

6.3 Error 3 = STUCK BUTTON

This error indicates that one of the buttons in the touchpad is stuck or has been held down for more than one minute. This may be caused by damage to the touchpad or its cable, or by the pool cover pressing on the touchpad.

- *Inspect the touchpad for damage or water ingress; test the operation of each button by checking that they all feel the same.*
- *Check the touchpad to main circuit board connection and the cable itself for any damage or corrosion.*
- *Disconnect the touchpad and run the controller for one minute. If it cuts out on Error 3, then the problem is in the controller. If not it is in the touchpad.*
- *If no resolution is found replace the touchpad.*
- *When all other options have been exhausted change the main circuit board.*

6.4 Error 4 = NO WATER SENSOR

This error indicates a problem with the optical water sensor in the heater. It may be caused by the sensor being disconnected or by damage to the sensor.

- *Check the water sensor to circuit board connection for water, corrosion or fouling.*
- *Remove the water sensor and inspect, replace if necessary.*
- *When all other options have been exhausted change the circuit board.*

6.5 Error 5 = OVERTEMPERATURE

This error indicates that the digital temperature sensor in the heater or pool has detected a temperature of 45°C or more. This is not necessarily a problem with the controller itself. It might be caused by excessive pump use during hot weather. In this case reduce the filtration time and increase the sleep time.

- *Check that another source of heat is not heating the pool excessively. Look at pumps operating for long durations, solar heating, heat pumps, lighting etc.*
- *Check that the ambient temperature is not above or close to 45°C.*
- *Check that there is adequate water flow through the heater. Check that the filter and pump are not blocked and that the jets and valves are open.*
- *Measure the pool temperature and verify the controller's reading. If the controller has an in heater sensor then circulate the water for a few minutes first. If the controller is reading an incorrect temperature then the temperature sensor may be damaged or faulty. Connect another sensor and check that the controller is operating correctly. If it is then change the temperature sensor, if not change the circuit board.*

6.6 Error 6 = THERMAL CUTOUT TRIPPED

This error indicates that the safety electromechanical over temperature cutout on the heater has operated. This is not necessarily a problem with the controller itself. It may have been caused by high temperatures during shipping or by disconnection or failure of the pump. Waiting for the heater to cool below about 40°C and resetting by pushing the top four buttons simultaneously will clear this error.

- *Check valves are open correctly and that there is adequate water flow through the heater tube.*
- *Check that filters are clean and jets are open.*
- *Check that pumps are working and start reliably.*
- *Check thermal cutouts in pumps and other equipment. (Run pump directly from mains to see if it overheats and cuts out. If the pump stops or doesn't start, the heater will overheat and an error6 will occur).*
- *Check all connections in the controller are tight and clean, especially the pump.*
- *Make sure air cannot collect in the heater tube. Refer to the 'Circulation Pump' and/or 'Ozone' sections of this manual when using these systems.*
- *When all options have been exhausted change the circuit board.*

6.7 Error 7 = STUCK RELAY

This error indicates a problem with the heater control circuitry inside the unit.

- *Check that there are no short circuits across the relay terminals or associated wiring.*
- *Check that all internal wiring is correct and that terminals are tight and clean.*
- *A mild blow to the control box can often un-stick a sticky relay and normal operation will resume. However there is an increased risk that the error will reoccur.*
- *If the fault continues to occur, change the circuit board.*

6.8 Error 8 = NO TEMPERATURE DATA

This error indicates a problem with the digital temperature sensors in the heater and pool. It might be caused by the sensor being disconnected or by damage to the sensor or cable.

- *Use the diagnostic display to determine which temperature sensor is at fault (see Diagnostic Displays section 6). Note that both sensors need to be bad for an error 8 to happen.*
- *Check the temperature sensor to circuit board connection for water, corrosion or fouling.*
- *Connect another sensor and check that the controller is operating correctly. If it is then change the temperature sensor, if not change the circuit board.*

6.9 Error 9 = REAL TIME CLOCK

This error indicates a problem with the real time clock on the main circuit board.

- *Try resetting the unit.*
- *If fault continues to occur, change PCB.*

7 Diagnostic Display Descriptions

The SP800 and SP1200 controllers have four diagnostic/information displays that may be of use during service and installation. These displays provide information about:

- 1) Software versions (firmware) in the controller and touchpads (switches)
- 2) DIP switch settings
- 3) Temperature sensor readings and their operational status
- 4) Logged error codes

The diagnostic displays can only be activated in two display states:

- 1) When the controller is displaying an error code:
Press and hold down the SCROLL button for approximately five seconds (until a double beep is produced). The first diagnostic display will be shown.
- 2) When viewing the default display (no error raised and not within the menu system):
Press and hold down the SCROLL button. The main menu should be displayed. While viewing the main menu, keep holding down the SCROLL button for approximately five seconds (until a double beep is produced). The first diagnostic display will be shown.

Once the first diagnostic display is shown, you may step through the remaining three displays by pressing the SCROLL button. One additional press of the SCROLL button will return you back to the previous display state (error or default display). There is no automatic timeout while viewing the diagnostic displays.

Note: In the text below “L1:” and “L2:” refer to text line one (top) and text line two (bottom) on the touchpad LCD.

7.1 Software Versions

L1: “ **Vxxx DD/MM/YY** ” (controller software version)

L2: “ **Vxxx DD/MM/YY** ” (switch software version)

Where xxx is the software version (1 and beyond) and DD/MM/YY is the release date.

Note 1: The switch software version is created by the switch itself and not the controller. If more than one switch is connected their versions may differ because each switch will display its own version.

7.2 DIP Switch Settings

L1: “ **DIP SWITCHES:** ”

L2: “ **BCDEF-----P** ”

Each DIP switch is represented by a character on line two of the LCD. There are a total of 16 DIP switches, but switch “A” cannot be read by the micro-controller and is therefore not displayed.

If the letter “B” to “P” is displayed then the given DIP switch is ON. If a “-“ is displayed in place of the letter then the DIP switch is OFF. Refer to the DIP Switch Settings section for interpretation of the DIP switch settings and how they affect the controller’s configuration. Note that the way the controller interprets the DIP switches may change with different controller software versions.

7.3 Temperature Sensor Readings and Operational Status

L1: " **TMP-H**: *tt.tt,xy* " (in-heater temperature)

L2: " **TMP-P**: *tt.tt,xy* " (in-pool temperature)

Where tt.tt is the current temperature reading, x is the presence digit and y is the status digit (see below).

Presence digit:

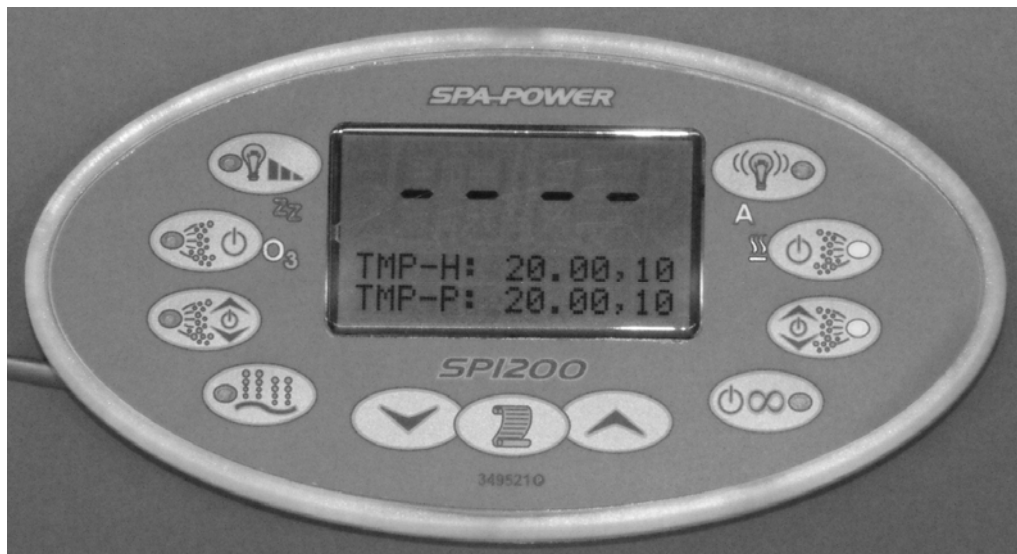
- 0: Sensor presence not logged
- 1: Sensor presence has been logged (currently, or previously fitted)

Status digit:

- 0: Sensor present and responding OK
- 1: Data line always high, no presence pulse (sensor not fitted)
- 2: Data line always low (or shorted to GND)
- 3: Data error (Bad data checksum or configuration byte)
- 4: Sensor returned reset value of 85.00°C

Note 1: After power is applied to the controller or the defaults are loaded, it takes approximately one minute for the controller to log that a given sensor is fitted (presence digit = "1").

Note 2: Once a sensor starts producing errors, it takes approximately one minute for the user to be notified by means of messages on the touch pad. If only one sensor was present then if it stops working an Error 8 condition is raised (NO TEMP DATA). If both sensors were present and one stops working then a warning is displayed but the controller continues to work using the other (good) sensor. This "fail operational" behaviour allows the pool to continue in use while service is arranged for the faulty sensor.



7.4 Logged Error Codes

L1: " **LOGGED ERRORS** "

L2: " **14-----** "

This display shows the last 15 error codes recorded by the controller. The most recent error is shown first, on the left hand side of the display, up to the oldest error on the right hand side. Error codes are single digit numbers 1 to 9. If no error has been logged in a given slot then a dash "-" is shown instead.

Note 1: When the defaults are loaded all logged errors are cleared (display will show all dashes).

Note 2: Errors are stored approximately 4 seconds after they are generated. If power is lost before 4 seconds elapses the error may not be logged.

8 Troubleshooting

8.1 Touchpad Buttons Don't Work

The controllers have a key lock function which may possibly be applied inadvertently. If this happens the touchpad buttons do not work and the display shows "KEYS LOCKED" when a button is pushed. The user can disengage the key lock by pressing the button sequence; Down, Scroll, Down, Up, Scroll. See User's Guide section 8.3.

8.2 Touchpad Works but Pumps Wont Come On

The controllers have a demonstration mode, which can be entered by pressing the up button when in the Error 1 "PRIME FAILED" condition. This mode allows the controller to operate on a pool without water in it for demonstration purposes, without turning on the pumps etc. This mode may result in a service call if demo mode is entered inadvertently when trying to operate the spa normally. To fix this problem the power should be cycled off and on again so the controller restarts and primes normally.

8.3 Controller Behaves Unusually

The controllers have a lot of configuration settings which can be adjusted on the touchpad. If an inexperienced (or malicious) user sets unsuitable values there is potential to make the controller behave unusually, leading to service calls. E.g. Pool temperature setting, Clock setting, Sleep time settings, Filtration time settings and other more minor settings could be corrupted. In order to ensure that no unsuitable setting have been made on a system it may be desirable to reload the factory default settings. This can be done by the user through the display menu system. See User's Guide section 7.10.

8.4 Touchpad LCD is Too Light/Dark

The touchpad display may appear too dark or too light for clear visibility, especially in extreme temperature conditions. If so then the user can correct the display contrast by holding down the top left light button, and either the up or down buttons, until the display looks correct. See User's Guide section 8.4.

8.5 Touchpad Shows a Foreign Language

The SP800 and SP1200 controllers are intended for an international market and have the ability to display the LCD user interface text in several different languages. The user can select their preferred language from the following choices: English, French, German, Dutch, Japanese, Spanish or Portuguese. This is done by first holding the down button for four seconds to enter the language selection menu, then selecting the desired language using the up and down buttons and finally setting this language by pressing the scroll button. See User's Guide section 8.6.

8.6 The Thermal Cut-Out Keeps Operating.

- Check that the plumbing is clear and that there is adequate water flowing through the heater tube.
- Check that filters are clean, water valves are open and jets are open.
- Check the thermal cutout in the circulation pump. If the pump stops the controller cutout will operate.
- Check the circulation pump is well ventilated and cannot overheat.
- Check the circulation pump is securely plugged in and connected.
- Check the motor start capacitor(s) in the circulation pump is the correct value and in good condition.
- Turn the power supply to the unit off and allow the unit to cool. Turn the power back on.
- Check no pumps are running continuously. A large pump will heat the pool until the cutout operates or the power to it is cut.
- If a small circulation pump is in use check there is enough flow through the heater tube and that air is not collecting in the heater tube. Try to measure the flow from the circ pump outlet jet. This can be done by holding a hose on the jet's outlet and timing how long it takes to fill a bucket. Aim for more than 50 L/m. i.e. it should take no longer than 24 seconds to fill a 20 litre bucket.
- If all else fails the controller may be faulty and need to be returned for service.

8.7 The Unit Won't Power Up.

- Check there is power to the unit and that the touchpad is plugged in correctly.
- Check the touchpad for damage or corrosion. Try another touchpad.
- Check all connections are correct, tight and clean.
- Replace the unit.

8.8 The Unit Leaks.

- First ascertain where the leak is. Check that nearby glued plumbing joints are well made.
- Check that the mac-unions are tight, have O-rings fitted, are well aligned and not distorted.
- Inspect the water sensor body for cracks and O-ring location. Replace if necessary. Do NOT over-tighten as there is a risk of cracking the body. Hand tighten only and then back off ¼ turn.
- Inspect the element boss screws and tighten if necessary to compress the O-ring.
- Check for cracks in the top of the heater tube and replace the heater tube if necessary.

8.9 The RCD Keeps Tripping Out.

- Check for shorts to earth and loose, dangling wires. Check the element earth leakage. Try disconnecting equipment piece by piece until you can identify what is causing the fault.
- Check that other household equipment is not causing the tripping. Any equipment connected through the RCD could contribute to it tripping. Try a dedicated RCD circuit for the spa.
- Check that the RCD is not also an over-current circuit breaker. If it is, make sure it is rated for motor start up surges and is not overloaded.
- Make sure the unit is not drawing too much current from the supply – see loading calculations.
- Check for damage to wiring, pumps, blowers, and lights.
- Check for water ingress or leaks onto live parts or into the supply conduit.
- Check earth connections.
- Check the supply is wired correctly.
- Some older switchboard RCDs are not compatible with EMC filtered equipment and must be replaced.
- The RCD may be faulty and require replacement.

8.10 My Pool is Getting Too Hot.

- Check that another source of heat is not heating the pool excessively. Look at pumps operating for long durations, solar heating, heat pumps, lighting etc.
- In extreme climatic conditions where there is a high ambient temperature the normal operation of the unit and water pump may cause the water to overheat. To counter this, remove the pool cover overnight to allow the pool to cool. Be sure the pool is safe to leave uncovered. Consider access by children, animals etc.
- To reduce pump run times increase the sleep time and minimise the filtration time.
- In extreme heat consider adding cold water or ice to cool the pool.

8.11 Sometimes I Get Tingles From My Pool!

Low voltage 'tingles', which can be quite painful and alarming, are usually caused by poor or overloaded connections in the power supply wiring to the house or a nearby house. When this happens, small but significant voltage differences can occur in the earth/neutral wiring network so that the water in the pool and the ground around the pool might be at slightly different voltages. This can result in tingles, especially when stepping out of the pool wet. This is a dangerous situation as the tingles may hurt the user directly or indirectly through falls. Any pool which gives tingles should be isolated at the main supply and not used until a professional electrician has corrected the problem. This may well require the involvement of the local supply authorities. Each SP800 and SP1200 controller is supplied with a "Recommended Pre-Installation Supply Checks" sheet (pn Q916333), which details the electrical tests required to identify a problem supply situation (for Multiple Earthed Neutral Supplies as used in Australia and New Zealand only). Ensure that this check sheet is passed to any investigating electrician. Note that this situation is not peculiar to SP800 and SP1200 controllers but can occur on any pool with any model/brand of controller.

9 24Hr Circulation Pump Recommendations

Small circulation pumps that run for long periods with low flow rates are sometimes used to circulate water through the pool's filter, heater and ozone systems. These offer low power usage and silent operation. They are generally between 80W and 375W and have flow rates between about 20l/min and 200l/min.

All SP800 and SP1200 controllers have been designed to operate with these small circulation pumps. However two flow directors (part number Q6927) should be added to the heater tube when the 24Hr circ pump flow rate is very low. Care must be taken to ensure that the following points are considered and any such pool design should be carefully trialled to ensure that all is well.

9.1 Air Must Not Collect in the Heater Tube.

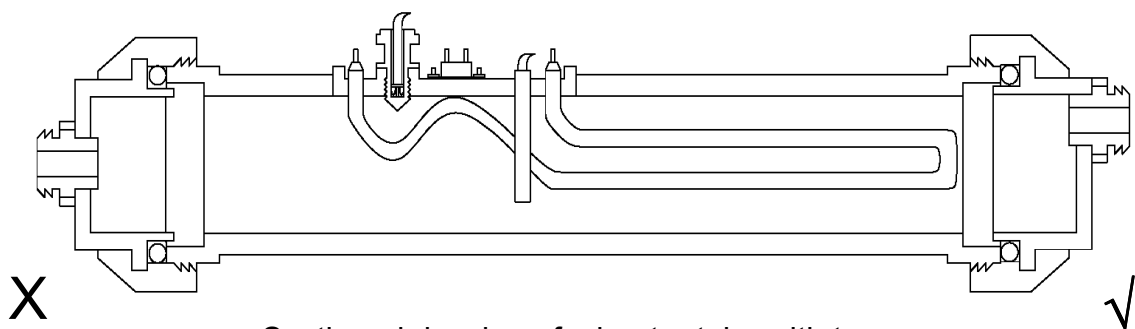
The water detector may sense any air bubbles trapped in the heater tube, causing the controller to think the heater tube is empty and resulting in it stopping in an Error 1 "Prime Failed" condition. Conversely froth in the heater tube may be detected as water while failing to cool the element boss, resulting in thermal cut-out operation and the controller stopping in an Error 6 "Thermal Cutout Tripped" condition.

9.2 There Must be Sufficient Water Flow Through the Heater Tube.

If the water is not flowing through the heater tube fast enough then the heat energy will build up in the heater and may cause the thermal cutout to activate leading to an Error 6 condition. Due to the higher temperature rise caused by low flow rates, it is advised that an 'in-pool' temperature sensor be used to achieve good, accurate temperature control of the pool.

9.3 Plumbing Recommendations for 24Hr Circulation Pumps

- Use offset step down adapters, like that shown on the right hand side of the diagram below, do not use those shown on the left. This will allow any air to flow out at the top of the heater tube.
- Mount the controller on a slight incline so that the water outlet is raised. This will aid the air to flow out of the heater tube.
- Use 45° or 90° 50mm elbows (facing up) then step the pipe down to the required diameter.



Sectioned drawing of a heater tube with two different outlet adapters

9.4 Other Circulation Pump Tips

- The circulation pump is turned off when the system is asleep so this feature may be used to extend the circulation pump's life and optimise the filtration.
- When using an injector to introduce ozone gas it is necessary to ensure a sufficient water flow rate is maintained in the heater. Also to fit the injector 'down stream' of the controller for air bubble reasons.
- Circulation pumps are designed for low flow rates so they have small impellers that are easily blocked. Be careful not to allow debris to enter the pump when changing a filter or use the pump without a filter.
- Due to low flow rates, it is recommended that a skimmer type spa filter be used to allow the pump to remove floating matter from the pool's surface.
- Make sure the pump is not starved for water flow as cavitation and/or air locking may occur.

100zone System Recommendations

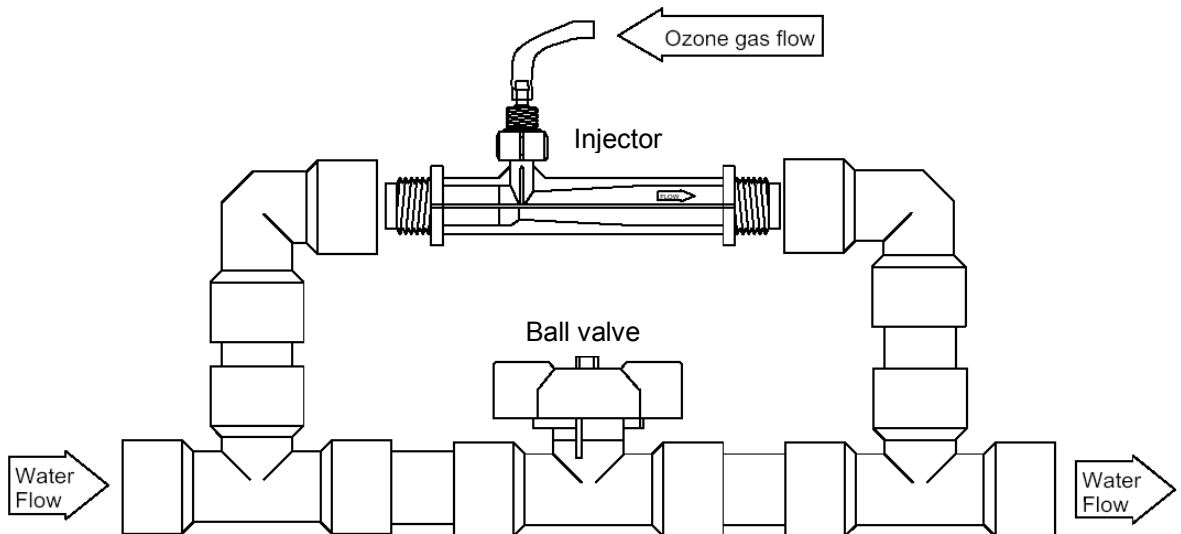
All SP8-1200 controllers are equipped with an ozonator outlet socket. This socket is turned on when the main filtration pump is operating. This will provide ozonation of the pool water during the filtration period.

10.1 Ozone Background Information

- Ozone does not affect the pH balance.
- Ozone reduces total dissolved solids in water.
- Ozone helps to reduce the amount of chemicals required to treat a pool.
- Ozone kills bacteria, viruses, cysts, yeast, moulds, and mildew.
- Ozone is a gas that is generated from fresh air and is dissolved into the pool water.
- Ozone has more oxidising potential than chlorine gas and bromine.
- Ozone can be generated by UV light or corona discharge (CD). Corona discharge uses a high voltage to produce a spark. Generally CD ozonators produce more ozone than UV ozonators. Both types have a limited service life.

10.2 Ozone Tips

When using an injector to introduce the ozone gas into the water, it is recommended that a water by-pass be used parallel with the injector. See diagram below. A by-pass will allow the water flow rate through the injector to be tailored (by adjusting the ball valve) so that the correct ozone gas flow and therefore ozone gas concentration and gas to water mixture is delivered. It will also ensure the water flow rate through the heater is maximised. Refer to your ozonator's installation instructions for more information.



- The best use of any generated ozone gas is to keep it dissolved in the water as long as possible.
- A low water flow rate through the injector produces a low gas flow rate and results in higher ozone gas concentration and better ozone absorption into the water.
- Also a low injector water / gas flow rate produces small fine bubbles that are suspended in the water. This is better than large bubbles that rise straight to the pool's surface and let the gas escape.
- Ozone production is dependent on the condition of the air fed into the ozonator. Try to keep the air clean, dry and cool. Try to pipe the air into the ozonator's input from outside the spa cabinet.
- Be careful of ozone when in the gaseous state as it will damage unsuitable plastics very quickly.
- Ozonator's service life can be prolonged if they are not used 24hrs a day. Most CD systems producing 50mg/hr of ozone gas only need to run for about 4-8hrs per day for sufficient pool water treatment.
- Some ozonators require a minimum air flow rate to cool the ozone unit. Refer to your ozonator's instructions for more detail. Some ozonators require the injector to produce a slight suck when blocked off with a finger whereas others require a specific flow rate that can be estimated by timing the injector sucking water out of a bottle.

11 Parts Replacement

Every precaution has been taken to insure the highest quality and reliability is delivered in each controller. However in the unlikely event that something does go wrong, it is normally a simple operation to replace the faulty section of the controller or the entire controller if necessary.

To avoid unnecessary part replacement it is important that the fault be diagnosed correctly. Refer to the diagnostics and troubleshooting sections before attempting to change any parts. Only authorised service agents should attempt to change parts.

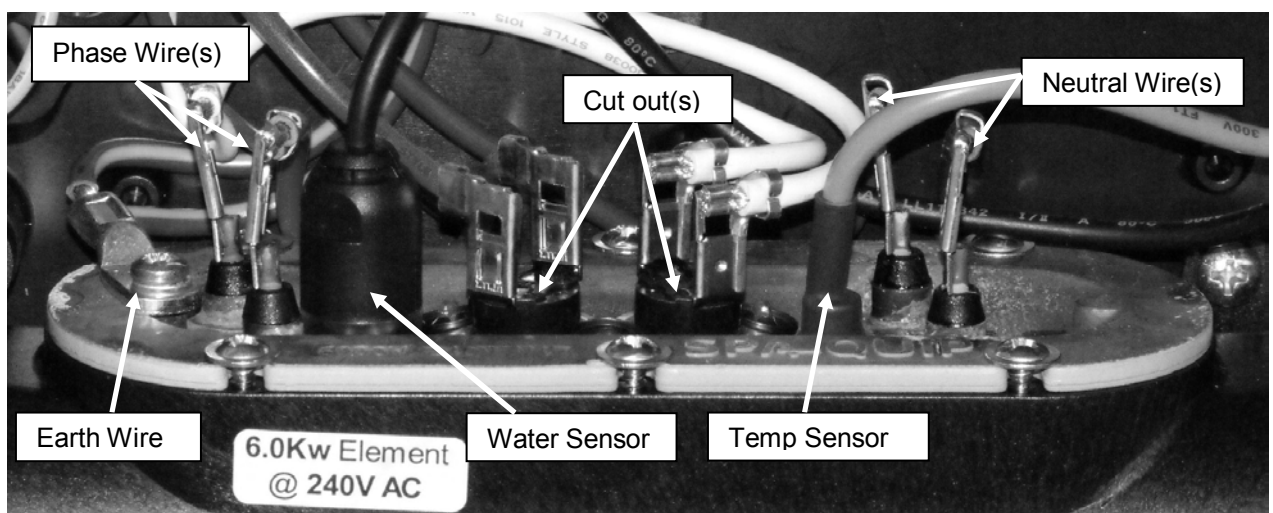
Most problems are caused by something obvious so remember to check the obvious first: connections, power supply, pumps, water flow, and leaks... Refer to the wiring diagram when checking connections.

11.1 Heater Tube

Removal

Disconnect from the supply. Close the water valves so that the unit can be removed without draining the pool or causing a flood. Loosen the locking rings on the mac-unions and disconnect the pipe work (don't lose the O-rings). Take note of the connections in the unit so that they may be disconnected and reconnected later on.

Disconnect the heater tube wiring using a pair of pliers to grip each terminal in turn. Don't pull on the wire itself. Disconnect the two wires from the thermal cutout(s), disconnect the earth wire, disconnect the element phase and neutral wires and unplug the water sensor and temperature sensor from the PCB. Unscrew the three mounting screws that locate the heater tube in place so that it can be removed.



Installation

Installation is the reverse of removal but remember to soak up any water in the unit. Check the replacement element is the same rating as the old one and check the connections are correct and tight. (Refer to the appropriate wiring diagram) Turn the water back on, bleed air from pipe work and reconnect power. Check the operation of the unit and check for leaks.

11.2 Water Sensor

Removal

Disconnect from the supply. Isolate the water supply and drain the heater tube so that the water sensor can be removed without draining the pool or causing a flood. Cut the cable ties on the sensor's leads and disconnect the plug from the circuit board. Unscrew the sensor from the element boss.

Installation

Lubricate the water sensor O-ring with a little silicone grease if it is not already lubricated. Slide the O-ring over the water sensor and hand screw the water sensor into the element boss until the O-ring is seated inside the recess and the sensor body starts to tighten up on the brass boss. Then back the sensor off $\frac{1}{4}$ of a turn. This will insure that the water sensor's body is not in contact with the top of the element boss and the thread is not under too much tension. If the water sensor is over tightened or its body is hard up against the element boss it may crack and leak.

Plug the sensor into the circuit board and cable tie the leads into place. Soak up any water in the unit, reconnect the water, bleed air from pipe work and reconnect power supplies. Check the operation of the unit and check for leaks.



11.3 In Element Temperature Sensor



Removal

Disconnect from the supply, unplug from the PCB and the sensor should pull out from the element boss. The heat shrink may hold on to the metal but it will wiggle free.

Installation

Insert the sensor all the way into the element pocket and use a sleeve of glue lined heat shrink tubing (pn QHS08A), or similar, to hold the sensor in place and to seal the pocket. The pocket must be sealed to ensure that the sensor is reading the water temperature accurately and is not affected by the enclosure air temperature.

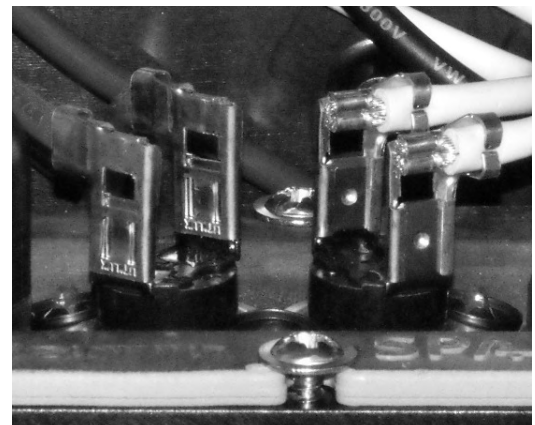
11.4 Thermal Cutout(s)

Removal

Disconnect from the supply and disconnect the wires from the thermal cut out using pliers to grip the terminals. Use side cutters to cut off the steel retaining clips holding the cutout in place and remove the cutout.

Installation

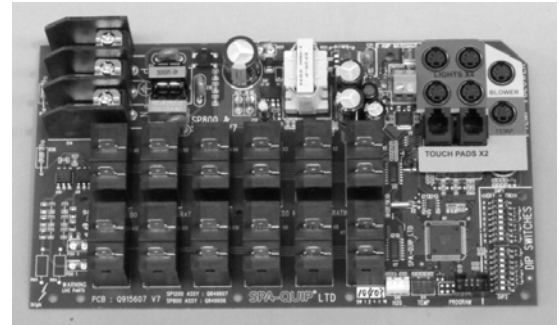
Clean the cutout land on the element with a rag and add a small blob of thermal jointing compound in the centre of it. Place the new cutout on the land squeezing the jointing compound between the cutout and brass boss. Ensure the cutout flange is properly located on the two mounting spigots. Secure the cutout with two new retaining clips, pn QHRW02. These should be tapped into place on the spigots using a hollow ended M3 nut runner or similar tool. It is important to use new clips, in good condition, for a secure fastening. The clips are not designed to be reused.



11.5 Circuit Board

Take anti-static precautions.

The main anti-static precaution to take is to make sure your body is at the same electric potential as the circuit board. To do this **first disconnect the power**, then touch the Earth terminal on the mains terminal block. Now you can handle the circuit board.



Removal

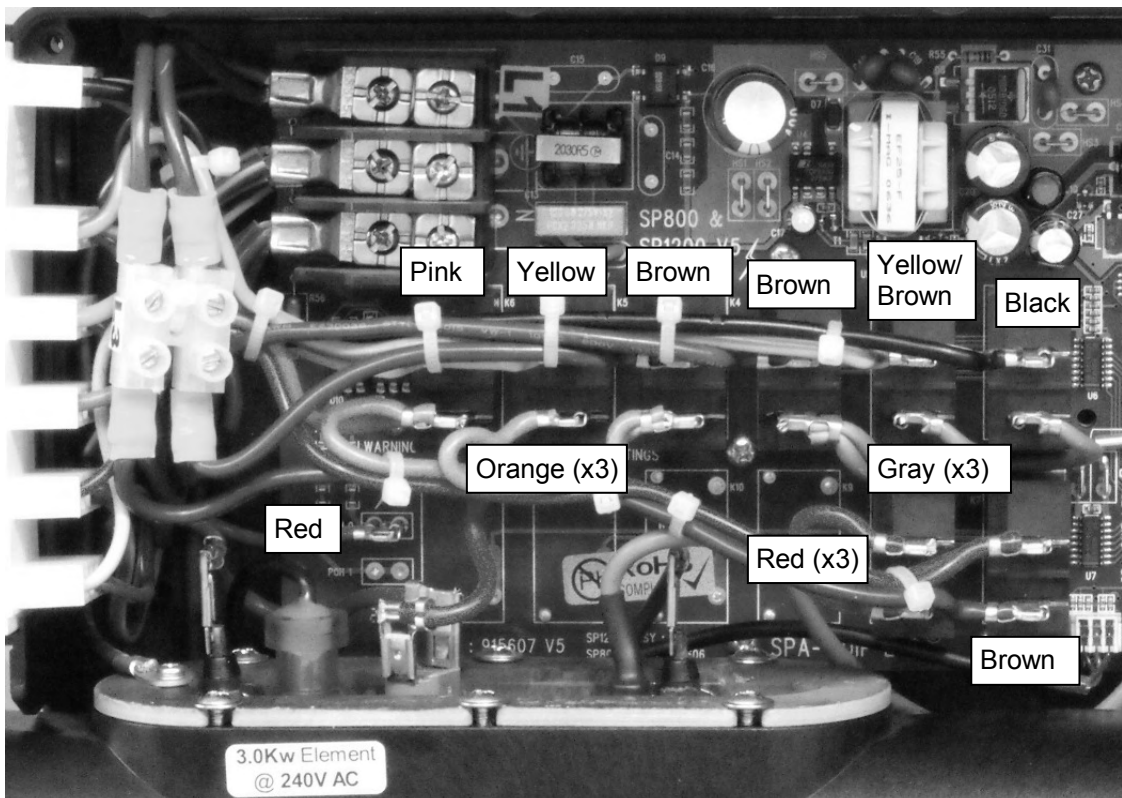
Disconnect from the supply. Take note of where each wire is connected on the circuit board and relays. Disconnect all wires, the cable ties will hold the wires in position for reassembly so don't cut them. When disconnecting terminals, use a pair of pliers to grip the terminals, not the wire, and then pull the terminal off. The heater tube assembly will need to be removed first to allow access to the screws holding the PCB in place. It can be left wired as there is enough play in the cables.

Remove all of the twelve screws that hold the circuit board to the housing and lift the circuit board out of the unit.

Installation

Taking antistatic precautions as described above, screw the circuit board into place using the twelve screws. Reconnect all wires and check that all connections are correct and tight. (Refer to the appropriate wiring diagram) Reconnect the power to the unit.

Reset the set temperature and filtration as desired and check the DIP switches are set correctly. See sections 2.4 and 2.5.



12 Frequently Asked Questions

1) Can I make it load shed?

YES, refer to the dipswitch settings information on the inside lid label or the DIP switch settings in section 2.4 of this manual.

2) Can I mount the SP800 on its side?

YES, the SP800 can be mounted so that its heater tube is vertical with the water sensor at the top. The water must flow from the bottom of the tube to the top. This is the opposite direction through the tube from that recommended for horizontal operation and is intended to force all air out of the tube. Note that an in pool temperature sensor is highly recommended in this configuration, especially if a small circulation pump is used.

3) Can I mount the SP800 on its back / front / upside down?

NO, any of these mounting positions will cause the water detection system to operate incorrectly.

4) Can I run a standard incandescent pool light from the SP800/SP1200?

YES, but it must be used with a separate transformer and controlled by a 220-240Vac on/off outlet such as the Aux outlet. You cannot connect this type of light to the LED light output, even if its rating seems suitable, as the turn on inrush current is too high and may shut down the 12V power supply.

5) Can the power supply for the SP800/SP1200 be 3 phase?

YES for certain models, but it must be a 3-Phase + neutral power supply. The jumper leads on the default connection must be removed and supply wiring must be as described in the instructions in section 3.3.

6) Can I run the standard SP800/SP1200 on a 60Hz supply?

YES, but it must be a 220-240V supply, not a 110-120V supply. You will need special pumps designed for use on a 60Hz supply however, as 50Hz pumps will run too fast and be overloaded on a 60Hz supply.

7) Can I run my existing 12Vdc LED Light on the SP800/SP1200?

YES, the SP8-1200 provides a switched 12Vdc power output for control of third party 12Vdc LED lights. See section 3.7.9.

8) Can I speed control a blower with the SP800/SP1200?

YES, but it must be a Davey Spa SPVSB (pn Q5602-AMP). This blower has speed control circuitry built in and is designed to operate with the SP8-1200 controllers which provide full speed control on the touchpad. Standard blowers cannot be speed controlled.

9) Can I get custom touchpad overlays with my own company branding on them?

YES, this is common and can be arranged by negotiation if you agree to take a suitable quantity.

10) Can I get a special version of the SP800 or SP1200 control box to meet my needs?

YES, special customer specific versions exist for certain large customers. If you have special requirements that are not met by the standard products then we will consider making a special variant just for you in order to meet your needs.

13 Warranty information



TERMS AND CONDITIONS

1. This guarantee applies to all states and territories of Australia and New Zealand only and is subject to the provisions of the Trade Practices Act (Aust.), the Goods and Consumer Protection Legislation of the various Australian states and the Consumers Guarantee Act 1993 (NZ) as applicable.
2. The guarantee period commences on the date of original purchase of the equipment. Evidence of this date of original purchase must be provided when claiming repairs under guarantee. It is recommended you retain all receipts in a safe place.
3. This guarantee covers parts and workshop labour only. Goods should be forwarded, with proof of date of original purchase, to an Authorised Davey Service Centre freight paid.
4. This guarantee is subject to due compliance by the original purchaser with all directions and conditions set out in the Installation and Operating Instructions. Failure to comply with these instructions, damage or breakdown caused by fair wear and tear, negligence, misuse, incorrect installation, chemical or additives in the water, inadequate protection against freezing, rain or other adverse weather conditions, corrosive or abrasive water, lightning or high voltage spikes or through unauthorised persons attempting repairs are not covered under guarantee. The product must only be connected to the voltage shown on the nameplate.
5. Without limiting the original purchaser's entitlements under the Trade Practices Act (Aust.), the Goods & Consumer Protection Legislation of the various Australian states, or the Consumers Guarantee Act 1993 (NZ), Davey shall not be liable for any loss of profits or any consequential, indirect or special loss, damage or injury of any kind whatsoever arising directly or indirectly from the product or any defect.
6. Where the Trade Practices Act (Aust.), the Goods and Consumer Protection Legislation of the various Australian states and the Consumers Guarantee Act 1993 (NZ) does not apply, Davey shall not be liable for any loss of profits or any consequential, indirect or special loss, damage or injury of any kind whatsoever suffered by the purchaser arising directly or indirectly from the product or any defect and the purchaser shall indemnify Davey against any claim by any other person whatsoever in respect of any such loss, damage or injury.
7. Nothing in this guarantee is intended to have the effect of contracting out of the provisions of the Trade Practices Act (Aust.), the Goods and Consumer Protection Legislation of the various Australian states and Consumers Guarantee Act 1993 (NZ) except to the extent permitted by the various Acts and this guarantee is to be modified to the extent necessary to give effect to that intention.
8. Davey may be collecting personal information from you in order to provide you with a service. Davey Water Products Pty Ltd promises only to use this information in accordance with the Provisions of the Privacy Act 1988 (Cth) and the Privacy Policy of Davey Water Products Pty Ltd which is available at www.davey.com.au.

14 Product Identification



The model number is identifiable from the main controller lid label as shown on the right. This is the most important number to quote when seeking service, along with the serial number described below.

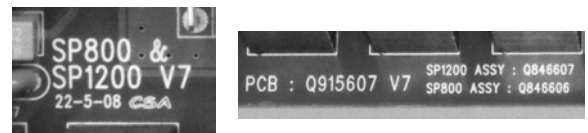


Each SP8-1200 has a unique serial number, as shown below, attached next to the circuit board and on the unit's lid label. This number uniquely identifies the individual controller unit and includes a manufacturing date code and a 3 of 9 format barcode of the same number shown in plain text.

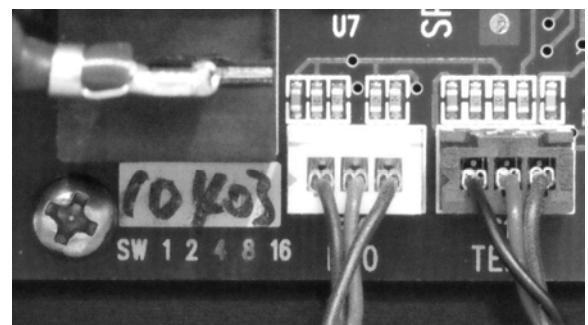
The first letter (C) is a model ID code.
 The next five numbers (09156) are a Julian date code.
 09 means year 2009 and 156 means the 156th day of that year.
 The next letter (U) is the product group. U = SP1200 & T = SP800
 The next 6 digits (488357) are a unique sequential serial number.



The PCB has a version number included as part of its design artwork just above the relays and again along the bottom edge. This is the bare board design version.



The PCB also has an assembly manufacturing job number and software version number marked on it. The job number is hand written and the software version number is found by adding up the crossed out numbers. For example in the picture on the right the job number is 10403 and the numbers 4 and 8 have been crossed out indicating the software version is 12. Software versions can also be identified on the touchpad as described in section 6.1.



The element power rating is identified by a sticker on the side of the heater tube and is also stamped into the element boss above the sticker (just visible in the picture).



15 Part Numbers for Spares Ordering

Description	Part number
SP800 Controller circuit board - all models	Q846606
SP800 Heater tube element assembly 2.0kW	Q80062T
SP800 Heater tube element assembly 3.0kW	Q80063T
SP800 Wiring loom - all models	Q927081
SP800 Additional mounting feet	Q6926
SP1200 Controller circuit board - all models	Q846607
SP1200 Heater tube element assembly 3.5kW	Q80064T
SP1200 Heater tube element assembly 4.5kW	Q80065T
SP1200 Heater tube element assembly 6.0kW	Q80066T
SP1200 Wiring loom - all models	Q927082
SP8-1200 Oval touchpad - all models	Q70068
SP800 Generic overlay for Q70068 oval touchpad	Q616013
SP1200 Generic overlay for Q70068 oval touchpad	Q616016
SP8-1200 Narrow oval touchpad - all models	Q70070
SP800 Generic overlay for Q70070 narrow oval touchpad	Q916967
SP1200 Generic overlay for Q70070 narrow oval touchpad	Q916970
SP8-1200 Secondary touchpad - all models	Q70078
SP800 Generic overlay for Q70078 secondary touchpad	Q916965
SP1200 Generic overlay for Q70078 secondary touchpad	Q916966
In Element optical water sensor - all models	Q915441AC
In Element temperature sensor - all models	Q915439
In-Pool temperature sensor - all models	Q915445
Flow Directors for low flow 24Hr circ pumps - all models	Q6927
Davey Spa Power Single Colour Light (SPCL)	Q3709
Davey Spa Power Variable Colour Light (SPVCL)	Q3708
Davey Spa Power Variable Colour Light for Chain Lighting	QRDL7GSL
5" Lens for Davey Spa Power Light for Chain Lighting	QRD5LH
Davey Spa pool ozonator (DEL MCD-50)	Q5000-AMP
Davey Spa Power Variable Speed Blower (SPVSB)	Q5602-AMP

16 Davey Spa Contact Details

Davey Water Products Pty Ltd

Member of the GUD Group

ABN 18 066 327 517

Head Office

6 Lakeview Drive,
 Scoresby, Australia 3179
 Ph: +61 3 9730 9222
 Fax: +61 3 9753 4100
 Website: www.davey.com.au

Customer Service Centre

Ph: 1300 2 DAVEY (1300 232 839)
 Fax: 1300 304 850
 E-mail: sales@davey.com.au

Interstate Offices

Sydney • Brisbane • Adelaide
 Perth • Townsville

Davey Spa New Zealand

2 Rothwell Avenue,
 North Harbour Industrial Park
 North Shore City, Auckland 0632
 Ph: +64 9 415 8622
 Fax: +64 9 415 8621
 Website: www.daveyspa.co.nz
 E-mail: service@daveyspa.co.nz

International

6 Lakeview Drive,
 Scoresby, Australia 3179
 Ph: +61 3 9730 9121
 Fax: +61 3 9753 4248
 E-mail: export@davey.com.au

USA - Davey Pumps Inc.

Website: www.daveyusa.com
 E-mail: export@davey.com.au