

# Liquid Additive System LAS

**Project : 1A Prototype**

Code: Python

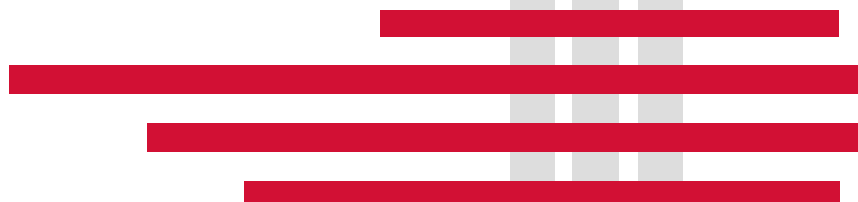
Prepared for:

Version 1

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**Submitted by Geoff White | Electronics Tech**

Phone: +64 211 273487



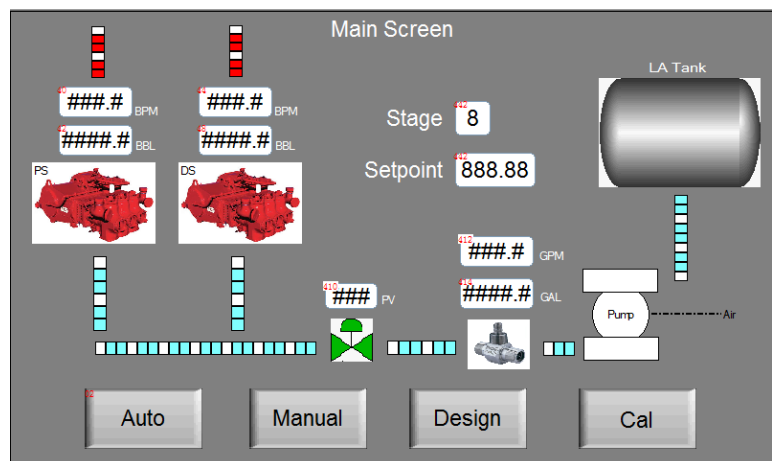
## LAS Overview

Liquid additive systems are already in widespread use throughout the oil and gas industry. This system was designed to be simple to use and setup. It's constructed out of a tough plastic pelican case with 4mm aluminum cut-outs and durable double layered delcal labeling. It's operated using IP56 rated 7" touch screen. All field connections are made via the front panel. Data can be record via the Ethernet connection located on the front panel. The inputs consist of four frequency inputs and two 4-20mA outputs. The current software version LAS 1A controls one output with the second reserved for future updates. The feedback for the output channel is derived from a 1" flow meter in line with an electric motorized ball valve. The LA rate is slave to either frequency input on channel one and two.



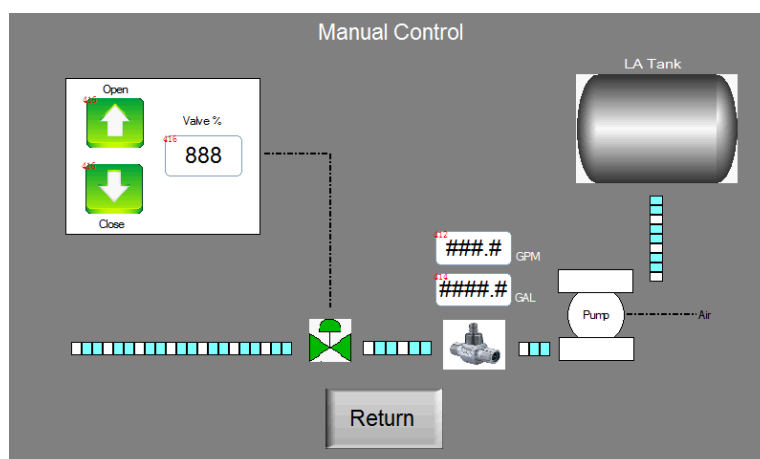
## Main Screen

The main screen will appear on power up. There are four buttons at the bottom of the screen that will lead you to alternative screens. The Auto button puts the system in to run mode. This means as soon as the system senses a rate from ether down hole pump, liquid additive will be added at the desired ratio. Both rate and total are displayed for both downhole pumps. Totals can be zeroed independently by touching on the barrel counter. Rate and total are also displayed for the liquid additive. This is displayed in gallons per minute and gallons. The LA total can also be zeroed by touching on the total display. Above the green valve symbol is an indicator for the drive signal to the motorized ball valve. If the value is 0 the ball valve is completely closed. If the value is 100 then the ball valve will be completely open. The stage and set point numerics show the current stage selected and the set point for that stage. The set point is displayed in gal/bbl.



## Manual Control

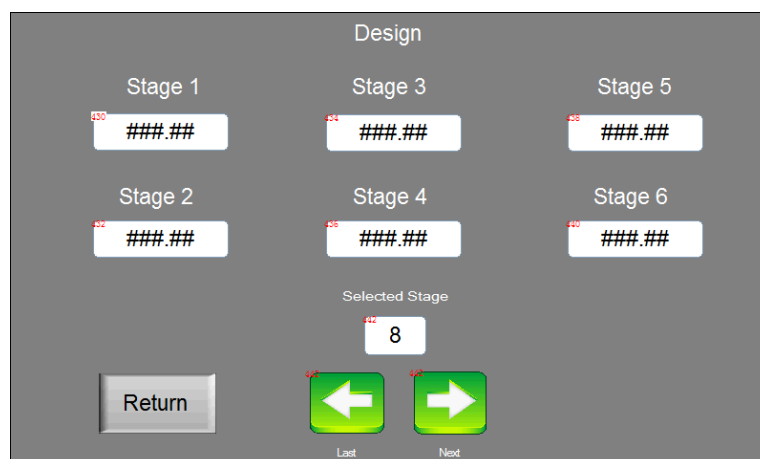
The manual button will lead you to the manual control screen. This will override auto mode if selected. The up/down arrows allow you to manually open and close the ball valve, alternatively you can enter in a numeric value by touching on the valve percentage display. The return button will lead you back to the main screen.



## Design

The design screen is where you set up the different LA ratios for the different stages of the job. The units are in gallons per barrel. For example a value of one will give you a liquid additive rate of 1 GPM with a pump rate of 1 BPM.

The arrows are used to advance to the next stage.



## Calibration

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The calibration screen is where you enter the figures for the pumps and flow meter. The value for the flow meter is taken from the tag that is on the flow meter which is in pluses per gallon and is entered directly into the numeric display. The HT400 is also in pluses per barrel and is calculated on the number of teeth on the pump drive shaft and the size of the fluid end. The P, I and D terms are for the control loop and should be only adjusted by a technician.

The screenshot shows a 'Calibration' screen with the following fields and values:

Parameter	Value
P Term	####.####
I Term	####.####
D Term	####.####
LA TFM	####.##
DS HT400	####.##
PS HT400	####.##

A 'Return' button is located at the bottom center of the screen.

## Motorized Ball Valve

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The motorized ball valve and liquid additive 1" flow meter are arranged as shown. This is plumbed in line with a lung pump and then into the suction of the HT400 (for zone seal).

There are two electrical connections. One is a two pin type for the magnetic pickup on the flow meter and the other is for the motorized ball valve. There is a small eye glass on the ball valve to indicate its position.



## Additional Info

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The LAS system is powered of an AC source between 110 -230v AC 60 or 50Hz. The IP rating for the unit is IP56 meaning it is splash proof from water.

