HERON ELECTRIC COMPANY LTD

Buffer Tank Installation Manual

MPD9

Doc ref. MIXTANK Version 9

1 System Considerations

Your system has been fully tested before it left the factory. However, it is recommended that the system is thoroughly tested in **your application** using the chemicals you intend to use before you use it on your crop.

Allow sufficient time to carry out these tests.

Every effort has been made to make your EC/pH controller as reliable as possible. However, components, especially mechanical components will fail. You need to decide what back-up systems you need to employ and spare parts you should hold. The type of back-up system you employ will be dependent upon the time that your crop can be without water and how long you crop can be without water treated to the correct pH and correct EC**. It is essential you give this thorough consideration before you use this system.**

This manual describes the Heron EC/pH Buffer Tank dosing system. The system is used to dose acid and fertiliser to control pH and EC levels. The system components are shown in Fig 1

If you have just had the system delivered you will need to carry out the following steps before operating the system.

- Read this manual
- Install system and connect to mains supply
- Connect the dosing rig to the buffer tank
- Calibrate the pH probe
- Adjust flow in to be slightly more than flow out
- Adjust **Valve 1** to give 1 bar pressure across venturis
- Adjust **Valve 2** to get the correct flow from the sensor drain tube
- Ensure other System Parameters are set correctly.
- Set pH pulse length alarm
- Check calibration of EC sensor
- Check acid premix pot does not overflow on fill up

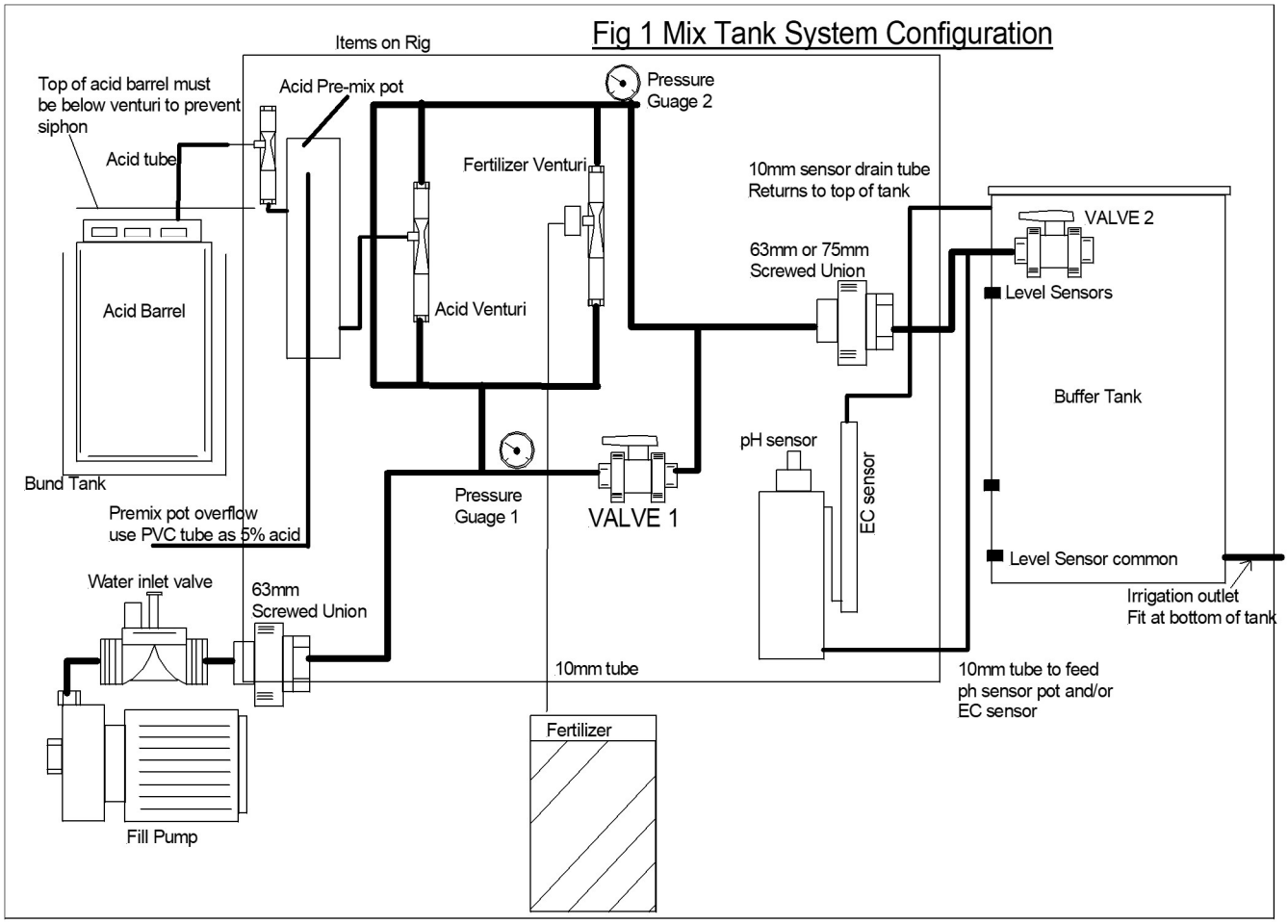


Fig 1 Mix Tank System Configuration

2 SYSTEM OVERVIEW

The system works by pumping irrigation water through the dosing rig into the buffer tank. The treated water can then be pumped out of the buffer tank.

Venturis are used to inject fertilizer and acid. Valve 1 (shown in Fig 1 and the picture below) is partially closed to provide 1 bar pressure differential between pressure Gauge 1 and pressure Gauge 2.

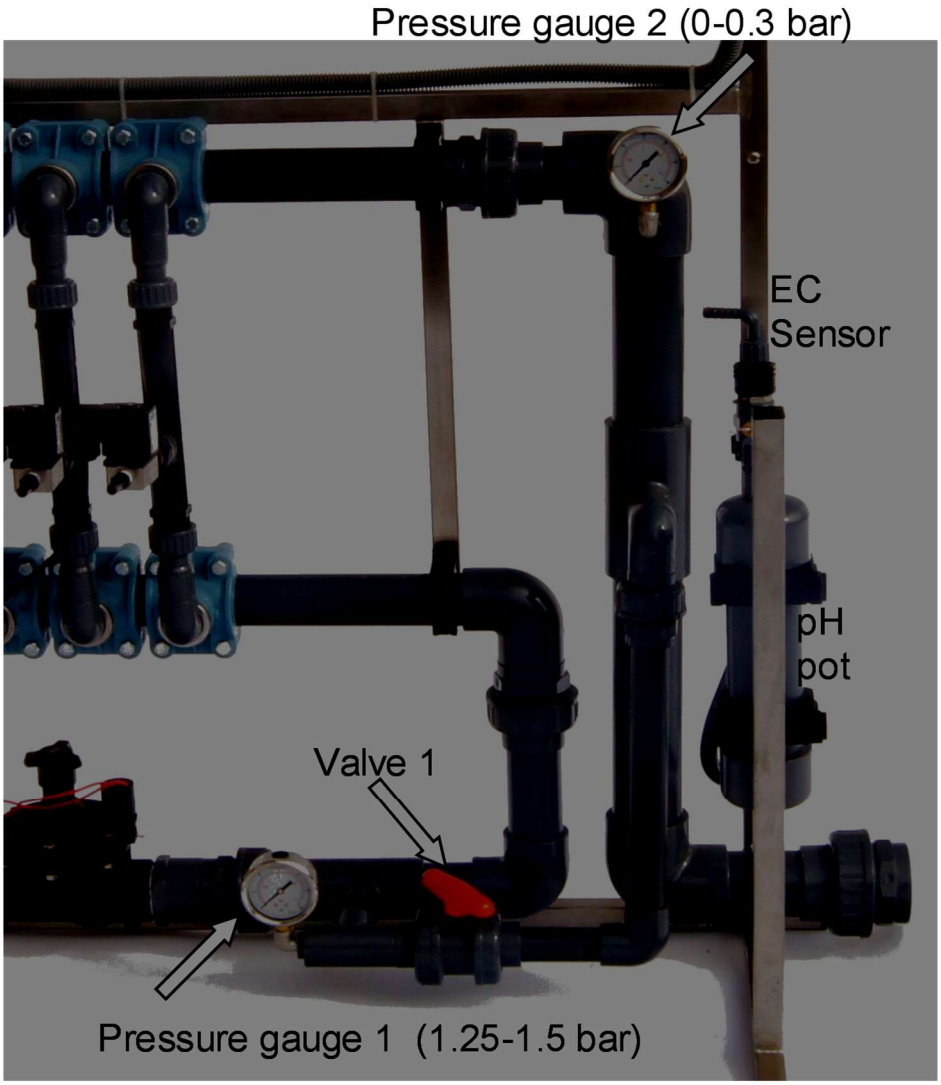
The treated water is monitored from the correct pH and EC via the pH pot and EC sensor. The sensors are connected via a 10mm hose. The hose is connected to the pipe work on the tank as shown in Figs 1 and 1c . The return from the sensors goes back to the buffer tank.

Water is forced through the pH pot and EC sensor by slightly closing valve 2.

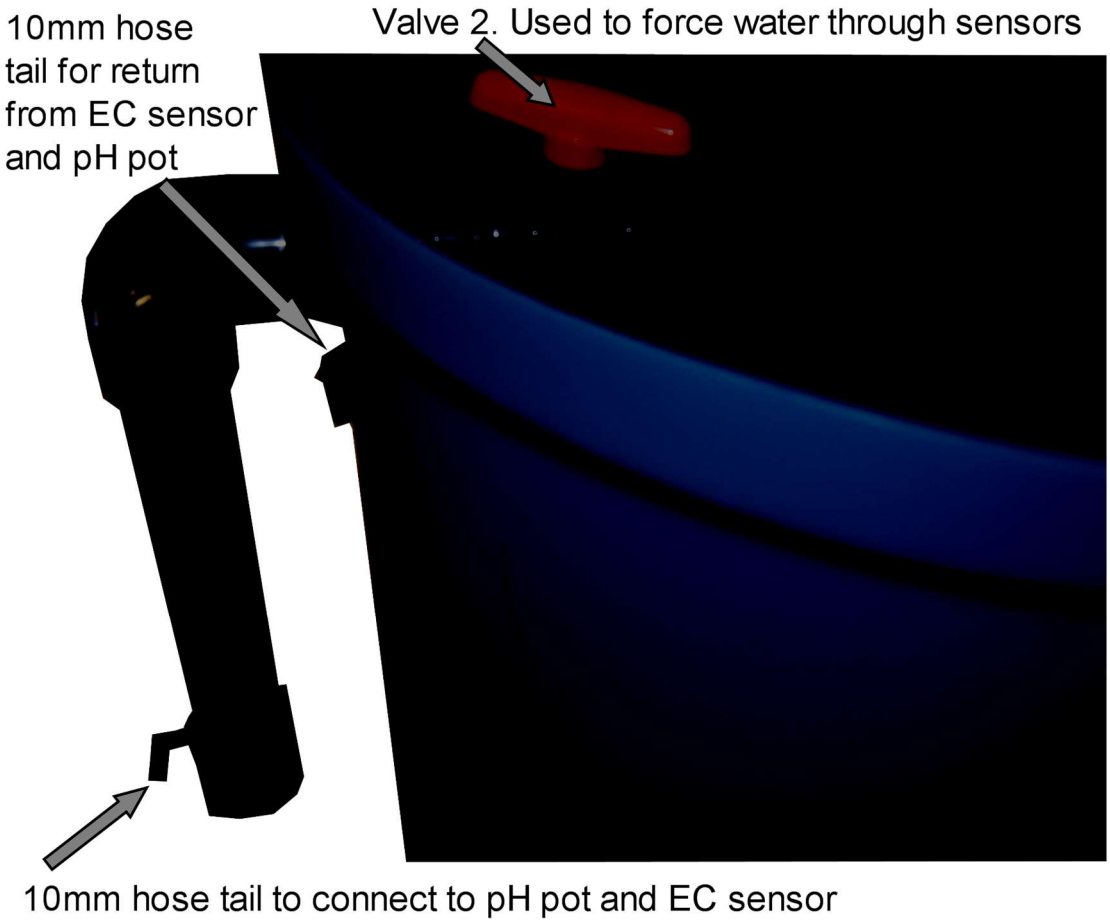
Note: If this is a Multi-Buffer Tank system there is no Valve2. Water is sucked through the EC sensor and pH pot via an additional venturi on the dosing rig.

Fig 1B Creating Pressure Differential

Fig 1c



Sensor Connections



IMPORTANT

The top of the Acid barrel must be BELOW the Premix Pot venturi as shown in the diagram above. This is to prevent acid siphoning into the premix pot.

The Acid barrel must be kept in a bund tank to contain or drain away any acid spills.

It is important to make sure that the fertiliser valves are kept clean and not become partially blocked so that an equal flow is obtained through both valves, please refer to the maintenance section of the user manual. Similarly, make sure that the fertiliser filters and tubes do not get blocked.

Valve seals will need replacing after approximately 1,000,000 operations. But this will be dependent upon chemicals used and temperature. Check regularly.

Only Fertilisers that ionise are suitable with this system.

No chemicals should be included in the fertiliser that may react over time and effect the ion concentration in the buffer tank. This will cause unstable results in measurement and control of the EC. For example, you cannot make the fertiliser mix too acidic.

The fertiliser must be compatible with the material used in the fertiliser valves, the fertiliser seals, the venturis, filters and connecting pipe work.

Fertiliser and Acid Flow Rate

The system is designed to dose fertiliser at approximately 3.5 litres per minute per valve. Two fertilizer valves are provided as standard. This can be increased to 4.

The maximum acid flow rate is approximately 0.35 L/min for the 24,000 L version and 0.2L/min for the 12,000 L version.

Control of EC

The system controls the EC by pulsing fertiliser in every 5 seconds. The controller varies the pulse length depending on whether the EC is to high or low (the pulse length can vary from 0.02 seconds to 5 seconds) The standard system pulses an equal amount of fertiliser through the two fertiliser valves.

Control of Acid (pH)

The system controls the pH by pulsing acid every 5 seconds. The controller varies the pulse length depending on whether the pH is high or low.

The pH pot (shown in Fig 1) is used to provide a good average and allow time for the acid to react. The pH probe should be screwed into this pot. Because acid takes time to react the system can only respond slowly to any changes in the water input flow rate. It is recommended that the water input flow rate is kept as constant as possible.

Control of Acid flow into premix pot (far left of rig see Fig 1).

Acid is sucked into the acid premix pot when ever the level sensor in the premix pot falls. If there is a fault with the sensor or the brass valve controlling this the pot may over flow. The acid concentration in the premix pot is about 5%.

You will need to connect a drain tube to the over flow of premix pot. The overflow is needed in case the valve feeding the premix pot fails or the level sensor in the premix pot fails.

Note. The rig will shut down if the premix pot does not fill in certain time. In this situation ‘Alarm 28’ will be displayed

IMPORTANT

The acid and concentration of acid must be compatible with the material used in the acid valves, the acid seals, the venturis, filters and connecting pipe work

Valve seals will need replacing after approximately 1,000,000 operations. But this number of operations will be dependent upon chemicals used and temperature. Check regularly for ware.

The minimum pH level that can be used which will achieve stable results is pH 5.7

Control of water flow.

When water is pump out of the buffer tank the system will switch on and re-fill the buffer tank with treated water until the top sensor is reached. If the bottom sensor is not covered in 20 seconds the controller will activate the stop output to suspend irrigation. The stop out is then deactivated when the top sensor is reached.

3 RECOMMENDED INSTALLATION

The rig should be installed on a flat surface.

Acid Supply

The acid barrel must be positioned next to the rig on the left hand side.

Never extend the length of the acid tube as this will seriously affect control of acid dosing

The filter should be fitted to the end of the PTFE tube.

Fertilizer Supply

A 10mm tube should be connected to the fertiliser venturis as shown on Fig 1. Filters should be pushed on the end of this tube. It is advisable to keep the filters off the bottom of the stock tanks. When the system is operating you must check no air is leaking into the tubes.

Water In

If you have a pressurised water supply you can connect this directly to the rig. Connect to the screwed union at the front of the rig on the right.

If you do not have a pressurised water supply you need to install a fill pump. The pump should be capable of producing 2.5 bar pressure at the maximum flow rate. The controller provides a 24VAC start and stop signal for this pump.

You must install a non-return valve between the pump and dosing system to keep the inlet valve shut and prevent water flowing back out of the rig when the fill pump is switched off.

Water Out

Connect the buffer tank to the rig as shown on the attached diagram using the pipe work provided. Connect this pipe work to the screwed union at the back of the rig.

Important

Make sure you have installed an adequate over flow protection system for your installation. If the input valve fails or the level sensors fail, the buffer tank **WILL** overflow. You must arrange a suitable over flow drainage system and alarm.

Sensor Supply And Drain

Connect a 10mm hose between the elbow at the top of the buffer tank to the bottom of the pH pot to supply the sensors. The drain from the sensors is taken from the top of the EC sensor to the top of the buffer tank. A hose tail is provided on the buffer tank for this purpose.

Electrical Installation.

Connect the mains supply to the controller as shown in Fig 2.

Connect the fill pump relay/contactor to the controller as shown in Fig 2.

Connect the buffer tank level sensor cable between tank and controller as follows:-

- Green Wire – C3 on the controller to bottom of the buffer tank
- Blue Wire – L1 on the controller to middle of the buffer tank
- Red Wire – L2 on the controller to top of the buffer tank

Note: If this is Multi-Buffer Tank System, connect the additional buffer tank to the second level sensor card.

IMPORTANT

Star wire the mains supply to the ECPH controller electronics back to the main electrical distribution panel. **Do not connect any motors, pumps or other high power equipment to this circuit,** ie do not connect the fill pump or circulating pump to this circuit.

Stop Output

Connect the stop output to prevent the irrigation running when the buffer tank is empty. It is essential this is connected unless you have a digital link to the irrigation controller.

It is also recommended that an, additional, mechanical low level sensors is fitted if your pump has no other protection system preventing it from running when dry.

The stop output is a 24VAC signal. The stop output is controlled by Option 20**.**

Alarm Circuit

The controller provides an alarm output across on the A, C1 terminals. The alarm circuit should be wired to disable irrigation.

Digital Connection to HM or HT Controllers

If you intend to start the dosing controller from an HM or HT controller you need to fit the 4 wire digital link between the irrigation controller and dose controller. The wiring is shown in the following table. Use signal cable for this purpose.

	Wiring
Direct Connection using 'Short Distance Card'	T to T, R to R, V to V and G to G.
Dose controller connected via Card Connection Unit (CCU) (the CCU is used if multiple devices connected to the irrigation controller)	T to R, R to T, V to V and G to G.

4 SETTING VALVES FOR CORRECT OPERATION

You now need to do the following:-

- adjust flow rate through the rig
- create 1.25 bar pressure across the venturis
- force the correct flow rate water through the pH pot and EC sensor.

Proceed as follows:-

Empty the buffer tank to below the bottom level sensor. Now start an EC/ph program so the controller fills the buffer tank

Adjust your water inlet valve so the flow into the buffer tank is slightly greater than your maximum irrigation flow out. If you find you do not have enough flow you can turn the knob on the top of the diaphragm valve anti clockwise to allow more flow through this valve. Do not turn more than one turn as this will cause the valve to switch off more slowly (see next section).

Adjust **Valve 1** so the pressure at **Pressure Gauge 1** (at the bottom) is 1 bar above the pressure at **Pressure Gauge 2**. (**Pressure Gauge 1** should read about 0.2 and **Pressure Gauge 1** should read between 1.25 and 1.5. You should also hear the venturis hissing.)

Adjust **Valve 2** so the flow rate of the sensor drain tube is 2.0 L/m. You may need to slightly adjust valve 1 again after you have done this.

5 SETTING SYSTEM PARAMETERS

If you are unfamiliar with the operation of the controller, now read the User Manual before setting the following system parameters.

For safe operation you should check and set the following system parameters. These are set in 'Options' Section of the user manual

Parameter	*Option*	*Triggers Alarm*
Max acid pulse length	**15 and 16**	**16**
pH alarm threshold	**10, 11 and 12**	**36 or 37**
EC alarm threshold	**7,8 and 9**	**34 or 35**

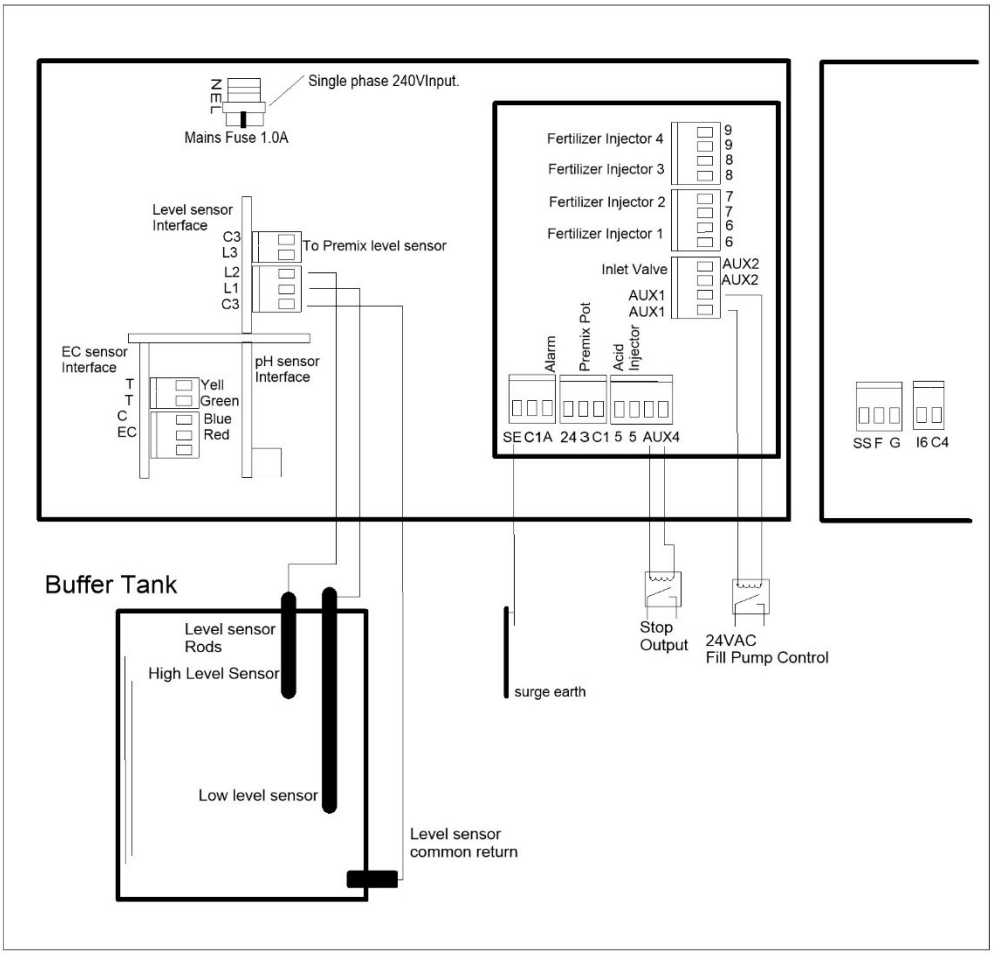
Maximum Acid Dose Percent
The maximum acid dose percent sets the maximum dose percent that the controller can use. If the controller increases the acid dosing to this level for the time specified in Option 15, Alarm 16 is raised. To set this value

you should run the system and then view the acid pulse length that is displayed on the Information page. Set the maximum dose percent to be approximately 25% longer.

pH Alarm Threshold
The pH Difference threshold allows you to set an Alarm threshold closer to the pH you are working at. The default value is for difference pH of 1.0 with a timer set at 120 seconds. This means that the measured pH has to have a difference of more than 1.0 pH from the required for 120 seconds.

EC Alarm Threshold
The EC alarm threshold allows you to set the EC Alarm threshold. The default value is for a percentage error of 50% and a timer of 120seconds. This means that the measured EC has to be over 50% in error for 120 seconds before alarm 34 or 35 is set.

Fig 2 Output Wiring (EC and pH)



Parts Check List

	Check
Connectors plugs and IEC connector	
pH probe	
Bung	
Filter for each fertilizer valve	
Buffer-Tank Cable	
2 x Screwed Unions	
Elbow and pipe	
Black hose and 4 x jubilee clips	
2 x Manual	