OPERATION MANUAL

INDEX

INTRODUCTION

The GLADIATOR GAS MONITTOR is a multi-channel 19" Rack mounted Controller system that monitors the levels of up to sixteen remotely mounted Gas Sensors. The instrument is a standalone system that can be operated independently, or can also be connected to a PLC or DCS through a RS485 communication port on Modbus RTU protocol. This advanced multi-microcontroller based system is compatible with all the Gas Sensors from Honeywell Life Safety and can provide audio/visual alarms when the set values are exceeded.

The GLADIATOR GAS MONITTOR has a central OLED 20-character by 4-line bright blue display which sequentially indicates the details of the Gas being monitored in each of the sixteen channels along with it's level and units. This Display is also used to configure the instrument, select Gas names from a library of 24 Gases and 7 Units, set the measured Ranges of each Gas, set the required Alarm Levels, the Alarm Types and Alarm Delays, besides additional functions like Calibration, Retransmission, Drift Values, enabling or disabling Relays, Skipping Channels, setting the Password, performing self-diagnostics, etc.

The display information is multiplexed for eight channels at a time, with a Page Mode which gives complete information of any desired Channel. Further, each channel has an eight-bar multicolor LED bar-graph display for real-time monitoring of Gas levels. The instrument offers four Relay controls for each channel with three Alarm levels and one Fault output to monitor Sensor Fault /Inhibit output. Besides, the GLADIATOR GAS MONITTORprovides analog retransmission for each of the sixteen channels. Data information of all channels is available on a communication port on the rear panel on a RS485 port on Modbus RTU protocol.

The GLADIATOR GAS MONITTOR has a six-key tactile Keyboard interface on the front panel, which allows the user to set and monitor the various Gas parameters, Acknowledge and Reset Alarms, etc. The configured system menu is stored in a NVRAM which protects the data against power fluctuations and outages.

SPECIAL FEATURES

The GLADIATOR GAS MONITTOR has a host of unique and special features, which include the following:-

- Multifunctional architecture with simple operational procedure.
- Simultaneous sixteen-channel monitoring of Gas levels.
- Standard 19" Euro Rack execution for Full-Rack (16 channel) and Half-Rack (8 channel) options.
- Modular execution in plug-in Euro-card format with minimal rear terminal wiring.
- 16-bit Microcontroller-based Central Controller card.
- Every channel Card with independent 14-bit Microcontroller in modular configuration.
- Three programmable Alarm set-points with potential free Relay change-over contacts.
- Fault control Relay output for Sensor Fault. Total of 64 Relays per Rack
- Inhibit indication for each channel.
- 7" Touch screen color Monitor for system parameters.
- Dedicated analog 4 to 20 mA DC retransmission for each channel
- RS485 Data communication on Modbus RTU protocol
- Local and Remote acknowledge function.
- Half-Rack and Full-Rack versions
- Stand-alone execution or compatible with PLC / SCADA.

SYSTEM DESIGN

The GLADIATOR GAS MONITTOR system is designed for standard 19" Euro Rack cabinet mounting. The system is offered in two executions:

- Full Rack: 19" width enclosure with 16 Channel Cards.
- Half Rack: Half 19" width enclosure with 8 Channel Cards.

This design is based on Raspberry-Pi.

The system is centrally controlled by a 16-bit Microcontroller based Control Card which processes the data of the individual Channel Card signals, displays all necessary data on the 7" display, displays the individual Gas level on LED Bar Graph displays for each channel, monitors each input signal for process alarms and communicates the complete system status to an external PLC or DCS system via a RS485 port on Modbus protocol.

Each individual Channel Card is also controlled by it's own 14-bit Microcontroller, which drives the Gas Sensor for the specific Channel, accepts the analog input signal, provides up to four Relay control outputs for the signal level and provides analog signal retransmission of the Gas level.

The system has a Mother board on the rear of the enclosure which provides the Euro connector slots for each individual Channel Card and screw-type terminals for external process connections.

INSTALLATION

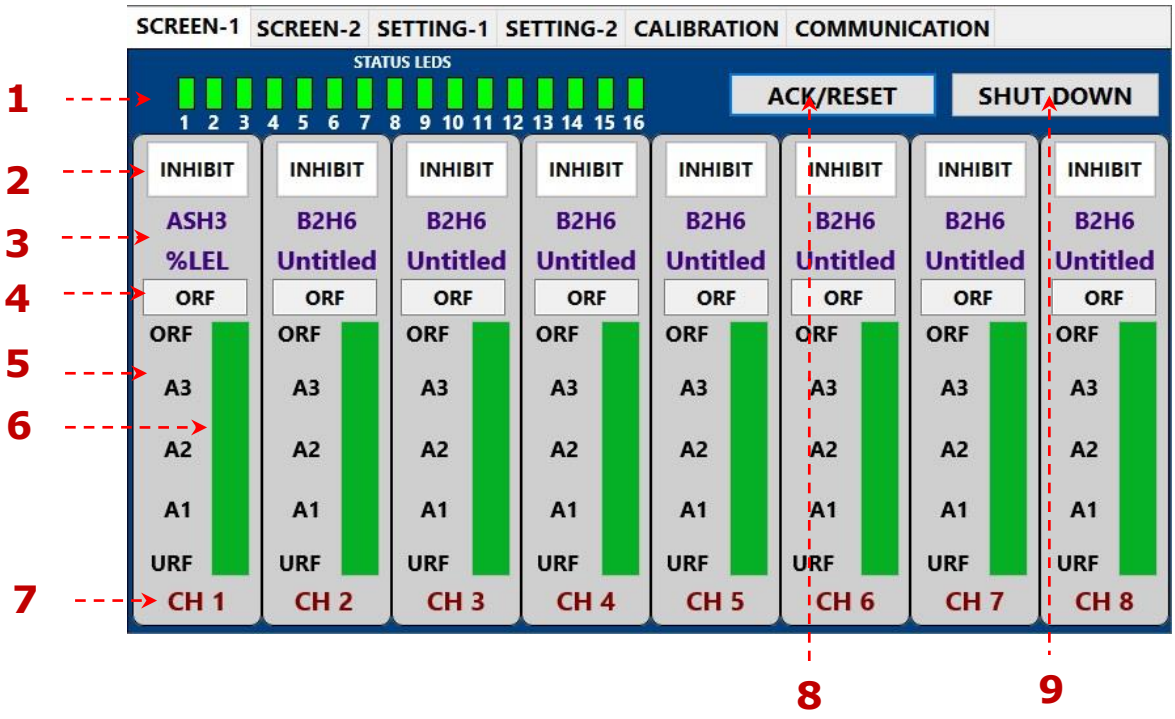
The GLADIATOR GAS MONITTOR should first be mounted in a standard 19" Rack cabinet. All interconnections to the instrument should be made with strong multi-strand wire of the order 2.5 sq.mm. The ends of the wires should be properly ferruled and suitable lugs must be used for effective termination.

The cables carrying the input signal from the Sensor should be routed separately and properly isolated from the power line cables, to prevent any electromagnetic interference in the input signal readings from the mains power line. The instrument operates on 24 VDC power supply. The Relay contacts are potential free and may be powered as per customer's requirements with the desired voltage.

The front panel of the GLADIATOR GAS MONITTOR is fixed on hinges. To access the Controller Card or Channel Cards, the two screws on the upper border of the Keyboard may be loosened and the Keyboard lowered to horizontal position. The Cards are plugged in to the rear Motherboard on Euro-Connectors and are provided with pull-out handles using which they may be pulled out gently along the card guides.

FRONT FACIA

The front panel layout of the GLADIATOR GAS MONITTOR is as below:



The first front SCREEN-1Contains-

1) Channel Card Status LEDs for all 16 Channels

2) Inhibit status key/LEDs for every channel.

3) Gas Name and its Unit for every channel.

4) Process Value indication of every channel

5) Alarm LEDs for indication of Relay status of every channel

6) Bar graph display for individual channels.

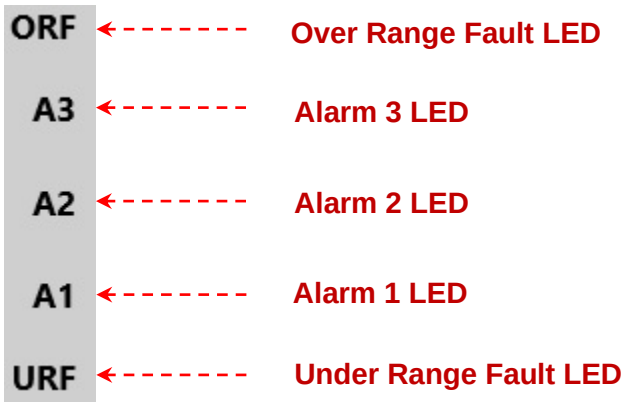
7) Channel Number Indication for every channel

8) Acknowledge/Reset key for All Alarm

9) Shut Down Key to power OFF

OPERATION AND SETTINGS

1. ALARM and FAULT LEDs



The three Red LEDs A1, A2 and A3 indicate the three Gas alarm level for individual channels.

The URF and ORF LEDs indicate the Fault level of individual channels.

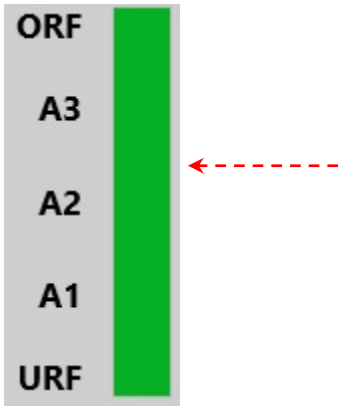
The Fault condition occurs when the input signal drops below 4 mA DC or rises above 21 mA DC.

The Black color of the LED indicates that the Gas level is either within normal acceptable limits, or in Reset condition.

2. INHIBIT Key/LED

If we tap the "INHIBIT" key then all Alarm Relays of individual channel will get disabled and color of Inhibit key will changes to Orange.

3. BAR-GRAPH



Every Channel is represented by Blue color Bar Graph which indicates the corresponding status of the Gas Level.

4. ALARM RELAYS

Each channel has four Alarm Relays. Relays 1, 2 and 3 are controlled by gas limit level alarms and their status is indicated by LEDs A1, A2 & A3.

Relay 4 is used as a Fault relay. The alarms for the individual Relays may be set in various monitoring modes, such as Latching / Non-Latching and Acknowledgeable / Non-Acknowledgeable. These combinations are described below:

a. LATCHING/ACKNOWLEDGABLE MODE

If the Relay is configured as LATCHING/ACKNOWLEDGABLE mode, the Relay will activate and stay latched when it's set-point is crossed in the Fall or Rise cycle (as selected), with Red A1/A2/A3 indication. The Relay will not reset to normal even when the process value regains normalcy. Since the Relay is in Acknowledgeable mode, the Alarm can be acknowledged by pressing the ACK key.

b. ACKNOWLEDGABLE MODE

If the Relay is configured as ACKNOWLEDGABLE, the Relay will activate when it's set-point is crossed in the Fall or Rise cycle (as selected) but will not stay latched when the process value returns to normal limits, with flashing LED. Since the Relay is in Acknowledgeable mode, the Alarm can be acknowledged by pressing the ACK key.

c. NON-LATCHING/NON-ACKNOWLEDGABLE MODE

If the Relay is configured as NON-LATCHING/NON-ACKNOWLEDGABLE, the Relay will activate when its set-point is crossed in the Fall or Rise cycle (as selected) but will not stay latched when the process value returns to normal limits, with flashing LED. Since the Relay is in Non-Acknowledgeable mode, the Alarm cannot be acknowledged by pressing the ACK key. The Alarm LED corresponding to this Relay will stay continuously flashing only until the process value returns within normal limits.

d. LATCHING/NON-ACKNOWLEDGABLE MODE

If the Relay is configured as LATCHING/NON-ACKNOWLEDGABLE mode, the Relay will activate and stay latched when it's set-point is crossed in the Fall or Rise cycle (as selected), with Red A1/A2/A3 indication. The Relay will not reset to normal even when the process value regains normalcy. Since the Relay is in Non-Acknowledgeable mode, the Alarm cannot be acknowledged by pressing the ACK key

5. ALARM LEVELS

The Alarm Levels for each of the three Alarm Relays A1, A2 and A3 can be set between 0000 and 9999. The status of these Relays is indicated by LEDs A1, A2 & A3 when the set levels on the Rising or Falling trail are crossed.

6. RISING AND FALLING ALARM LEVELS

The Alarm Levels for each of the three Alarm Relays A1, A2 and A3 can be configured to activate on the rising graph or on the falling graph. In RISING condition, the corresponding Relay will activate above the set limit level, while in FALLING condition, the corresponding Relay will activate below the set limit level. The status of these Relays is indicated by LEDs A1, A2 & A3 when the set levels on either the Rising or the Falling graph are crossed.

7. ALARM HYSTERESIS

The Hysteresis for each Relay is the gap between an Alarm trip level and the Alarm Reset level. This is also called as Dead band. The Hysteresis for each Relay in each channel can be set independently.
The status of the Relays is indicated by LEDs A1, A2 & A3 when the set levels on either the Rising or the Falling graph are crossed and the Relay is in Alarm condition.

8. DISABLE ALARM RELAYS

Any of the three Alarm Relays A1, A2 and A3 in any channel can be disabled, or in other words, be prevented from getting activated. In the Disabled condition, the Relay will not alter it's state when an Alarm occurs. The status of the Relays of any channel can be reviewed in the Page mode, as described in this manual.

9. FAULT AND INHIBIT ALARM

a. FAULT ALARM

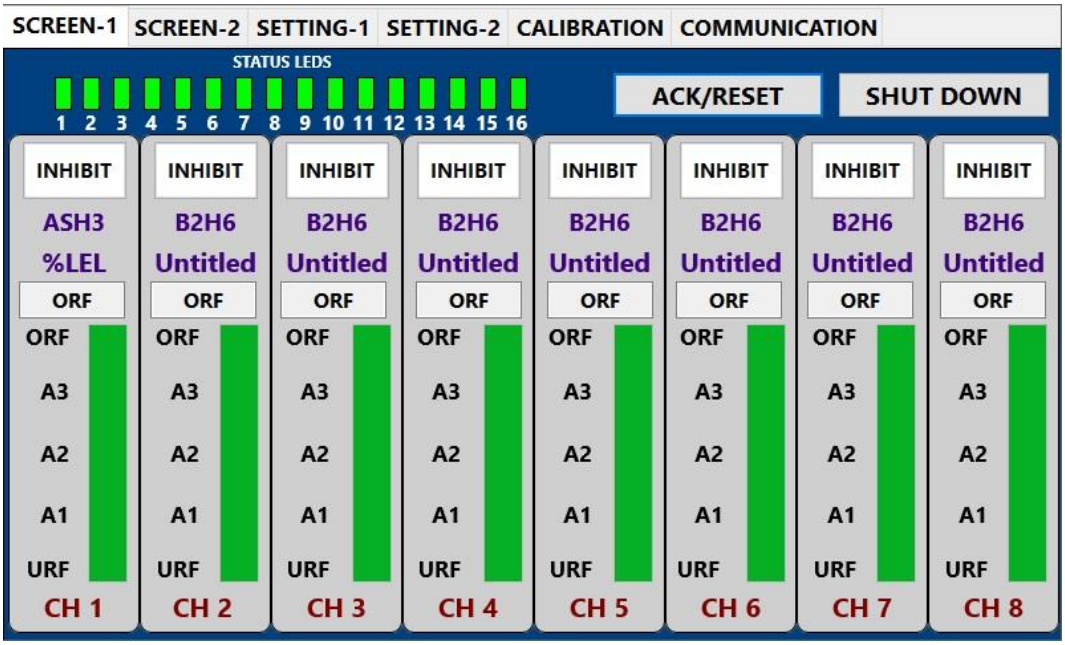
Fault condition means when input signal goes below 3.5 mA or above 21 mA, then the 4th Relay will energize.

b. INHIBIT ALARM

When a channel is put into inhibit mode, all relays of inhibit mode channel will be de-energized.

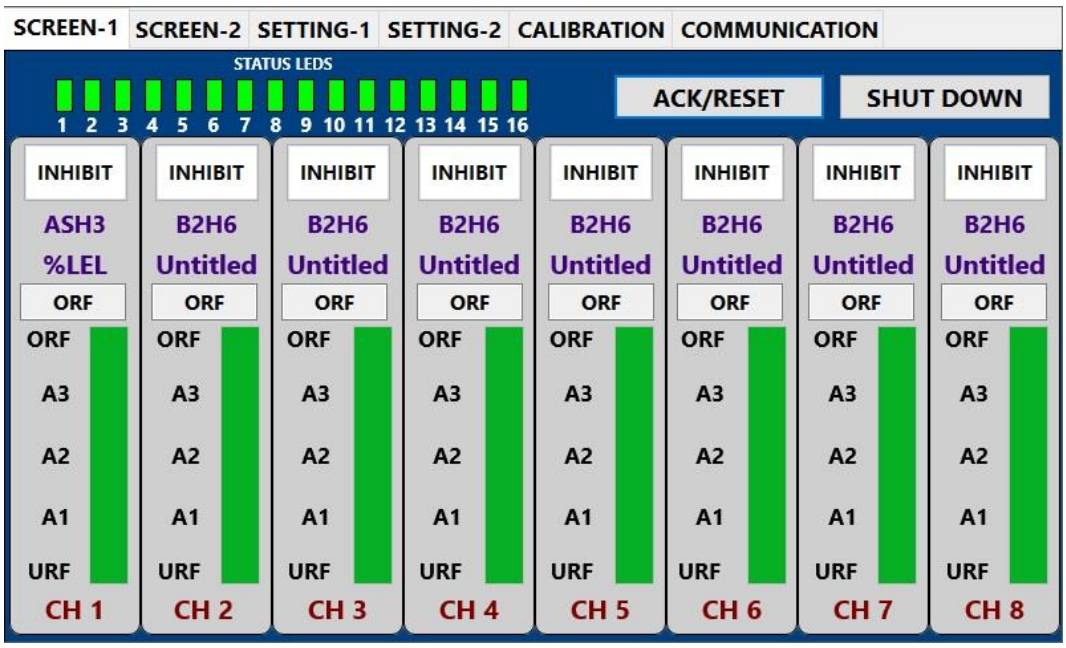
SYSTEM CONFIGURATION

POWER ON SCREEN



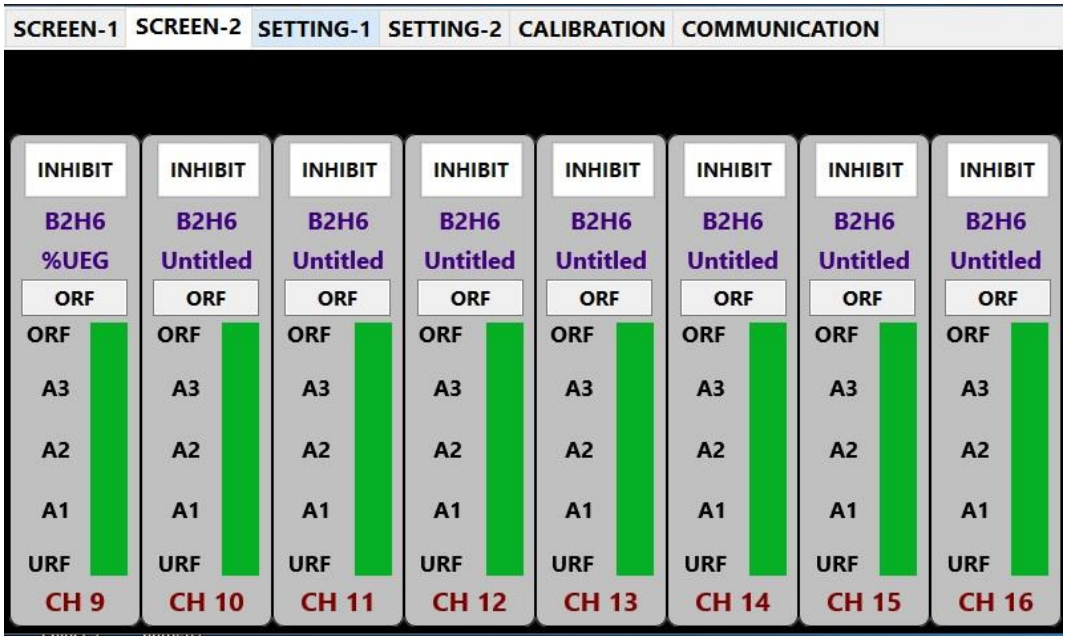
MENU STRUCTURE

If tap SCREEN-1 then –



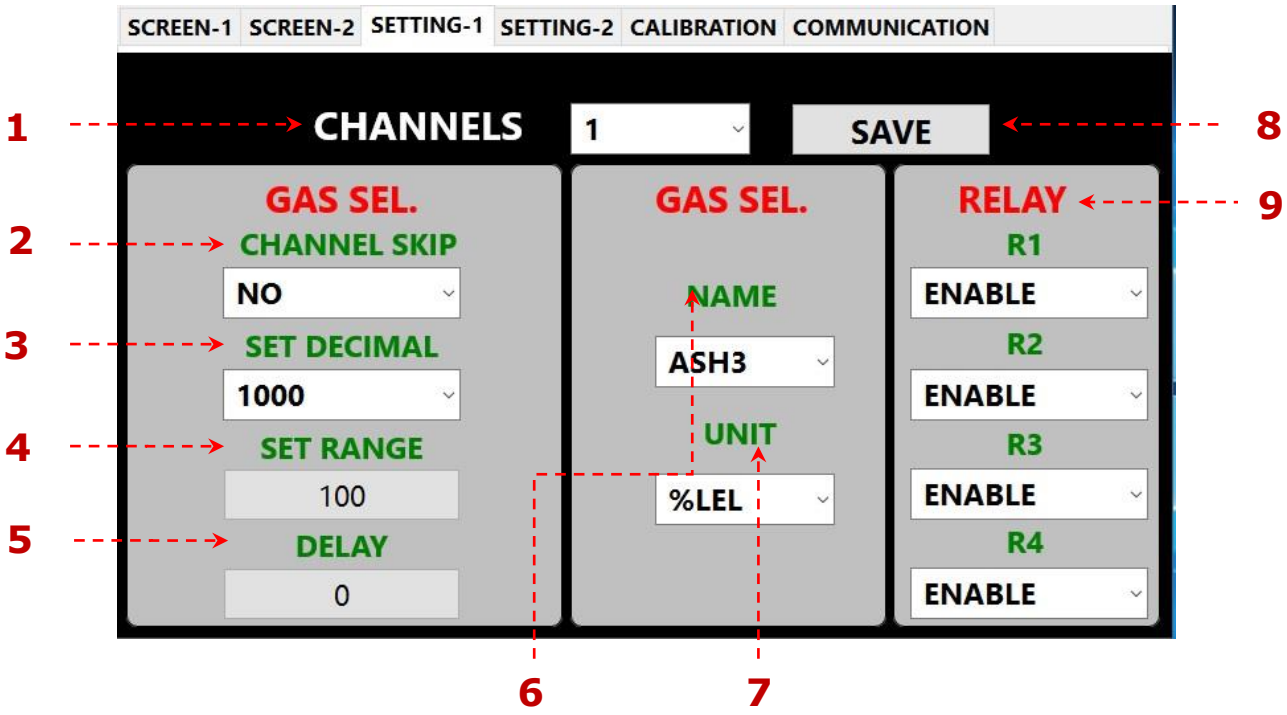
SCREEN-1 represents the status of individual channel from Channel-1 to Channel-8.

If tap SCREEN-2 then –



SCREEN-2 represents the status of individual channel from Channel-9 to Channel-16.

If tap SETTING-1 then –



SETTING-1 window represents the parameter settings of particular channel.

1) Select the desire Channel Number from channel list 1 to 16.

2) Select Channel Skip Yes Or No option to selected channel5.

3) Set Decimal Position to selected channel

Options are:

- 1000
- 100.0
- 10.0

4) This is the High Gas range of the selected channel - It can be set from 0000 to 9999**.**

5) This is the delay time provided to activate an actual alarm. In that time period, the Controller will not respond to any alarm conditions. This time is set in seconds and it will apply to all the ALARMs of the selected Channel.

If the ALARM TIME is set for 0005, then the alarms will activate after 5 seconds.

6) Select Gas Name to selected channel.

Options are:

- ASH3
- B2H6
- BR2
- CH3
- CH4
- CLO2
- CL2

- CO2
- EO
- HBR
- HC
- HCL
- HCN
- HF
- H2
- H2S
- H2O2
- NH3
- NO
- NO2
- O2
- O3
- SiH4
- SO2
- C3H8

7) Set Unit Name to selected channel

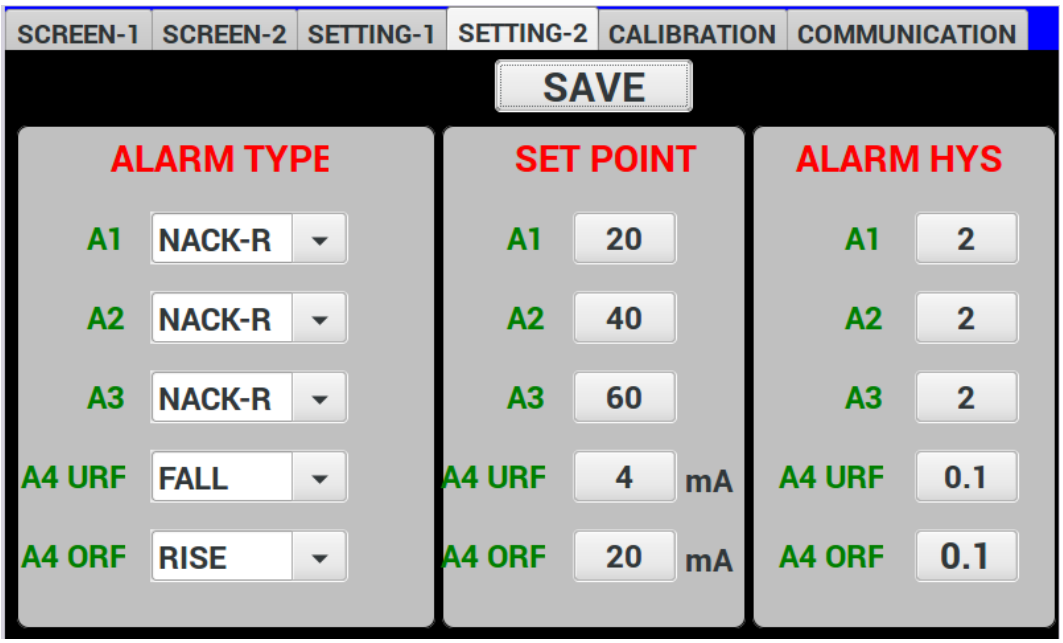
Options are

- %LEL
- %UEG
- %VOL
- %V/V
- PPM
- PPB
- %LIE

8) Tap SAVE key to save the parameters.

9) In RELAY window we can set Relay Enable/Disable for each relay of selected channel.

If tap SETTING-2 then –



SETTING-2 window represents the parameter settings of particular channel.

1) In "**ALRM TYPE"** window we can set the Relay Logic for A1, A2, A3, URF and ORF.

2) A1 means 1st Relay of selected channel.

3) A2 means 2nd Relay of selected channel.

4) A3 means 3rd Relay of selected channel.

5) A4 URF and A4 ORF means 4th Relay-4 of selected channel.

- **URF** (Under Range Fault)
- **ORF** (Over Range fault)

6) Options for Relay Logics are as follows-

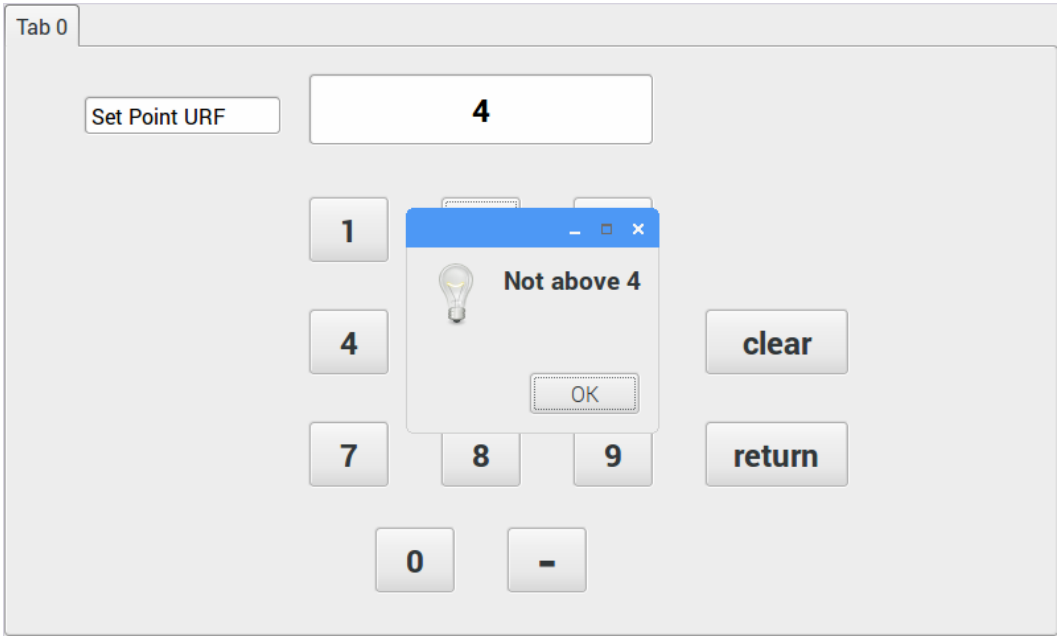
- **LACK-R** (Latching and Acknowledge, Rise)
- **ACK-R** (Non-Latching and Acknowledge, Rise)
- **NACK-R** (Non-Latching and Non-Acknowledge, Rise)
- **LNAK-R** (Latching and Non-Acknowledge, Rise)

- **LACK-R** (Latching and Acknowledge, Fall)
- **ACK-R** (Non-Latching and Acknowledge, Fall)
- **NACK-R** (Non-Latching and Non-Acknowledge, Fall)
- **LNAK-R** (Latching and Non-Acknowledge, Fall)

- **Rise** : Relay will energize above set point
- **Fall** : Relay will energize below set point

7) In "**SET POINT"** window we can set the set points of each relay of selected channel card.

8) If tap A4 URF then -



In this window we can set the set point of Under Range Fault.

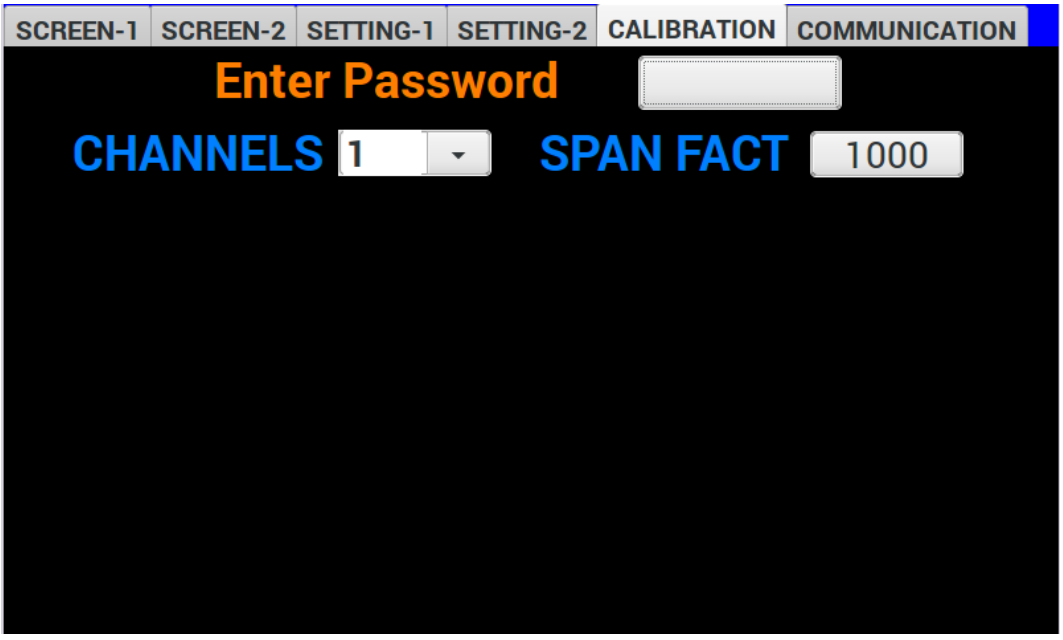
9) In A4 ORF we can set the set point of Over Range Fault.

10) In "**ALARM HYS"** window we can set the Alarm Hysterisis for each relay for Relay-1 (A1), Relay-2 (A2) and Relay-3 (A3).

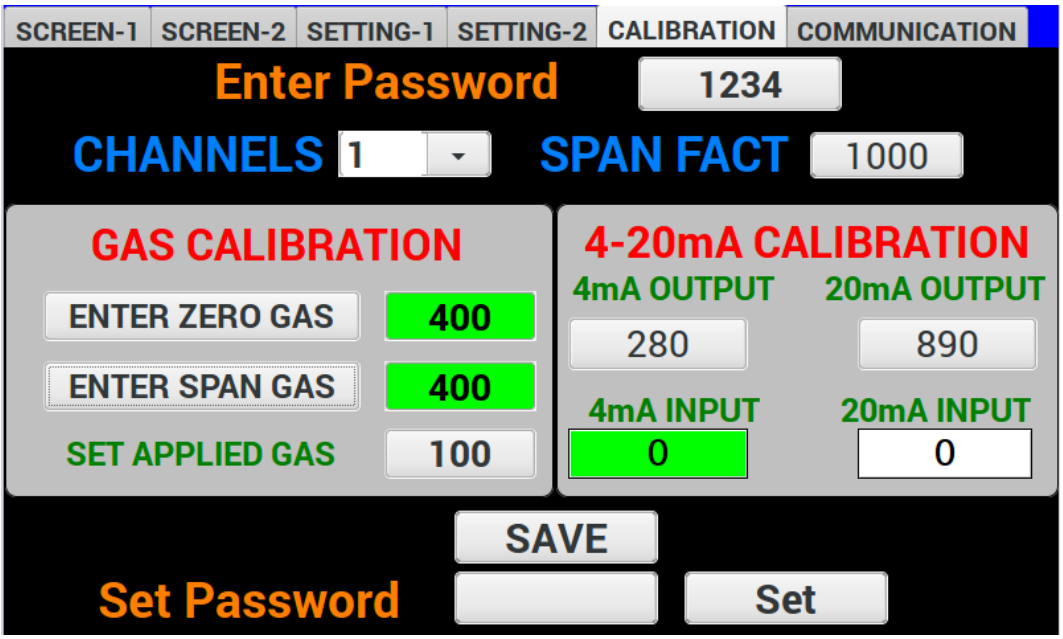
- Hysteresis is the gap between an Alarm Trip level and the Alarm Reset level. This is also called as "**dead-band"**. Hysteresis needs to be set for the control action of Relays.

e.g. If an Alarm is selected for RISE logic, and the set-point is set as 0100 and Hysteresis is set as 0010, then the Relay will energize at 110.

If tap CALIBRATION then –



Enter the Password 1234 then display will show below window-



SETTING-2 window represents the parameter settings of particular channel.

1) In **"GAS CALIBRATION"** window we can set the input calibration of selected channel.

2) **"ENTER ZERO GAS"** means Zero Gas Calibration.

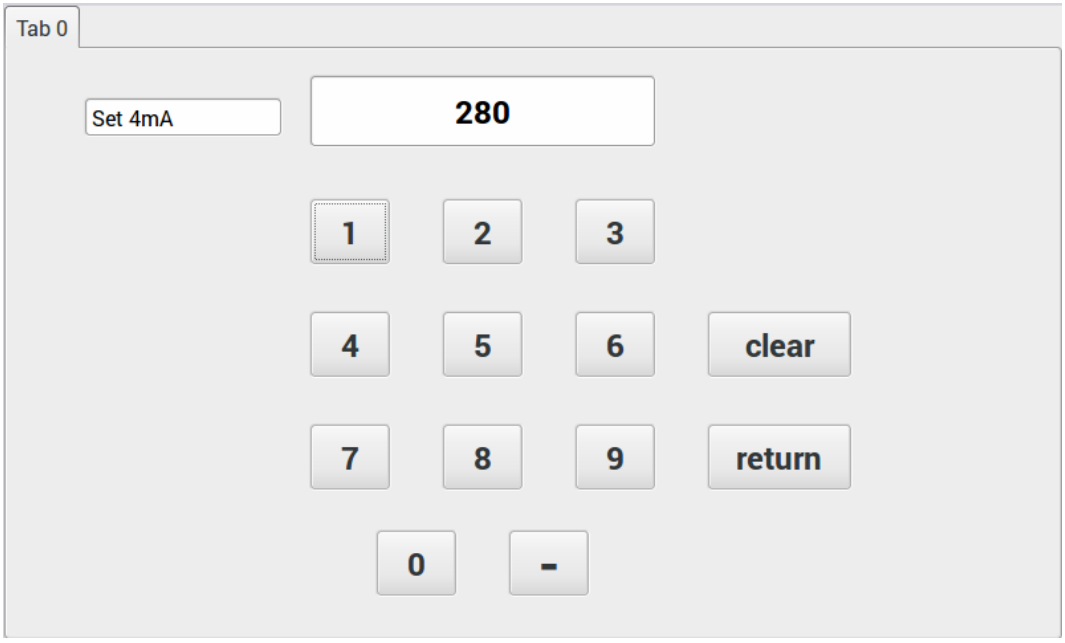
- As per input some ADC counts will display in ENTER ZERO GAS tap.
- Tap that ADC counts to save the Zero Gas Calibration.

3) **"ENTER SPAN GAS"** means Span Gas Calibration.

- As per input some ADC counts will display in ENTER SPAN GAS tap.
- Tap that ADC counts to save the Span Gas Calibration

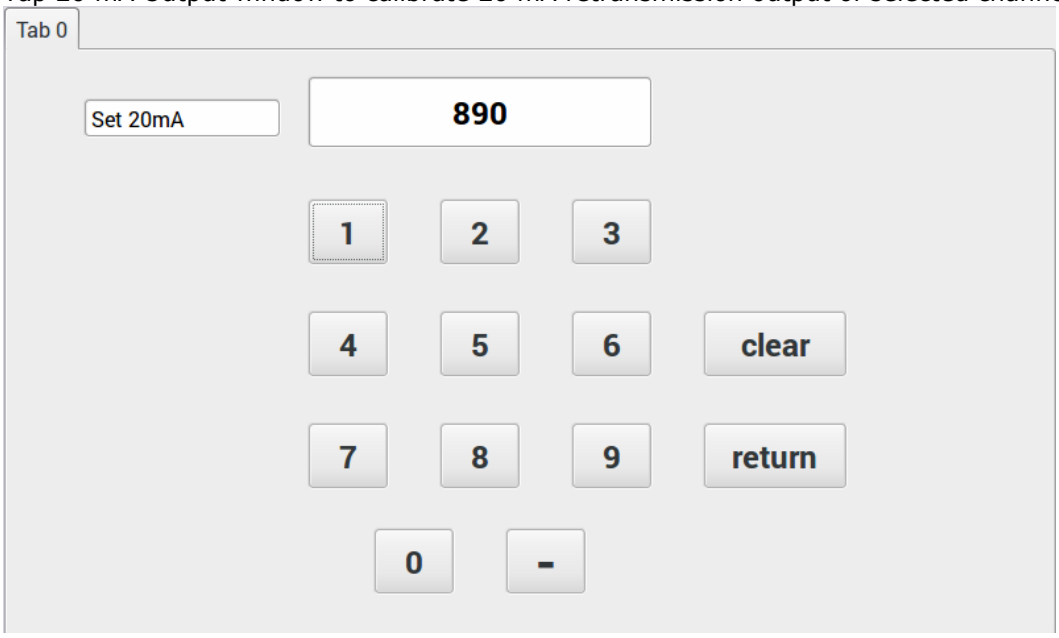
4) In **"4-20mA CALIBRATION"** window we can set the retransmission output calibration of selected channel.

5) Tap 4 mA Output window to calibrate 4 mA retransmission output of selected channel.



- Connect Digital Multimeter to output terminal.
- Set the ADC counts until you get 4 mA on Multimeter.
- Tap 'return' to go back to previous window.

6) Tap 20 mA Output window to calibrate 20 mA retransmission output of selected channel.



- Connect Digital Multimeter to output terminal.
- Set the ADC counts until you get 20 mA on Multimeter.
- Tap 'return' to go back to previous window.

7) In **"4 mA INPUT"** window we can set the input calibration of selected channel.

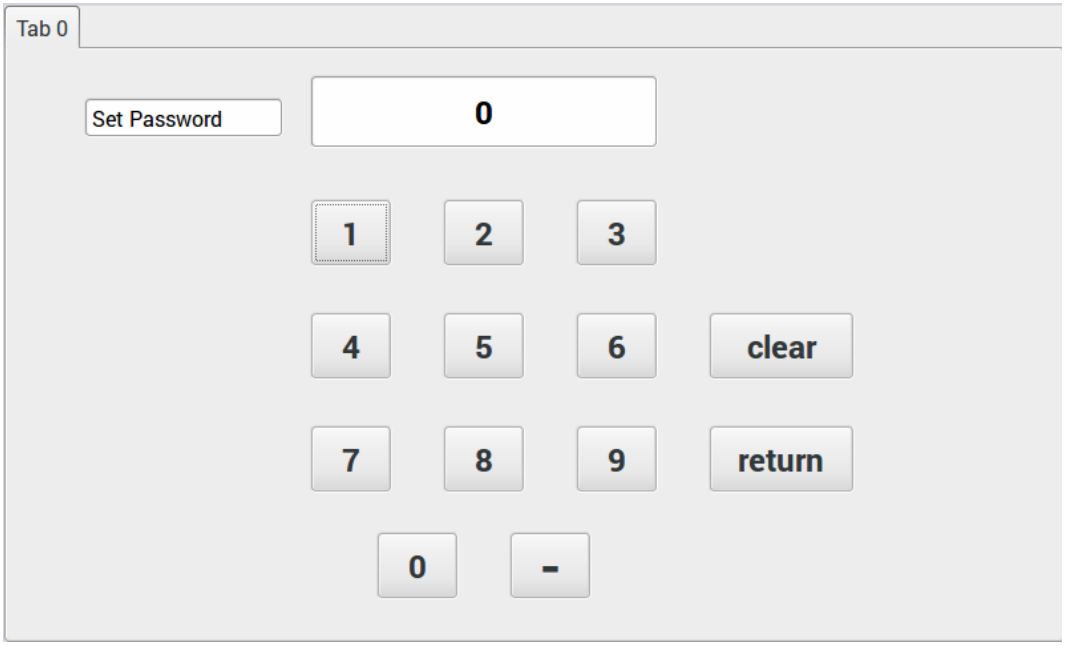
- Apply 4 mA input to selected channel card, ADC counts will display in window.
- Tap that window to save the counts.

8) In "**20mA INPUT"** window we can set the input calibration of selected channel.

- Apply 20 mA input to selected channel card, ADC counts will display in window.
- Tap that window to save the counts.

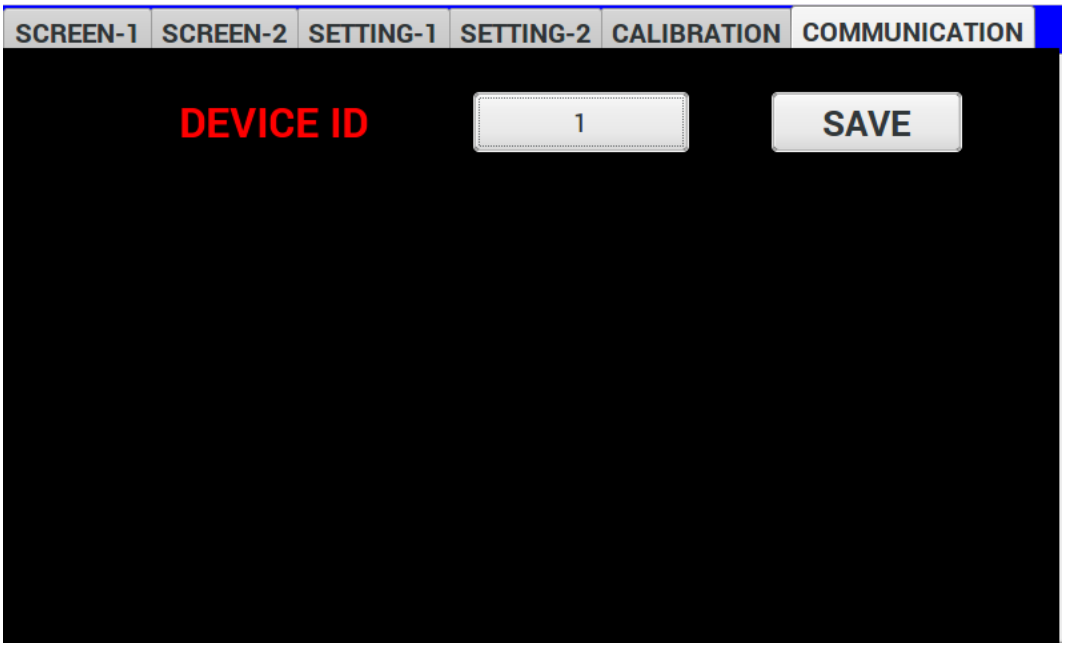
9) Tap SAVE key to save the parameters.

10) If tap "**SAVE PASSWORD**" then-



- The **Set Password** selection allows the user to set a password for menu access.
- Set password and tap return to go back to previous window.

If tap COMMUNICATION then –



1) Selecting the COMMUNICATION option allows the setting of the RS485 communication options.

2) We can set Device Id of particular Rack in this window for Modbus communication.

3) RS-485 output is based on Modbus RTU protocol.

TERMINAL DIAGRAM

The rear terminals of the GLADIATOR GAS MONITTOR are localized for every channel along with one set of common terminals :

TERMINAL BLOCK	TERMINAL NO.	NOTATION	DETAILS
CHANNEL TERMINALS	1	IN +	GAS SENSOR INPUT 4 to 20 mA DC (3-wire)
	2	GND -	
	3	+24V OUT	
	4	+	RETRANSMISSION OUTPUT 4 to 20 mA DC
	5	–	
	7	NO	RELAY 1 (ALARM-1)
	8	C	
	9	NC	
	10	NO	RELAY 2 (ALARM-2)
	11	C	
	12	NC	
	13	NO	RELAY 3 (ALARM-3)
	14	C	
	15	NC	
	16	NO	RELAY 4 (FAULT)
	17	C	
	18	NC	

TERMINAL BLOCK	TERMINAL NO.	NOTATION	DETAILS
COMMON TERMINALS	1	+	POWER SUPPLY 24 V DC.
	2	–	
	3	A	RS485 MODBUS DATA COMMUNICATION
	4	B	
	5	GND	
	6		REMOTE ACKNOWLEDGE
	7		

TECHNICAL SPECIFICATIONS

Model	:	GLADIATOR GAS MONITTOR SYSTEM.
Type	:	Micro-controller based, multi-channel monitoring and control of Gas Sensors.
No. of Channels	:	16.
Input Signals	:	Three-wire Gas Sensors.
Gas Library	:	25 Gases and 7 Units – freely customizable for each channel.
Indications	:	7" Touch screen color Monitor
Control outputs	:	Four control Relay outputs - three for Alarms and one for Fault
Contact Rating	:	10 Ampere @ 230 VAC for non-inductive loads.
Alarm Annunciation	:	Acknowledge and Reset Keys on front panel.
Analog Outputs	:	16x 4 to 20 mA DC retransmission signals - one for each channel.
Load Driving Capacity	:	600 Ohms each.
Communication Port	:	RS485 on Modbus RTU.
Features	:	Channel Skip, Relay Disable, Latching / Non-latching, Acknowledgeable / Non-Acknowledgeable alarms
Termination	:	On rear Mother-board.
Power Supply	:	24 V DC.
Execution	:	19" Rack system, 3U enclosure with modular channel-cards.
Enclosure	:	Aluminum Card-frame with plug-in Cards in modular system.
Dimensions	:	3U x 84T x 240 mm (133.35 x 482.6 x 240 mm).
Ambient Temperature	:	0 to 60 deg C.
Rel Humidity	:	0 to 95% non-condensing.