Troubleshooting On-site

If there is a problem with the system, and the basic system checks have been done, further troubleshooting can be conducted on-site. This module will cover the basic on-site troubleshooting which can be used to resolve most issues. The topics include:

- Checking the power
- Using PumpScanner
- Using the display lights

Contents

1. Power check

WARNING: Power checks should only be conducted by trained technicians.

A power check is recommended before troubleshooting is conducted, as this is the root cause of most problems. This should preferably be done in full sunlight.

A multimeter that can read DC amps (up to 10A) is required for this process.

1.1. Check overall output

This can be done with PumpScanner if the controller power light is on. (Go to Pumps, and tap *Actual Data*). Or it can be done with a DC multimeter at the PV Disconnect.

Compare with *Table 1* (below) to see if sufficient power is generated to run the pump.

Table 1: Voltage requirements for pump to run

Pump Controller	Min. Vmp for full speed	Max. Voltage
PS2 – 150	17V (DC)	50V (DC)
PS2 – 200	34V (DC)	100V (DC)
PS2 – 600	68V (DC)	150V (DC)
PS2 – 1800	102V (DC)	200V (DC)
PS2 – 4000	238V (DC)	375V (DC)

If power readings are outside of this range, and full, direct sunlight is available, then a panel or a connection is faulty. Proceed to detailed power testing.

1.2. Detailed PV testing

Warning: Don't touch any exposed wire when connecting or disconnecting panels. Ideally the panels should be covered when connecting.

If full sunlight is available, and the power is not as expected, then either an improper connection has been made, or a panel is faulty. The following steps should be taken:

1. Inspect all cables for damage
2. Check the panel wiring arrangement. **This should agree with the initial COMPASS report**
3. Measure the Isc of each string; a faulty string will have a significantly lower amperage.
4. Turn the Isolator Switch
5. Measure the individual panel Voc and Isc.

The following table gives a summary of how to measure each of the values, and what to compare with.

Table 2: Panel electrical characteristic measurement guide

Where	Value	How	Compare
Single Panel	Voc	Connect multimeter leads to the +ve and –ve panel leads and measure voltage.	Compare with the name plate data.
	Isc	Connect the panel leads together and use clamp meter to measure DC current OR use a multimeter between panel leads (usually 10A max).	Compare with the name plate data.
String	Isc	Use DC clamp meter to measure each string before isolator.	Compare each *string,* the faulty string will read lower. Should be within 15% of panel name plate data depending on sunlight

If the panels are ok but strings are not reading expected values, then a connection is faulty, and will need to be identified and repaired.

Any faulty panels will need to be replaced.

If no strings/panels are faulty, then the controller is likely faulty and the appropriate board needs to be replaced. Usually this is the main board that needs to be replaced.

2. Troubleshooting with PumpScanner

If power is not the issue, then PumpScanner can be used to identify most issues. Table 3 gives a summary of the faults identified by PumpScanner.

To find the fault tap *Pumps* → Select the pump → tap *Actual Data* → Scroll down to *Pump off reason*.

Table 3: Summary of "pump off reasons" in PumpScanner

Error	Description	Actions
Source Low	The sensor has detected a low source. The pump will turn on 15min after water is registered again.	Check for broken sensor. Wait for source to recover.
Remote Switch	The remote switch sensor has been triggered. The pump will turn on 15min after the sensor resets.	Check for broken sensor. Check the storage is full.
Water Sensor	The water sensor has detected an event.	Check for a low source, or an air leak in the pipe
Overload	The controller has detected an overload and stopped the motor. Many possible issues may be causing this. A pump inspection may be req'd.	Toggle on/off switch to reset. Inspect the system for faults. Check for dirt accumulation or a seized rotor/stator.
Overvoltage	The overvoltage limit is exceeded, so controller will not start.	The array needs to be reconfigured to spec.
Manual software switches off	The controller has been stopped in PumpScanner.	Open *Operational Settings* and look under *Pump Speed.*
Sun Sensor	Irradiation is below minimum setting.	Change under *installation settings.*
Pressure/ Liquid Level Sensor	Controller has stopped due to high/low pressure. Pump will start when the pressure returns within set range.	Change under *Feature Settings.*
Constant Pressure/flow control	The controller stopped the pump because the pressure or flow rate exceeded the set range. Will automatically restart and try to resume constant pressure/flow.	Change under *Feature Settings* and look under *Pump Control.* Use *Advanced Settings* to control *adjustment speed*. This changes how fast the pump will speed up/down to keep constant pressure/flow. A low setting may result in high overshoot.
Daily Amount	Controller has stopped because the set pumping amount has been reached. Controller will automatically start the next day.	Change under *Feature Settings.*

Battery Low (LVD)	Input voltage low, pump stopped to prevent harm to battery.	Pump will restart when it has recovered.
Timer	Controller is stopped by software setting.	Change under *Operation Settings.*
Min. Speed Timer	The min. motor speed required to run the pump can't be reached. Absolute min. is set to avoid damage.	Wait for greater sunlight. Change in *Operational Settings* under *Pump Speed*.
	Advanced Information	
Analog Input 1 (or 2) Error	Controller does not receive plausible measurements from Analog input 1 (or 2). The valid range is 4-20mA.	Check connection and polarity of sensor. Replace sensor if suspected faulty. If problems persist, replace the IO board.
Over-temperature	Reduced power/stopped pump because controller temperature is too high. Normally due to insufficient ventilation.	Will restart when it has cooled down sufficiently. Improve ventilation if req'd
Sun Sensor Fault	Controller is not receiving plausible measurements from the Sun Sensor module.	Check connection and polarity of Sun Sensor. Replace sensor if suspected faulty. If problems persist, replace the IO board.
Internal Comm Error (Bt) or (mppt)	The main board has to be replaced.	Normally replace entire controller.
Low Power	Pump stopped due to low power, likely morning, evening, or sudden clouds.	If sufficient light is available, go through power checks
Short Circuit Motor Cable	The controller has detected a high current peak and stopped the motor to protect itself from damage.	The system must be inspected for a fault. Check motor cable especially.
Internal Comm Error (LED)	The controller detected a problem with the LED board.	Check LED board wiring. If fine, replace the LED board.

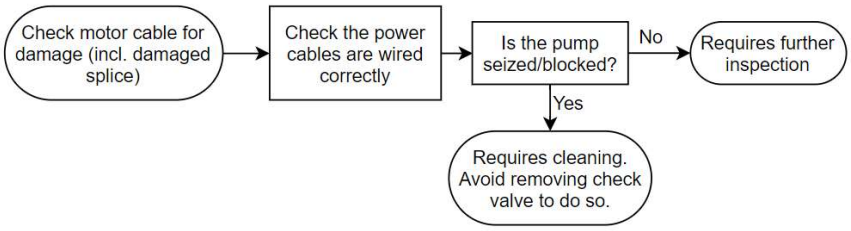
3. On-site troubleshooting without PumpScanner

If PumpScanner can't be used for a system inspection, or does not give a clear answer, the LED status indicators is the next recommended method for determining the cause of failure.

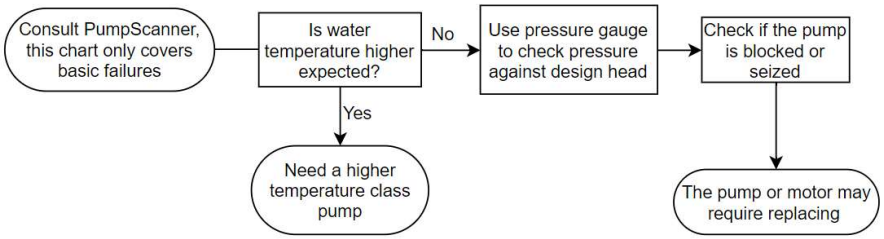
System inspections using the LED indicators should only be conducted once it is certain that sufficient power is going to the controller.

Pump Status Indicator

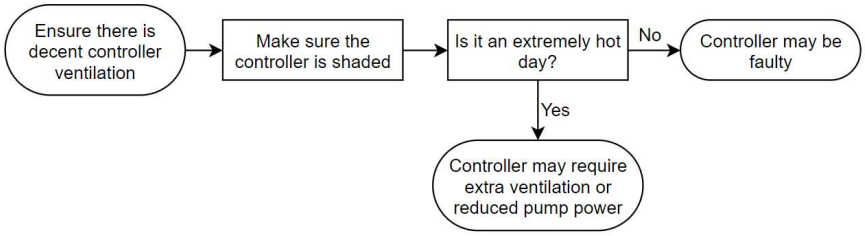
Green briefly, then goes off every 2min



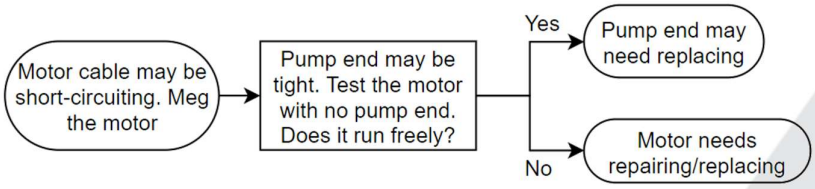
Solid Red



Red Flashing – controller overheating

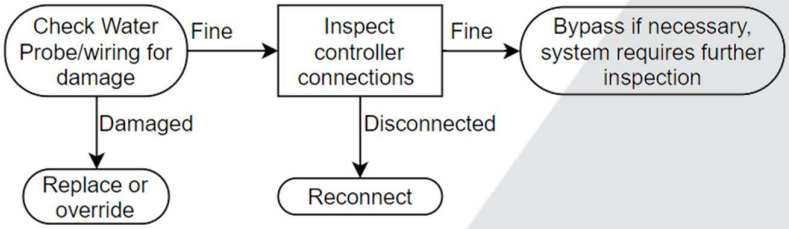


Off – Light may flash briefly then go out



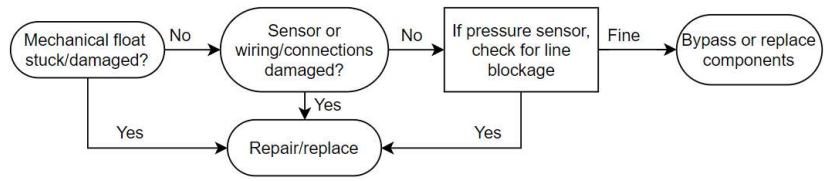
Low Source Indicator

Solid Red



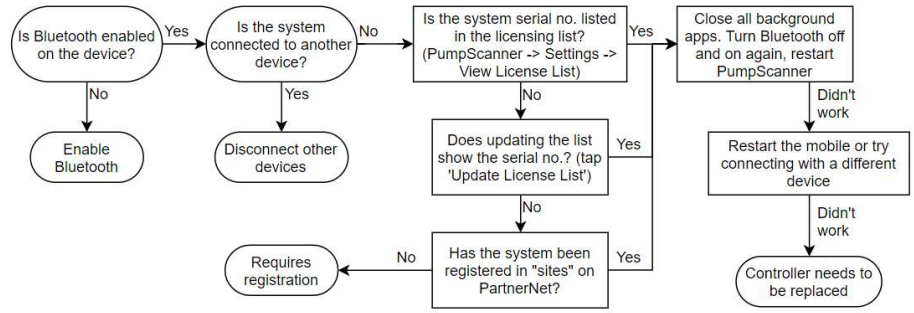
Remote Switch Indicator

Solid Red



Local Communication

Off – No Bluetooth devices connected



Note: PumpScanner will usually give a more detailed assessment of any faults, and may prevent the need to pull the pump out for inspection.

It is possible to turn the pump on/off using the switch on the controller in the bottom left. This does NOT turn the controller on or off, just power to the pump.

A DC Isolation switch is required to isolate power from the controller. It is recommended to leave the controller sit for a couple of minutes before doing anything inside the controller, to allow the capacitors to discharge (especially PS2-4000).

It's always recommended to connect a motor for testing the controller

The controller is designed to be easily repairable if there is a board failure internally. The Main board, IO Board and LED Board can all be replaced easily. Replacing the power board is more complicated, and generally it is better to get a replacement controller.