Floswitch TS

Operation Manual

Part Number 079-0203

Spectron Gas Control Systems

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Contents

Important Safety Information

Read and understand the safety warnings on page 4 before installing this equipment

Failure to do so can result in *Personal Injury or Death.*

Warnings:

Warnings, like the example shown below are found throughout the manual to point out *hazards* which could cause *personal injury or death* if proper procedures are not followed:

All installation personnel MUST read and understand the safety warnings section before installing this equipment

System Hazards:

Possible hazards when **installing** this equipment are exposure to:

- Pressurised Gases
- Electrical Hazard

Do not make any changes to the equipment independently. Injury or death may result from unauthorised modifications. If equipment needs to be modified a Spectron Gas Control Systems representative must be contacted

Safety Warnings

Please read the following safety warnings before installing the equipment

1. Introduction

This section is meant to communicate to the user any hazards involved with the equipment.

The following paragraphs will define the hazard warnings used and describe the icons found in various sections of the manual.

2. Level or intensity of Hazard

Indicates an immediate hazard, which if not avoided, will result in death or serious injury

Indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury

Indicates a potentially hazardous situation, which if not avoided may result in minor or moderate injury. It may also be used to alert against unsafe practices.

3. Hazard Types (symbols)

This symbol represents Electric Shock Hazard

This symbol represents a compressed gas hazard

This symbol is a safety alert

Installation

The Floswitch TS should be mounted to a suitable wall or framework, using four fixings maximum diameter 4.8mm. Once the Floswitch TS is mounted, the four red plastic sealing blanks should be fitted over the fixings to maintain the IP65 rating.

An optional angled wall mounting bracket is available from Spectron.

Mains Power Connection

Mains Voltage is present inside the Floswitch TS enclosure if not isolated at the Switched Fused Outlet. Caution must be taken to identify Live Connections whilst working inside the enclosure.

The Floswitch TS is shipped with a 3 metre hard wired cable which can be cut to the required length; this should be connected to a Double Pole switched fused outlet fitted with a 3 Amp fuse. The Floswitch TS is isolated from the Mains Power supply by a 2 AMP Miniature Circuit Breaker (MCB fitted inside the Floswitch TS enclosure). All Earth wires are connected via the power supply to the facility Earth.

Sensor Connection

Mains Voltage is present inside the Floswitch TS enclosure if not isolated at the Switched Fused Outlet. Caution must be taken to identify Live Connections whilst working inside the enclosure.

It is essential that polarity of the sensors is checked and if required, maintained. A short circuit during sensor connection will cause the 24V control fuse to break.

All sensors are to be of the two wire type, the cable (max diameter 6mm) should be passed through one of the glands on the base of the unit (after removing the blanking spool) and connected as per the electrical connection diagram on page 8 the maximum stripped back wire diameter allowed is $1.5mm^2$.the connections points are of the spring cage type and require the release button to be depressed to insert the wire. If necessary, it is possible to remove the plug for easier access

Pneumatic Connection

⚠CAUTION

Installers must be aware of the hazards associated with compressed air/inert gas and be competent in the fitting of associated equipment.

The solenoid valves require a supply of Clean Dry Air (CDA) or Nitrogen filtered to 10µm and regulated to 5.5 bar g Max. This is connected via a 4mm push in fitting on the base of the unit as indicated by the label. Any exhaust from the solenoid valves is vented internally and excess pressure build-up is vented to atmosphere via an IP65 breather on the base of the unit. The solenoid outputs are connected via four 4mm push in fittings as indicated by the label on the base of the unit.

Introduction

The Floswitch TS is an automatic valve controller with a Graphical User Interface (GUI) that is designed to be operator friendly whilst operating in a safe and logical manner.

A dedicated input is available for an Emergency Stop Button if the customer requires this, which is linked out as a standard shipment.

Each Floswitch TS controller is capable of receiving and acting upon up to ten User digital inputs that can be normally open or normally closed, as well as eight User analogue (4-20mA) signals. There are also four Form C volt free relay outputs for reporting the valve status. These are connected to the controller through glanded ports in the base of the controller and a prefabricated I/O board in the base of the controller enclosure.

Power to the controller is provided via a three core power lead that is hard wired to the controller and exits through the base of the controller enclosure.

The complete enclosure assembly has an environmental rating of IP65.

The controller is designed to operate in three different customer selectable formats:

The first of these allows two types of gas source to each have two supply cylinders that automatically change over when the cylinder contents are depleted allowing continuous supply of process gas. This can be achieved by valves upstream or downstream of the regulator

The second format can be utilised as an auto changeover source with the addition of two extra valves that could be used for shutdown of other gas sources in the case of Emergency.

The third format is used for Emergency shutdown of four independent gas sources.

Wherever valves are configured as independents, they can be enabled/disabled from the configuration screen

All controller actions which require an input from an operator are protected by a dual layer password system that allows up to five trained operators to have different operational access via their own Personal Identification Number (PIN)

Configuration of the controller type, digital and analogue inputs and alarm settings are all set via the GUI.

Access Levels Matrix

Operation	Level 0	Level 1	Level 2
Horn Silence	**Yes**	**Yes**	**Yes**
View Analogue Displays	**Yes**	**Yes**	**Yes**
View Alarms Screen	**Yes**	**Yes**	**Yes**
Enable Manual Shutdown	**No**	**Yes**	**Yes**
Enable Service	**No**	**No**	**Yes**
Enable Manual Control	**No**	**No**	**Yes**
Enter Configuration	**No**	**No**	**Yes**

Specification.

Digital Inputs

- Dry contact
  High Logic Voltage: 24VDC
  Low Logic Voltage: 0VDC
  Current Load, typical: 8mA
  Maximum conductor diameter 20AWG (0.518mm^2)

Analogue Inputs

- Transducer
  Supply Voltage 24VDC (provided from power supply)
  Maximum conductor diameter 20AWG (0.518mm^2)

Digital Outputs

- Indicator lamps
  Voltage, maximum permissible: 24VDC
  Current, maximum permissible: 80mA
- Dry Contact, VOUT1 to VOUT4
  Form C relays (NO,COM,NC)
  Maximum conductor diameter 20AWG (0.518mm^2)

Solenoid Valve

- Voltage: 18 to 30 VDC
- Current: 20mA
- Pressure: maximum operating

Ambient Physical Requirements

- Temperature
  Operating 0 to 45°C
  Storage -40 to 85°C

- Relative humidity, maximum 95% at 32°C

- Environmental Rating IP65

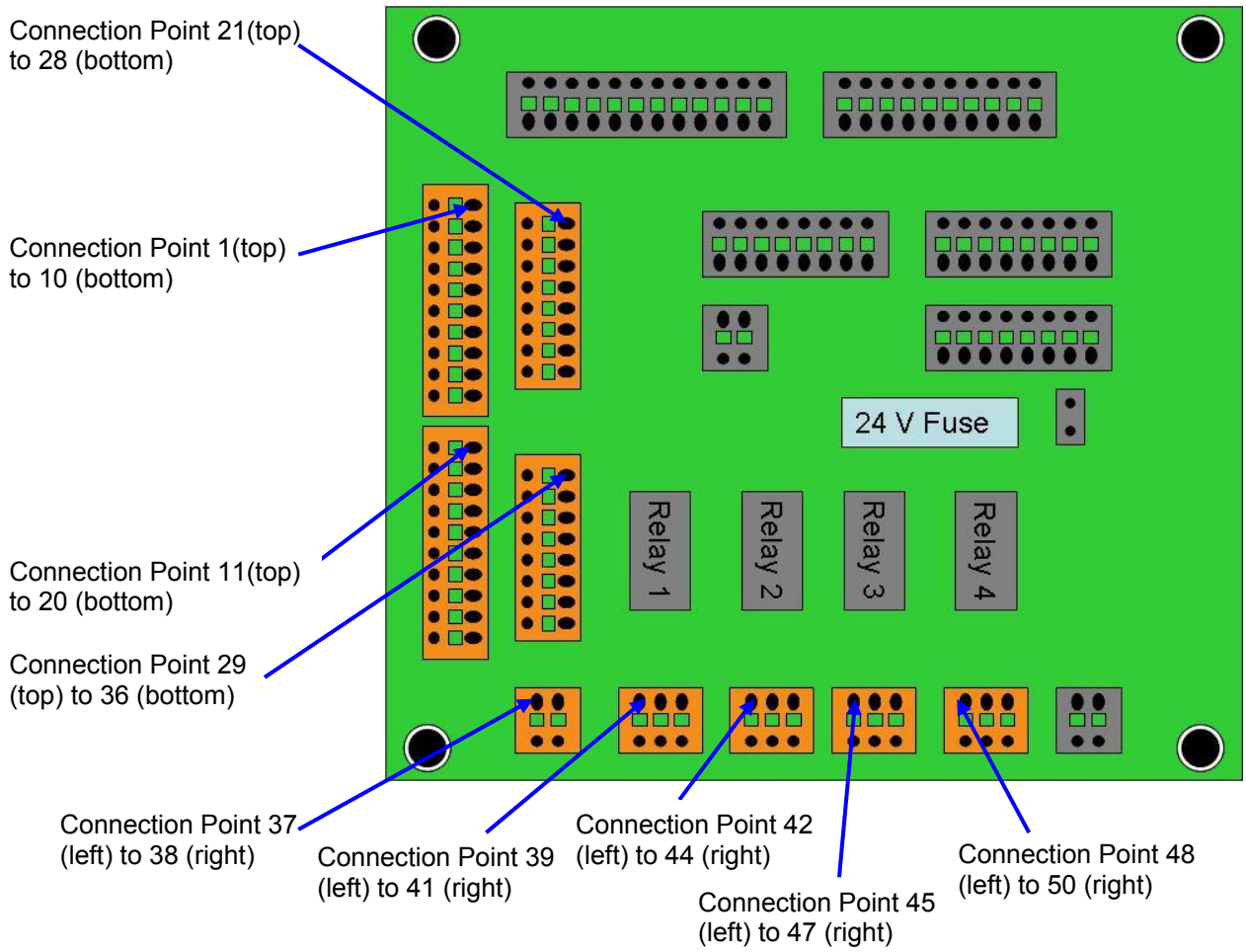
Utility Requirements

- Line power: 100 240 VAC, 47-63Hz, 1A
  Inrush current limitation <45A, <3mS
- Pneumatic Actuation Gas
  Dry Air or Nitrogen at 5.5 bar and 1 slpm, filtered to 10µm

Circuit Breakers and Fuses

- Line power circuit breaker, from 2A, characteristic C, inside enclosure
- 24VDC protection fuse 1.25A mounted on baseboard

Electrical Connection Diagram



Digital Inputs	
Signal	Connection Point
DIN1 +24Ve	1
DIN1 Signal	2
DIN2 +24Ve	3
DIN2 Signal	4
DIN3 +24Ve	5
DIN3 Signal	6
DIN4 +24Ve	7
DIN4 Signal	8
DIN5 +24Ve	9
DIN5 Signal	10
DIN6 +24Ve	11
DIN6 Signal	12
DIN7 +24Ve	13
DIN7 Signal	14
DIN8 +24Ve	15
DIN8 Signal	16
DIN9 +24Ve	17
DIN9 Signal	18
DIN10 +24Ve	19
DIN10 Signal	20

Analogue Inputs	
Signal	Connection Point
AIN1 +24Ve	21
AIN1 Signal	22
AIN2 +24Ve	23
AIN2 Signal	24
AIN3 +24Ve	25
AIN3 Signal	26
AIN4 +24Ve	27
AIN4 Signal	28
AIN5 +24Ve	29
AIN5 Signal	30
AIN6 +24Ve	31
AIN6 Signal	32
AIN7 +24Ve	33
AIN7 Signal	34
AIN8 +24Ve	35
AIN8 Signal	36

EMO and Valve Status	
Signal	Connection Point
EMO Signal	37
EMO +24Ve	38
VOUT1 NO	39
VOUT1 COM	40
VOUT1 NC	41
VOUT2 NO	42
VOUT2 COM	43
VOUT2 NC	44
VOUT3 NO	45
VOUT3 COM	46
VOUT3 NC	47
VOUT4 NO	48
VOUT4 COM	49
VOUT4 NC	50

Configuration.

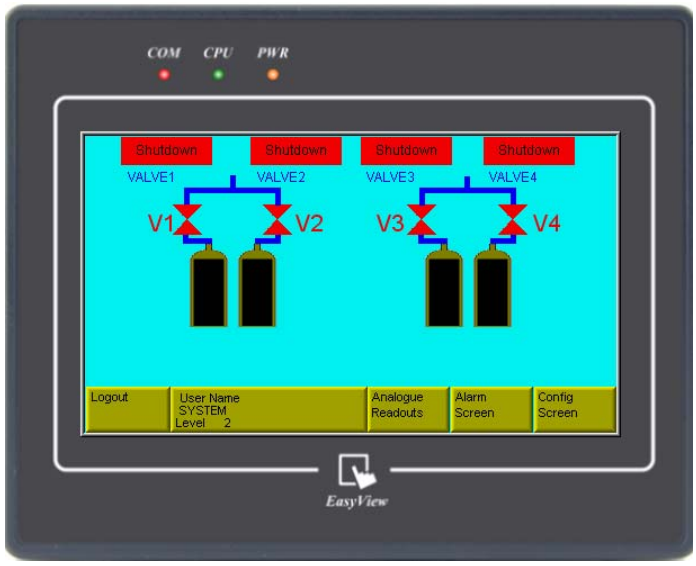
For this operation manual we will assume that this a first time setup and follow through from Default Settings

On power up, the controller will display the following screen:

Initial Start-up Screen

Touching the Load Default Settings button will set the controller to a dual auto changeover system and de-activate all alarms, all digital and analogue inputs will be de-activated and all passwords set to default values.

Touching the Load User Settings will load up all previously configured settings.

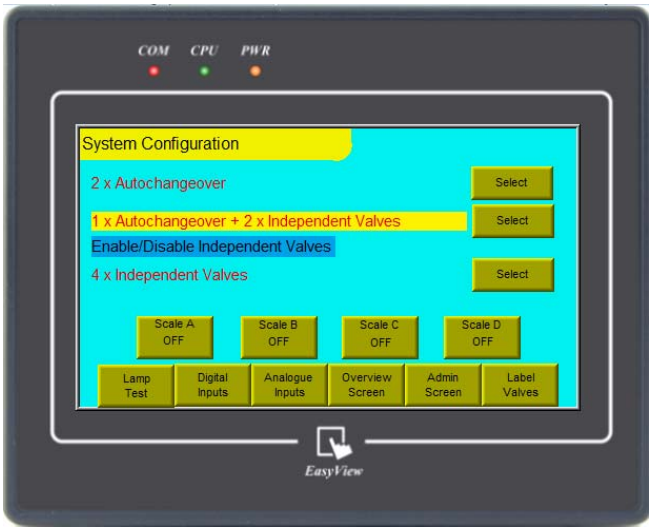


Dual Auto Changeover overview Screen

The only active buttons at the current level (not logged in) are to view the Analogue Readouts and alarm Screen. In order to login, touch the Login button on the control bar, this will popup a numerical input keypad. The default level two PIN is 1111 and will access all controller operations. On correct entry of a PIN the popup will close and the legend on the Login button will change to Logout. If an

attempt is made to input an incorrect PIN then the popup will close and an error message will be displayed.

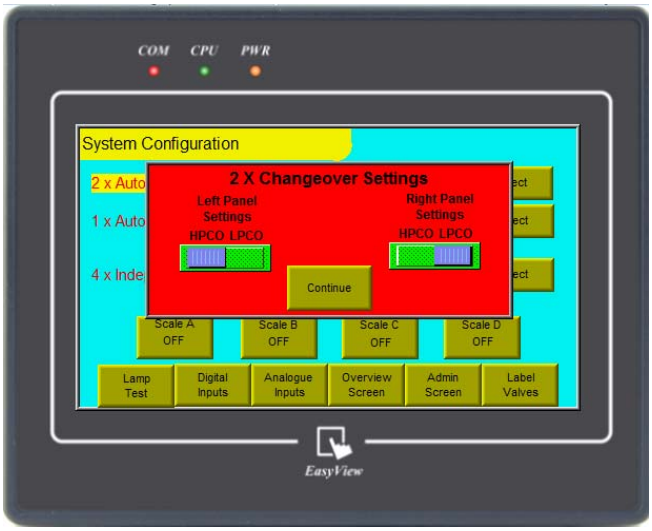
Once an operator is logged in at level 2, the system can be configured as required. Touching the Config Screen button will open the System Configuration window.



System Configuration Window

From this window it is possible to select the type of controller by touching the appropriate button; this will open a confirmation popup. The selected controller type will be highlighted.

If a changeover system is selected then after the confirmation screen has been acknowledged, a popup window will appear allowing the operator to select changeover by valves on the High Pressure (HPCO) side of the regulator or by valves on the Low Pressure side of the regulator (LPCO), this is determined by the hardware that the Floswitch TS is connected to.



Changeover settings popup window

Once this window is closed the configuration window is active again, it is possible to incorporate a scale platform for each liquefied gas cylinder from this screen.

Note:

Activating a cylinder scale from this window will automatically allocate an analogue input channel, these allocated channels will have the channel name, zero and span automatically installed as well as the engineering unit. These channels cannot be re-allocated later in the configuration.

After the initial controller type configuration it is possible to configure the digital and analogue inputs, there is no order in which this must be done and is at the discretion of the user.

It is also possible to alter the passwords and user names by touching the Admin Screen button and to install valve labels that will differentiate the valves according to the user's protocol by touching the Label Valves button.

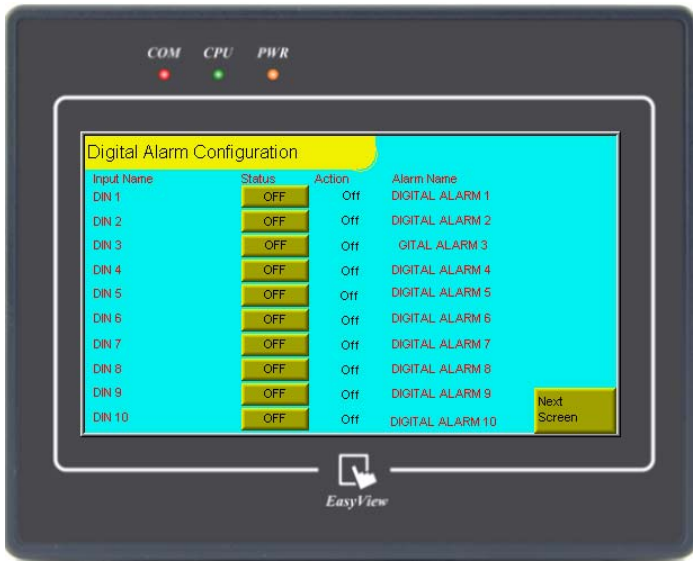
Touching the Overview Screen button, will return the Operator to the Main Screen.

Touching the Digital Inputs button opens the following window

Digital Input Configuration Window

Touching on the input name (for example, DIN1) will popup an alphabetical keyboard which the Operator can use to name the input allocated to the channel for ease of use (max 16 characters). Once entered, the name will be displayed under the Input Name. Touching the toggle switch next to the channel being configured allows the Operator to select either a Normally Open contact (NO) or a Normally Closed contact (NC). Touching the Delay (sec) button, opens a numerical popup window which allows an adjustment of delay time from the initial detection of a contact state change to the activation of an associated alarm, the range is 0 to 15 seconds.

Once all channels have been configured as required pressing the Next Screen button will open the following screen.



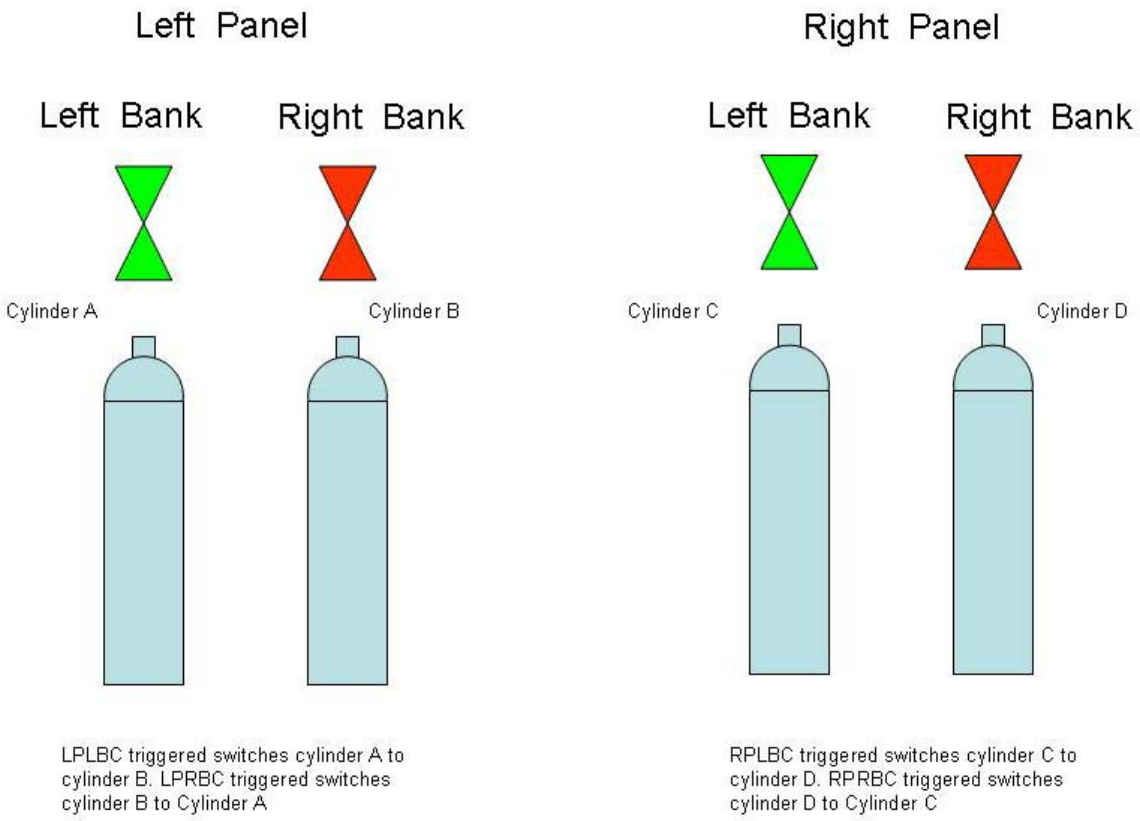
Digital Alarm Configuration

As the inputs have been configured previously, the names of the inputs are automatically carried over to this screen, Touching the OFF button will activate the alarm status and change the legend to ON.

NOTE:
Configuring an alarm at this point will not activate the actual alarm; Alarms will not be fully active until the operator has exited the configuration screen.

It is now possible to set the action of the alarm; there are seven possible states of alarm which are listed, along with a brief description in the table below:

Action	Description
OFF	The alarm has no action
Warning	The alarm is active but will not operate on any valves
Shutdown	The alarm is active and will close any associated valves
LPLBC	The alarm is active and will operate on the left bank of an auto changeover system on the left hand panel
LPRBC	The alarm is active and will operate on the right bank of an auto changeover system on the left hand panel
RPLBC	The alarm is active and will operate on the left bank of a dual auto changeover system on the right hand panel
RPRBC	The alarm is active and will operate on the right bank of a dual auto changeover system on the right hand panel



Digital Alarm Configuration Screen with alarm actions set (example)

It is also possible to re-label the alarm name; by touching the alarm name an alphabetical keyboard will popup allowing the operator to type in the name of the alarm for easy reference (max 16 characters).

Once all alarms have been configured pressing the Next Screen button will open the following window:

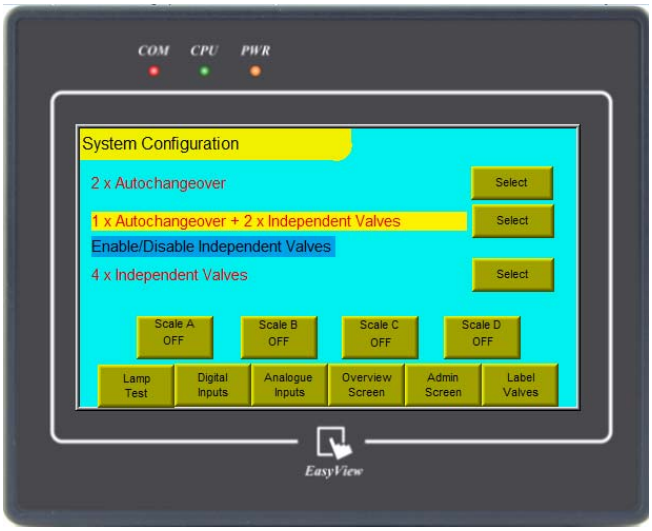
Alarm to Valve – Digital

This window allows the operator to configure which valves the alarm will operate on if it is configured for Shutdown. All other states that do not require operator action are indicated by text labels.

When an alarm is configured for shutdown four toggle switches are available for editing, labelled V1 through V4. Touching a toggle switch will change the colour from red (shutdown inactive on that valve) to Green (shutdown active on that valve). This way the Operator can tailor the system to their requirements.

(For example, a gas detection input on Digital input 4 is only to shutdown one particular gas cylinder controlled by valve V3).

Once all alarm to valve configuration is done, pressing the Config Screen button will return the Operator to the System Configuration Window.



System Configuration Screen

Touching the Analogue Inputs button opens the following window

Analogue Input Configuration Window

Touching on the input name (for example, AIN1) will popup an alphabetical keyboard which the Operator can use to name the input allocated to the channel for ease of use (max 16 characters). The status of the analogue input can be togged between on and off by using the appropriate status button. Should an analogue input be switched off, then all alarms assigned to that input will be switched off as well, all labels and settings will be returned to the default settings

Note:

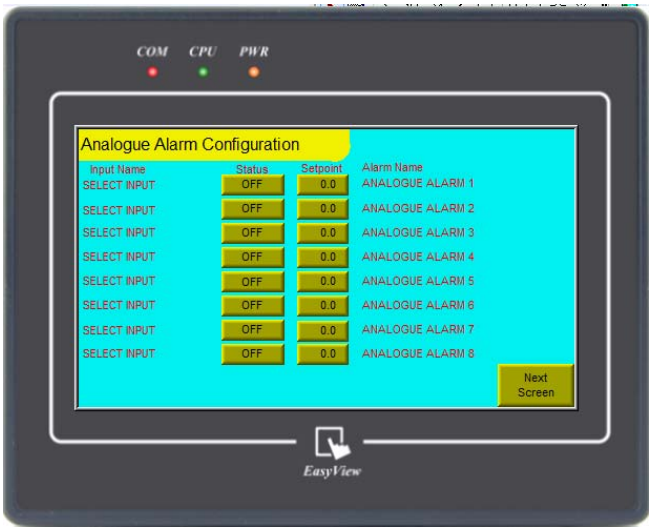
If a cylinder scale has been set from the System Configuration Window, the allocated channel(s) will have the channel name, zero and span automatically installed as well as the engineering unit. These channels cannot be re-allocated during this configuration but may have the span adjusted for differing scale platforms

The operator can then input the zero and span of the device attached to the input as well as selecting the Engineering unit to be displayed (SI Units or Imperial)
Once all channels have been configured as required pressing the Next Screen button will open the following screen.

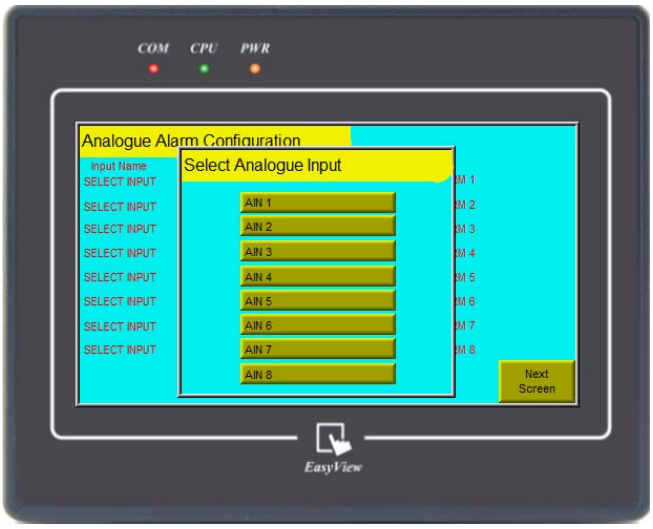
NOTE:

Configuring an alarm at this point will not activate the actual alarm; Alarms will not be fully active until the operator has exited the configuration screen.

The Floswitch TS allows multiple alarms to be assigned to a single analogue input, the first stage is to select the analogue input to be used by touching on the “select Input” associated with the alarm, this will open a popup window were all the analogue inputs will be visible. Touching an input will assign that input to the alarm being edited. This can be repeated for all analogue alarms



Select input Screen



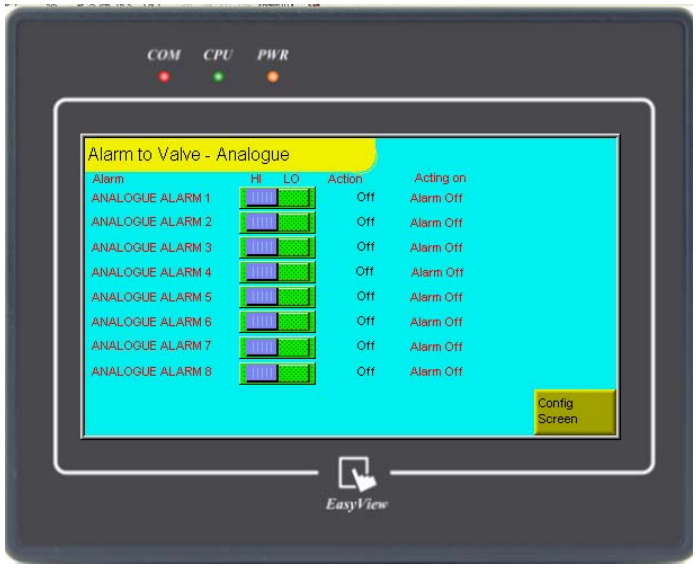
Input screen with popup

Analogue Alarm Configuration

As the inputs have been configured previously, the names of the inputs are automatically carried over to this screen, Touching the OFF button will activate the alarm status and change the legend to ON.

Touching the Set point button will popup a numerical keypad to enable the Operator to input the Threshold value for the alarm. It is also possible to re-label the alarm name; by touching the alarm name an alphabetical keyboard will popup allowing the operator to type in the name of the alarm for easy reference (max 16 characters).

Once all alarms have been configured pressing the Next Screen button will open the following window:

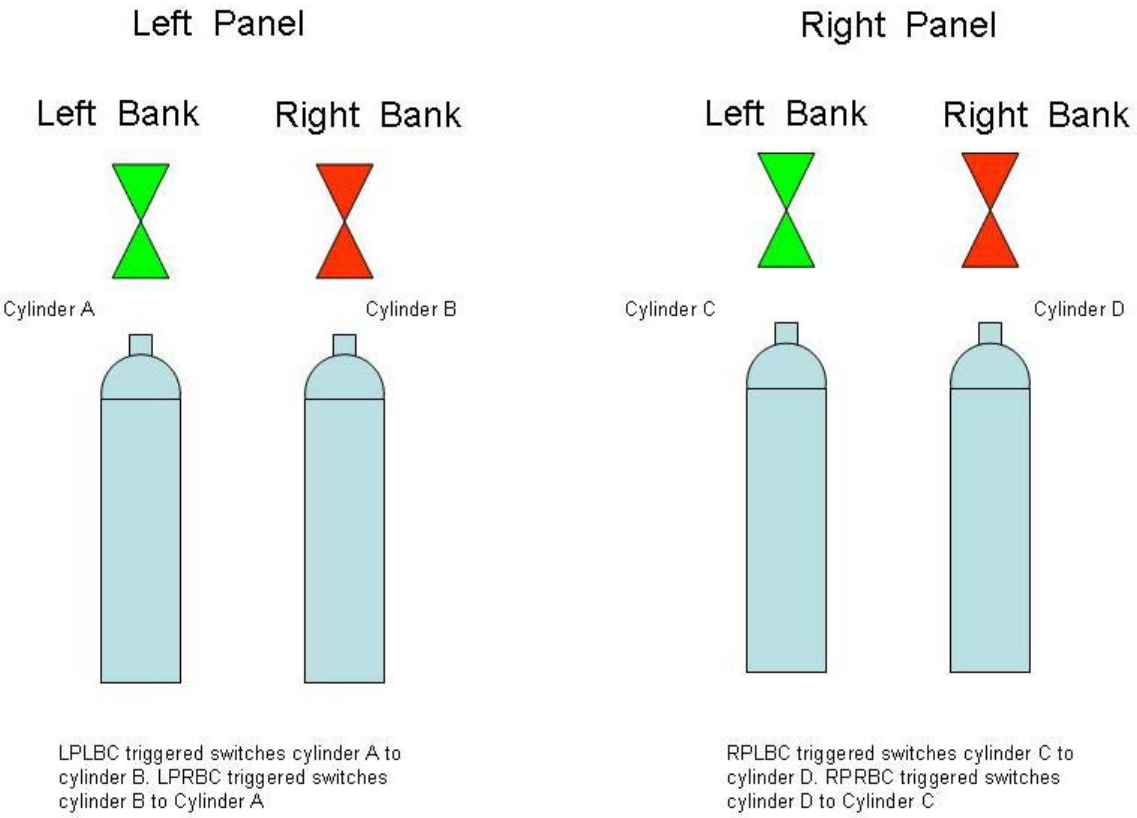


Analogue Alarm to Valve Configuration Screen

The Operator also has the option of determining whether the alarm should be set as on ascending (high) or descending (low) the threshold.

It is now possible to set the action of the alarm; there are seven possible states of alarm which are listed, along with a brief description in the table below:

Action	Description
OFF	The alarm has no action
Warning	The alarm is active but will not operate on any valves
Shutdown	The alarm is active and will close any associated valves
LPLBC	The alarm is active and will operate on the left bank of an auto changeover system on the left hand panel
LPRBC	The alarm is active and will operate on the right bank of an auto changeover system on the left hand panel
RPLBC	The alarm is active and will operate on the left bank of a dual auto changeover system on the right hand panel
RPRBC	The alarm is active and will operate on the right bank of a dual auto changeover system on the right hand panel

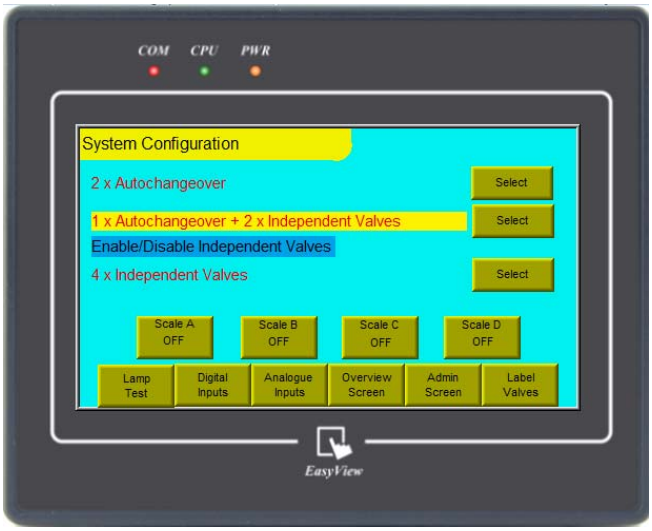


This window also allows the operator to configure which valves the alarm will operate on if it is configured for Shutdown. All other states that do not require operator action are indicated by text labels.

When an alarm is configured for shutdown four toggle switches are available for editing, labelled V1 through V4. Touching a toggle switch will change the colour from red (shutdown inactive on that valve) to Green (shutdown active on that valve). This way the Operator can tailor the system to their requirements.

(For example, a gas detection input on Analogue input 4 is only to shutdown one particular gas cylinder controlled by valve V3).

Once all alarm to valve configuration is done, pressing the Config Screen button will return the Operator to the System Configuration Window.

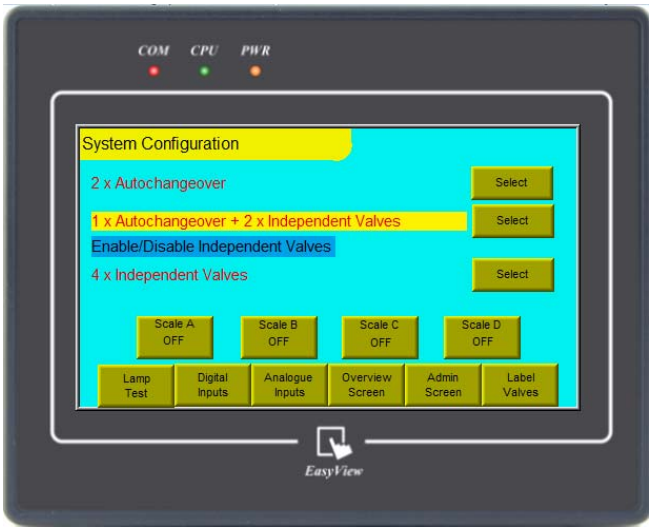


System Configuration Screen

Touching the Admin Button will open the following window.

Administration Screen

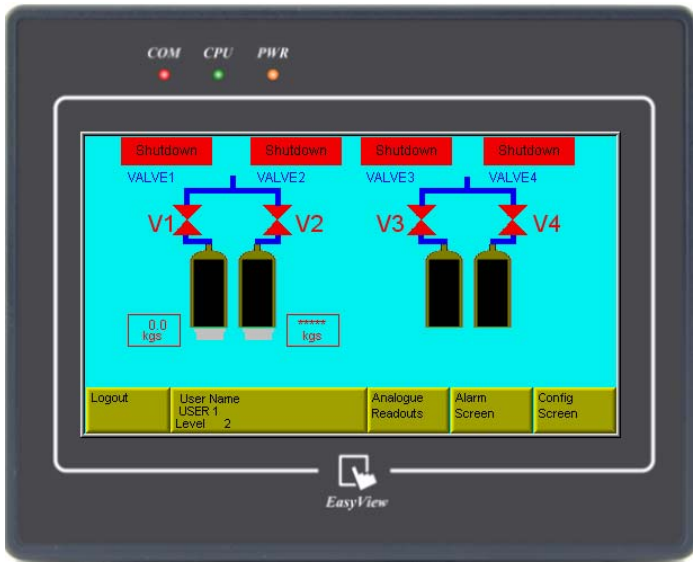
From this screen the Operator can edit the user name. By touching the appropriate User, an alphabetical keyboard will popup allowing the input of a new name (max 16 characters). By touching on the PIN number, a numerical keypad will popup, allowing editing of the 4 digit PIN number in the range of 1111 to 9999. Touching the Level button will cycle through the three available access levels of Disabled, Level 1 and Level 2. When editing is finished, touching the Config Screen button will return the Operator to the Configuration Screen.



Configuration Screen

Touching the Label Valves button will open a widow which enables the Operator to install easy self reference labels for the valves which are hard identified by the V* number. This purely an aid to Operators for service.

Touching the Overview Screen button, exits the configuration Screen and displays the main operation screen.

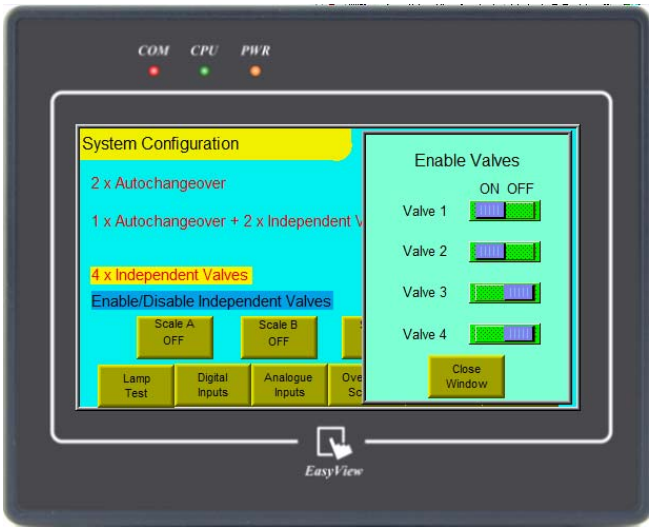


Dual Auto Changeover Screen with one System configured for Scales

Configuring Independent Valves

If a system has been selected with independent valves, it is possible to disable any that are not currently in use, this then releases the LED indicators to indicate the correct automatic operation as well as preventing accidental operation of pneumatic solenoid valves that might not be connected

From the configuration screen, touch the label Enable/Disable Independent Valves that has a blue background, this will open a popup window as shown below



4 independent valve configuration popup

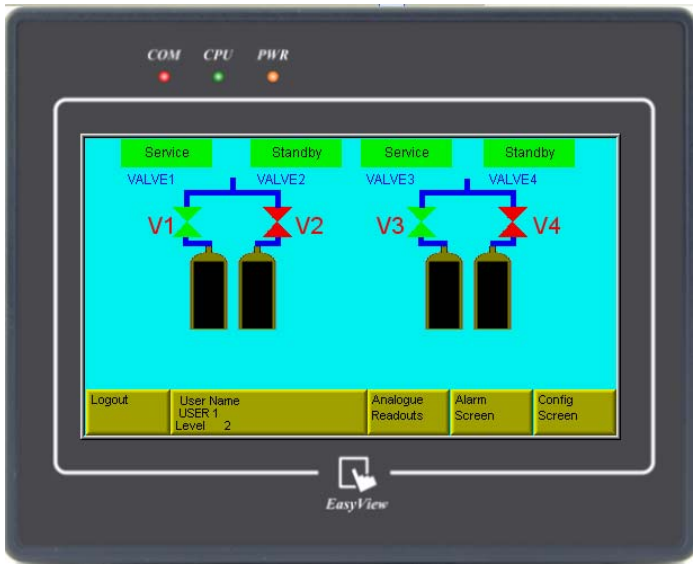
By adjusting the toggle switches, the operator can decide which valves they want operational and which they don't, touching the close window button will close the popup

Operation

With the configuration of the Floswitch TS complete, provided that the Operator has the correct access level according to the PIN entered; (see Access Matrix on page 4) it is now possible to put the system into service. Touching the valve status label located above each valve will open a Commands popup.

Valve Status indicated by the colour of the valve, a solid red colour indicates that the pneumatic supply is off; a solid green colour indicates that the pneumatic supply is on. It is the Operators responsibility to check whether associated equipment is of the right orientation.

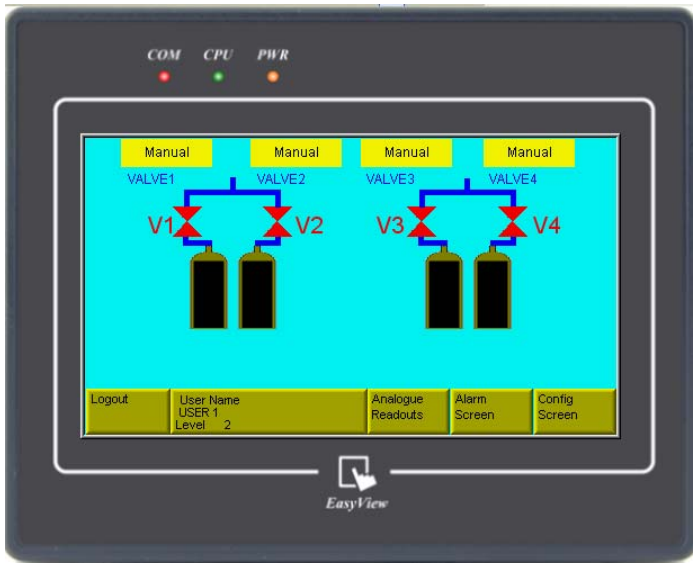
Touching the Service Button will, if there are no active alarms, open the associated valve and change the status label to service with a green background and open the associated valve.
If in the case of an Auto Changeover system, the other side is already in Service, then the legend will change to Standby with a green background but the associated valve will remain closed until called into service.



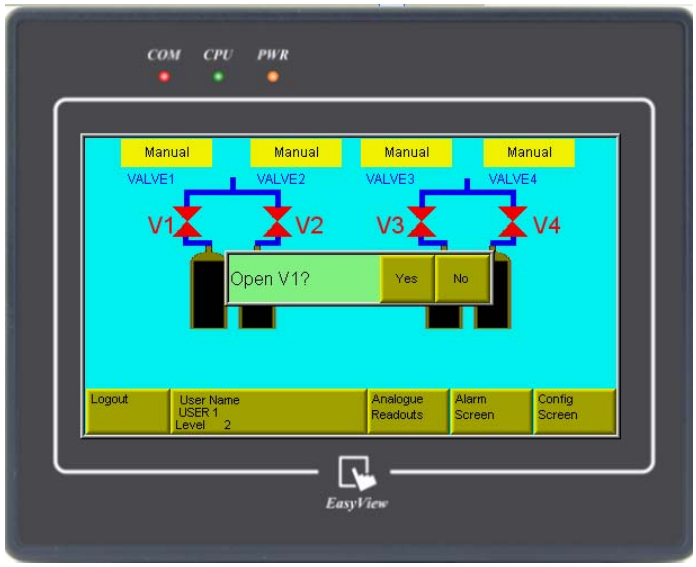
Floswitch TS in Service

Touching the Shutdown button will close the associated valve and change the status label to Shutdown with a red background

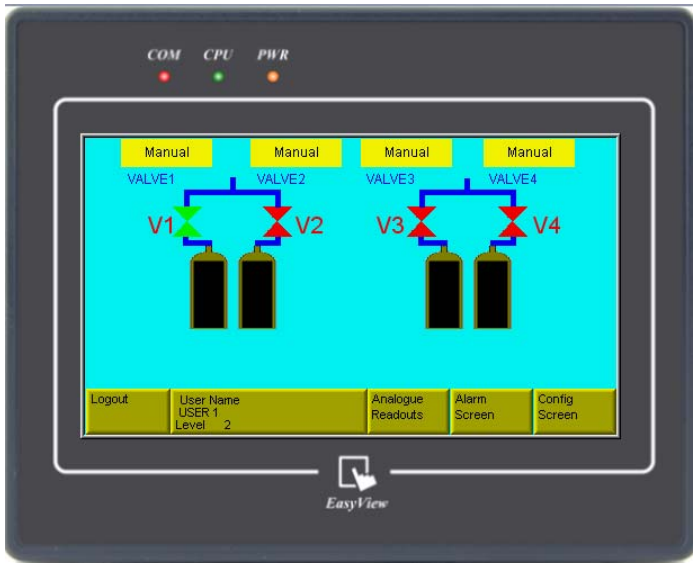
Touching the Manual Control Button will place the associated valve in manual, where the Operator can, by touching the valve symbol open and close the valve after acknowledging a safety prompt. Manual Control overrides all alarms and it is imperative that this is only used by trained Operators for maintenance only.



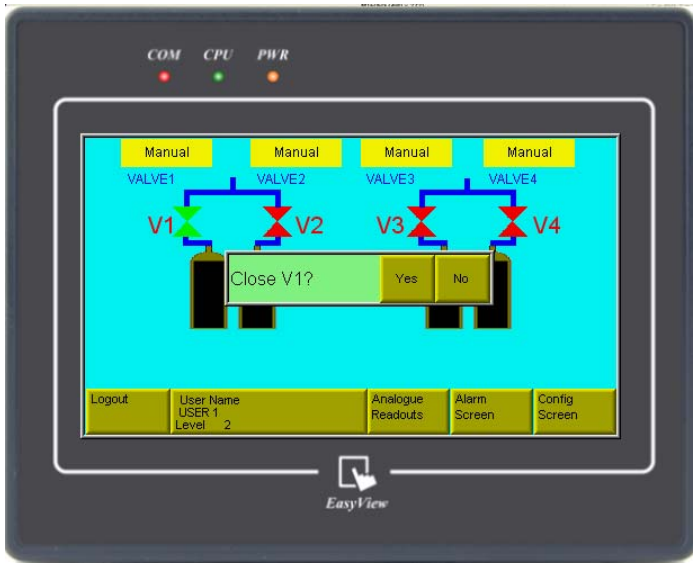
Floswitch TS in manual control (all valves)



Open Valve confirmation request

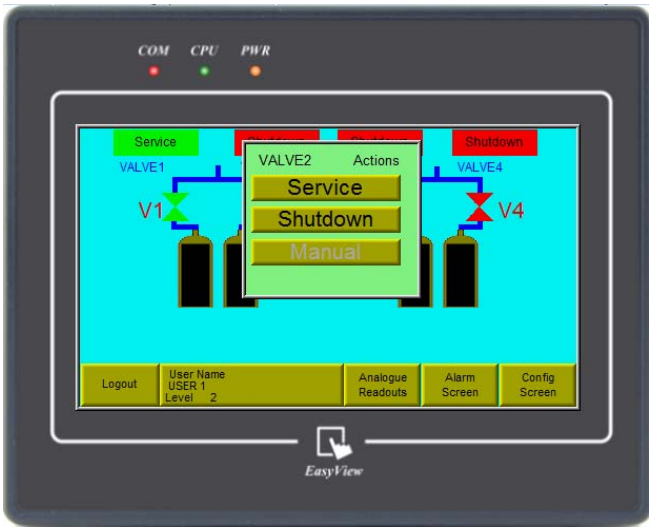


Valve opened manually



Close Valve Confirmation request

For auto changeover panels, it is not possible to have one side of the system in Service and the other side in Manual, should this be attempted, an interlock will be in operation and the manual button will be greyed out

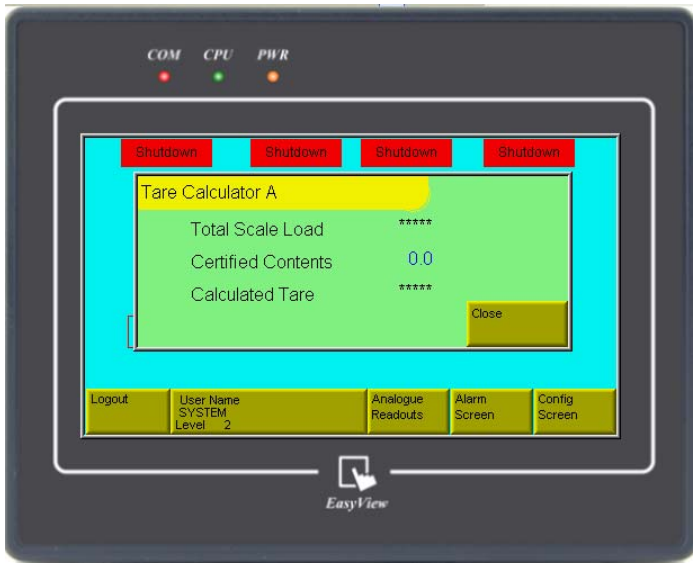


V2 Actions box with Manual Interlock

Should a changeover system be in manual control and the operator places one side into service, the the opposing side will be placed into shutdown and the valve, if appropriate, closed

Systems with Scale Platforms

For liquefied cylinder contents, touching the relevant weight display will open a popup window to allow the operator to edit the contents of the cylinder. The controller will then take this input and automatically calculate the tare load on the scale platform and subtract this from the total load in order to display the liquid contents only.


COM
CPU
PWR
Shutdown
Shutdown
Shutdown
Shutdown
Tare Calculator A
Total Scale Load
*****
Certified Contents
0.0
Calculated Tare
*****
Close
Logout
User Name
SYSTEM
Level 2
Analogue Readouts
Alarm Screen
Config Screen
EasyView

Alarm Display and Reset Procedure

Alarm Display Screen

When an alarm is activated, the Alarm Display Screen is automatically loaded, indicating the fault condition immediately. An audible sounder will be activated and dependent on the alarm condition, the LED's will indicate according to the following table. Whilst the sounder is active, the Amber or RED LED's will flash on and off.

Alarm Condition	Red LED	Amber LED	Green LED
E-Stop (if fitted)	ON	OFF	OFF
Alarm Shutdown of All Valves	ON	OFF	OFF
Alarm shutdown of >0<4 Valves	OFF	ON	ON

If the alarm is a warning condition, then the reset button next to the active alarm will be displayed in Yellow. If the alarm is for a shutdown condition OR a completed Auto Changeover function, then the reset button next to the active alarm will be displayed in Red.

If, in the case of an Auto Changeover system and the event of the standby source not being available, the service source will continue supplying until totally depleted, however a warning alarm will be activated with the reset button next to the active alarm being displayed in Yellow.

In order to clear an alarm, the condition causing the alarm must first be rectified. Once the actual condition is cleared, touching the reset button will clear the alarm provided that the Operator has Level 2 access rights. An attempt to clear an alarm without the correct access level will result in an error message only.

Document Revision History

Revision Number	Date	Change	By	Approved
0	23-9-09	Initial Release	S.B	G.W
1	11-3-10	Alarm description change	S.B	G.W
2	24-8-10	Alarm description Change tare addition	S.B	G.W
3	22-11-12	Addition of Analogue input Selection,Manual interlock and Independent valve enable/disable	S.B	R.S