# GASMARK M255

GAS DETECTION CONTROL PANEL

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**GASMARK** M255
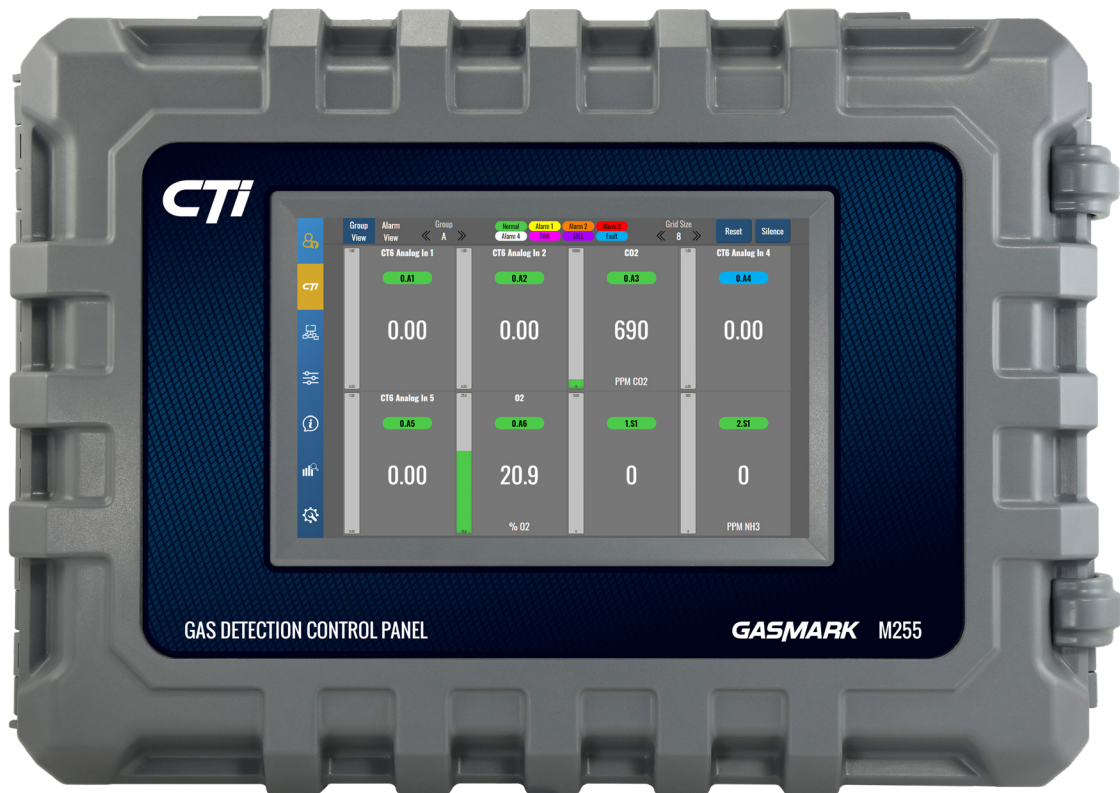
**CALIBRATION TECHNOLOGIES INC.**
*GAS DETECTION SPECIALISTS*

## Installation and Operation Manual

**Warning**

**To ensure your personal safety, read the Safety Information section before installing or servicing this device. Use this product only in the manner described in this manual.**
**If the equipment is used in a manner not specified by CTI, the protection provided by the equipment may be impaired.**
**This equipment should be installed by qualified personnel.**

For technical support, contact:

**CTI**
920 N Tradewinds Pkwy
Columbia, MO 65201

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**email: sales@ctigas.com**
**website: ctigas.com**

# Table of Contents

## Safety Information

Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by CTI, the protection provided by the equipment may be impaired.

This equipment should be installed by qualified personnel.

If disposing of the M255 controller, take care to properly dispose of or recycle the CR 2032 coin cell lithium battery.

Always disconnect power before performing any wiring at the controller.

## 1. General Description

The M255 is a Modbus gas detection controller specifically designed for use with CTI Modbus capable devices. It has four RS-485 Modbus channels and can handle up to 255 devices. Additionally the M255 is backwards compatible with all CTI 4/20 mA devices.

It has two on board 24Vdc power supplies to provide power for the controller, gas detectors and audible/visual devices.

The color LCD touchscreen provides an at-a-glance status of gas concentrations and alarms.

The M255 control panel is assembled into a wall mounted enclosure designed for indoor Non-Classified locations only. The supported Modbus devices can be installed up to 4,000' from the controller.

The eight programmable on board relays have on/off time delays and can be programmed to be silenceable, latching and normally energized.

All operator functions are performed from the touchscreen on the front of the panel.

*Note:* "Device(s)" in this manual will refer to any component which may be controlled and/or read via a Modbus address.

## 2. Installation

### 2.1    Installation Guidelines:

**Locating the M255 Gas Detection Control Panel (controller)**

• The important consideration when installing the M255 is that it must be easily accessible for operating personnel.

• Mount the controller indoors on a solid surface with minimal vibration. If mounting on a wall with studs, the mounting screws should be screwed into the studs.

• Mount the controller through the holes in the mounting flanges.

• Mount the controller in a general-purpose location only. Do not install in a hazardous environment.

• Mount the controller away from electromagnetic interference.

• Protect the controller from physical damage.

• When connecting to metallic conduit, attach appropriately sized conduit hub to conduit prior to connection with enclosure is made.

### 2.2    Dimensions:

19.5"

12.125"

14.5"

13.125"

6.2" deep
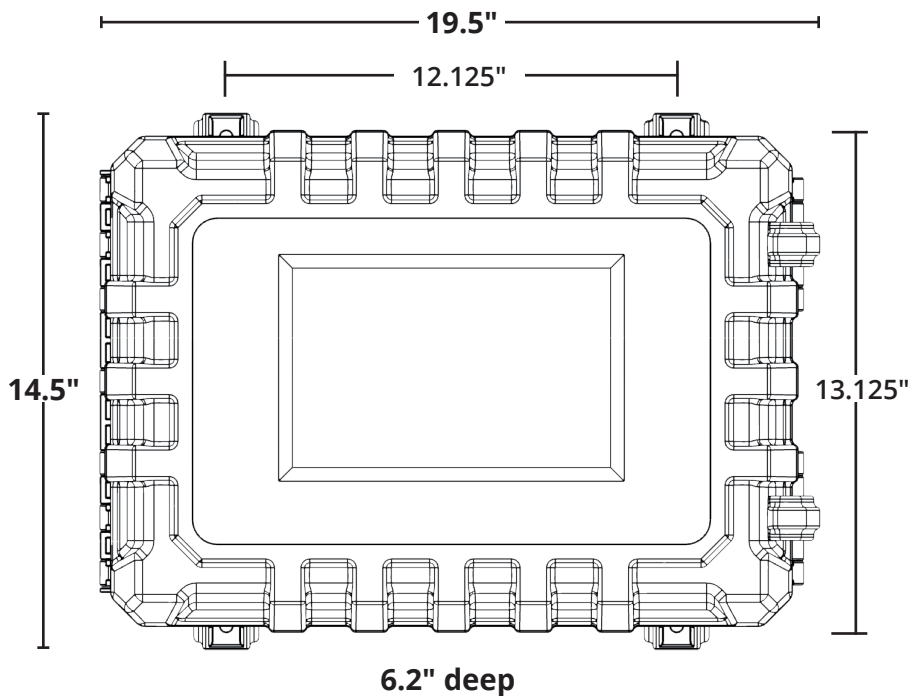
## 2.3   Wiring:

### 2.3.1  Wiring Guidelines:

• **Electrical wiring must comply with all applicable codes**
• Use stranded, copper wire/cable with a minimum of 167°F rating (75°C rating).
• All wiring should be rated for 300V or greater (see illustration on page 11 for label location).
• Always use insulated, stranded, shielded copper cable for all communication cables. Refer to individual device manuals for wiring instructions.
• Do not pull communication wiring with AC power cables. This can cause electrical interference.
• Use only the existing conduit hole for connections to each device.
• Bonding between metallic conduit connections is not automatic with the non-conductive enclosure. Separate bonding must be provided.
• During installation, cover conduit holes and close the enclosure cover to prevent debris from falling into the equipment.
• After wiring, any unused conduit holes should be covered with an appropriate sized plug, flammability rating V-1 or better, to maintain integrity of enclosure.

### 2.3.2  AC Power Wiring:

• Power should be provided by a dedicated 15A circuit breaker. It is recommended that the circuit breaker be located near the equipment, and clearly marked as the disconnect for the M255.
• See Specification on page 45 for requirements.



L   N   ⏚

Line
Neutral
Earth Ground
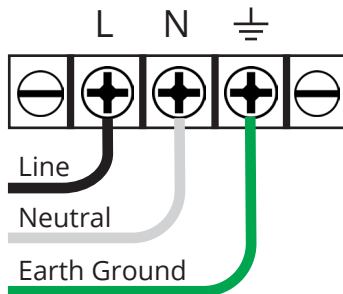
• For 200-240Vac input voltage, the input voltage selector switch must be switched.  The factory setting is 100-120Vac.  It is located on the side of the right power supply.  See illustration on page 11.  Red circle shows location of switch.  The switch is located behind the protective cage of the power supply, but is accessible by using a small screwdriver or pointy object.

### 2.3.3  Communication Wiring:

The M255 has four Modbus communication channels.  Up to 255 devices can be installed on the M255, distributed among the four channels.

It is recommended to pull 24Vdc power cable with the communication cables.  These cables can share the same conduit.

• RS-485 communication cable, 22-24 AWG, 2 conductor, twisted pair, shielded, stranded, with drain wire (Alpha Wire 6460 or equivalent)
• 4,000 ft max per channel.
• For optimum performance, it is recommended that no more than 128 devices are connected on any of the four channels.
• For optimum performance, CTI recommends that the M255 is always at the end of the line. When the M255 is at the end of the line, the EOL switches should always be set to the ON position.
• Avoid splices and T-taps.  All terminations should be made at network device wire terminals.
• Wire shields must be connected at all shield terminals, creating a continuous shield run from the M255 to the device at the end of the line.

COM 1



GND SHLD        SHIELD
                not used
A               A
B               B

*To first device*
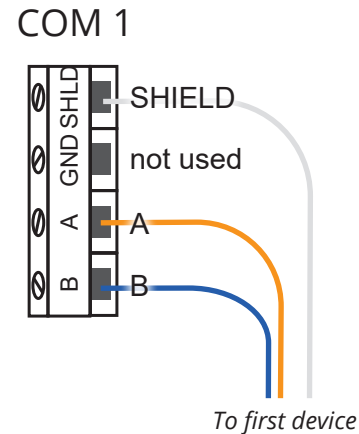
**Terminal Block Plug (Field Wiring):**
SHLD: To shield terminal of first network device.
GND: Not used
A: To RS-485-A terminals of first network device.
B: To RS-485-B terminals of first network device.

See supported Modbus device installation manuals for more details on communication wiring.

Each device has a communication port with two terminals, A and B. In these two terminals, the communication cable is connected so that all the devices that take part in the communication are connected in parallel. All of the 'A' terminals must be connected together and all the 'B' terminals must be connected together, respectively.

## 2.3.4 Device Power Wiring:

24Vdc power is provided by the on board 24Vdc power supplies within the M255. Additional power supplies can be added on the Modbus channels distributed throughout the network as needed.

• Use 14 AWG, 2 conductor, shielded, stranded cable with a drain wire (Belden 5100UE or equivalent)

See supported Modbus device installation manuals for more details on device power wiring.

**Caution:**
To prevent excessive voltage drops and/or power supply overloads, careful consideration should be taken to take into account all 24Vdc devices on the power supplies. This includes gas detectors, audio/visual devices, etc. See Specifications on page 45 for maximum current draw for all devices.

If the supply voltage drops below a devices minimum supply voltage at any device on the network, a power supply should be added at that point on the power cable. When utilizing the 24Vdc supply for any connected relays for external devices (horn-strobes, fan controllers, etc.), make sure all device's minimum supply voltage is maintained under full load (all devices active)."

*Note:*
When adding a power supply, make sure to tie the power supply grounds together to maintain the same ground for all devices on that Modbus channel.

PWR



*To first device*
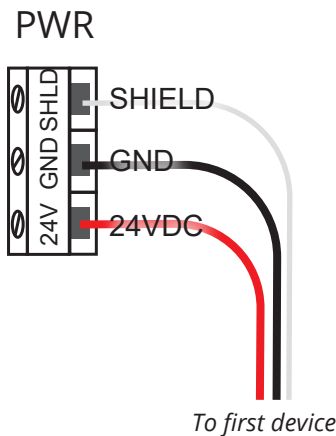
**Terminal Block Plug (Field Wiring):**
SHLD: To shield terminal of first network device.
GND: To ground terminal of first network device.
24V: To 24Vdc terminal of first network device.

## 2.3.5 Relay Output Wiring:

There are nine relay outputs local to the M255. One is designated as the Fault Relay, while the other eight are general purpose, user configurable relays.

• AC wiring must be run in separate conduit from the sensor cables.
• All relays have Form C dry contacts, and are rated 5A @ 24Vdc or 8A @ 240Vac (dry contacts require external power).
• The fault relay is normally energized. It will trip upon loss of power or hardware failure of the M255.
• Each relay has a status LED to show the state of the relay.
• When utilizing the on board power supplies of the M255 for powering of external devices such as horn/strobes, make sure the total current draw of all powered devices does not exceed the current limits on page 45.
• There are two courtesy 24Vdc and ground terminal blocks amongst the relays. These can be used to provide power for external devices such as audio/visual devices, exhaust fan control, etc.
• See Relay Output section (3.4.4.3.1) in the Setup menu for more details on relay configuration.

COURTESY



*To relay output device*
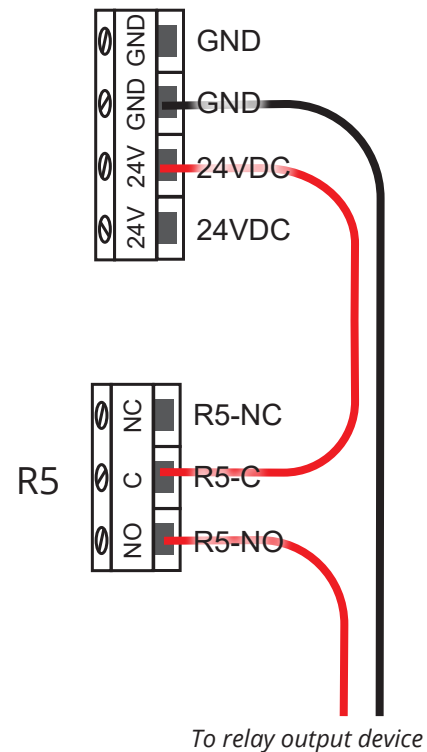
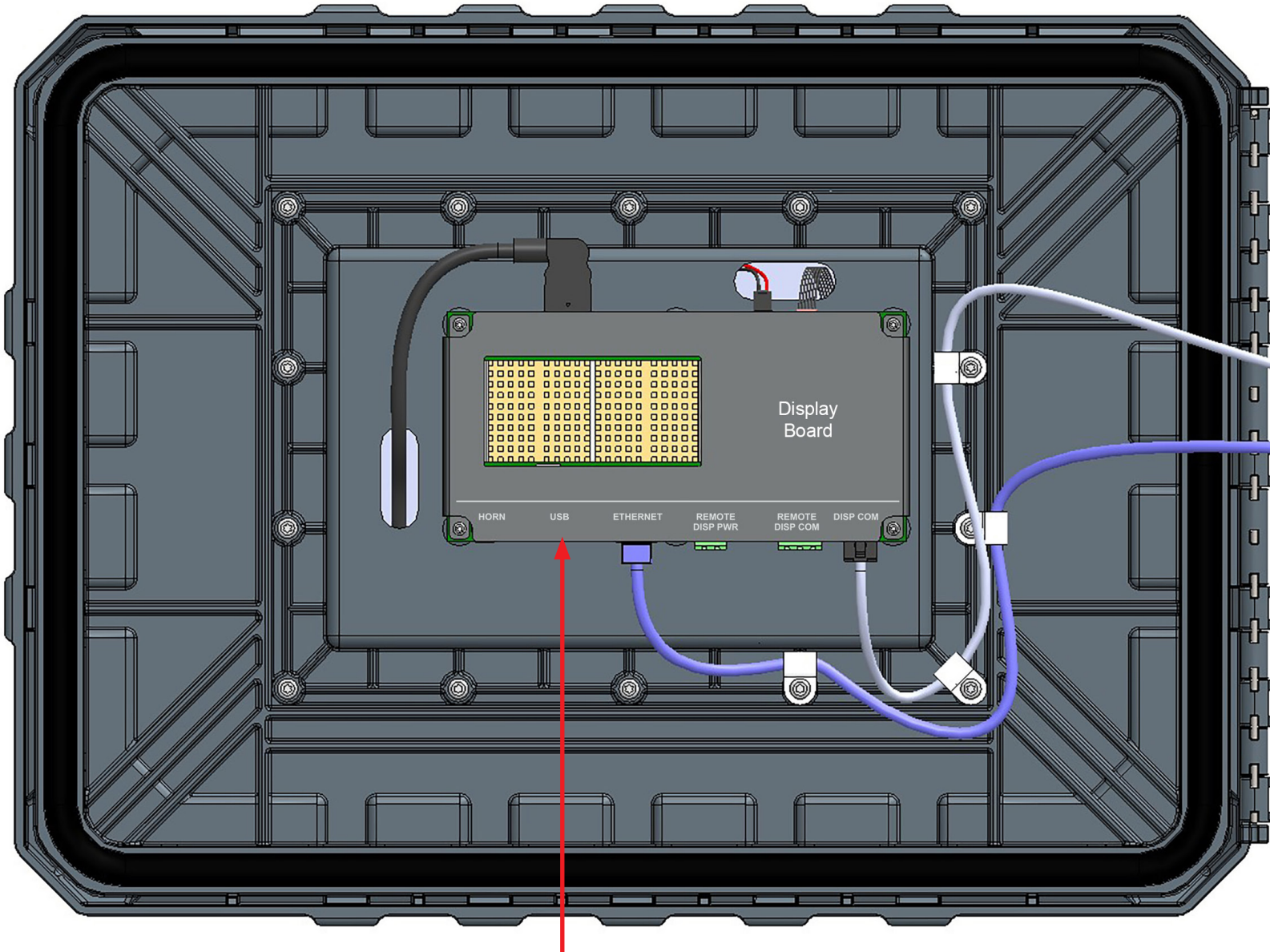## 2.3.6 Network Layout Example

Page intentionally blank

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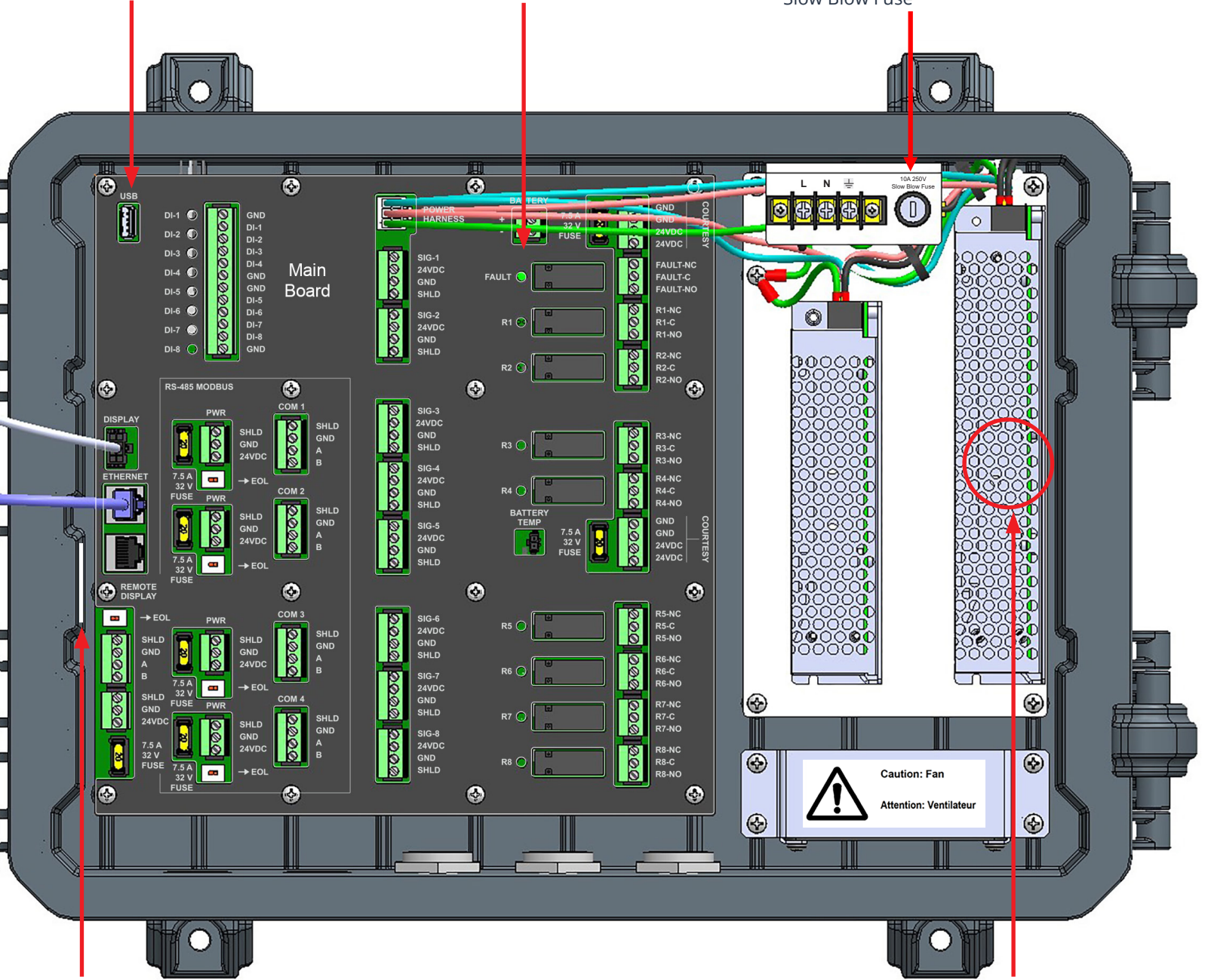## 2.4    M255 Terminals, Ports, Components, and Board Layout



USB port: Display updates

USB port: Logic updates

Fault Indicator

10A 250V
Slow Blow Fuse



Warning label:
All wiring should be rated
for 300V or greater.

Voltage input
selection switch
(120V/240V).

# 3. Operation

## 3.1 Power-up

Before applying power, make a final check of all wiring for continuity, shorts, grounds, etc. It is usually best to disconnect external alarms and other equipment from the control panel until the initial start-up procedures are completed.

### 3.1.1 Normal Use

Operation of the unit is considered normal use only when the enclosure is closed.  Opening of the enclosure should only be performed by qualified personnel, after disconnection from power and review of operation guidelines.  Upon opening of enclosure please be aware of all internal markings prior to performing any tasks.

### 3.1.2 Initial Startup

The "CTi" logo will be displayed while the system initializes the hardware and software components. The Initial Startup sequence will be initialized by simply powering up the unit from an OFF state.

### 3.1.3 Home Screen

The initial system status screen will only show analog inputs prior to discovery of other networked devices. The home screen may be accessed at any time (See 3.4.3).

## 3.2 Programming the Controller

*Note:*
If Importing a previously saved Configuration file, skip to Import/Export section of this manual (3.4.5.3).

### 3.2.1 Preparation

The key to accurate and timely programming is defining the configuration parameters ahead of time.

Included with the control panel are blank worksheets to fill out prior to programming. Make sure to notate the Modbus ID along with sensor name and location as this will be needed for sensor configuration later.

Defining the configuration parameters in the following order will usually make programming easier to assimilate.

1. Detectors
2. Groups
3. Relays
4. Analog Outputs

#### 3.2.1.1 Connected Devices

Once powered, make sure all connected devices are programmed with unique Modbus ID's (1-255).  See device manuals for details.

#### 3.2.1.2 Naming

Keep in mind character length (max 20) when naming. Abbreviations may need to be used.

Sensors: Typically, using the sensor location for the name provides the best information. For example: Blast Freezer, Comp Room, etc.

Relays: The relay output function typically works best for the name of the relay. For example: Vent fan North, etc.

## 3.2.2 Navigating the screens

### 3.2.2.1 Scrolling

Scroll up or down to view more table rows when applicable. Where side scroll bars are present, they can be used for fasting scrolling.

### 3.2.2.2 Page Activity

The M255 screen will default to screen saver mode after 60 minutes of inactivity. To wake the screen, press the display.

*Note:* The screen will wake from screen saver if an alarm signal is active.

### 3.2.2.3 Tables

When the user selects a box/field on a page with a table, a pop-up keyboard will allow edits to the field. Tables can scroll beyond the page.

Unless otherwise specified, if the user presses any of the column headers in a table, the data will be sorted in descending order by that columns data. If the user presses the column header again, the data will toggle between descending and ascending sort order.

### 3.2.2.3.1 Pop-up Interface

When the user input is required, a pop-up interface, either numeric or alpha-numeric, will appear; all pop-up interfaces will:

- Have a cursor to show the location of the next typed character and allow the user to touch the data entry screen and select the location of the next typed character.
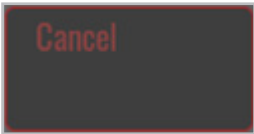


- Have a Cancel key that will exit the keyboard without changing the field. This may either appear as:
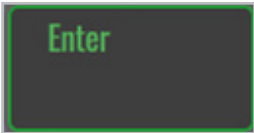


- Have an Enter key that will exit the keyboard and save the entered value. This may appear either:

- Certain value entries will include a slider. The user may move the slider with their finger to increase or decrease values quickly, using the "+" and "-" to make fine



## 3.3 Quick Start Guide

1. **Check Wiring**: Make sure all connected devices are terminated and wire terminals are tightened.

2. **Apply Power**: Turn on AC power breaker to apply power to the system.

3. **Setup**: Configure all connected devices with proper Modbus ID's per device instructions.

4. **Discovery:** Discover all connected devices.

5. **Devices**: Configure all settings.

6. **Programming:** Complete M255 programming, tying sensor Groups to intended Relay Outputs or Analog Outputs.

7. **Test System:** Perform extensive startup test to verify all alarm functions perform as intended.

8. **Export:** Save new configuration and system settings to USB drive for backup.

## 3.4  Menu Screens

### 3.4.1  Menu tree outline

The Menu Tree can be used to quickly find screens. It also shows which screens are configurable and which are view only.



Menu tree showing the following hierarchy:

- **Login**
- **CTi** → Home Screen
- **Devices**
  - Inputs → Group Selection, Group Config, Digital Inputs, Detectors
  - Outputs → Analog Outputs, Relay Outputs
  - Discovery
- **Settings** → General, Gateway, Import/Export, User Admin, Software Update, Factory Reset
- **Info**
  - Unit Info
  - Unit Status
  - Relay States
  - System Info
- **Data**
  - Event Log
  - Configuration Log
- **Service**
  - Sim Mode
  - Relay Mode
  - Calibration Mode

## 3.4.2 Login Screen

To change configurations or system settings, a login is required. A login pop-up screen will appear when the user attempts the changes.

*Note:* Each user will be assigned a role by an admin; the role for each user will determine access to various functions of the M255.

The user may also directly access the login feature from the home screen, at top left, when they begin the updates.

Once the login pop-up appears:

• Tap the Username field; a keyboard will appear.

• Use the on-screen keyboard to enter the username, the text will display above the keyboard. Press the "Enter" key to save and return to login entry.

• Tap the Password field.

• Use keyboard to enter password, only dots will appear above keyboard. Press "Enter" to save and return to login entry.

• Tap the Login key.

Once logged in successfully, the Login icon on the home screen will show yellow with a key.
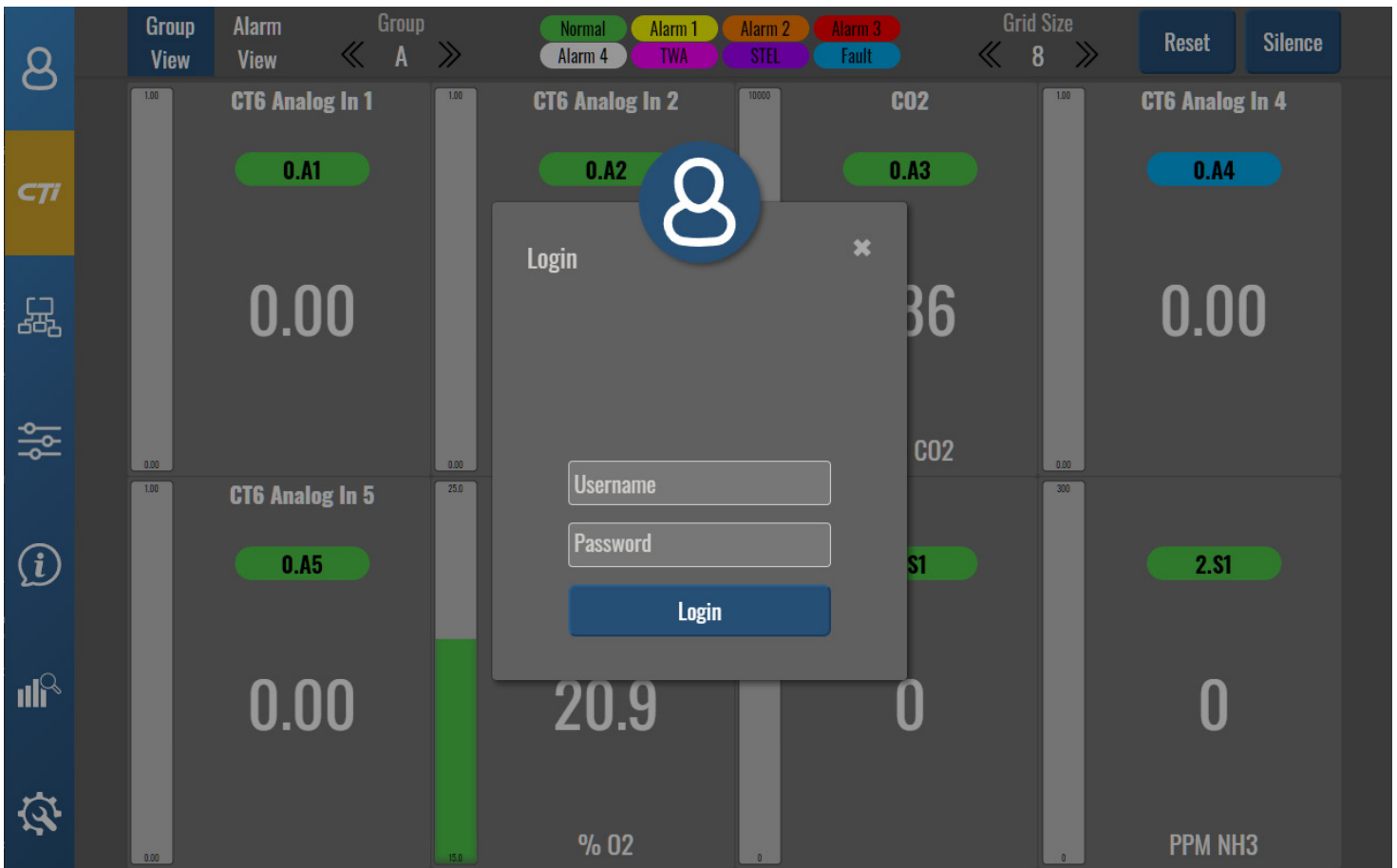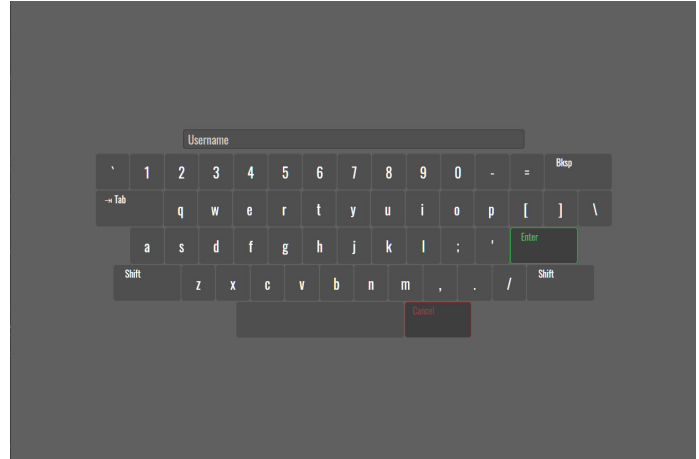
### 3.4.3 CTI Home Screen

The user may access the Home Screen at any point by tapping the "CTi" button on the left side of screen.

The Home Screen allows an at-a-glance view of the status of all connected devices. Data from each device is displayed in a grid pattern.



Each configured device will display:

- Name of Device (If named)
- Device ID (colored to current state)
- Current sensor reading*
- Signal Level Indication Bar
- Gas being sensed
- Method of Indication (PPM or %)
- Gas being measured

*Devices which are not sensors will show a "0" for reading.



**Group View** allows the user to view current state and readings of devices.
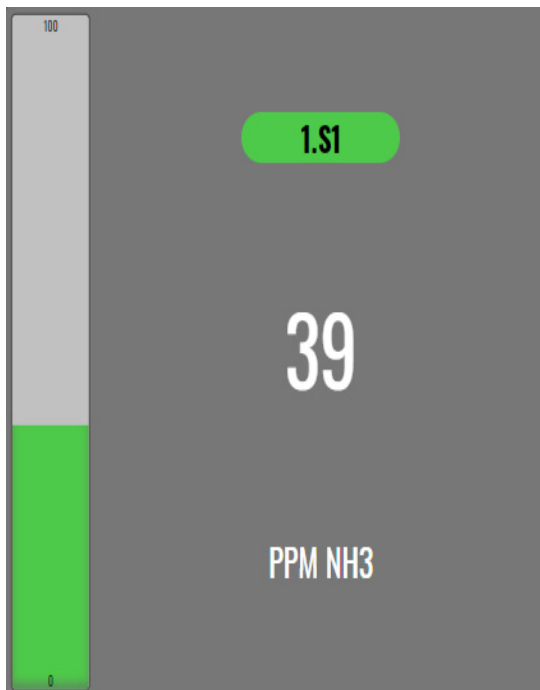


Users may toggle between assigned groups of devices (3.4.4.2.3) by using the arrow keys.



**Alarm View** will display any special states that exist and at what time it occurred.
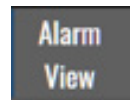


**Grid Size** allows the user to change the number of displayed devices by using with arrow keys.
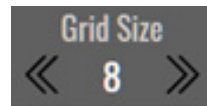


*Note:* When more devices are configured to the M255 than are displayed in the Grid Size, users may toggle between the different screens using arrows located to the side of the readings.

The state will be color coded with a key available at the top of the screen. The colors maybe configured (3.4.5.1).



If the M255 receives alarm (3.6) or fault (3.7) signals, the user may **Reset** or **Silence** from the M255 Home Screen.
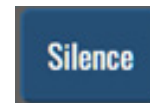
## 3.4.4  Devices Screen

## 3.4.4.1 Discovery Screen

Discovery attempts to communicate with all Modbus addresses to establish communications with all connected devices.

Prior to using Discovery, make sure all devices are installed, powered, and are programmed with unique Modbus ID's. See device instruction manuals for Modbus ID setup.

When ready, select "Devices" on the Home screen. Then "Discovery."

The user may select individual Modbus ID's by tapping the appropriate numbers on the grid or they can attempt a full discovery by using the "Select All."  After the selection has been made, tap start.

The time it takes to discover devices will depend on the number of devices selected.

There will be no duplicates, only unique discovered devices will be added to the lists.

After Discovery, verify all devices have been disovered.

If it appears that one or more devices were not discovered, verify Modbus addresses and perform Discovery process again.

## 3.4.4.2 Inputs Screen

## 3.4.4.2.1 Detectors Screen

The Detector input page allows the user to configure and activate the detector settings.

*Note:* All sensors are made Active by default during Discovery.

Using your provided worksheet and notes:

1. Assign sensor name and/or location. Use abbreviations for long names.

2. Assign the Gas for the selected detector.

3. Specify which unit of measure.

4. Designate Zero and Span for the detector.

5. Adjust Alarm set points if desired.

6. Select sensor Group.  Keep in mind that the Group will be tied to a specific relay output or analog output,see Relay Output section (3.4.4.3.1).

*Note:* A scroll bar (light grey) is available to the right of table to access additional rows.

### Devices > Inputs > Detectors

| Edit | Active | ID | Name | Gas | Unit | Zero | Span | Deadband |
|------|--------|------|---------------|------|------|------|-------|----------|
| Edit | ⬤ | 0.A1 | CT6 Analog In 1 | | | 0.00 | 1.00 | 0.050 |
| Edit | ⬤ | 0.A2 | CT6 Analog In 2 | | | 0.00 | 1.00 | 0.050 |
| Edit | ⬤ | 0.A3 | CO2 | CO2 | PPM | 0 | 10000 | 0.0 |
| Edit | ⬤ | 0.A4 | CT6 Analog In 4 | | | 0.00 | 1.00 | 0.050 |

### 0.A1 Config

| | Alarm 1 | Alarm 2 | Alarm 3 | Alarm 4 | TWA | STEL | Fault |
|--------|----------|----------|----------|----------|----------|----------|-------|
| Status | Inactive | Inactive | Inactive | Inactive | Inactive | Inactive | Fault |
| Level | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | Fault |
| Output | | | | | | | |

Name

CT6 Analog In 1

Deadband    0.050

[−]  ━━━━━━━━━━━━━━  [+]

Gas

[                    ]

Unit of Measure

[                    ]

Zero (Min = -1000 Max = Span - 1)

0.00

Span (Min = Zero + 1 Max = 100000)

1.00

Signal Offset    0

[−]  ━━━━━━━━━━━━━━  [+]

Signal Gain    1.0000

[−]  ━━━━━━━━━━━━━━  [+]

## Alarm 1

Status

Inactive

Level

0.05

## Alarm 2

Status

Inactive

Level

0.05

## Alarm 3

Status

Inactive

Level

0.05

## Alarm 4

Status

Inactive

Level

0.05

## TWA

Status

Inactive

Level

0.05

## STEL

Status

Inactive

Level

0.05

## 3.4.4.2.2 Digital Inputs Screen

The Digital Inputs screen allows the user to configure the inputs to control outputs of the system.

The user is able to:

- Configure the Name
- Configure the Active State of the input, choose whether it is "Open" or "Closed." This designates at which condition the input becomes active.
- Configure whether the Function is "Digital," "Reset," or "Silence."
- Assign input to a Modbus Address and ID.

When the user selects Active State of Closed and Function as Digital the input will Alarm when the input becomes closed.

When an input is configured Active State Open and Input Function is Silence or Reset; the input may be used as a remote Silence or Reset of Alarms.

## Devices > Inputs > Digital Inputs

| Edit | Active | ID | Name | Active State | Input Function |
|------|--------|-----|------|--------------|----------------|
| Edit | ● | 0.D1 | CT6 Discrete In 1 | Closed | Digital |
| Edit | ● | 0.D2 | CT6 Discrete In 2 | Closed | Digital |
| Edit | ● | 0.D3 | CT6 Discrete In 3 | Closed | Digital |
| Edit | | | | | Digital |

**0.D1 Config**

| | Digital |
|---|---|
| Function | Digital |
| Output | |

Name

CT6 Discrete In 1

Active State

Closed

**Closed**

Open

Digital

---

## Devices > Inputs > Digital Inputs

| Edit | Active | ID | Name | Active State | Input Function |
|------|--------|-----|------|--------------|----------------|
| Edit | ● | 0.D1 | CT6 Discrete In 1 | Closed | Digital |
| Edit | ● | 0.D2 | CT6 Discrete In 2 | Closed | Digital |
| Edit | ● | 0.D3 | CT6 Discrete In 3 | Closed | Digital |
| Edit | ● | | | | Digital |

**0.D1 Config**

| | Digital |
|---|---|
| Function | Digital |
| Output | |

Modbus Address

0

Relay

0.R1

Accept

## 3.4.4.2.3 Group Config Screen

The Group Configuration screen allows the user to configure and link groups of inputs to outputs of the system.

The M255 supports up to 26 different groups. Group A includes all active Input Signals. The user may configure Groups B-Z as needed.

The user may name each Group.

Each Group can have up to 24 outputs assigned.

*Note:* Alarm conditions are read together.

### Devices > Inputs > Group Config

| Edit | Group | Name |
|------|-------|------|
| Edit | A | |
| Edit | B | |
| Edit | C | |
| Edit | D | |

### Group B Config

| | Alarm 1 | Alarm 2 | Alarm 3 | Alarm 4 | TWA | STEL | Fault |
|--------|---------|---------|---------|---------|-----|------|-------|
| Output | 1.R1 | | | | | | |
| Output | | | | | | | |

## 3.4.4.2.4 Group Selection Screen

The Group Selection screen allows the user to group Active Input Signals into a common alarm.

The user will be able to quickly see which detectors are actively a part of a group.

Detectors may be selected or removed from groups by tapping the dot corresponding the detector and group.

Devices > Inputs > Group Selection                    Modbus Address: [ All ]

| | Name | 0.A1 | 0.A2 | 0.A3 | 0.A4 | 0.A5 | 0.A6 | 0.A7 | 0.A8 | 1.S1 | 2.S1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A | Edit | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| B | Edit | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| C | Edit | ○ | ○ | ● | ● | ● | ● | ○ | ○ | ○ | ○ |
| D | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● | ● |
| E | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| F | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| G | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| H | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| J | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| K | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| L | Edit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

## 3.4.4.3 Outputs Screens

## 3.4.4.3.1 Relay Outputs Screen

The Relay Outputs screen allows the user to configure the relay settings on board the M255 controller.

User may quickly:

**Name:** Relays may have a name assigned by selecting the Edit button. Assigning a name during installation/start-up provides an at-a-glance relay assignment on the Home Screen and status menu without the need for electrical drawings lookup.

**Active:** Allows a simple single tap activation/deactivation of relays.  Any listed relay set to Active will trip when all of the following conditions are met.

• Gas concentration exceeds the set point for the configured alarm.

• Time exceeds the On Delay time setting

**ID:** Designates on which unit the relay is located (E.g. 0.R1 is located on board the M255).

**Normally Energized**: Selecting normally energized keeps the relay energized in the non-alarm state.

**Latching**: Setting the relay to latch (typically recommended for equipment shutdown) will require a manual reset from the M255 operator interface.  A latching relay will only reset after the gas concentration has dropped below the alarm set points. A non-latching relay automatically resets after the gas concentration has dropped below the alarm set points.

**Silenceable**:  Setting the relay to be silenceable (typically used for buzzers/horns) allows the relay to be reset by pressing SILENCE from the M255 operator interface.

### Devices > Outputs > Relay Outputs

| Edit | Active | ID | Name | Normally Energized | Latching | Silenceable |
|------|--------|-----|------|--------------------|----------|-------------|
| Edit | ● | 0.R8 | CT6 Relay 8 | ○ | ○ | ○ |
| Edit | ● | 0.R9 | CT6 Horn | ○ | ○ | ○ |
| Edit | ● | 1.R1 | | ○ | ○ | ○ |
| Edit | ○ | 1.R2 | | ○ | ○ | ○ |
| Edit | ○ | 1.R3 | | ○ | ○ | ○ |

### 1.R1 Config

Add Config

| Edit | Input Device/Group | Alarm Condition | Set Delay | Reset Delay | Delete |
|------|-------------------|-----------------|-----------|-------------|--------|
| Edit | B | Alarm 1 | 00:00 | 00:00 | Delete |

**Add Config:** The M255 controller allows the user to add and configure which devices or group of devices are connected to a certain relay.

All of the other eight on board relays are listed in the Relay Configuration table, along with any connected devices.  Below is an explanation of the relay configuration settings.

**Input Type:** The user may specify whether it will be an analog, digital input, or group.

**Modbus Address:** Select from previously discovered device addresses if analog or digital.

**Input:** Choose which input is appropriate for the device.

**Alarm Condition:** Select from prior specified conditions the relay will be tripped and signal an alarm.

**Set Delay**: Set relay on-time delay

**Reset Delay**: Set relay off-time delay
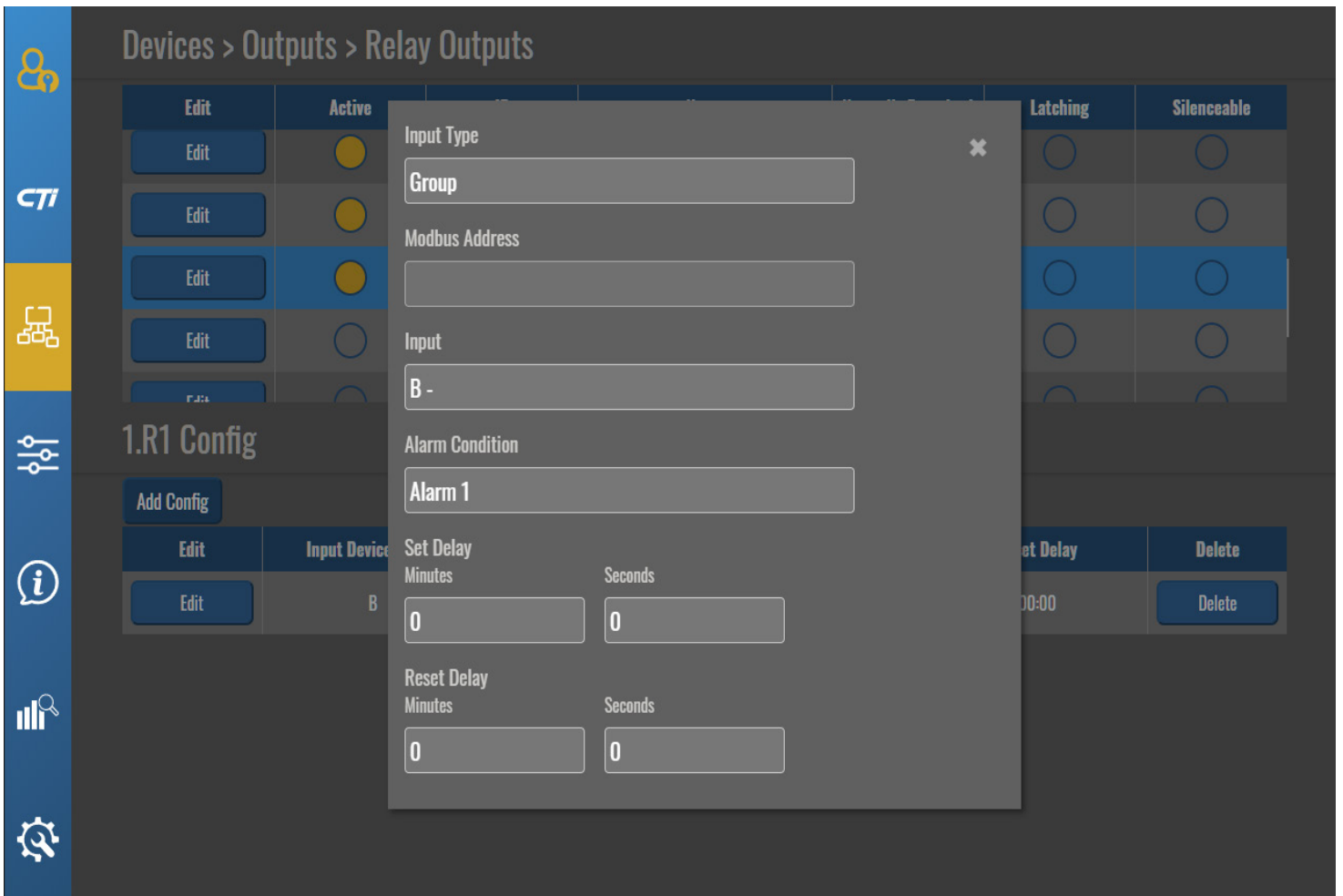
### 3.4.4.3.2 Analog Outputs Screen

The Analog Output Configuration page allows the user to configure the 4-20 mA analog output settings.

Using your provided worksheet and notes:

1.  Make the device analog output active (if desired).

2.  Assign name and/or location. For example, Exhaust Fan 3.  Use abbreviations for long names

3.  Select sensor or group source.  Selecting "None" will disable the analog output.

Each Active sensor has a 4-20 mA value, equivalent to it's gas concentration, calculated based on the range of the sensor.

Each Group has a 4 to 20 mA value calculated, based on the largest 4-20 mA value in that group. If a Group is selected as the Source, the devices Analog Output will be commanded to output the calculated 4-20 mA for that Group.

Refer to your specific device manual for details and requirements for analog and digital inputs for fan activation and speed control.

**Devices > Outputs > Analog Outputs**

| Edit | Active | ID | Name | Input ID | Signal Offset | Signal Gain |
|------|--------|-----|------|----------|---------------|-------------|
| No Analog Outputs Discovered | | | | | | |

# 3.4.5 Settings Screens

## 3.4.5.1 General Screen

The user may adjust Date/Time, User Time-out, Main Menu Time-out, Local Reset/Silence, and Alarm/Special State colors through the Settings menu by selecting "General."

Having the correct date and time is important for accuracy of the Event Log.  It is recommended to review and adjust time during each calibration.

*Note:* Time does not adjust automatically for daylight savings time.

User and Main Menu Time-out settings allow users to specify how long, in minutes, the display will remain active before returning to the screen saver.

Local Reset/Silence (3.4.4.3.1) setting allows the user to allow alarms and special states to be controlled at the individual detectors/devices

The user may also change the colors indicated on the Home Screen representing the status of each device.
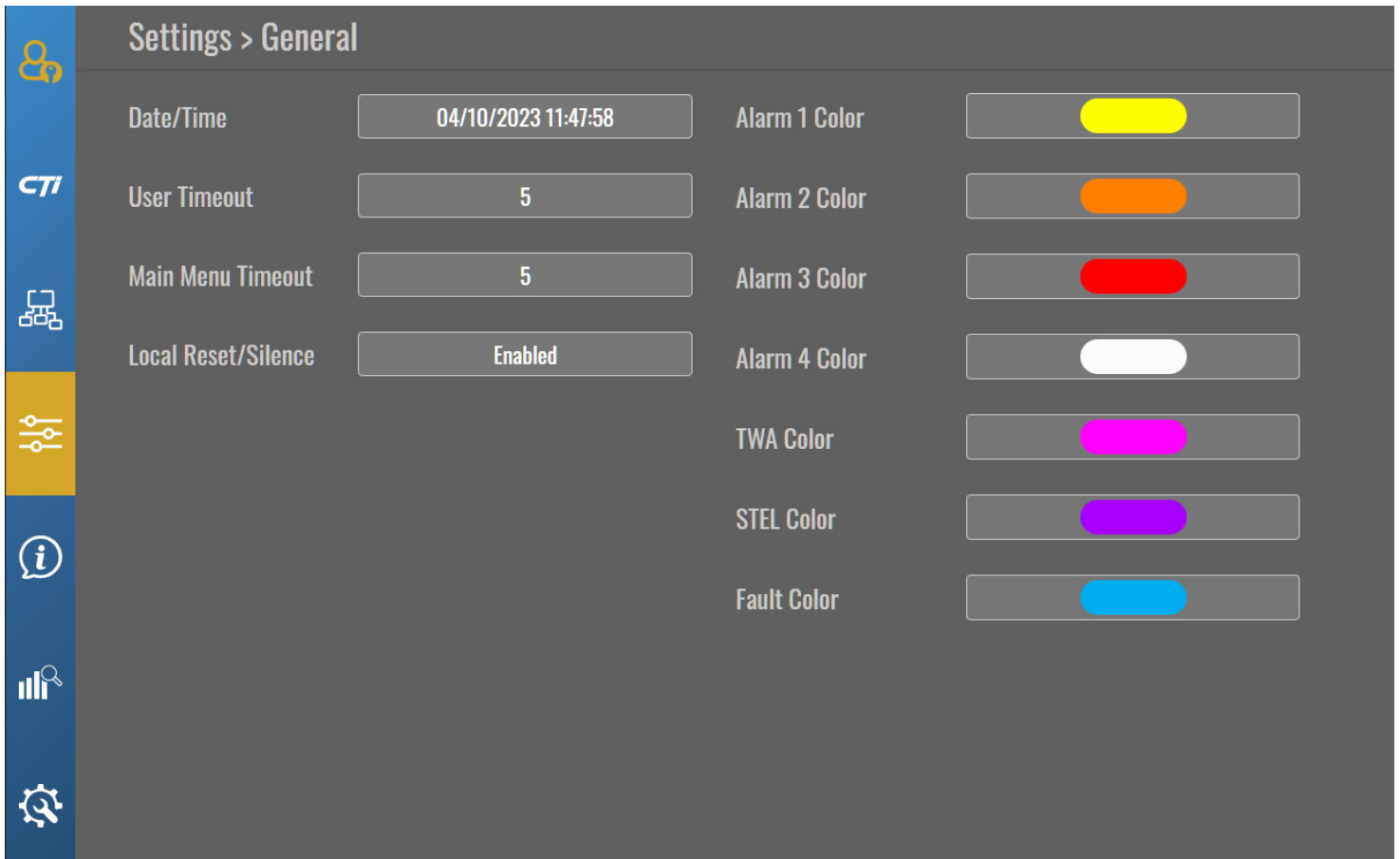
## 3.4.5.2 User Admin Screen

During initial start-up of the M255 the general Admin Username and Password is used to designate additional users depending on their role.

*Admin Username: cti*

*Admin Password: 5861*

Users will be classified as one of:

- User - View Only, able to silence/reset alarms
- Manager - View/Change all, except Settings/User Admin and delete logs
- Administrator - View/Change all, except delete logs
- CTI - View/Change all

| Edit | Username | access-level | Delete |
|------|----------|--------------|--------|
| Edit | Administrator | Administrator | Delete |

Settings > User Admin

Add User

## 3.4.5.3 Import/Export Data Screen

To import or export files:

1. Use a USB flash drive >1GB.

2. Insert the flash drive into the USB port on the main display unit on the inside of the enclosure door .

3. Select *Click to select USB,* and select the USB.

4. Use the drop-down menu to select files to be imported or exported.

### Import

The Import feature allows users to import a system configuration file (xxx.mff from the flash drive.)

This file can be imported to restore corrupt configuration, or uploaded into another M255 controller to duplicate the configuration.

### Export

The Export feature allows the user to export the following controller files to the flash drive:

**System Configuration:** Creates a backup .mff file of the user programmed data tables in the event of a system crash or software corruption.

**Event Log**: Creates a CSV file of all events with a date/time stamp.

**Data Log**: For CTI personnel diagnostics

**Diagnostics Log**:For CTI personnel diagnostics
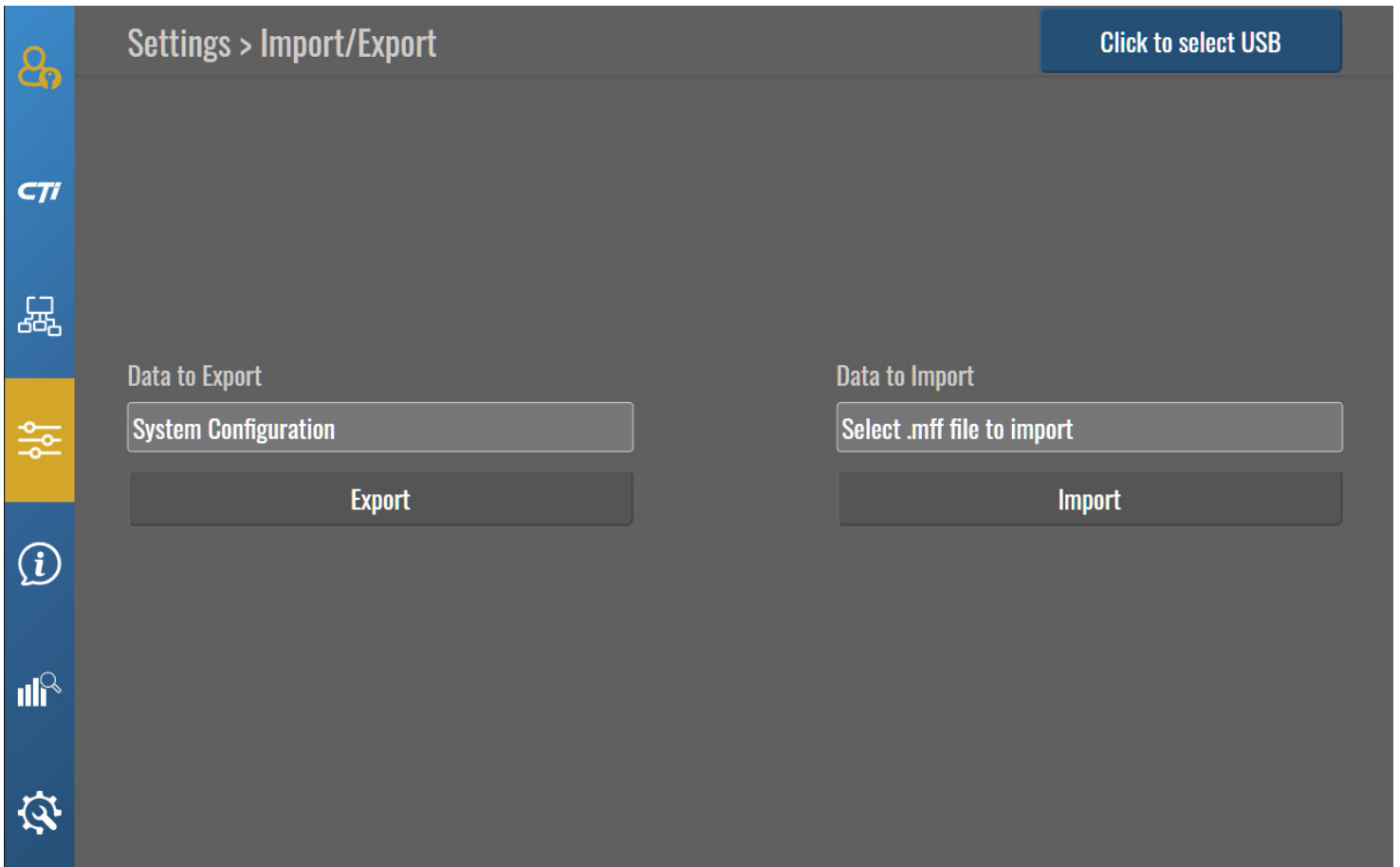
## 3.4.5.4 Software Update Screen

Updating the M255 software will require use of an empty USB drive, FAT32 formatted.

The software can be emailed to the user and loaded onto the USB flash drive.

Users will insert the USB drive into one of the two USB ports inside the M255. To update the Display users will need to locate the USB port on the back of the lid .  To update the logic software users will need to locate the USB port on the M255's interface board .

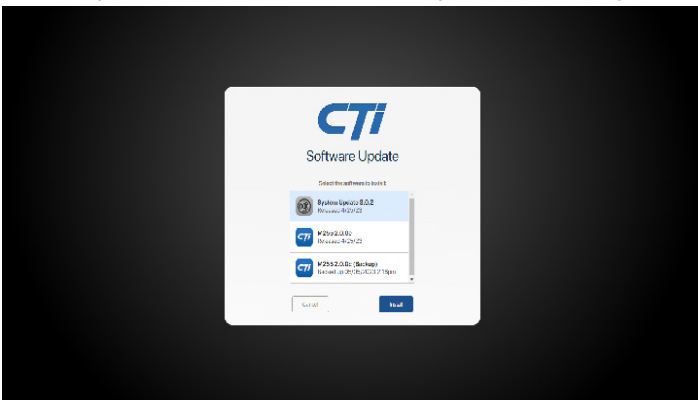### 3.4.5.4.1 Display Update

Plug USB drive into the port located on the back of the lid . When the USB has been plugged in, the M255 will read the drive and display all available updates.
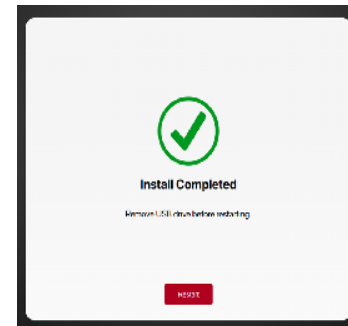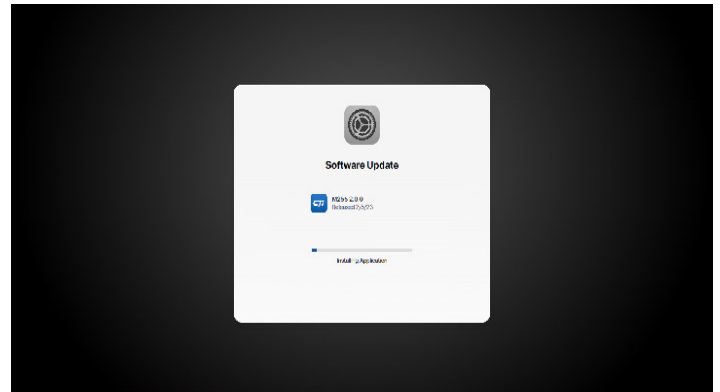
Users will see  either/both system updates or application updates (M255).



Select updates one at a time and tap the install key.



The unit will install software and prompts for a restart of the M255.





*Note:* Updating Display software requires the M255 to restart after each update.  A single update packet could include more than one restart.  Updates should be scheduled for when these restarts will not impact safety.

### 3.4.5.4.2 Logic Update

*Note:* Updating the logic software will not utilize the display.

Only a single update, bin file, should be loaded onto the USB drive. Place the bin file on the top level of USB drive.

Plug USB drive into the port located on the interface board .

The fault indicator light located on the interface board will deactivate while software updates.  If the light does not deactivate within 6 seconds remove and reinsert drive.

Once update has completed fault light will reactivate and the USB drive may be removed and the M255 has been updated.

## 3.4.5.5 Factory Reset Screen

Similar to smart phones and other devices, factory reset deletes data tables and configuration files, and restores it back to factory settings.

*Note:* Event Log (3.4.7.1) and Configuration Log (3.4.7.2) will not be erased if a factory reset is performed.

This cannot be undone once the Reset button is selected.

Make sure you have a good backup copy of the M255 config file that is intended to be imported into the M255, or be prepared to start over with programming of the M255.

*Note:* If the Flash version has changed any current configurations will reset. It is recommended to document the current configurations before performing reset.
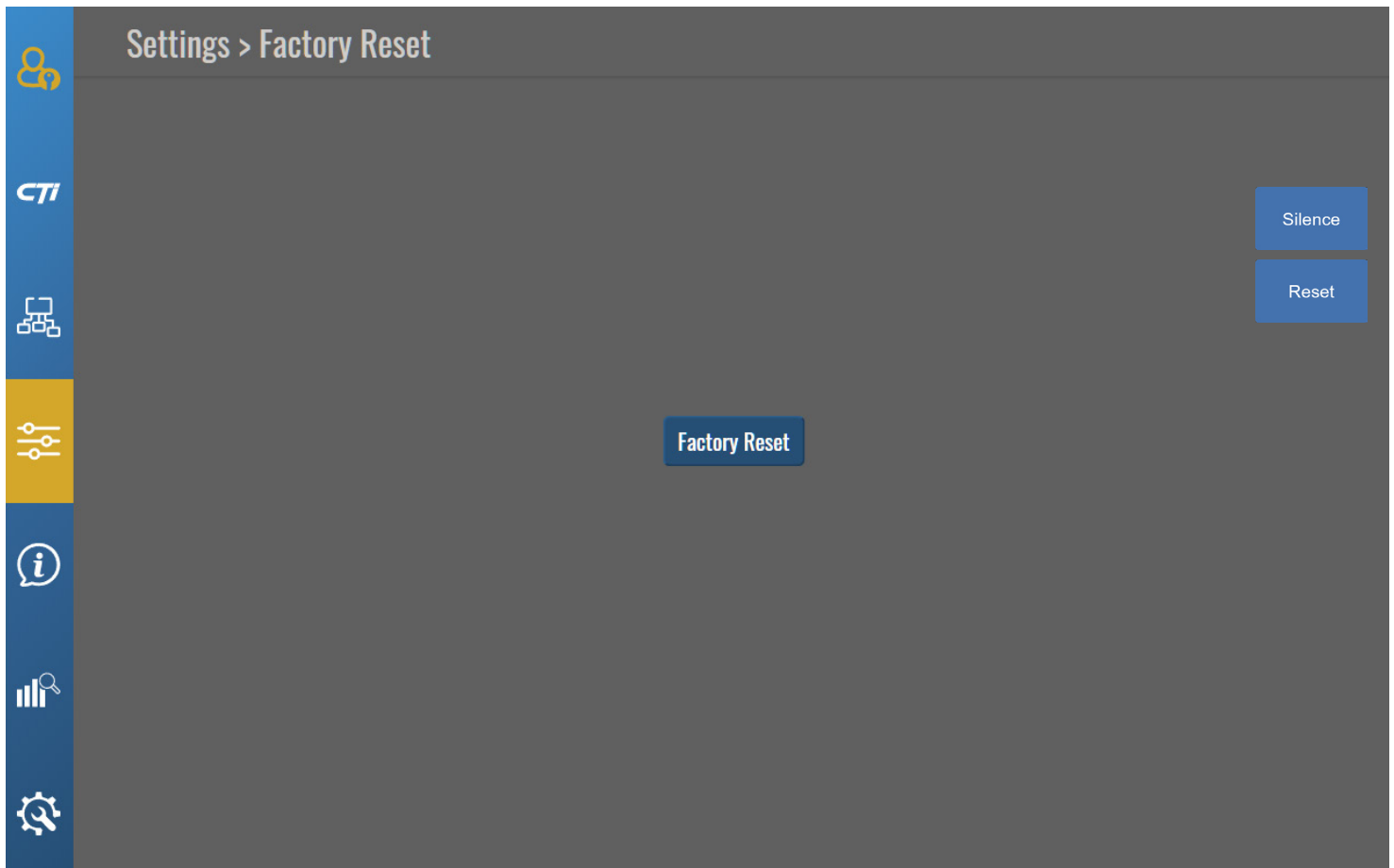
# 3.4.6 Info Screens
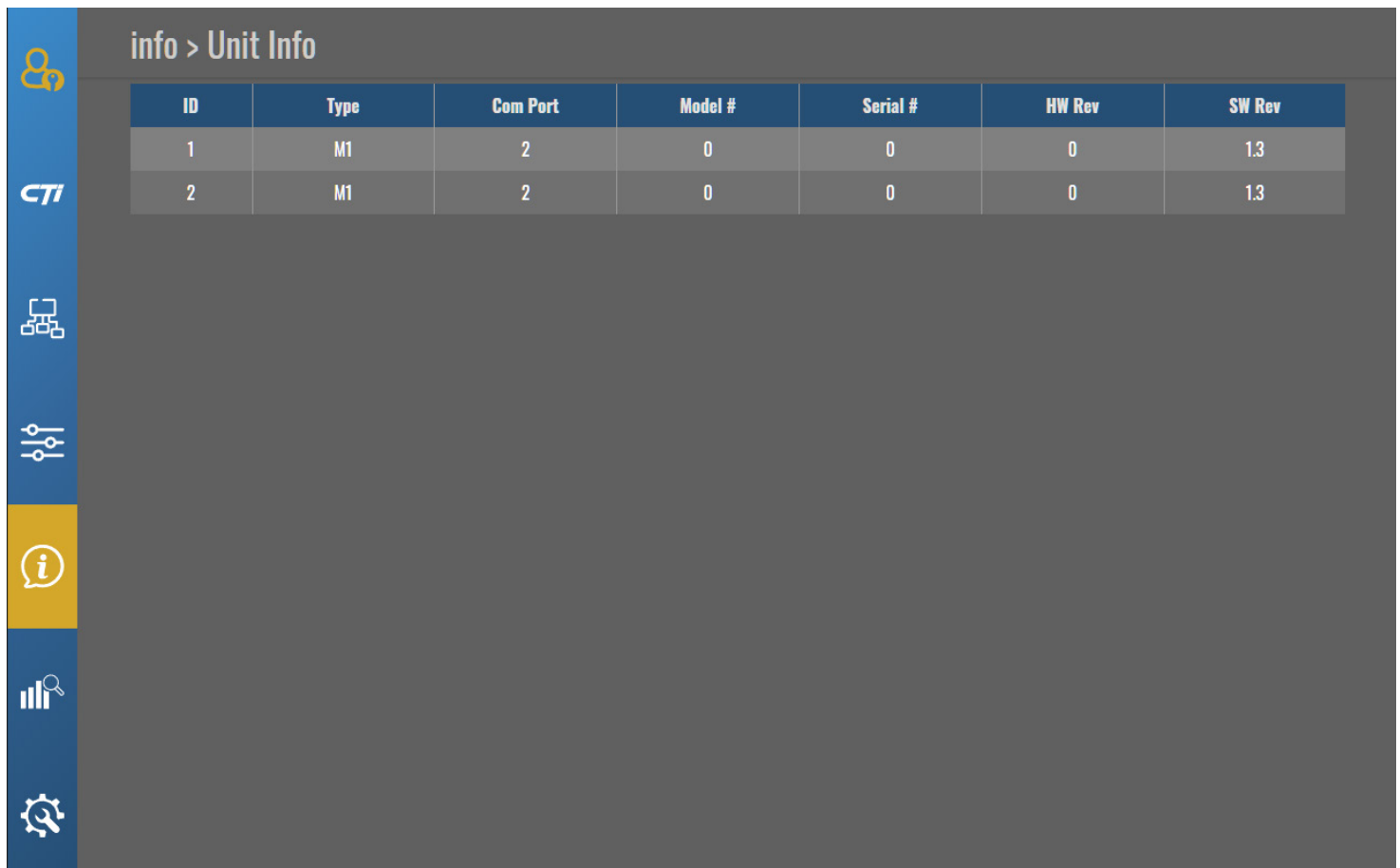
The following screens are view-only status screens.

## 3.4.6.1 Unit Info Screen

A unit is a group of devices that share the same Modbus address.  (e.g. - An M1Controller is a single unit with 1 sensor and 3 relay devices.)

The Unit Info screen is an at-a-glance view of what type of units are currently tied into the network. Along with which communication ports are currently being utilized.

It also displays the hardware revision and current software revision of the discovered devices at the right of the screen.

info > Unit Info

| ID | Type | Com Port | Model # | Serial # | HW Rev | SW Rev |
|----|------|----------|---------|----------|--------|--------|
| 1 | M1 | 2 | 0 | 0 | 0 | 1.3 |
| 2 | M1 | 2 | 0 | 0 | 0 | 1.3 |

## 3.4.6.2 Unit Status Screen

The Unit Status screen lists all connected units and provides network communication diagnostics data for each.

This table is a useful tool for diagnosing anomalies and other intermittent issues for units and power/comm wiring.

Contact service at CTI for help troubleshooting.

| ID | Type | Comm Status | Total Messages | No Response (%) |
|----|------|-------------|----------------|-----------------|
| 0 | M255 | ✔ | 30611258 | 0.0000000 |
| 1 | M1 | ✔ | 5064127 | 0.0000000 |
| 2 | M1 | ✔ | 5064121 | 0.0000000 |

Info > Unit Status — Reset Statistics

| ID | Type | Comm Status | Total Messages | No Response (%) |
|----|------|-------------|----------------|-----------------|
| 0 | M255 | ✔ | 344853610 | 0.0000000 |
| 1 | M1 | ✔ | 39025382 | 0.0076027 |
| 2 | M1 | ✔ | 4788478 | 0.0018377 |
| 3 | M1 | ✔ | 4790981 | 0.0009184 |
| 4 | M1 | ✔ | 4787184 | 0.0104028 |
| 5 | M1 | ✔ | 4785777 | 0.0053701 |
| 6 | M1 | ✔ | 4785714 | 0.0012119 |
| 7 | M1 | ✔ | 4785746 | 0.0012328 |
| 8 | M1 | ✔ | 4786949 | 0.0009609 |
| 9 | M1 | ✘ | 4790771 | 0.0011480 |
| 10 | M1 | ✔ | 4776342 | 0.0553980 |
| 11 | M1 | ✔ | 4780891 | 0.0008785 |
| 12 | M1 | ✔ | 4784907 | 0.0006270 |
| 13 | M1 | ✔ | 4778781 | 0.0009207 |
| 14 | M1 | ✔ | 4780104 | 0.0005648 |
| 15 | M1 | ✔ | 4783169 | 0.0039723 |
| 16 | M1 | ✔ | 4779288 | 0.0000000 |
| 17 | M1 | ✔ | 4777855 | 0.0000000 |
| 18 | M1 | ✔ | 4794093 | 0.0000000 |
| 19 | M1 | ✔ | 4794093 | 0.0000000 |

### 3.4.6.3 Relay States Screen

The relay states screen shows which relays on the network are active, and whether they are tripped due to an event.

Info > Relay States

| ID | Name | Tripped State |
|---|---|---|
| 0.R1 | CT6 Relay 1 | ○ |
| 0.R2 | CT6 Relay 2 | ○ |
| 0.R3 | CT6 Relay 3 | ○ |
| 0.R4 | CT6 Relay 4 | ○ |
| 0.R5 | CT6 Relay 5 | ○ |
| 0.R6 | CT6 Relay 6 | ○ |
| 0.R7 | CT6 Relay 7 | ○ |
| 0.R8 | CT6 Relay 8 | ○ |
| 0.R9 | CT6 Horn | ○ |
| 1.R1 | | ○ |
| 2.R1 | | ○ |

### 3.4.6.4 System Info Screen

The system info screen provides a convenient view of vital hardware and software information.

## Info > System Info

| System Info | |
|---|---|
| IP Address | 192.168.220.145 |
| MAC Address | e4-5f:01:1e:fc:2a |
| CPU Serial Number | 1000000041434f1f |
| CPU Temperature | 45° |

| Software Version | |
|---|---|
| M255 Flash | 3 |
| M255 Logic Board | 2.0.0 |
| M255 Backend | 2.0.0 |
| M255 Socket Server | 1.0.0 |

## 3.4.7 Data Screens
### 3.4.7.1 Event Log Screen

The event log records every event and stores them in chronological order, with date and time stamps.

*Note:* The event log is not erased when the M255 is restored to factory defaults (3.4.5.5).

**Event:**

The event can be any of the following:

- Alarm, vent or fault activated or cleared
- A relay tripped or cleared
- M255 powered on
- Cal timer started or ended
- Alarms enabled or disabled

**Set Point (PPM):**

If applicable, shows the gas concentration alarm trigger level.

**ID**:

Shows the Modbus ID of the device.

**Name**:

Shows the name of the device.

## Data > Event Log

| Date & Time | Event | Set Point (PPM) | ID | Name |
|---|---|---|---|---|
| 2023-04-10 11:49:39 | Fault On | 0 | 0.A4 | CT6 Analog In 4 |
| 2023-04-10 11:12:46 | Fault Off | 0 | 0.A8 | CT6 Analog In 8 |
| 2023-04-10 11:12:46 | Fault Off | 0 | 0.A7 | CT6 Analog In 7 |
| 2023-04-07 13:49:56 | Fault On | 0 | 0.A8 | CT6 Analog In 8 |
| 2023-04-07 13:49:56 | Fault On | 0 | 0.A7 | CT6 Analog In 7 |
| 2023-04-07 13:49:56 | Fault On | 0 | 0.A4 | CT6 Analog In 4 |
| 2023-04-07 13:29:35 | Fault On | 0 | 0.A8 | CT6 Analog In 8 |
| 2023-04-07 13:29:35 | Fault On | 0 | 0.A7 | CT6 Analog In 7 |
| 2023-04-07 13:29:35 | Fault On | 0 | 0.A4 | CT6 Analog In 4 |
| 2023-04-07 13:25:20 | Fault On | 0 | 0.A8 | CT6 Analog In 8 |
| 2023-04-07 13:25:18 | Fault On | 0 | 0.A7 | CT6 Analog In 7 |
| 2023-04-07 13:25:06 | Fault Off | 0 | 0.A8 | CT6 Analog In 8 |
| 2023-04-07 13:25:05 | Fault Off | 0 | 0.A7 | CT6 Analog In 7 |
| 2023-04-07 10:10:22 | Fault On | 0 | 0.A8 | CT6 Analog In 8 |
| 2023-04-07 10:10:22 | Fault On | 0 | 0.A7 | CT6 Analog In 7 |
| 2023-04-07 10:10:22 | Fault On | 0 | 0.A4 | CT6 Analog In 4 |
| 2023-04-07 09:42:23 | Fault On | 0 | 0.A8 | CT6 Analog In 8 |

## 3.4.7.2 Configuration Log Screen

The Configuration Log records when a user changes a setting through the M255 controller.

Changes are stored chronologically with a date and time stamp.

*Note:* The Configuration Log is not erased when the M255 is restored to factory defaults (3.4.5.5).

**User:**

Individual user logins are recorded when configuration changes are made.

**ID:**

Shows which devices on the system was changed, if value is blank the change occurred to M255 controller.

**Parameter:**

Shows which parameter was changed.

**Values:**

Shows last recorded and newly changed value for the parameter changed.

### Data > Configuration Log

| Date & Time | User | ID | Parameter | Old Value | New Value |
|---|---|---|---|---|---|
| 2023-04-10 11:48:38 | CTi | | Alarm 3 Color | #FFFF00 | #FF0000 |
| 2023-04-10 11:48:38 | CTi | | Alarm 1 Color | #FF0000 | #FFFF00 |
| 2023-04-10 11:48:37 | CTi | | Alarm 1 Color | #FFFF00 | #FF0000 |
| 2023-04-10 11:48:37 | CTi | | Alarm 3 Color | #FF0000 | #FFFF00 |
| 2023-04-10 11:48:34 | CTi | | Alarm 1 Color | #FF7F00 | #FFFF00 |
| 2023-04-10 11:48:34 | CTi | | Alarm 2 Color | #FFFF00 | #FF7F00 |
| 2023-04-10 11:48:32 | CTi | | Alarm 2 Color | #FF7F00 | #FFFF00 |
| 2023-04-10 11:48:32 | CTi | | Alarm 1 Color | #FFFF00 | #FF7F00 |
| 2023-04-10 11:12:46 | CTi | 0.A8 | Active | True | False |
| 2023-04-10 11:12:46 | CTi | 0.A7 | Active | True | False |
| 2023-04-07 13:44:54 | CTi | 0.A3 | Deadband | 480.0 | 0.0 |
| 2023-04-07 13:44:52 | CTi | 0.A3 | Deadband | 490.0 | 480.0 |
| 2023-04-07 13:44:51 | CTi | 0.A3 | Deadband | 500.0 | 490.0 |
| 2023-04-07 13:44:48 | CTi | 0.A3 | Deadband | 0.0 | 500.0 |
| 2023-04-07 13:25:20 | CTi | 0.A8 | Active | False | True |
| 2023-04-07 13:25:18 | CTi | 0.A7 | Active | False | True |
| 2023-04-07 13:25:06 | CTi | 0.A8 | Active | True | False |

# 3.4.8 Service Screens

## 3.4.8.1 Sim Mode Screen

The M255 Sim Mode allows the user to simulate different gas levels detected for the purpose of testing alarm and gas threshold actions as programmed and configured.

The user may select a specific device to test. They will use the slider that appears to adjust the simulated value to be tested.

The simulation may be activated by tapping the "Active" dot on the screen corresponding with the device.

| Edit | Active | Sim Value | ID | Name |
|------|--------|-----------|------|------|
| Edit | ○ | 0.00 | 0.A1 | CT6 Analog In 1 |
| Edit | ○ | 0.00 | 0.A2 | CT6 Analog In 2 |
| Edit | ○ | 0 | 0.A3 | CO2 |
| Edit | ○ | 0.00 | 0.A4 | CT6 Analog In 4 |
| Edit | ○ | 0.00 | 0.A5 | CT6 Analog In 5 |
| Edit | ○ | 15.0 | 0.A6 | O2 |
| Edit | ○ | 0 | 1.S1 | |
| Edit | ○ | 0 | 2.S1 | |

Service > Sim Mode — Total Sim Time 00:01:00

## 3.4.8.2 Relay Mode Screen

The M255 Relay Mode is used to disable and test relays in the controller.

If the user disables a relay, a disable will start; while relay is disabled it will not go into alarm. If the timer counts down to zero all disabled relays will re-enable.

If the user presses the relay test button, a test timer will begin, time-out is set in the General menu. A relay in test will be forced into an alarm state. If the test timer expires the relay will return to its normal operating state.

**Service > Relay Mode**

Total Relay Time 00:01:00

| Relay Test | Disable Relay | ID | Name |
|---|---|---|---|
| ○ | ○ | 0.R1 | CT6 Relay 1 |
| ○ | ○ | 0.R2 | CT6 Relay 2 |
| ○ | ○ | 0.R3 | CT6 Relay 3 |
| ○ | ○ | 0.R4 | CT6 Relay 4 |
| ○ | ○ | 0.R5 | CT6 Relay 5 |
| ○ | ○ | 0.R6 | CT6 Relay 6 |
| ○ | ○ | 0.R7 | CT6 Relay 7 |
| ○ | ○ | 0.R8 | CT6 Relay 8 |
| ○ | ○ | 0.R9 | CT6 Horn |
| ○ | ○ | 1.R1 | |
| ○ | ○ | 2.R1 | |

### 3.4.8.3 Calibration Mode Screen

The M255 Calibration Mode is used to put a selected number of devices into calibration mode so a calibration gas may be applied to the device in order to adjust the zero and span.

When a user activates calibration mode, a timer will activate. The time needed for each calibration is chosen by the user.

While in calibration mode the alarms associated with the selected device will disable. When the timer completes its count down, selected devices will return to normal operation.

After all calibrations have been completed, the user must press the "Update Last Cal" button for the "Last Cal Date" and "Cal Due Date" to change.

| Service > Calibration Mode | Analogs | Groups | Modbus Address: All | Total Cal Time 00:01:00 |
|---|---|---|---|---|

Update Last Cal    Last Cal Date: 04/04/2023

| Calibration | ID | Name | Cal Due Date |
|---|---|---|---|
| ○ | 0.A1 | CT6 Analog In 1 | 10/1/2023 |
| ○ | 0.A2 | CT6 Analog In 2 | 10/1/2023 |
| ○ | 0.A3 | CO2 | 10/1/2023 |
| ○ | 0.A4 | CT6 Analog In 4 | 10/1/2023 |
| ○ | 0.A5 | CT6 Analog In 5 | 10/1/2023 |
| ○ | 0.A6 | O2 | 10/1/2023 |
| ○ | 1.S1 | | 10/1/2023 |
| ○ | 2.S1 | | 10/1/2023 |

## Service > Calibration Mode

Analogs **Groups**

Total Cal Time
00:01:00

**Update Last Cal**   Last Cal Date: 04/04/2023

| Calibration | ID | Name |
|:---:|:---:|:---:|
| ○ | A | |
| ○ | B | |
| ○ | C | |
| ○ | D | |
| ○ | E | |
| ○ | F | |
| ○ | G | |
| ○ | H | |
| ○ | I | |
| ○ | J | |
| ○ | K | |
| ○ | L | |
| ○ | M | |

# 3.5  Startup test

Once the system is powered up and the M255 has been fully programmed, a system startup test should be performed, testing all intended alarms are working as intended.

## Start-Up Test Recommendations:

1. CTI recommends users perform sensor calibration upon start-up per sensor instructions.

2. A second person may be needed to confirm alarms, exhaust fans, louvers, audio/visuals devices, etc are working as intended.

3. A person may be needed to stay at the M255 controller to silence and reset the alarms.

## 3.6 Responding to Alarm

When an alarm occurs on a device configured to the M255 controller, the status color of the device will change according to the alarm being signaled. The user will have the options to Silence and/or Reset the alarm (if configured accordingly), and take appropriate action.

*Note:* Modbus devices configured to be controlled by the M255 cannot be silenced or reset from the local device.
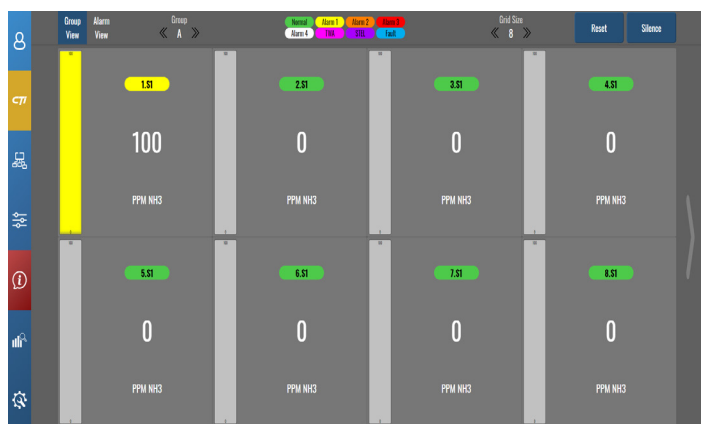


### Silence Button

Pressing the Silence button will clear all silenceable relays. This is typically used for horns/buzzers. All silenceable relays will clear even if conditions triggering the alarm continue. Silenceable relays are configured on the Relay Configuration screen (3.4.4.3.1).

### Reset Button

Pressing the reset button will clear all latched relays only if the detector has sensed that conditions have fallen below Alarm set point. Latching relays are configured in the Relay Configuration screen.

## 3.7 Responding to Fault

If the M255 receives a Fault signal from a configured device the color of the device ID will change, defaulted to blue.
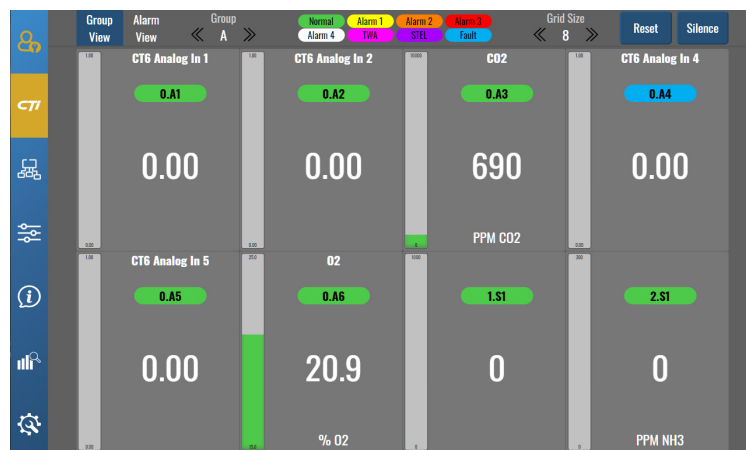


### Sensor Element not detected:

If the sensor element attached to a discovered detector has become unseated a fault will be signaled, try removing sensor element and reseating it. Use this opportunity to check the electrical contact points for corrosion or other damage.

### Communications Fault:

A communication fault can occur if the M255 loses communication with supported devices.

A fast way to check is to access the Unit Status screen.

This is usually a wiring problem but can be occur if supported devices share a Modbus ID or there has been a hardware failure with a device.

Check the RS-485 Modbus wiring, if there is a break all devices after the break will have faulted Comm Status and should be obvious when viewed at the control panel.

# 4. Maintenance

## 4.1 System Maintenance

All gas detection systems should be calibrated with certified calibration gas as specified in the individual device manuals. All alarm functions and outputs should be tested, verified, and documented after calibration.

## 4.2 Sensor Maintenance

If sensor span or zero cannot be adjusted, the sensor may be approaching its end of life and must be replaced. Keep an operation log of all maintenance, calibrations and alarm events.

## 4.3 Cleaning

Cleaning of the controller should only be done with a damp, soft cloth. Do not use solvents or chemicals.

# 5. Specifications

**Input Power Requirements:**
100-120Vac, 5.5A 50/60Hz
200-240Vac, 3.5A 50/60Hz (selected by switch on side of power supply - see )

**Fuses:**
AC power: (250V, 10A slow blow fuse 5x20mm)
RS-485 Modbus channels: (x4) (32V, 7.5A)
Courtesy relay outputs: (x2) (32V, 7.5A)

**Output 24 Vdc Power available for sensors and audio/visual devices:**
24Vdc, 4A @ 86°F (30°C)
24Vdc, 3.25A @ 104°F (40°C)

**Communications:**
RS-485 Modbus RTU, 4 channels, compatible with CTI Modbus capable device models only. 4,000 ft (1,220 m) per channel max.

**Capacity:**
255 devices.

**Cable Recommendation:**
Communication: RS-485 communication cable, 22-24 AWG, 2 conductor, twisted pair, shielded, stranded, with drain wire (Alpha Wire 6460 or equivalent).
Device Power: 14 AWG, 2 conductor, shielded, stranded cable with a drain wire (Belden 5100UE or equivalent).

**Relay Outputs:**
(8) Programmable relays, SPDT, Form C dry contacts 5A @ 24Vdc or 8A @ 240Vac
(1) Dedicated Fault relay, normally energized, SPDT, Form C dry contacts 5A @ 24 Vdc or 8A @ 240 Vac

**Dimensions**:
14.5" high x 19.5" wide x 6.2" deep (368mm high x 483mm wide x 158mm deep)

**Weight**:
15 lbs (6.8kg)

**Enclosure**:
Polyurethane with neoprene gasket. Continuous stainless-steel hinge pin. Clasp-type latches with captive locking screw in latch. For Indoor non-classified areas. Tighten captive screw on latch to 0.56 N-m (5.0 in-lbs).

**Temperature Range**:
-4°F to 104°F (-20°C to 40°C)

**Humidity Range**:
0-95% RH condensing

**Terminal Block Plugs (Field Wiring)**:
26-12 AWG, torque 4.4 in-lbs.

**User Interface/Display:**
10" (254mm) color, capacitive touch LCD.

**Language:**
English only

**Altitude:**
Up to 4000 m (13,123 ft)

**Pollution Degree Classification:**
Pollution degree 2

**Transient Overvoltage:**
Category II

# 6.  Warranty

## Limited Warranty & Limitation of Liability

Calibration Technologies, Inc. (CTI) warrants this product to be free from defects in material and workmanship under normal use and service for a period of 2 years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. CTI's warranty obligation is limited, at CTI's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a CTI authorized service center within the warranty period. In no event shall CTI's liability hereunder exceed the purchase price actually paid by the buyer for the product.

This warranty does not include:

a.  routine replacement of parts due to the normal wear and tear of the product arising from use;
b.  any product which in CTI's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;
c.  any damage or defects attributable to repair of the product by any person other than an authorized dealer or contractor, or the installation of unapproved parts on the product

The obligations set forth in this warranty are conditional on:

a.  proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of CTI;
b.  the buyer promptly notifying CTI of any defect and, if required, promptly making the product available for correction. No goods shall be returned to CTI until receipt by the buyer of shipping instructions from CTI; and
c.  the right of CTI to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CTI SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.