FlowMaster

UltimateValve

User Manual

Safety First

Warning: Several safety rules must be followed throughout the operation of FlowMaster. Severe damages will occur to the product or personnel in charge if the safety rules are not strictly obeyed.

Please note:

- Power **OFF** the FlowMaster before connecting or disconnecting the UltimateValve and also wiring of FlowMaster.
- Handle FlowMaster carefully to prevent crack on HMI screen.

Safety precautions must be followed and adhered at all times. There are more safety rules will be listed in next few pages in the manual.

CONTENT

1.0 INTRODUCTION

1.1   Product Description

The FM-15, FlowMaster is a monitoring hub for all PA UltimateValve series, which includes digital and analog I/O signals for communicating with industrial programmable logic controllers. The PA FlowMaster has a built-in touch screen that is able to manage the entire valve operations. The controller has several important functions. It can be connected to up to four (4) valves, supports up to six (6) different display languages, has an auto/manual mode, an alarm system and is very user friendly.

Front View   Side View   Top View

1.2   *Available in <u>six (6)</u> languages:*

- English
- German
- Simplified Chinese
- Japanese
- French
- Spanish

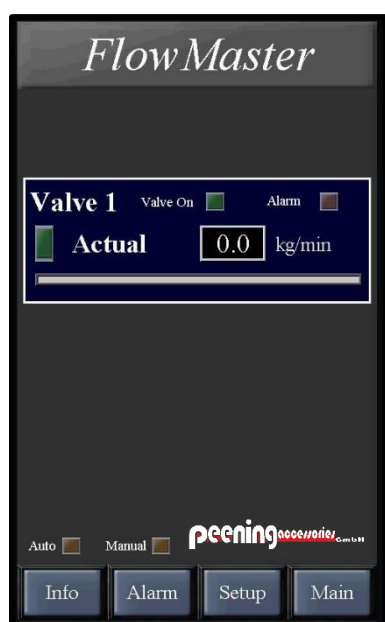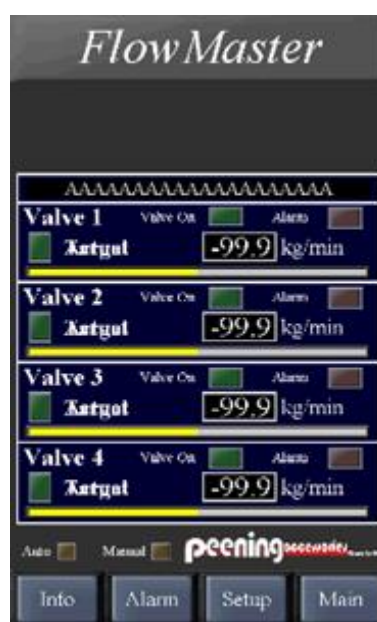## *1.3   FlowMaster Connections*

FlowMaster comes with different packages, it could connect from one UltimateValve or up to four UltimateValve with minor charges. Brings substantial savings if more than one (1) valve is in operation.

Example of display page for one (1) UltimateValve & four (4) UltimateValve:
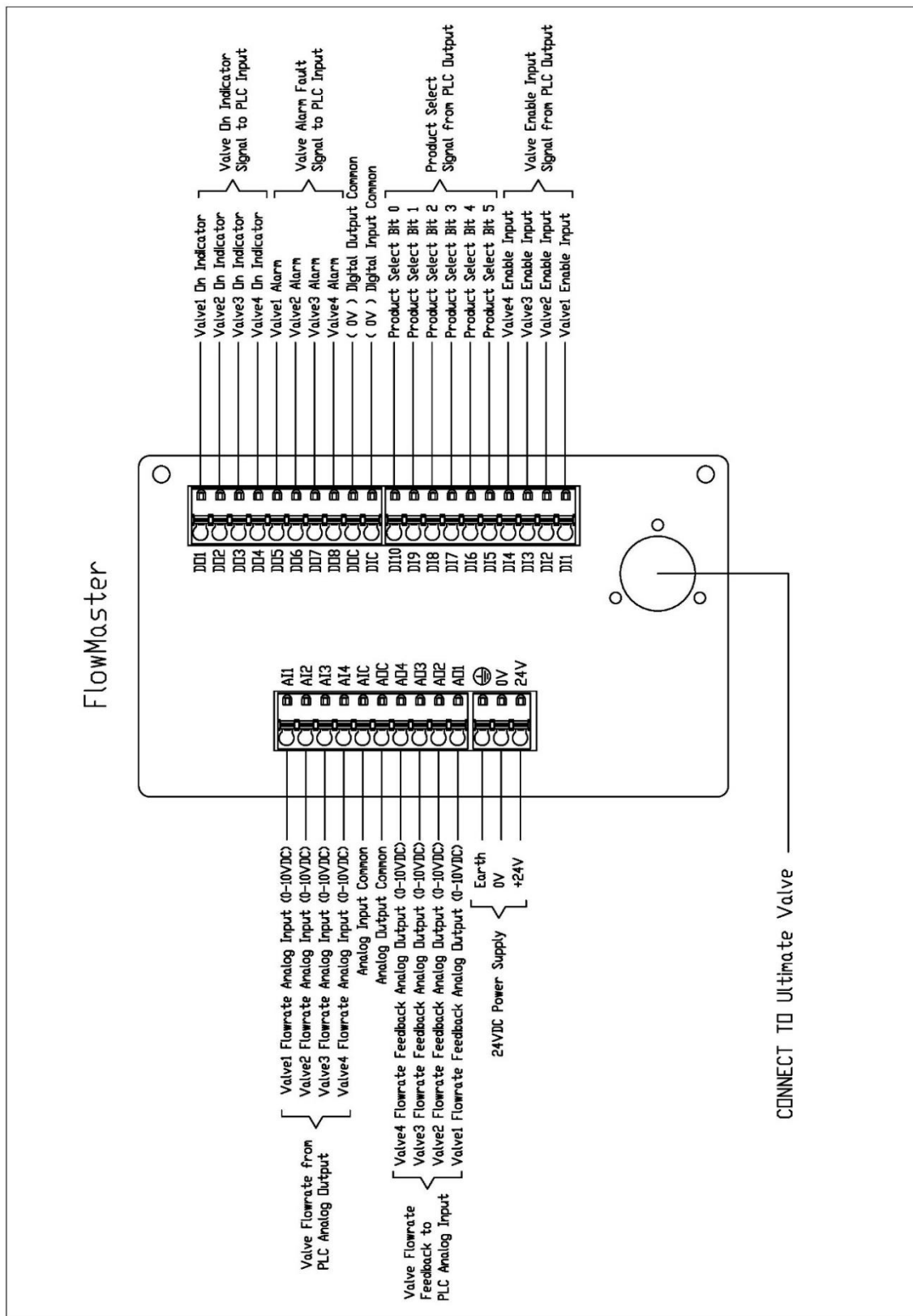
1 UltimateValve	*4 UltimateValve*

1.4   Basic Pin Connection

The signal names corresponding to the connecting terminals are as shown in the following diagram.

Note that valve1, valve 2, valve3 and valve4 in the signal names are indicating the respective valves that are installed with this controller, as a maximum of four (4) valves can be connected to a single controller. The use of connecting terminal will be depends on the number of valves that are connected, for example if only one (1) valve is installed, the terminal of which contains the name of valve1 will only be use, whilst terminal of valve2 to valve4 will be non-applicable for this case.

For **Digital Inputs** section, DI1 – DI4 are correspond to the input valve power on where each represent valve 1 to valve 4 respectively. DI5 – DI10 are correspond to product select bit or known as recipe/program, it is listed out in table form in section 4.2.

For **Digital Outputs** section, DO1 – DO4 are correspond for each respective valve output indicator. DO5 – DO8 are correspond to the alarm output of each valve, the alarming type is listed out in section 3.2.

For **Analog Inputs** section, AI1 – AI4 are the input terminal of each respective valve to control the flowrate of the valve from 0 – 10V, which could be correspond to specific flowrate, for example 0 – 10 V are correspond to 1 – 13 kg respectively, depends on the maximum flowrate the valve could achieve.

For **Analog Outputs** section, AO1 – AO4 are the output terminal of each respective valve to provide feedback signal back to the PLC to display the real time actual flowrate.

Digital Inputs

DI1	Valve1 Enable Input
DI2	Valve2 Enable Input
DI3	Valve3 Enable Input
DI4	Valve4 Enable Input
DI5	Product Select Bit 5
DI6	Product Select Bit 4
DI7	Product Select Bit 3
DI8	Product Select Bit 2
DI9	Product Select Bit 1
DI10	Product Select Bit 0
DIC	Digital Inputs Ground

Digital Outputs

DO1	Valve1 On Indicator Output
DO2	Valve2 On Indicator Output
DO3	Valve3 On Indicator Output
DO4	Valve4 On Indicator Output
DO5	Valve1 Alarm
DO6	Valve2 Alarm
DO7	Valve3 Alarm
DO8	Valve4 Alarm
DOC	Digital Outputs Ground

Analog Inputs

|	
AI1	Flowrate Analog Input 1 (Valve1)
AI2	Flowrate Analog Input 2 (Valve2)
AI3	Flowrate Analog Input 3 (Valve3)
AI4	Flowrate Analog Input 4 (Valve4)
AIC	Analog Inputs Ground

Analog Outputs

AO1	Flowrate Feedback Analog Output 1 (Valve1)
AO2	Flowrate Feedback Analog Output 2 (Valve2)
AO3	Flowrate Feedback Analog Output 3 (Valve3)
AO4	Flowrate Feedback Analog Output 4 (Valve4)
AOC	Analog Outputs Ground

Power Supply Terminals

| ⏚	Earth contact
0V	Ground
24V	DC 24V Supply

2.0 DISPLAY

2.1 Main Display
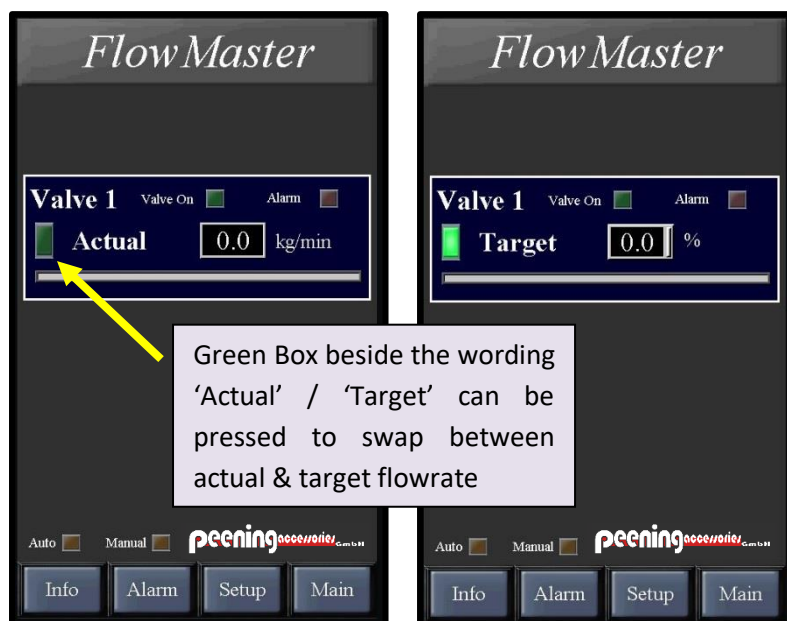
- Actual Flowrate – The actual value of the flowrate
- Target Flowrate – The targeted flowrate value pre-set by user
- Force On/Off – Enable user to force on/force off the FlowMaster by long press on the square box beside the "Valve On"

2.2   Information Display

All the information of FlowMaster & UltimateValve can be viewed by using FlowMaster including flow rate display, manual/auto control setup, valve status, system I/O etc. There are three main types of information:
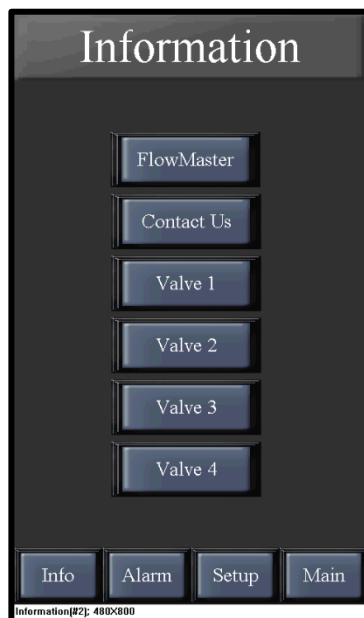
- FlowMaster Information
- Contact Us
- UltimateValve Information

Each information pages have been displayed in the following page of this manual.
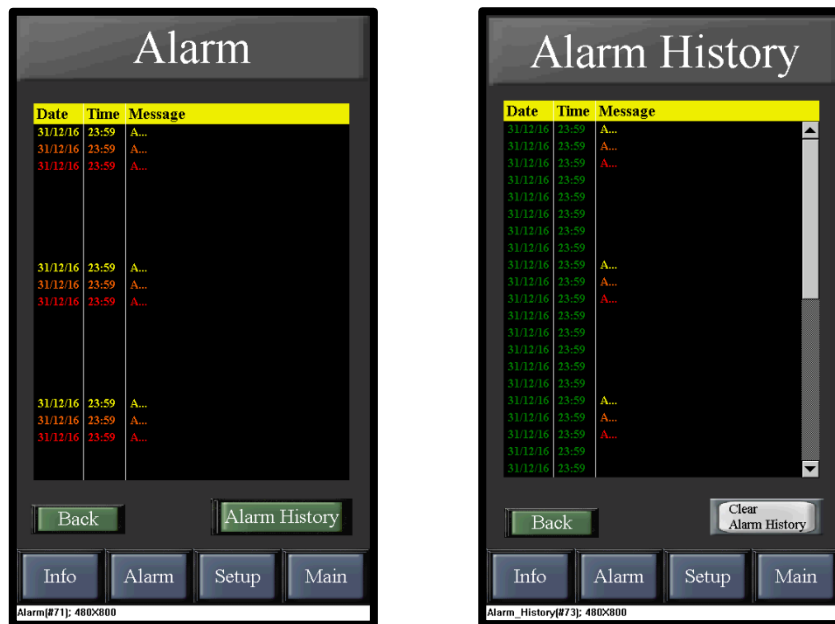
- *FlowMaster Information*

- *UltimateValve Information*

- *Contact Us*

2.3 Alarm Display

- *Alarm*
  - ➢ To check the alarm information in terms of date, time and faulty message
  - ➢ Alarm History – To proceed to alarm history page

- *Alarm History*
  - ➢ To view back the alarm history
 - ➢ Clear Alarm History – To clear all the previous saved alarm history

Each alarm type & its troubleshooting guide is listed as below:

Alarm Type	Possible Causes	Recommended Solution
Option Card Communication Lost	• Hardware connection lost • Software timing not match during start-up • Option card spoiled	• Restart the FlowMaster • If the issue persist, call us for further assist
Lower Flowrate Alarm	• Low media or no media supply • Tight alarm band	• Check the media storage, piping and pressure or on/off valve • Reset the alarm band, alarm delay & start up delay • If the issue persist, call us for further assist
Higher Flowrate Alarm	• Media choked • Tight alarm band	• Check the piping & pressure • Reset the alarm band, alarm delay & start up delay • If the issue persist, call us for further assist
Valve Communication Lost Alarm	• Hardware connection lost • Software timing not match during start-up • Valve faulty	• Restart the FlowMaster • If the issue persist, call us for further assist
Option Card Low/High Voltage Alarm	• Power Supply Fluctuation • 24V power supply not within the range	• Check the power supply voltage • If the issue persist, call us for further assist

3.0 SETUP

All of the FlowMaster functions can be set up through the setup page, which includes Configuration, Alarm Setup, Analog Setting, Program Setting, and Calibration.

Setup(#3); 480X800
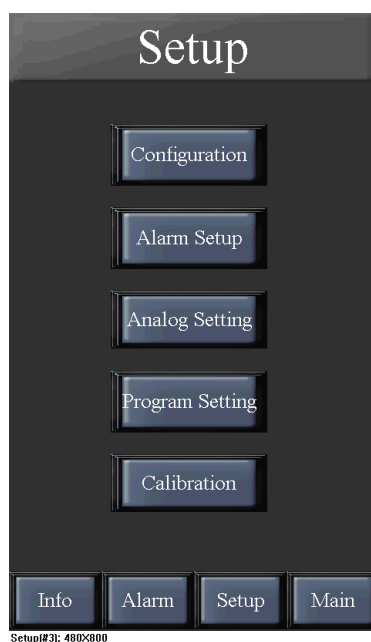
- *3.1 Configuration*
    - Configuration of FlowMaster and UltimateValve
- *3.2 Alarm Setup*
    - Setup page for alarm
- *3.3 Analog Setting*
    - Adjust analog output offset ($\pm$ 1V)
- *3.4 Program Setting* (Local Mode)
    - Setup page for each program auto flowrate
- *3.5 Calibration*
    - Setup for calibration mode and media equation

3.1 Configuration

Configuration

Controller Setting

Auto/Manual

Auto   Manual

Flowrate Input Select

Analog   Program

Measurement Unit

lbs   kg

Back   Next

Info   Alarm   Setup   Main

Config(#5): 480X800
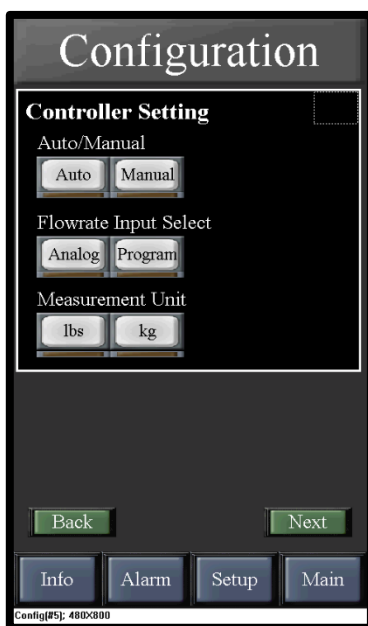
Controller Setting

- Auto/Manual – To switch between auto and manual mode
  - Auto – To select either analog or program flowrate input
  - Manual – To manually key-in flowrate in main page
- Flowrate Input Select – To select desired flowrate input method
  - Analog – To receive input signal from PLC
  - Program – To select the desired programmed flowrate in program setting
- Measurement Unit – To select desired measurement unit between pound (lbs) and kilogram (kg).

  - ✓ Press Next button to proceed to system setting page
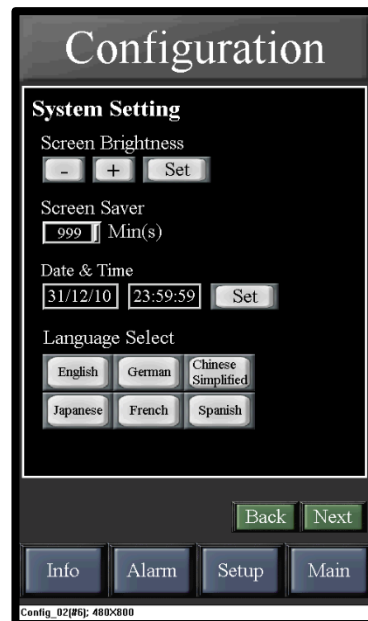
System Setting

- Screen Brightness – To adjust the brightness of display
  - ➢ [-] Negative sign – To decrease the brightness of display
  - ➢ [+] Positive sign – To increase the brightness of display
  - ➢ [Set] button – To confirm the desired brightness after complete adjustment
- Screen Saver – Set the time (in minutes) to enable the screen automatically blacked out for energy saving purpose
- Date & Time – To adjust the date & time
  - ➢ [Set] button – To confirm the date & time after complete adjustment
- Language Select – To select the desired language to be shown in this controller. Total of six (6) languages are available.

  - ✓ Press [Back] button to proceed to controller setting page
  - ✓ Press [Next] button to proceed to media setting page
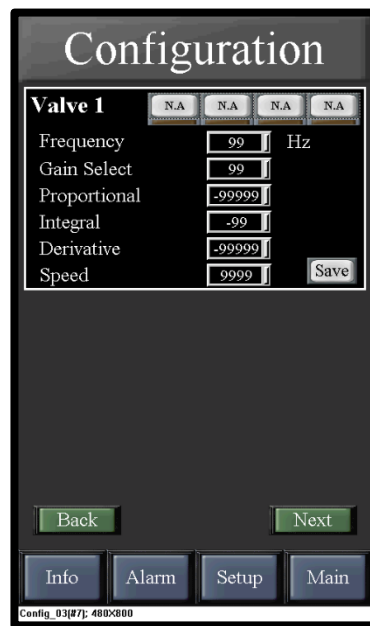
- Media Type

  - ➢ Maximum of four (4) media types available on one (1) valve

- Frequency

  - ➢ To key in the desired frequency in Hertz (Hz)

- Gain Select

  - ➢ Refer to UltimateValve user manual (page 7-8)

  - ➢ Follow the hardware number for gain select

- Proportional

  - ➢ To adjust response time of valve

- Integral

  - ➢ To adjust flowrate output

- Derivative

  - ➢ To increase damping effect of valve

- Speed

  - ➢ To adjust the increment step of response

- ✓ Press [Back] button to proceed to system setting page

3.2 Alarm Setup
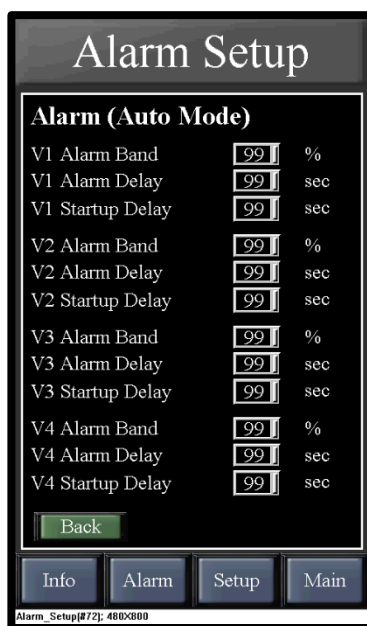
- Alarm Band
  - ➢ Key in the percentage (%) to decide the upper and lower limit to trigger the alarm
  - ➢ Particular Point alarm percentage is used. (PT %)
  - ➢ Default Value is 5%.

- Alarm Delay
  - ➢ To set the desired alarm delay (in seconds)
  - ➢ The specification is 1 second for alarm delay according to AMS2430
  - ➢ User will need to take own responsibility if alarm delay is set according to user-preference
  - ➢ Default Value is 5s.

- Startup Delay
  - ➢ To set the desired startup delay (in seconds)
  - ➢ Acts as a buffer timing period that will not trigger the alarm even if the flowrate is out of the preset alarm band within the buffer period.
  - ➢ Default Value is 10s.

✓ Example, with an input as below :

Flowrate – 3 lbs/min

Alarm Band – 10 %

Alarm Delay – 1 second

Startup Delay – 10 seconds

The alarm will not be triggered within first ten (10) seconds albeit of any faulty issue found including the flowrate is exceeding the alarm band of 10% which is either higher than 3.3 lbs/min or lower than 2.7 lbs/min. After the first ten (10) seconds, if the flowrate is exceeding the alarm band of 10% for 1 second (alarm delay) continuously, then the alarm will be triggered.

3.3   Analog Setting

Analog Input Offset Adjustment

- Input Range(3700-3800)
- Insert Value respective to 10V shown in **3.5 Calibration** in order to have correct 10V to flow limit.

Analog Output Offset Adjustment

- Input Range (-100 to 100)
- Adjust analog output feedback from FlowMaster approximately +- 1V.

Analog Setting

Analog 1 Input Offset	9999
Analog 1 Output Offset	-999
Analog 2 Input Offset	9999
Analog 2 Output Offset	-999
Analog 3 Input Offset	9999
Analog 3 Output Offset	-999
Analog 4 Input Offset	9999
Analog 4 Output Offset	-999

Back   Save

Info   Alarm   Setup   Main

Analog_Setting(#51); 480X800

3.4 Program Setting
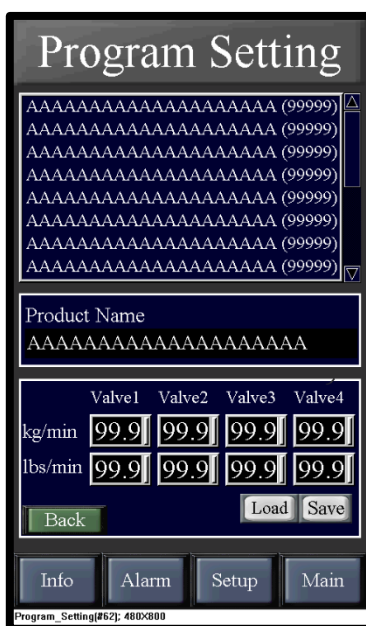
- Selection Box
  - ➢ To select which line of program to be edited or created
- Product Name
  - ➢ To set the specific name for each program
- Flowrate
  - ➢ To set the flowrate for each program
  - ➢ It is available in both measurement unit of kg/min and lbs/min

✓ Once the selected program is started, the the process will be carried out based on the pre-set flowrate value until it is completed.

✓ Changing of program/flowrate value in the mid of process will not changing the process outcome.

✓ Program Select by Product Select Bits Digital Input from behind of FlowMaster Controller

3.5 Calibration

Calibration is used to calibration valve's equation and analog input offset.

- To calibration valve's equation, there is a **Calibration Manual** show details calibration procedure of UltimateValve.
- To adjust AI1 analog input offset, just need to key in the value of ADC shown in red circle below into Analog Setting Page, while 10V is applied into AI1.
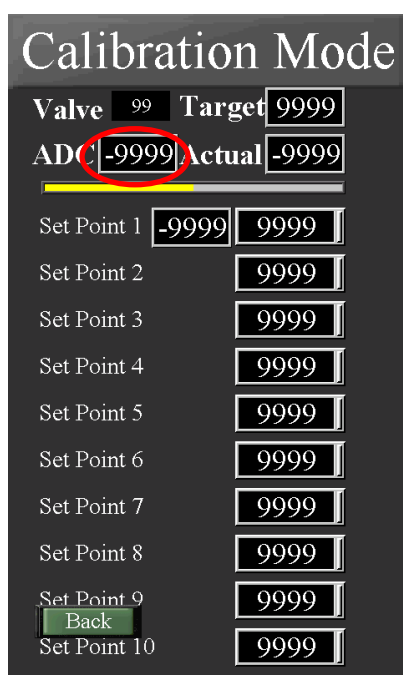
4.0 CONTROL PROCEDURES

```
                    ┌──────────┐
                    │   Mode   │
                    └──────────┘
                    ┌─────┴─────┐
              ┌──────────┐  ┌──────────┐
              │   Auto   │  │  Manual  │
              └──────────┘  └──────────┘
              ┌─────┴─────┐
        ┌──────────┐  ┌──────────┐
        │  Analog  │  │ Program  │
        └──────────┘  └──────────┘
```
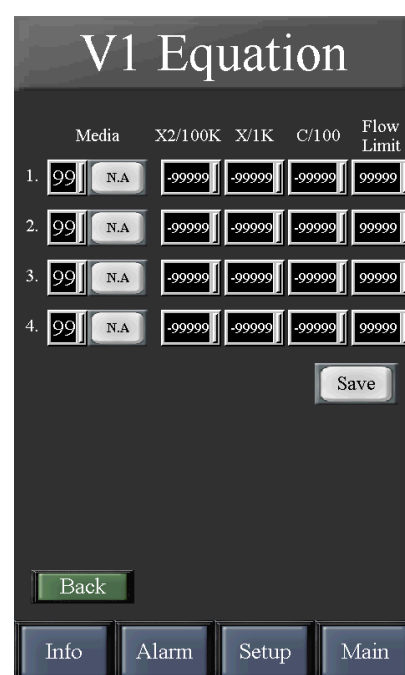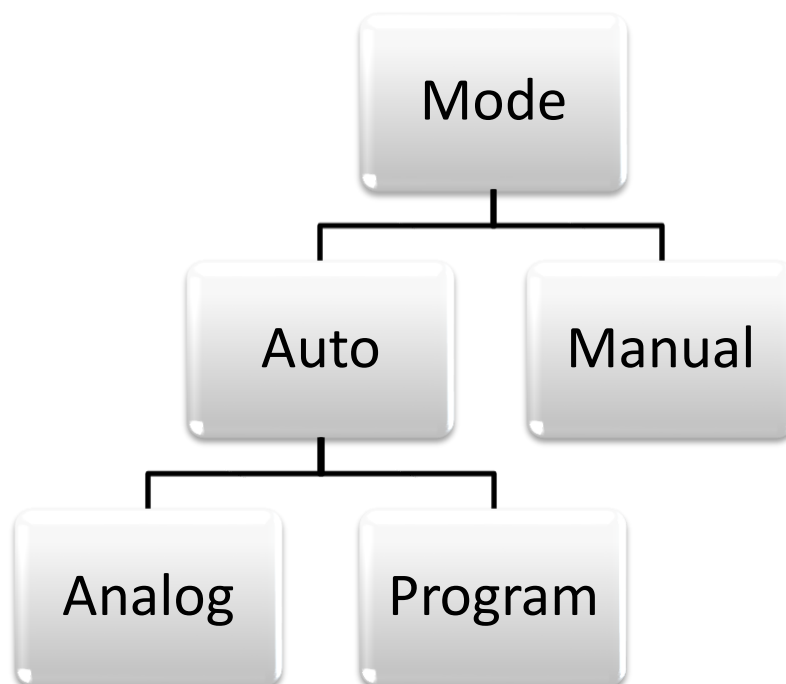
There are two different operation modes can be selected which is auto mode and manual mode whereby auto consists of two sub-modes which are analog and program while manual mode setting can be adjusted from the main page.

Note: Auto Mode is closed loop control of valve.

Note: Manual Mode is open loop control of valve.

4.1   Analog Mode a.k.a Remote Control

Analog Mode is used when user want to remote control FlowMaster by programmer logic controller PLC's voltage (0-10V). The procedure is listed below:

Analog mode's procedure for Valve ID 1:

1) Make sure UltimateValve to FlowMaster is tightly connected as shown in **5.0 Wiring Diagrams** in **UltimateValve User Manual.**
2) Power up FlowMaster and UltimateValve.
3) Select Auto and Analog in Configuration Page.
4) Select either kg or lbs unit.
5) Connect PLC's analog output (0-10V) and it's common to AI1 and AIC respectively as shown in **Figure 1.4 Basic Pin Connection.**
6) Make sure the UltimateValve is calibrated and configured. If not please refer to **UltimateValve Calibration Manual** for further calibration procedures.
7) Supply adequate voltage to FlowMaster to get desired Flow Rate by formula below:

$$Vout = \frac{Desired\ Flow\ Rate}{Flow\ Limit} x10V$$

8) Activate the UltimateValve by supply 24V and 0V into DI1 and DIC or long press 3sc Valve On button in Main Screen. Flow rate will be regulated afterward.
9) Deactivate the UltimateValve by supply 0V into DI1 or long press 3sc Valve On button in Main Screen when valve is regulating the flow rate.
10)   Flow rate's voltage feedback can be obtain from AO1 and reference to AOC, the formula shown as below:

$$Actual\ Flow\ Rate = \frac{Vout}{10V} xFlow\ Limit$$

Note: AIC and AOC must separate from the power's ground for more accurate reading.

11)   Alarm and ValveOn Status can also be obtained from DO5 and DO1 respectively, remember to connect DOC when using Digital Output.
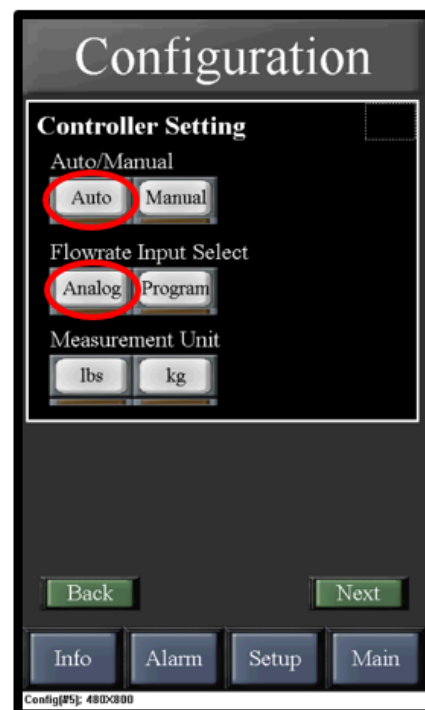
4.2   Program Mode a.k.a Local Control

Program Mode is used when user want to control UltimateValve without remote control by any PLC. The procedure is listed below:

Local mode's procedure for Valve ID 1:

1) Make sure UltimateValve to FlowMaster is tightly connected as shown in **5.0 Wiring Diagrams** in **UltimateValve User Manual.**

2) Power up FlowMaster and UltimateValve.

3) Select Auto and Program in Configuration Page.
4) Select either kg or lbs unit.
5) Go to Program Setting Page to configure desired recipe settings shown in **3.4 Program Setting**.

6) Without six PLC's digital outputs, ground/ connect 0V into Product Select Bit 0-5. Use Recipe 0 to alter desired flow rate.
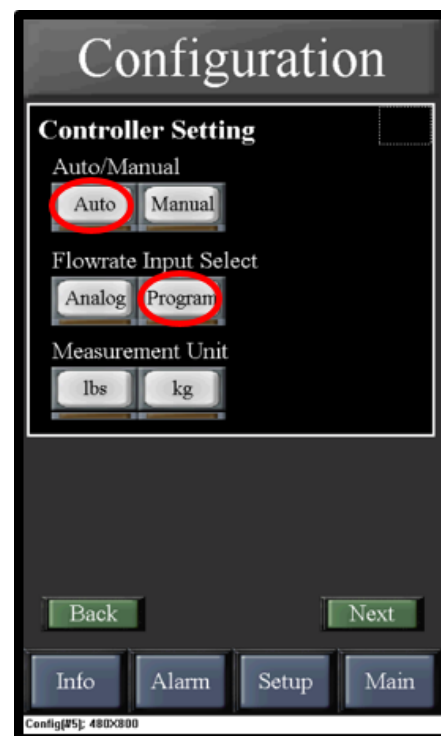
   Note: **Only required input one flow rate into kg/min or lbs/min, depend on which measurement unit is selected.**

7) With six PLC's digital outputs, you can select the recipe by using the digital output of PLC into digital input Product Select bits DI10-DI5 in FlowMaster. Table below shows the respective Product Select Bit x to DIx.

DI5	Product Select Bit 5
DI6	Product Select Bit 4
DI7	Product Select Bit 3
DI8	Product Select Bit 2
DI9	Product Select Bit 1
DI10	Product Select Bit 0

8) Select the correct recipe with correct Product Select Bits selected as shown in table below.

Recipe	Product select Bit 5	Product select Bit 4	Product select Bit 3	Product select Bit 2	Product select Bit 1	Product select Bit 0
0	0	0	0	0	0	0
1	0	0	0	0	0	1
2	0	0	0	0	1	0
3	0	0	0	0	1	1
4	0	0	0	1	0	0
5	0	0	0	1	0	1
6	0	0	0	1	1	0
7	0	0	0	1	1	1

| 62 | 1 | 1 | 1 | 1 | 1 | 0 |
| 63 | 1 | 1 | 1 | 1 | 1 | 1 |

9) Product Name will be show in the main page to verify correct recipe selected.

10) Make sure the UltimateValve is calibrated and configured. If not please refer to **UltimateValve Calibration Manual** for further calibration procedures.

11) Activate the UltimateValve by supply 24V and 0V into DI1 and DIC or long press 3sc Valve On button in Main Screen. Flow rate will be regulated afterward.

12) Deactivate the UltimateValve by supply 0V into DI1 or long press 3sc Valve On button in Main Screen when valve is regulating the flow rate.

13) Flow rate's voltage feedback can be obtain from AO1 and reference to AOC, the formula shown as below:

$$Actual\ Flow\ Rate = \frac{Vout}{10V} xFlow\ Limit$$

Note: AIC and AOC must separate from the power's ground for more accurate reading.

14) Alarm and ValveOn Status can also be obtained from DO5 and DO1 respectively, remember to connect DOC when using Digital Output.

4.3 Manual Mode

Manual Mode is open loop system control of UltimateValve. Open loop mean no sensor feedback to control valve's flow rate. Thus, no alarm in this mode.

Target Unit is opening percentage % of UltimateValve.

Actual Feedback Unit is kg/min or lbs/min depend on user selection.

Manual Mode's Procedure:

1) Select Manual Mode in configuration.

Note: After manual mode is selected, analog and program mode will be ignored.

2) Return to main page to adjust the target opening percentage of valve.
3) Make sure the UltimateValve is calibrated and configured. If not please refer to **UltimateValve Calibration Manual** for further calibration procedures.
4) Activate the UltimateValve by supply 24V and 0V into DI1 and DIC or long press 3sc Valve On button in Main Screen. Flow rate will be regulated afterward.
5) Deactivate the UltimateValve by supply 0V into DI1 or long press 3sc Valve On button in Main Screen when valve is regulating the flow rate.
6) Flow rate's voltage feedback can be obtain from AO1 and reference to AOC, the formula shown as below:

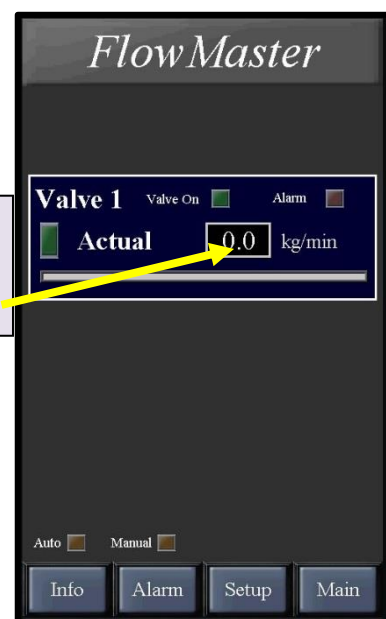$$Actual\ Flow\ Rate = \frac{Vout}{10V} x Flow\ Limit$$

Note: AIC and AOC must separate from the power's ground for more accurate reading.

7) ValveOn Status can also be obtained from DO1 and remember to connect DOC when using Digital Output.
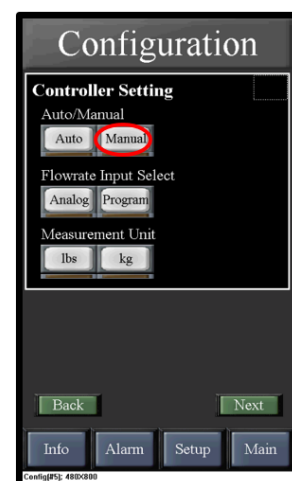
4.4 Factory Default Settings

FlowMaster's default settings is listed in table below:

Analog x Input Offset	3700u
Analog x Output Offset	0u
Auto/Manual	Auto
Kg/Lbs	Kg
Analog/Program	Analog
Vx Alarm Band	5%
Vx Alarm Delay	5sec
Vx Alarm Startup Delay	10sec

Note:
x represent 1, 2, 3, and 4 only.

4.5 Factory Default Password

FlowMaster's have two default passwords can be used by users, which are configuration password and calibration password. For secure reason, the password won't be written down anywhere in this manual.

Note: The only way to get the password is to contact the manufacturer.

FlowMaster's password can modified and change as customer request in purchase order before purchase the product or on factory password change service.

5.0 INSTALLATION

There are two (2) types of fixing method for the FlowMaster as shown:
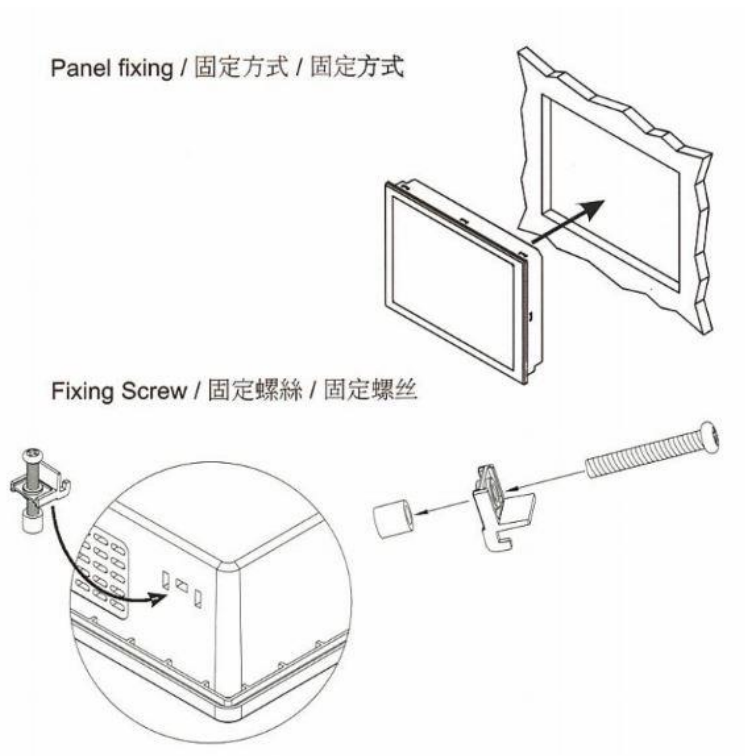
The dimension of the cut-out for panel fixing is as shown:
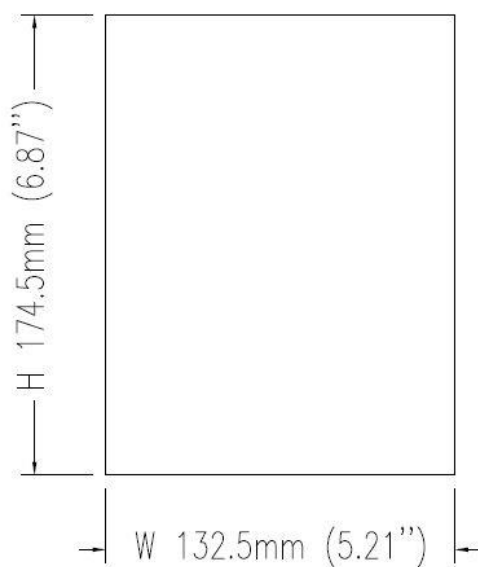
5.1   Connection of Cable

This FlowMaster can be connected to either single UltimateValve or multiple UltimateValve (up to four valves). It is a simple plug-and-play connection between the FlowMaster and UltimateValve. The quantity of cables required is depend on the numbers of UltimateValve – 1 cable for 1 valve, 2 cables for 2 valves.

For single-valve connection:
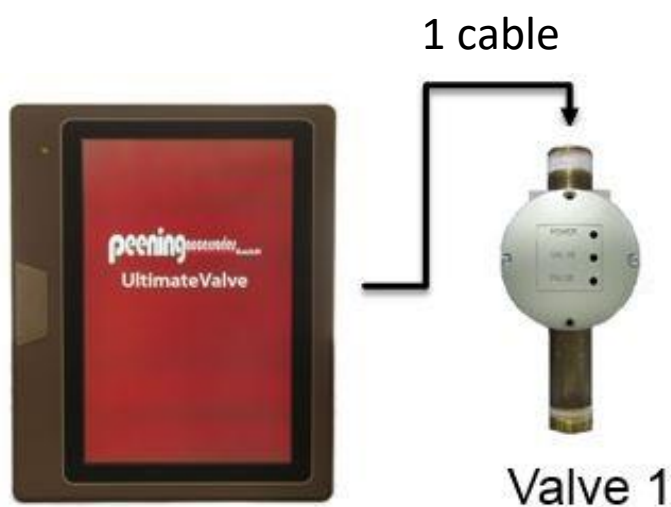
For multiple-valve connection:
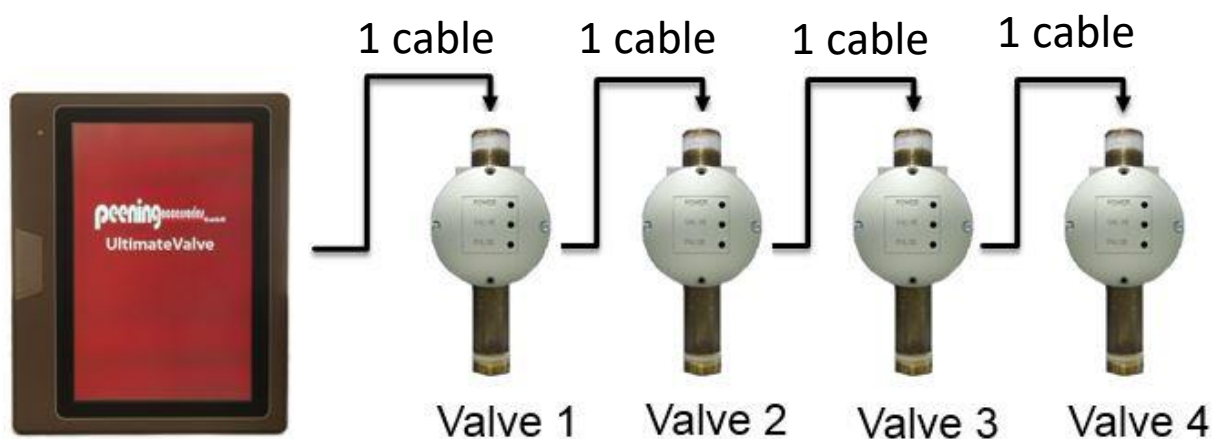
The cable is required to connect from the FlowMaster output port to UltimateValve input port (located top) to complete the installation.

If there are multiple valve to be installed, additional cable will be required to be connected from first valve output port (located bottom) to second valve input port (located top), and continue the same practice for the rest of connection of valve (if applicable).

Output to Next Valve
(If applicable)

Input from FlowMaster
or Previous Valve
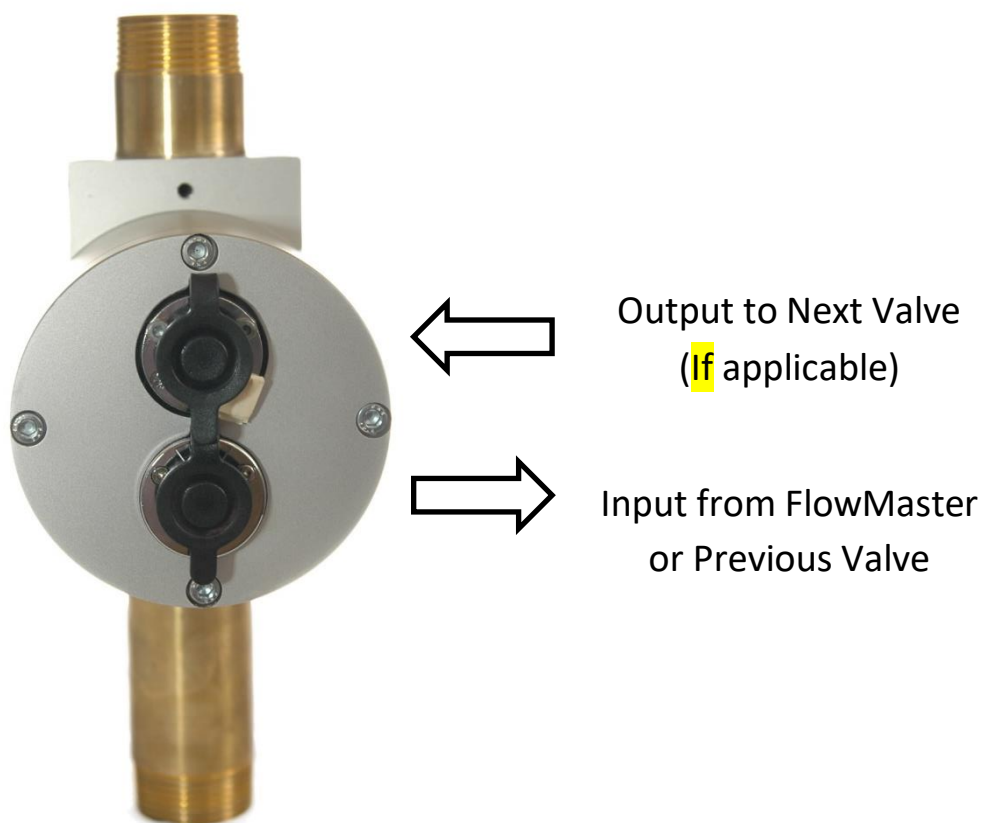
5.2 Dimension of FlowMaster

Note: Dimensions in mm
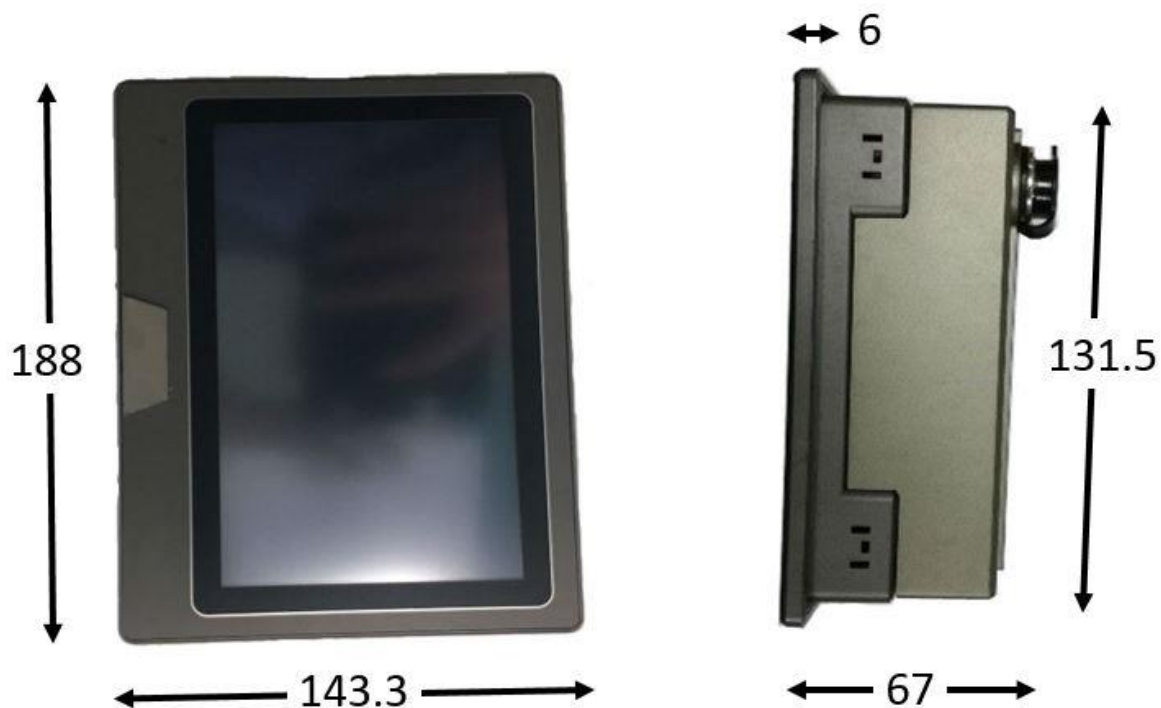
6.0 SPECIFICATIONS

Power	+24Vdc @ 0.4A
Inputs	
Digital Input	0/24V
Analog Input	0-10V
Outputs	
Digital Output	0/24V
Analog Inputs	0-10V
Weight	**1kg/2.2lbs**
Temperature	**0°C - 55°C (32 °F-131°F)**

7.0 FLOWMASTER WARRANTY

The warranty of this product is follow the terms and conditions below:

Warranty Period
One year from shipping date of the product.

Scope of Warranty
Labor and parts costs.

Limitations and Exclusions
- The product serial number or warranty seal has been removed, erased, defaced, altered, tampered or is illegible; or The product shows evidence of commercial use; impact, shock; accident; fire, flood, earthquake, lightning or other acts of nature; sand, liquid or food damage; exposure to extreme thermal or environment conditions beyond product specifications or a rapid change in such conditions; electrostatic discharge; batter or chemical corrosion; abuse, mishandling, improper installation, operation or maintenance, use of wrong electrical supply or voltage; damage during shipment to/from manufacturer authorized service center; improper alteration, modification, adjustment, tampering; replacement of parts with parts not provided or approved by manufacturer; or dismantling, opening, service or repair performed other than by manufacturer authorized center; or any other use contrary to the product manual. Missing accessories or external parts of the Product, unless is made within 7 days from the date of origin retail purchase;
- Cosmetic damage to outer surface/finishing and external parts of Product, including without limitation cracks, dents or scratches on the exterior casing;
- Deterioration of the Product due to normal wear and tear, including without limitation rust or stains;
- General maintenance, password reset assistance, routine servicing and cleaning, updating/upgrading of software, installation of software or applications, product demonstration, or any other service other than repair;
- To the fullest extent permitted by law, manufacturer shall not be in any way liable for any consequential, incidental, indirect, special or similar damages whatsoever arising from or in connection with the use, inability to use or performance of the Product, including without limitation loss of revenue, loss of profits, loss of opportunity, loss of business, loss of goodwill, loss of reputation, failure to realize savings or other benefits, loss of use of the Product or any associated equipment, loss of damage to other property due to the malfunction of the Product, costs of substitute equipment, loss due to downtime cost, costs of recovering, reprogramming or reproducing any program or data stored in or used with a system containing the Product, or loss, damage, corruption or compromise of data, whether due to breach of warranty, strict liability, product liability, the negligence of manufacturer, or otherwise, even if manufacturer is aware of the possibility of such damages. Manufacturer does not exclude or limit liability for personal injury of death resulting from manufacturer's negligence.
- In no event shall any recovery against manufacturer exceed the actual price paid for the purchase of the Product.
- Without limiting the generality of the foregoing, you assume all risk and liability for loss, damage or injury to you and your property and to any third parties and their property arising out of the use, misuse or inability to use the Product not caused directly by the negligence of manufacturer.
- You agree and acknowledge that manufacturer's limitations and exclusions of liability are reasonable in the circumstances.

Obtaining Warranty Service

Prior to making a claim under this warranty, please contact the manufacturer by email or telephone with the following information:

- Name of contact person
- Company name
- Return shipping location
- Product model
- Product serial number

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- Retails Purchasing Date

If a valid claim is made on a valid warranty during the Warranty Period, manufacturer will repair any defective parts free of charges within a reasonable period of time, and restore the product to its proper condition. If the defective product cannot be repaired, it will be replaced with a new unit and the original warranty date will be continue from previous product. The product should be properly packed to prevent damage in return transit. Manufacturer will not responsible for any risk of loss or damage during return shipment.

If the product is out of its warranty period, customer need to issue purchase order to manufacturer prior to repair. If the product cannot be repaired, customer can purchase new unit of valve or refurbished unit at a discount price with six (6) month warranty.

Manufacturer reserved the right to vary the warranty of this Products from state to state.