AIRWELL PUMPS PTY LTD

DESIGNED AND MANUFACTURED IN AUSTRALIA

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May 2003

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25L River Pump & Solar Controller
(Version 2)

SERIAL NUMBERS

Important information when speaking with Airwell Pumps.

Solar Controller:
Serial Number **SCICC - …… - V6**

River Pump:
Serial Number **SP - …… R - V2**

Contents

TECHNICAL INFORMATION

An explanation of how the AIRWELL pump works:

Compressed air is a particularly useful means of transferring energy to pump water. Air compressed at an existing power source can be carried significant distances through MDPE polyethylene pipe with limited loss of pressure, saving a costly power installation to the water source, whist allowing the compressor to be used for multiple pumps, or other local purposes.

The Airwell pump component is a 316L grade stainless steel tube that can be manufactured in varying forms and sizes to suit a variety of different applications. The tube is enclosed at each end, and incorporates a foot valve(s) to allow the submerged vessel to fill with water, and a check valve on the outlet preventing the return of the expelled water. The valves are our own design, and incorporate special features to provide exceptional ability to handle silt and sand, whilst keeping a very simple, maintenance free construction. The clean, hard valve seats provided for the polyurethane balls to close on are kept clean by the circulation of the water, and are raised above the bottom of the pump to minimise contamination.

Within our most popular pumps there are two level (conductivity) probes; one long enough to reach the bottom of the pump to detect when the pump is empty, and one short one to detect when it's full. This is the key to the automatic function of the pump. We use the conductivity of water to monitor the high and low fluid levels in the pump. This means that a 'contact' is made when the water rises to the height of the short probe at the top of the vessel, (now both probes are wet) and is 'broken' when the water level falls below the lower probe at the bottom of the pump, (when both probes are dry). An electronic circuit in the control unit detects this making and breaking of water contact, and subsequently changes the state of a 3-way solenoid valve, allowing compressed air to the pump when a 'full' signal is received, forcing the water up the delivery pipe, and then exhausting the air pressure to allow the pump to refill when the 'empty' signal is seen. The result of this is that the Airwell Pump will only cycle when a 'full' or 'empty' signal is received, regardless of this being every few seconds, minutes, hours, weeks or years.

The control unit is located close to the pump, but above water level. Besides carrying the 3-way valve for the air and the electronic control circuit, it also houses a 4Amp/hour dry cell battery to power the system, which in turn is recharged by the solar panel on the lid of the controller. Mains powered systems are available for those applications where power is close to the water course, as are multiple pump controllers, flow monitoring and flow control options.

It should be noted that the solenoid valve is a 'latching' type valve, and requires a short pulse of power (60 milliseconds) in one direction to change state, and will stay that way until a pulse in the opposite direction changes it. A conventional solenoid requires permanent energisation to maintain either an open or closed state.

Should power be lost to the microprocessor, upon reconnection, the system will initialise on pressure, expelling any water in the pump, and regaining a reference for the controller.

The water delivered by an Airwell system comes in surges, not a continuous flow like that of most electric pumps.

Flow rates from the Airwell pump vary dependant on many factors. See the chart on Page 9 for a guide of expected performance in your application.

Installation of River Pumps

Refer drawing on page 28 for additional assistance
Please be aware that the threads on the poly fittings used for the air and water connections require sealing. Airwell use and recommends Loctite 569 for this purpose.

Whilst laying out the airline, start at the compressor end with the air compressor connected and turned on. It is good practice to run the compressor whilst laying the airline to blow out any grit and dust prior to connecting it to the controller. An air filter is included in the controller for additional protection.

1) With the pump on the bank of your water way fit the probe assembly (page 28, items 8 ,9) and the poly end connector (page 28, item 7) into the relevant sockets on the top of the pump body.

2) Next fit the inlet screen parts (page 28, items 3, 4, 5, 6) into the sockets on the side of the pump body.

3) Fit the check valve parts (page 28, items 5, 6, 10) into the outlet socket on the domed end of the pump.

4) Attach your water discharge pipe (page 28, item 12) to the check valve above using the poly end connector (page 28, item 7)

5) Attach your airline to the poly end connector (page28, item 7)

6) Unroll the probe cable and stainless steel rope.

7) **IMPORTANT**: Select the end of the probe cable that has the smaller stainless steel nut on it. Take the **Two** 'O'-rings from packet (if not fitted) in the controller carton, and carefully roll into the grooves on the black plastic plug of the probe cable, (they may already be on, if so check their condition). Should this stage be missed or carelessly done, water leakage past the plug will result in the control cable becoming wet inside, giving the controller a false 'full' signal. The controller will then continuously supply compressed air to the pump, causing air to then travel through the pump and up the water delivery pipe to the water storage tank. If water has entered the cable kit, contact Airwell Pumps for drying and repair instructions.
Note: Do not use any type of sealer on this plug. Generous amounts of penetrating oil/water dispersant are recommended to lubricate 'O' rings and improve reliability.

8) After all connections have been made and checked, lay the hoses (air, water, and electrical conduit) out ready for taping together. Start taping at the pump end, being sure to keep all the hoses at an even length, and making sure that the probe wire is not stretched. The s/s wire rope line is only taped into the bundle for the first metre, and from there, it is left free. Wrap 3 turns around the hoses about every one metre. Use plenty of tape just above the pump to prevent wire rope shackles from protruding unnecessarily. **Do not tape over stainless pump as this is bad for corrosion.**

Your pump is now ready to be lowered into the river.

Installation of Solar Controller - A bag of pre mix rapid set is handy.

9) Select the controller mounting post from the parts supplied, and screw the solar controller firmly on to the post using the ¾”BSP thread in the valve bottom.

10) A hole should be dug and with the **solar panel facing North**, concrete the post into the ground close to the river while allowing room to walk around the controller (approx. 1m). Be sure to keep the post vertical. A bag of rapid set concrete is very handy.

11) Allow the concrete to set.

12) Using thread sealer, (Locktite 569 is preferred), screw the 1/2" BSP to 16mm poly fitting provided in to the brass elbow (page 26, item 38), This is the air connection to the pump, so you can connect the 16 mm poly extending from the bore to this fitting.
NOTE: This airline should be trimmed as short as possible between pump and controller to obtain maximum pumping rate.

13) Again using sealer, screw a 1/2" BSP to poly end connector into the tap (page 26, item 23) of the controller. This provides the point of entry for the air supply into the controller and pump system. This poly fitting will vary with airline size. (There may be an air regulator to be fitted to this location)

14) Insert the 3-pin plug of the cable kit extending from the bore into the base of the control unit. This end of the cable kit will have a black plastic retaining nut. The plug has a flat face to enable correct alignment to the socket.

15) Open the lid of the controller and connect the battery, **ensuring correct polarity (see page 32),** red-to-red, black-to-black. Wrong polarity will result in the blowing of the in line fuse. **Do not replace with larger than a 3-amp fuse.**
Disconnect the battery if the unit is to be transported or stored.

16) Close the controller lid ready for use.

Air Connection to Solar Controller

17) Connect the compressed air supply to the poly end-connector on the air valve on the solar controller.
18) Turn on the air tap on the controller (page 26, item 23)

NOTE:
Before connecting the air line to the controller, it is recommended that you blow air through the line using the air compressor, to discharge any foreign material that may have entered during laying. For long airlines of say 4 km, this may take about 30 minutes. It is often beneficial to put a slug of water into the air line at the compressor end, and blow it through with the air to fully clean the inside of the air line. Your air filter will provide added protection to the valve.

An air regulator may be required on the air supply to limit the pressure the system operates at, particularly because high pressure may not be tolerated by your water pipe lines. The air regulator can be fitted to either the compressor or the controller end of the airline. Both options have advantages. When fitted at the compressor, the regulator is where it can be viewed easily and the airline does not have to run at as high a pressure. MDPE PN16 airline is recommended, and is rated at 1600Kpa, so operating pressure is not a concern.
When fitted at the controller end of the airline, the air storage capacity of your system can be greatly increased. If your compressor seems to be turning on and off too frequently, having the regulator at the controller may reduce the frequency of starting. This is important for extending the compressor life, and keeping running costs to a minimum.

Helpful Hints:

These tips can assist in getting the best performance from your Airwell pumping system:

a) **Dual Level Float Valves:** The fitting of this product will allow the water level in the tank to drop 500mm before the pump restarts. However, these do not work in all water types.

b) **High pressure MDPE poly water delivery pipe;** this is advisable when the total head exceeds 60 metres. We recommend using PN 12.5 or PN16 for long term reliability.

c) **Slowing down of reciprocating type compressors:** Using a larger compressor than needed, but slowed down to provide the air volume required can extend the compressors life. *Regular servicing greatly improves the life expectancy and reliability of your compressor.*

d) **The microprocessor-based controller** is normally supplied with a **black** epoxy Plug Pack, and is designed to cater for a wide variety of water types. If you have very fresh water you may require a **green** one or very salty water may require a **red** one. If problems are experienced, consult your Airwell agent. The plug packs (Item 7 page 26) can be purchased separately.

e) **If water is to be pumped over long distances**; an air cell fitted to the water pipe close to the pump will cushion the surge of water on each cycle of the pump, keeping the water moving through the pipe during the pump's filling cycle. A check valve fitted to the discharge side of the cell prevents the return of water when the air chamber is draining. Air cells are available from Airwell Pumps. Made from 316-grade stainless steel, they offer a lifetime of reliable service at reasonable cost.

Calculate Daily Flow

Using a stopwatch, commence timing cycle when air first blows off (end of pumping / pressure cycle, start of filling cycle), and continue to time until it blows off again. This will give you the total of filling and pumping time. Cycle displacement is as follows:

PUMP DIAMETER	PUMP LENGTH	PUMP VOLUME PER CYCLE
2" (51 mm)	0.5m	0.6 litres
2" (51 mm)	1 m	1.4 litres
2" (51 mm)	2 m	3.0 litres
3" (76 mm)	2 m	7.0 litres
3.5" (89 mm)	1 m	4.8 litres
3.5" (89 mm)	2 m	10.5 litres
3.5" (89 mm)	3 m	16.2 litres
4" (102 mm)	1 m	6.4 litres
4" (102 mm)	2 m	13.9 litres
4" (102 mm)	3 m	21.1 litres
6" (152 mm)	1 m	14.1 litres
6" (152 mm)	2 m	31.5 litres
6" (152 mm)	3 m	48.0 litres
Dam/Sump Pump	**-**	**25litres**

a) Pump displacement _____ litres, divided by time taken to complete a cycle (seconds) and multiplied by 86,400 gives you the amount of litres displaced in one 24-hour day.

b) The more water above the pump, the faster the filling time, although this is not relevant with Dam pumps.

c) The higher the operating pressure the faster the system will discharge the water contents.

d) *Remote mounted Controller options only;* Quick exhaust valves can sometimes be fitted with the benefit of allowing the pump to be filled quicker.

1 Litre = 0.22 Gallons
1 Gallon = 4.546 Litres

The displaced volumes shown above are a good guide. However, factors such as total depth, submergence, operating pressure etc can vary the pumps' discharge capacity. If accurate pumped volumes are important to you, it is a good idea to measure the discharge of your pump(s) over a number of cycles to determine the displacement in relation to your specific application.

Calculate Operating Pressure

Depth	(Head)		AIRLINE	PRESSURE
Feet	Metres		KPA	PSI
328.0	100	=	1020	147.9
311.6	95	=	969	140.5
295.2	90	=	918	133.1
278.8	85	=	867	125.7
262.4	80	=	816	118.3
246.0	75	=	765	110.9
229.6	70	=	714	103.5
213.2	65	=	663	96.1
196.8	60	=	612	88.7
180.4	55	=	561	81.3
164.0	50	=	510	74.0
147.6	45	=	459	66.6
131.2	40	=	408	59.2
114.8	35	=	357	51.8
98.4	30	=	306	44.4
82.0	25	=	255	37.0
65.6	20	=	204	29.6
49.2	15	=	153	22.2
32.8	10	=	102	14.8
16.4	5	=	51	7.4

NOTE:

The pressures on the above chart describe the amount of pressure required to reach equilibrium. No flow will occur with pressures less than these amounts. Pressures of greater than these amounts are required to achieve a flow. The amount of extra pressure required over the above amounts is equal to the friction created at that given flow rate.

Corrosion factors

Damage due to corrosion.

Airwell Pumps uses first grade, new materials throughout with 316L stainless steel as a standard minimum specification on down hole equipment. (Wire rope 304).
Every effort is made to maximise corrosion tolerance on all down hole equipment, however due to the unpredictable corrosive nature of ground water, Airwell Pumps Pty Ltd will not provide a warranty on corrosion.
Refer to Warranty conditions at the rear of this manual.
The exception where a warranty would apply would be if the corrosion is caused by a piece of sub standard or wrong grade material was included in a pump unit. (If more than one section of material in a pump has corroded it is safe to assume that it is a general corrosion problem and not a particular piece of material).

Corrosion solutions.

In cases of mild to moderate corrosion a great deal of protection is achieved with the addition of a sacrificial zinc anode. On request, Airwell pumps can weld a stainless steel mounting plate to the bottom of your pump before supply. (This plate must be welded on). We then supply the zinc anode to bolt to this plate. We suggest that this anode be inspected and / or replaced every 2 years and 1 year in servear waters.

Duplex grade pumps.

For extreme corrosive environments Airwell pumps do make some of their pump range in 2205 grade Duplex stainless steel. These are generally for water with very low ph and very high salt load.

Calculate Air Usage

Pump	Water Flow Rate	Volume of air required in CFM – per pump							
6" x 2m	**1.388 litres/sec**	6.4	10.3	14.6	19.5	24.8	-	-	-
4" x 2m	**5,000 litres/hour**	6.3	10.2	-	-	-	-	-	-
3.5" x 2m	**1,100 gallons/hour**	-	-	-	-	-	-	-	-
3" x 2m	**26,400 gallons/day**	-	-	-	-	-	-	-	-
Dam/Sump		-	-	-	-	-	-	-	-
6" x 2m	**1.111 litres/sec**	5.1	8.2	11.7	15.6	19.9	24.5	29.5	-
4" x 2m	**4,000 litres/hour**	5.1	8.2	11.7	15.6	-	-	-	-
3.5" x 2m	**880 gallons/hour**	5.1	8.5	-	-	-	-	-	-
3" x 2m	**21,120 gallons/day**	-	-	-	-	-	-	-	-
Dam/Sump		-	-	-	-	-	-	-	-
6" x 2m	**.833 litres/sec**	3.8	6.2	8.8	11.7	14.9	18.4	22.2	26.2
4" x 2m	**3,000 litres/hour**	3.8	6.1	8.8	11.7	14.8	-	**-**	**-**
3.5" x 2m	**660 gallons/hour**	3.8	6.4	9.4	12.6	-	-	-	-
3" x 2m	**15,840 gallons/day**	-	-	-	-	-	-	-	-
Dam/Sump		4.6	6.4	8.2	10.1	-	-	-	-
6" x 2m	**.555 litres/sec**	2.5	4.1	5.8	7.8	9.9	12.2	14.8	17.5
4" x 2m	**2,000 litres/hour**	2.5	4.1	5.8	7.8	9.9	12.0	14.7	-
3.5" x 2m	**440 gallons/hour**	2.5	4.2	6.2	8.4	10.8	13.7	-	-
3" x 2m	**10,560 gallons/day**	2.8	4.9	-	-	-	-	-	-
Dam/Sump		3.1	4.3	5.5	6.7	7.9	9.2	10.4	
6" x 2m	**.416 litres/sec**	1.9	3.1	4.4	5.8	7.4	9.2	11.1	13.1
4" x 2m	**1,500 litres/hour**	1.9	3.1	4.4	5.9	7.5	9.3	11.3	13.3
3.5" x 2m	**330 gallons/hour**	2.0	3.2	4.7	6.4	8.3	10.3	12.6	-
3" x 2m	**7,920 gallons/day**	2.1	3.6	5.5	-	-	-	-	-
Dam/Sump		2.3	3.2	4.1	5.0	5.9	6.9	7.8	8.7
6" x 2m	**.277 litres/sec**	1.3	2.1	2.9	3.9	5.0	6.1	7.4	8.7
4" x 2m	**1,000 litres/hour**	1.3	2.0	2.9	3.9	4.9	6.1	7.3	8.7
3.5" x 2m	**220 gallons/hour**	1.3	2.1	3.1	4.2	5.4	6.8	8.4	10.0
3" x 2m	**5,280 gallons/day**	1.4	2.3	3.4	4.8	6.3	8.0		
Dam/Sump		1.5	2.1	2.7	3.4	4.0	4.6	5.2	5.8
6" x 2m	**.139 litres/sec**	0.6	1.0	1.5	2.0	2.5	3.1	3.7	4.4
4" x 2m	**500 litres/hour**	0.6	1.0	1.4	1.9	2.5	3.0	3.7	4.3
3 1/2" x 2m	**110 gallons/hour**	0.6	1.1	1.6	2.1	2.7	3.4	4.2	5.0
3" x 2m	**2,640 gallons/day**	0.7	1.1	1.7	2.4	3.2	4.0	5.0	6.0
Dam/Sump		0.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9
6" x 2m	**.069 litres/sec**	0.2	0.3	0.4	0.5	0.6	0.8	0.9	1.1
4" x 2m	**250 litres/hour**	0.3	0.5	0.7	1.0	1.2	1.5	1.8	2.1
3.5" x 2m	**55 gallons/hour**	0.3	0.5	0.8	1.1	1.4	1.7	2.1	2.5
3" x 2m	**1,320 gallons/day**	0.3	0.6	0.9	1.2	1.6	2.0	2.5	3.0
Dam/Sump		0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.7
	DEPTH (HEAD)	**32 Ft 10m**	**65ft 20m**	**98ft 30m**	**131ft 40m**	**164ft 50m**	**196ft 60m**	**230ft 70m**	**262ft 80m**

1CFM =	**0.47 lts/sec**
1 litre/sec =	**2.11CFM**

TROUBLE SHOOTING

Trouble Shooting Pumps with Solar Controllers

The following information will assist you in diagnosing problems and with the maintenance of your Airwell pumping system. For every problem listed a fault reason and a remedy are shown, but first we will give some background on what to look for.

Preliminary Check List

a) Is sufficient air pressure registering on air regulator gauge to overcome the static head? See chart Page 9. Has this amount of pressure proved sufficient in the past?

b) Are the battery connections on the controller clean and tight?

c) Has the water got somewhere to go, i.e.; are water valves turned on, and is there room in the water tank?

d) Is the pump fully submerged, or is the dam dry or bogged?

e) Check the battery with a voltmeter to make sure that you have at least 12 volts on the terminals with the controller connected.

f) Is the fuse OK? Replace with **3A max**.

First Steps in Problem Solving

Probably the most important indicator to point you in the direction of a fault is whether or not the system is going through, or is capable of going through a cycling process. By this we mean that the Airwell system goes from being on *pressure cycle*, (when the water would normally be pumped away), to *filling cycle*, (when the pump would be exhausting the used air pressure and taking in more water), then back to pressure cycle and so on.

If the Controller cycles.

If the pump is cycling it shows that the controller is capable of doing what it is supposed to, and therefore there can't be much wrong with it.

Potentially, worn valve parts may still be wasting a lot of air and may cause problems, even though they are not leaking enough to stop the cycling process.

Controller cycles, but little or no water pumped

If the system is cycling, then it is most probably filling and emptying the pump. The controller has to see both *top* and *bottom* probes in the pump *wet* before it can cycle to *pressure* and has to see both *top* and *bottom* probes *dry* before it can cycle the system back to the *fill* state again. If the controller were cycling it would be hard for this pump not to be filling and emptying. However, the water that is being pushed out of the pump may not be going anywhere other than into the the watercourse.

Controller short (rapid) cycles.
If you have owned an Airwell pump for a while you will be familiar with the sound it makes and the frequency that it cycles. If the cycle rate is clearly far to rapid (every few seconds) and you have ruled out any possibility of the water going back down into the pump, then either a water recognition fault (water has got fresher/saltier), the battery voltage is too low, or there is a potential wiring fault between the pump and the controller. (Incorrect wiring is unlikely if the system has been working correctly up until the fault).

Controller not cycling at all
If the controller is not cycling, then we need to know two things. One is whether the controller is capable of cycling when given the right command, and the second is which part of the cycle is the controller stuck on (and why).
It is important to point out that the solenoid valves only require a pulse of power to change state from pressure to exhaust, or from exhaust to pressure, unlike most ordinary valves that require continuous power to maintain one state or another. ***Disconnecting power will not change the state of this valve.***

If we unplug the cable kit from the Controller.
By removing the plug, you are breaking the circuit. Regardless of whether the pump is full or empty, the controller will now only see the pump as being *empty*.

The controller changes cycle on plug removal, it will be changing from *emptying* to *filling*. This would prove two things, firstly that it was on *pressure* cycle before you removed the plug, and secondly, that it is capable of changing to *filling* cycle when given a "two dry probes" command from the pump. If re-inserting the probe plug instantly makes the controller change back to the *pressure* cycle, this would almost certainly rule out any fault with the controller. You would then need to ask "why does your controller only see your probes as *wet*?" This signal should go *dry* when the pump is empty. Check that your operating pressure can overcome your lift.

No change happens on plug removal, we would suspect that the controller was already on the fill cycle. We should check this by depressing the manual override button on the front side of the pilot solenoid valve (Item 8 page 26). If by depressing this button we can force an 'empty' cycle and pressurise the pump, we know that we **were** on the fill cycle, and when we release this button the system will go back to the fill cycle. We now need to establish whether the controller can operate the valve electrically as we have just done manually.
We can simulate "two wet probes" by bridging out the three pins in the socket of the probe connector. Once you pull out the probe plug and look up into the socket, you will see that there are three male pins in a triangle. If, by bridging out the three pins the controller responds in the same way it does when operating the manual override button, it is unlikely that there is any problem with the controller. This being the case consult fault 6 & 7 on page 19 to establish why you are not getting a full / wet signal from your pump.
If bridging out the three pins does not bring about a change in the controller, yet the manual override button does, then you should check your battery condition. This should be 12 volts or above. Another battery (if you are at all suspicious) such as from your vehicle, will indicate a problem. Contact your Air-Well pumps agent for further assistance.
Using these quick steps, you will probably have found the problem. If not you will have picked up enough to make use of the rest of this trouble-shooting chart.

If all check procedures prove to be correct, select which of the following symptoms best describes your problem.

Troubleshooting – Symptoms List
(PUMPS WITH SOLAR CONTROLLERS)

TROUBLESHOOTING IN DETAIL

Symptom 1:

Air is continually escaping from the pilot valve exhaust.

Small amount of air escaping from (Item19 Page 26) all the time)

FAULT (1):
Damaged or dirty pilot valve. (Items 8,10,11 Page 26)

REASON (1a):
Air compressor is producing excessive oil vapour, which may damage the rubber seal on the pilot valve, or airlines were not blown out clean after installation.

REMEDY (1a):
Dependant on result, either:
Check the air filter cartridge
Overhaul the compressor head.

REMEDY (1b):
Clean up all the external parts of the pilot valve. Very carefully clean out as much of the valve as you can without disassembly, being sure not to score the surfaces. Do not loose the three 'O' rings on the valve base. Blow the valve out through the three holes in the base at the same time as operating the manual button on the front of the valve.

NOTE: The parts (Items 8,10,11 Page 26) are sealed with red paint on screws (Item 6 page 26) and should not be disassembled unless completely necessary. Once the screws have been loosened, the pilot valve will need to be reset. This process is best done at an Air-Well workshop. Contact your agent for more information.

FAULT (2):
Control valve pressure diaphragm is damaged or not seating correctly.
(Items 25-26 page 26).

REASON (2a):
Normal wear.

REMEDY (2a):
Replace with new seal kit. See 21 for instructions.

REASON (2b):
Incorrect re-assembly.

REMEDY (2b):
Note instructions for seal kit assembly see 22.

REASON (2c):
Contaminants in the air supply line, possibly from time of airline installation.

REMEDY (2c):
Disconnect supply airline from controller and blow out.Replace valve seal kit. See page 21.

Symptom 2:

Pump operates, only a small amount of water delivered each cycle.

FAULT (1):
Probe cable incorrectly wired. All wires in place but wrongly connected.

REASON (1a):
Incorrect assembly.

REMEDY(1a):
Return cable kit to your Airwell Pumps agent for repair or see page 24 for correct wire connection details.

Pump cycles are very fast or irregular and only a small amount of water is delivered each cycle

FAULT (2):
Water conductivity changed, and is now fresher or saltier.

REASON (2a):
Seasonal change or natural change in water quality

REMEDY(2a):
Change out the control circuits' resistor pack to suit new conditions. Talk to your Airwell agent for advice

Fast pump cycles, with especially quick exhaust (pump refill) times.

FAULT (1):
Pump outlet check valve jammed open allowing water to flow back into pump during refill.

REASON (1a):
Large pieces of grit or foreign objects are holding the discharge ball valve open.

REMEDY (1a):
Remove and clean three urethane balls. Refer diagram (Item 14 Page 28).

REASON (2a):
Water flow rate is too slow to carry grits away.

REMEDY (2a):
Increase the operating pressure.

FAULT (2):
Splits in the water pipe.

REASON (2a):
Water pipe of too low a pressure class used or pipe worn.

REMEDY (2a):
Replace with one of higher-pressure class. Refer to pressure chart on Page 8.

Symptom 3:

Air escapes from exhaust ports when on the pressure (pumping) cycle.

FAULT (3):
Exhaust seal disk is damaged or worn out. (Item 34, page 26).

REASON (3a):
Pumping of grit or heavy salt contamination for extended periods.

REMEDY(3a):
Fit a quick exhaust valve to the line going to the pump.
(Contact your Airwell Pumps dealer).

REASON(3b):
Normal wear.

REMEDY (3b):
Replace seal kit. See instructions. Page 21.

Symptom 4:

Air escapes from exhaust ports on the exhausting (filling) cycle with the probe plug removed and the pump given adequate time to fill.

FAULT (4):
Control valve pressure diaphragm is damaged or not seating correctly.
(Items 25-26 page 26).

REASON (4a):
Normal wear.

REMEDY (4a):
Replace with new seal kit. See 21 for instructions.

REASON (4b):
Incorrect re-assembly.

REMEDY (4b):
Note instructions for seal kit assembly see 22.

REASON (4c):
Contaminants in the air supply line, possibly from time of airline installation.

REMEDY (4c):
Disconnect supply airline from controller and blow out.
Replace valve seal kit. See page 21.

Symptom 5:

Pump continually on pressure (air passing through pump).

NOTE: *To establish where the fault is,with air and power connected, unplug the probe cable from under control box. If the pump changes cycle when the plug is withdrawn, it indicates that the fault is in the cable kit or pump.*
If controller remains on pressure after probe plug is removed, the problem is likely to be the controller

If the fault appears to be with the controller;

FAULT(1):
Controller has a blown fuse.

REASON(1a):
Battery terminals connected in reverse polarity.

REMEDY(1a):
Replace fuse with a 3amp fuse.

FAULT (2):
Battery discharged. (Battery does not measure 12 volts or more when connected to controller).

REASON (2a):
Battery is flat or has expired (average 2 year life expectancy).

REMEDY (2a):
Replace battery with a 4 Ah S.L.A. as fitted.

REASON (2b):
Solar panel shaded from sunlight or is faulty.

REMEDY (2b):
Remove shadowing object or relocate controller.
Replace solar panel if faulty. (Unlikely unless smashed)

FAULT (3):
Controller circuit has failed.

REASON (3a):
There is no likely or predictable cause.
This circuit should have exceptionally long life.

REMEDY (3a):
Replace circuit. (Circuits are not repairable).

Symptom 5 continued

FAULT (4):
Solenoid failed electrically.

REASON (4a):
There is no likely or predictable cause.
This valve is high quality, and should not fail under normal operation.

REMEDY (4a):
Replace valve coil only.
(Impulse pilot valves are not readily repairable in the field other than by Airwell technicians).

If the fault appears to be the pump/cable kit;

FAULT (1):
Water has got in to the cable kit and is giving a pump full / probes wet signal all the time.

REASON (1a):
Watertight probe plug has leaked, allowing water past the 'O'-rings into cable kit.

REMEDY (1a):
Replace 'O' rings and thoroughly dry all water from plug fittings.
The water tends to get right up the strands of cable, which usually requires that a new length of cable be used.

REASON (1b):
Damage to cable conduit.

REMEDY (1b):
Replace entire cable kit.

FAULT (2):
Breakdown of insulation caused by heavy build-up of contaminants on the probes.
(This is very rare if not exceptional and should not be over considered)

REASON (2a):
Water contains large amounts of iron or other contaminants.

REMEDY (2a):
Lift pump to the surface and refer to procedure No 4 for probe cleaning instruction.

Symptom 6:

Pump remains on exhaust (filling) cycle.

FAULT (1):
No water entering the pumps.

REASON (1a):
Inlet screen clogged or water supply depleted.

REMEDY (1a):
Clear screens if clogged.

FAULT (2):
Pump inlet screen buried in mud.

REASON (2a):
Little or no water.

REMEDY (2a):
Wait until supply replenished.

Symptom 7:

Pump remains on exhaust (filling) cycle even when pump is full.

You should test the ability of your controller to change to pressure cycle by bridging out the three pins on the probe socket.

FAULT (1):
Lack of conductivity. The Controller is unable to detect that the probes are wet.

REASON (1a):
Probe plug not connected.

REMEDY (1a):
Connect probe plug to socket base under control box.

REASON (1b):
Wiring fault.

REMEDY (1b):
Check wiring between pump and controller. See page 24.
Contact your AIRWELL pump agent.

REASON (1c):
Water may be too fresh for conductivity setting.

REMEDY (1c):
On impulse controllers you may need a **blue** colour coded resistor pack rather than the standard **black**, although the water would have to be very fresh. Talk to your Air-Well dealer for more info.

Symptom 8:

Pump is inactive on pumping cycle.

You know that the pump is under pressure but it is not cycling or using any air.

FAULT (1):
Lack of air pressure.

REASON (1a):
Air supply tap not turned on, or pressure has not had time to build up prior to testing.

REMEDY (1a):
Try again after pressure has had time to build up between the compressor and the control box.

FAULT (2):
Air pressure set too low to overcome static head.

REASON (2a):
A miscalculation of the total static head.

REMEDY (2a):
Increase air pressure until the water flows at the required rate.
See pressure chart on Page 8.

FAULT (3):
Water delivery pipe is blocked.

REASON (3a):
Pumping excessive grit.

REMEDY (3a):
Unblock the water delivery pipe.

FAULT (4):
Water pipe tap is off or tank ball taps are blocked with debris.

REASON (4a):
Tank ball float valves often block.

REMEDY (4a):
Turn tap on or clean out float valve.
Repair or replace ball tap.

MAINTENANCE

Procedure 1:

Remove, Service and Reinstall the Solenoid Valve

It is very unlikely that the impulse pilot valve will require servicing. Return to Airwell Pumps for servicing. ***Do not attempt this in the field.***

WARNING: Ensure you have isolated the air supply before continuing.
*The diagram on page 26 shows the parts of the impulse valve, (items **8, 10** and **11**) disassembled. If these parts are separated or loosened, the valve will need to be reset, a process best done by an Air-Well technician.* **The two screws that are painted red should not be loosened.**

Disassembly:

1) Loosen and remove the screw (item 3) and lift DIN connector from valve.

2) Undo and remove the two mounting screws, (items 2). **NOTE. Not the red painted screws**.

3) Lift off the impulse pilot valve being careful not to loose the three 'O' rings (items 12).

Reassembly:

4) Place a film of grease on the base of the valve to hold the three 'O' rings (items 12) in place as you lower the pilot valve into position.

5) Thread screws (items 2) through valve and do up with light force only.

6) Gently press DIN connector, (item 4) on to the valve and replace screw (item 3)

7) Connect the leads from the solar panel and the circuit to the battery terminals, ensuring correct polarity.

Procedure 2:

Servicing the Main Control Valve.

1) Follow instructions STEPS 1 - 3 in Procedure No 1 to remove pilot solenoid valve if required. This is not required in most cases.

Disassembly:

2) Remove pump airline from control valve, and unplug probe cable from the base of the controller

3) Undo and remove the two screws holding the valve to the controller, (Items 17) and lift the stainless steel enclosure free of the valve.

4) Undo and remove the two remaining screws. With the top removed, being careful not to lose the sprong the pressure diaphragm (Item 25-26) can be lifted out. Check for damage or excessive wear on the seating surface.
Note: To dismantle the valve any further remove the valve from the mounting post.

5) By removing the four screws in the bottom of the valve (Items 39) the valve can be separated, exposing the exhaust diaphragm (Item 34). This should be inspected for cracks and wear and replaced if necessary.

6) Once you have removed the mid section of the valve (Item 28) and have it in your hand, you can press (Item 33) out of (Item 28) with your thumb from the top.

7) This will expose three 'O' rings. The thick 'O' ring (Item 32) is employed as a check valve. **Note: It is very important that the brass groove that the 'O' ring seals into is not scratched or damaged in the process of removing the 'O' ring.**

8) Inspect all seals for damage and replace if required. Contact your Airwell supplier for a replacement seal kit.

Reassembly:

9) Reassemble all parts in reverse order. Do not over tighten any of the fixing screws. If the 'O' rings are in good condition, excessive tension is not necessary

Procedure 3:

Removal of Pump from Watercourse and Service.

1) Pump removal is made considerably easier by expelling the water from the pump before lifting. To do this, depress and twist to lock the button on the side of the solenoid valve (item 24 page 26). This manually applies pressure to empty the pump and water riser pipe. **It is important to remember to unlock this purge button when the pump goes back in the water.** To maintain the air pressure in the pump, fit a temporary tap in the pump airline, or raise the pump above the water level before disconnecting from the controller.

2) When the pump presents at the bank, have someone to assist you to raise the water pipe whilst the pump is removed from the water to prevent the pipe from kinking.

Procedure 4:

Cleaning the Probe

1) Disconnect cable kit by undoing the knurled nut, and then easing the plug from the socket.

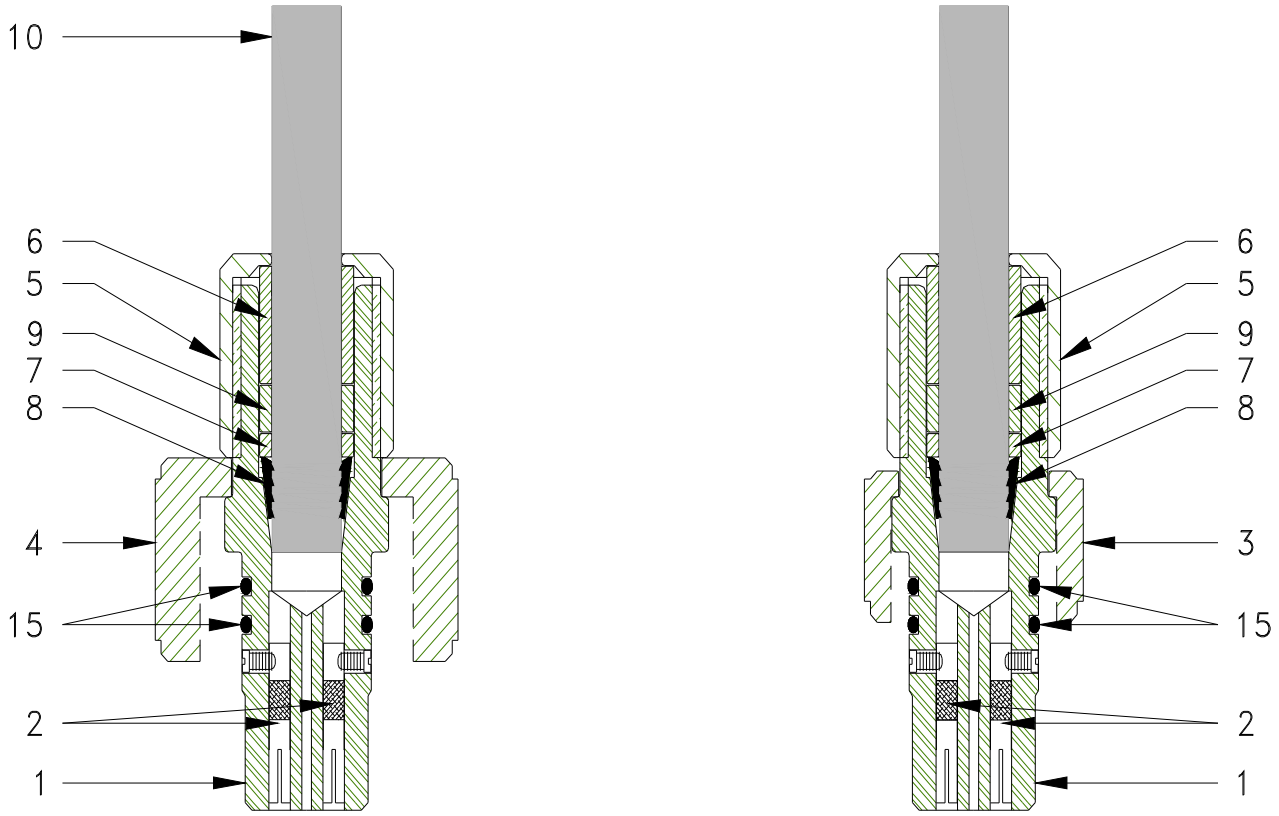
2) Unscrew the probe body (item 8 Page 28) and withdraw probe

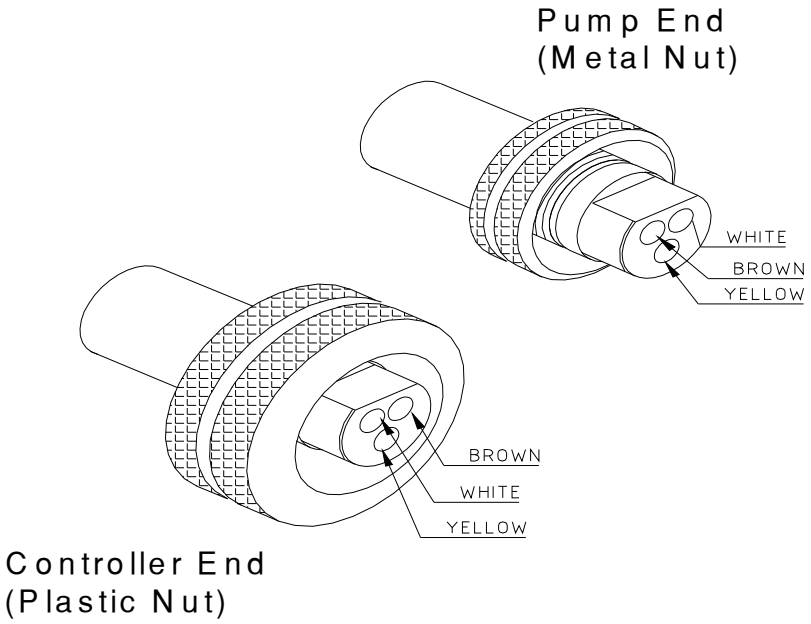
3) Clean probe insulation with a soft bristled brush until all build up is removed.

4) Refit probe ensuring that the 'O' ring is in good condition and threads are clean. Do not use any kind of sealer on 'O' rings. Vaseline or anti seize is advisable as a lubricant.

5) Refit the watertight probe plug, making sure the 'O'-rings on this plug are clean and in good condition. Penetrating / de watering oil is useful to reduce corrosion on this plug and can be used liberally as these products are non-conductive to electricity.

Cable Kit Diagram – Version 3

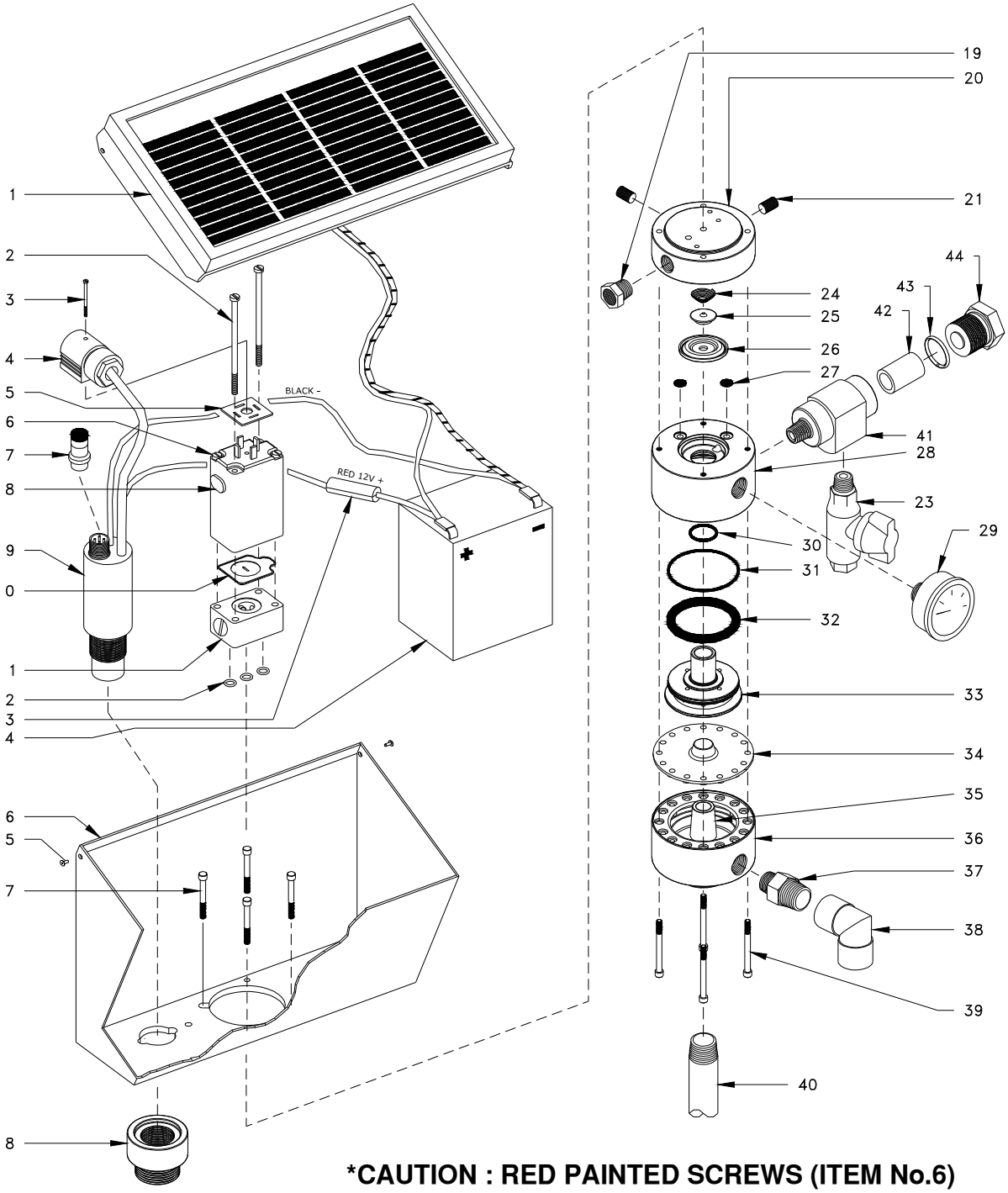




Spare Parts List – Cable Kit - Version 3

Item	Part No.	Description	Quantity
1	M235A	Acetal Gland Plug	2
	M235P	Polyethylene Gland Plug	2
2	H037	Brass Connector	6
3	M238	Stainless Steel Knurled Nut (pump end)	1
4	M201	Acetal Knurled Nut (controller end)	1
5	M024	Stainless Steel Gland Nut	2
6	M022	Acetal Long Bush	2
7	M023	Acetal Short Bush	2
8	M021	Acetal Grip Collar	2
9	M239	Nitrile Sealing Bush	2
10	H241	3 Core Poly Gland Cable	Xm
11	H043	Stainless Steel Rope (not shown)	Xm
12	H022	D Shackle (not shown)	2
13	H020	Rope Grip Ferrule (not shown)	1
14	H023	Stainless Steel Thimble (not shown)	2
15	H047	‘O’ Ring	4

Solar Controller Diagram -Version 6



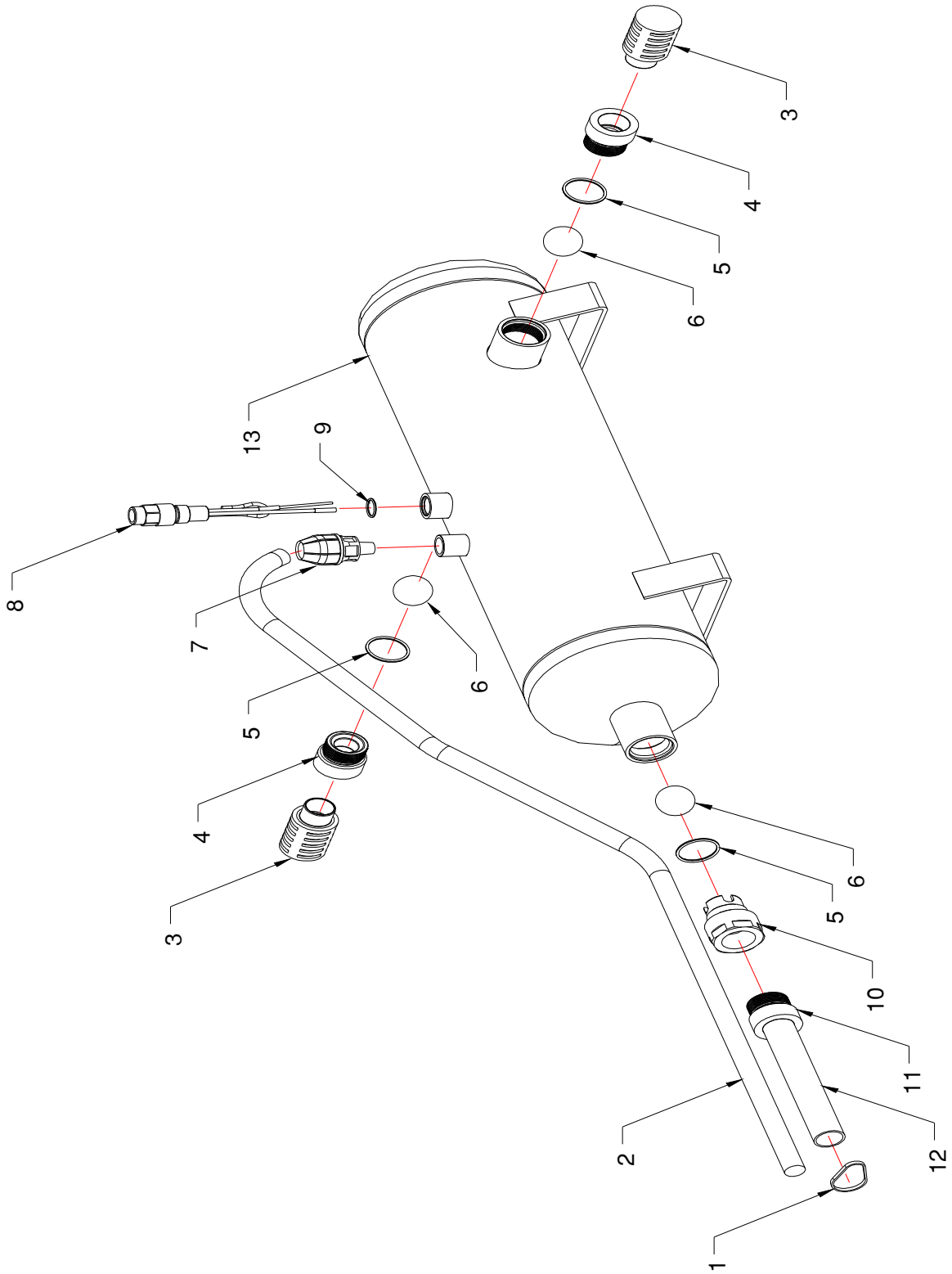
***CAUTION : RED PAINTED SCREWS (ITEM No.6) SHOULD NOT BE LOOSENED IN THE FEILD**

Spare Parts List – Solar Controller – Version 6

Item	Part Number	Description	Qty
1	E079	Solar Panel	1
2	N/A	Retaining Screws	2
3	H097	DIN plug retaining screw	1
4	E092	Wiring Harness	1
5	N/A	DIN connector gasket	1
6	N/A6	**RED PAINTED SCREWS – Do not touch**	2
7	PICC6RPB	Resistor Pack – Black (normal)	1
	PICC6RBE	Resistor Pack – Blue (fresh)	1
	PICC6RPR	Resistor Pack – Red (saline)	1
8	E091	Impulse Pilot valve coil assembly – non field serviceable	1
9	PICC6	Airwell microprocessor control circuit	1
	PICC6C	Airwell control circuit with counter and hold off facility	1
10	N/A	Impulse pilot valve diaphragm – not field serviceable	1
11	N/A	Impulse pilot valve base – do not remove in field	1
12	H049	'O' rings	3
13	N/A	Fuse assembly – 3A maximum 3AG type fuse	1
14	E060	12V 4ah SLA battery	1
15	H069	Lid retaining rivets (S/S 4mm x 5)	2
16	WA20	Stainless steel enclosure	1
17	H750	Valve retaining screws (M4 x 25)	4
18	M006	Circuit retaining nut	1
19	H715	Exhaust silencer	1
20	M704	Universal Valve Air inlet manifold	1
21	H701	Grub Screw (M6 x 8)	2
23	H003	Air inlet tap – ½" BSP	1
24	M719	Pressure valve spring	1
25	M717	Pressure valve diaphragm backing disk	1
26	M721	Pressure diaphragm	1
27	H049	'O' ring M6x1.5	2
28	M703	Universal Valve Body	1
29	AE094	50mm Gauge ¼" BSP Liquid filled	1
30	H047	'O' ring BS016	1
31	H710	'O' ring BS032	1
32	H708	Check valve 'O' ring M38x6	1
	H708S	Check valve 'O' ring M38x6 - soft	1
33	M707	Universal valve internal body	1
34	M702R	Universal Valve exhaust rubber diaphragm*	1
	M702U	Universal Valve exhaust urethane diaphragm	1
	M702V	Universal Valve exhaust viton diaphragm	1
35	M701A	Seat Insert - Std	1
	M701B	Seat Insert - Large	1
36	M701	Universal Valve air outlet manifold	1
37	H201	½" BSP Brass nipple	1
38	H203	½" BSP Brass elbow	1
39	H700	Manifold retaining screws (M4 x 50)	4
40	M114	Controller Support Post	1
	M113	Controller Support Post including silencer kit	1
41	M053	Filter body (angled)	1
42	H006	Filter element	1
43	H078	'O' Ring BS118	1
44	M052	Filter retaining nut	1
Note:	**H299SK**	**Full seal kit for universal valve Nitrile is the standard material used, although urethane and viton are available.**	1

* **Early models of item 34 had 8 holes, whilst valves manufactured after August 2002 have 16 holes.**

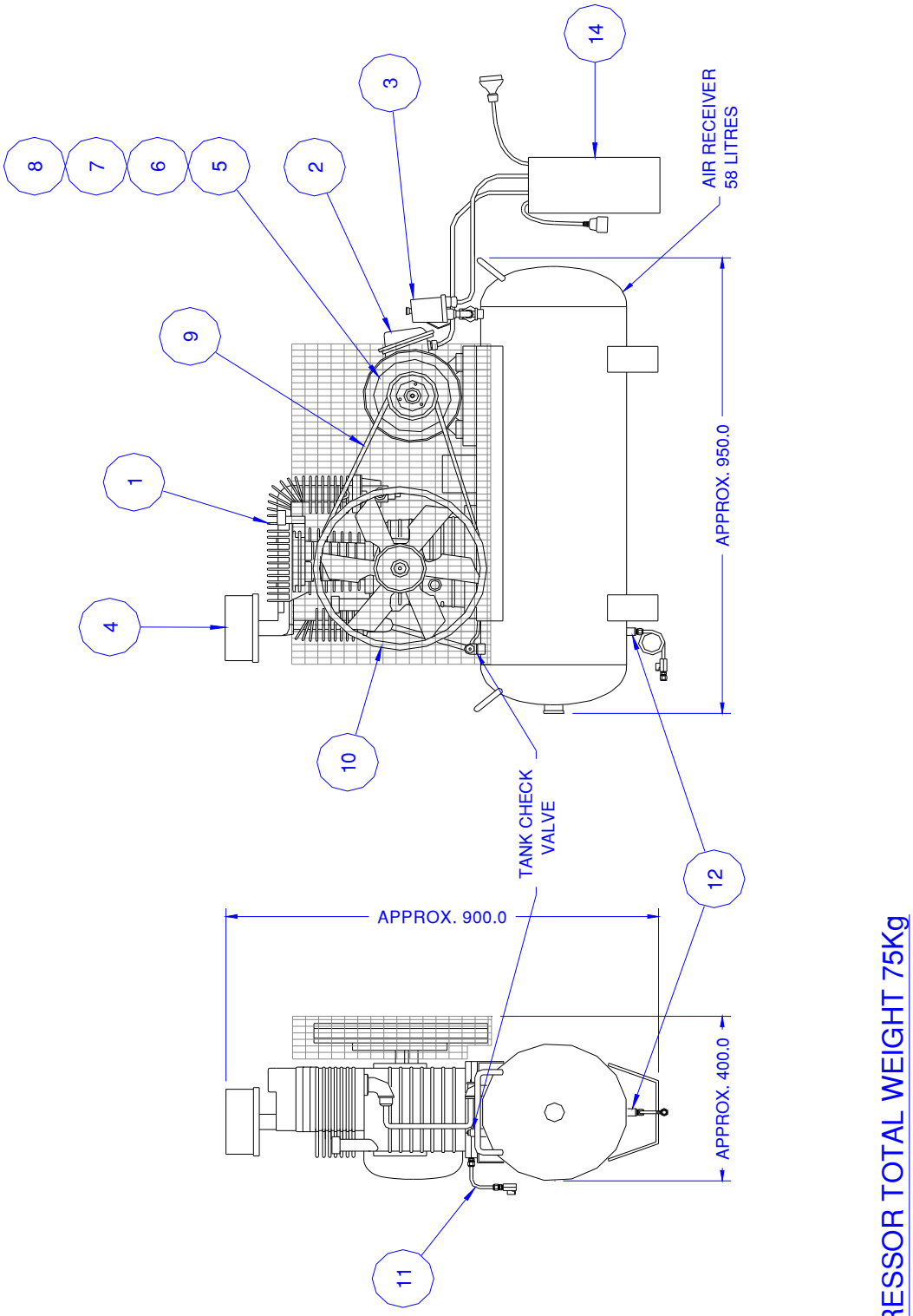
River Pump Diagram – Version 2



Spare Parts List – River Pump – Version 2

Item	Part No.	Description	Quantity
1	N/A	Taping of cable kit, air and water pipe back to bank at 1m intervals	
2	ALXXX	PN20 Airline (size to suit)	Xm
3	A035	Inlet screen assembly	2
4	M266	Inlet screen ball seat	2
5	H050	'O' Ring BS224	3
6	U044	Urethane ball	3
7	97722200	Poly end connector 20mm x ¾" BSP	1
8	A069	Acetal probe assembly	1
9	H053	'0' Ring BS119	1
10	M030	Acetal castle bush	1
11	97725400	Poly end connector 40mm x 11/4" BSP	1
12	WR4016	40mm PN12.5 discharge pipe	Xm
13	WA061	Weld assembly sump pump body	1
14	M608	Stabiliser Skid – 150mm x 75mm x 600mm	2
15	H239	M12 x 20 Bolt, Nut, Washer	4

Air Compressor Drawing



Spare Parts List – Air Compressors

Item	Part No.	Description	Quantity
1	ACK25/18B	Pilot Bare Pump – K25 (Std Fly Wheel)	1
	ACK17/12B	Pilot Bare Pump – K17 (Std Fly Wheel)	1
	ACK8/8B	Pilot Bare Pump – K8 (Std Fly Wheel)	1
2	ACK25/18M	Electric Motor – K25 – 3 HP	1
	ACK17/12M	Electric Motor – K17 – 2.2 HP	1
	ACK8/8M	Electric Motor – K8 – 2.2 HP	1
3	E200	Pressure Switch – Low Hysteresis	1
	E202	Pressure Switch – 240V	1
	E203	Pressure Switch – 415V	1
4	AC170	Air Filter Cartridge – K25	1
	AC160	Air Filter Cartridge – K8/K17	1
5	M453	Pulley / C'Weight – K25	1
	M452	Pulley / C'Weight – K17/K8	1
6	M455	Adaptor Sleeve – K25	1
	M454	Adaptor Sleeve – K17/K8	1
7	M457	Lock Nut – K25	1
	M456	Lock Nut – K17/K8	1
8	M459	Lock Washer – K25	1
	M458	Lock Washer – K17/K8	1
9	M517	'V' Belt – A51 – K25/K17	1
	H515	'V' Belt – A46 – K8	1
10	H520	Cast Iron Pulley – 310PD	1
11	AC155	Drain Kit – Oil	1
12	AC150	Drain Kit – Water	1
13	ACSUVK	Solenoid Unloader Valve Kit	1
14	ACVFDB	Variable Speed Drive – Delta Type	1
	ACOILPD100	Oil PD100 – 5 Litre	1

ELECTRICAL

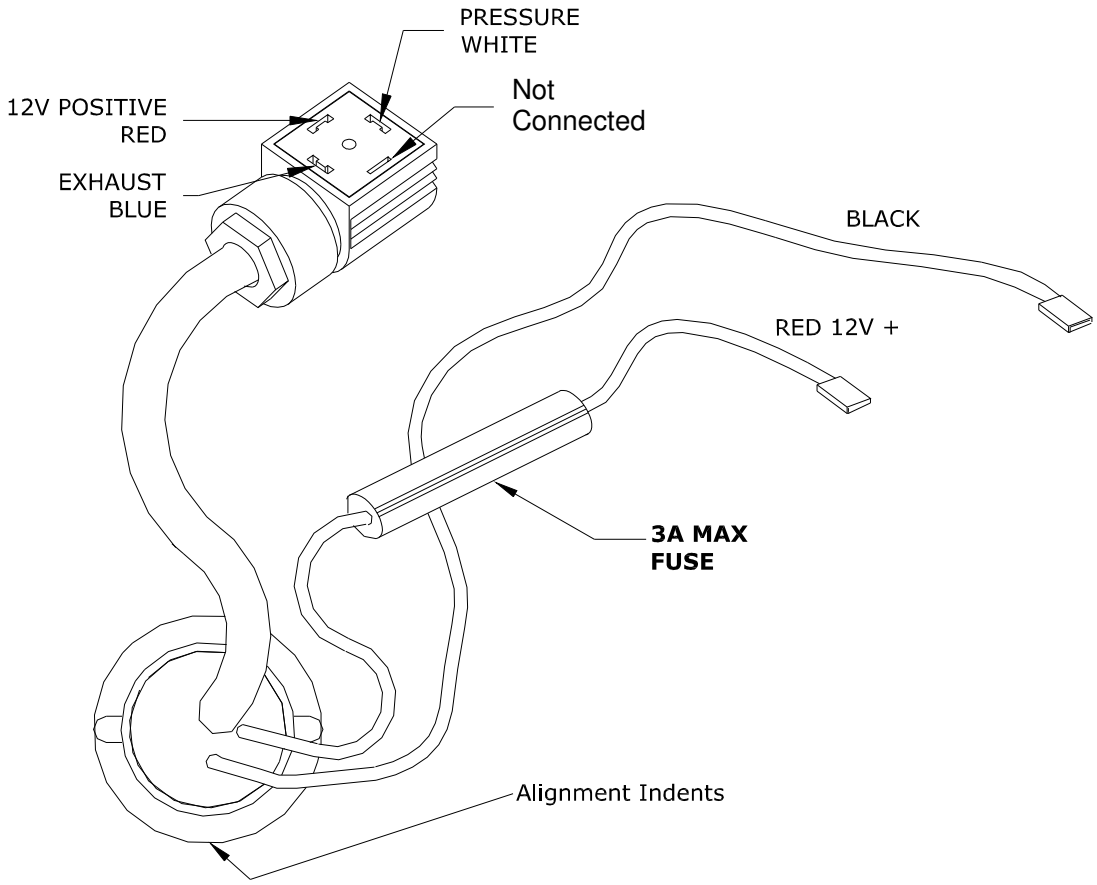
Impulse Controller - wiring colour code

PUMP CONTROLLER

Red	IN	12 volts DC Use 3-amp fuse	
Black	IN	Ground	
White	OUT	Pressure: -	pin 2
Blue	OUT	Exhaust: -	pin 1
Red	OUT	Positive: -	pin 3

SECONDARY CABLE – WHERE FITTED

Between Red and White = COUNT signal for use with counters (RED is +ve)
Between Black and Blue = HOLD OFF time delay for pump flow regulation (max 255secs)



Warranty Details

Airwell Pumps Pty Ltd

Warranty

Airwell Pumps Pty Ltd is committed to providing our customers with hardware whose manufacture, selection of materials and inbuilt quality exceeds their expectations. The Airwell system is designed to provide long-term trouble free service in a wide variety of applications. Provided the system has been installed in accordance with the instructions incorporated in the 'Operation and Parts' manual, and periodically maintained, the following Warranty is applicable:

Equipment manufactured by Airwell Pumps Pty Ltd is warranted to be free from manufacturing and material defects for **5 years** from date of purchase from Airwell Pumps or one of its recognised distributors. Should a problem arise, **any defective parts are to be returned to the point of purchase at the expense of the owner**, for examination. Replacement parts will be issued under warranty provided the equipment has not been repaired or altered by anyone other than an Airwell technician, or the equipment was improperly installed, abused, misused, neglected or accidentally damaged. Return of the faulty parts for analysis also enables us to continually improve the Airwell product. Please ensure that the returned items are suitably packaged. Transit damage is not warrantable.

Airwell Pumps will, on behalf of its customers, pursue manufacturers warranties on all third party equipment supplied by Airwell should the need arise.

Damage due to corrosion.
Airwell Pumps uses first grade, new materials throughout with 316L stainless steel as a standard minimum specification on down hole equipment. (Wire rope 304).
Every effort is made to maximise corrosion tolerance on all down hole equipment, however due to the unpredictable corrosive nature of ground water, Airwell Pumps Pty Ltd will not provide a warranty on corrosion. More anti corrosion tips can be found on page (8) of this owners manual.
The exception where a warranty would apply would be if the corrosion is caused by a piece of sub standard or wrong grade material being included in a pump unit. (If more than one section of material in a pump has corroded it is safe to assume that it is a general corrosion problem and not a particular piece of material).

It is the responsibility of the customer to advise Airwell Pumps staff if the pump is to be installed in areas whereby the system may be subjected to damage caused by chemicals, or the area is deemed 'Hazardous', whereby the environment is potentially explosive.
Airwell Pumps Pty Ltd shall not be liable for incidental or consequential damages, including any damage to equipment or the environment caused by the failure of the Airwell system.

Please detach and return the Warranty Registration Card either by fax or post to your point of purchase at your earliest convenience.

WARRANTY REGISTRATION CARD

PLEASE POST OR FAX TO

AIRWELL PUMPS PTY. LTD.
30 Harris Road,
Malaga
Western Australia 6090

Please note: Warranty is conditional upon correct installation and maintenance of the product as per the "Operators Manual" provided with the unit and the "Warranty Policy" contained within the "Operators Manual".

Pump serial number: - …….

Controller serial number: -……

Company name: -……

Address: - …….

Phone number: - (…..).....Fax number: - (.....).....

Contact name: - .....

Equipment purchased from: - …….

Commissioned by: - .....Date: - ...../..../.....

ARE YOU HAPPY WITH THE PRODUCT

We appreciate your comments regarding our products and service and welcome any suggestions that may help to improve them.

YES NO

Was there any transport damage: -.....……

Were you happy with the quality and presentation of the equipment: -

.....……...

Were you happy with the sales and service personnel: -
.....