Operating Manual

SENTRY io®

Wall Mount Controller

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US

MSAsafety.com

WARNING!

These instructions must be provided to users before use of the product and retained for ready reference by the user. Read this manual carefully before using or maintaining the device. The device will perform as designed only if it is used and maintained in accordance with the manufacturer's instructions. Otherwise, it could fail to perform as designed, and persons who rely on this device could sustain serious injury or death.

The warranties made by MSA with respect to the product are voided if the product is not installed and used in accordance with the instructions in this manual. Please protect yourself and your employees by following the instructions.

Please read and observe the WARNINGS and CAUTIONS inside. For additional information relative to use or repair, call 1-800-MSA-2222 during regular working hours.

The Safety Company

1000 Cranberry Woods Drive
Cranberry Township, PA 16066
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For your local MSA contacts, please go to our website www.MSAsafety.com

Contents

1 Safety Regulations

Read this manual carefully before using the SENTRY io. The SENTRY io will perform as designed only if it is used and maintained in accordance with the manufacturer's instructions. Otherwise, it could fail to perform as designed and persons who rely on the SENTRY io for their safety could sustain serious personal injury or death.

The warranties made by MSA with respect to the product are voided if the product is not installed and used in accordance with the instructions in this manual. Please protect yourself and your employees by following the instructions. Read and observe the WARNINGS and CAUTIONS inside.

Make sure any personnel who will be installing, using, or maintaining the SENTRY io have access to the user manual. If electronic access to the user manual is not possible, print a copy of the manual and keep it in an accessible location near the SENTRY io. Failure to obey the following guidelines and/or incorrect installation, operation, servicing, or maintenance of the SENTRY io can cause incorrect operation of the control unit.

1.1 Liability

MSA accepts no liability in cases where the device has been misused, used inappropriately or not used as intended. MSA accepts no liability in cases where damage or injury is caused by wear and tear, neglect or failure to carry out inspection and maintenance procedures. The selection and use of the device are the exclusive responsibility of the employer and/or individual operator. Warranties and guarantees made by MSA with respect to the device are voided, if it is not used, serviced or maintained in accordance with the instructions in this manual.

1.2 Warnings

WARNING!

- Install, operate, and maintain the SENTRY io in strict accordance with its labels, cautions, warnings, instructions, and stated limitations.
- For any maintenance procedure provided in this manual, use only genuine MSA replacement parts. Repair or alteration of the SENTRY io beyond the scope of these maintenance instructions or by anyone other than authorized MSA service personnel can cause incorrect operation of the SENTRY io. See 10 Ordering Information for available parts.
- Wiring procedures described in this manual are intended for proper functioning of the devices under normal conditions. Always be certain that all wiring and equipment installation meets or exceeds the latest revisions of the appropriate National Standards, Electrical Codes and all local ordinances. If in doubt, consult the Authority Having Jurisdiction (AHJ) before wiring the system.
- Never operate the SENTRY io without a connection to Earth ground. Failure to connect the device to Earth ground can result in electrical shock. Electrical shock can cause damage to the SENTRY io and injury to personnel.
- Do NOT use the SENTRY io in hazardous environments beyond the limits indicated on the product label.
- No internal power shut-off switch, breaker, or fuse is provided within the SENTRY io enclosure. An externally located power shut-off switch or breaker is recommended to enable removal of power from the system.
- Some devices and components covered within this document may contain semiconductor devices susceptible to damage by electrostatic discharge. An electrostatic charge can build up on the skin and discharge when an object is touched. Always observe normal precautions for handling electrostatic sensitive devices, such as use of a wrist strap (if available) and proper grounding, when installing the equipment described within this manual.
- External alarms and other mitigation devices must be disconnected prior to performing system tests to avoid causing interruption to facility operations. Ensure that external alarms and other mitigation devices are reconnected immediately after system testing.
- Do not exceed the relay contact rating listed in 7 Technical Specifications or relay operation may fail.
- For all devices connected to the SENTRY io, review and follow the device manuals for guidance and instruction on inspection, calibration, operation, and maintenance.

Failure to follow these warnings can result in serious personal injury or death.

1.3 Correct Use

The SENTRY io is a wall-mount multi-channel controller intended for use with MSA fixed gas detection devices. The controller is housed within a fiberglass enclosure along with the system power supply, input/output modules, field wiring terminals, and a graphic user interface screen with touch-panel and buzzer.

The SENTRY io is designed to accept standard 4-20 mA analog signal inputs from connected MSA or generic gas detectors and will also accept discrete inputs from contact closure devices such as switches or relay contacts. The system provides discrete relay outputs for use in energizing notification devices such as sounders, strobes, or horns. Optional analog 4-20 mA outputs are also available when specified. All systems include an internal field wiring termination strip to enable easy connection of interconnecting field wiring conductors.

The SENTRY io enclosure door needs to remain closed during operation of the unit.

The SENTRY io graphic user interface (GUI) with touchscreen provides the SmartStart configuration wizard enabling easy configuration of user language, date/time, connected gas detectors, discrete input and output signals, and user-specified cause & effect operating logic.

Multiple SENTRY io system configuration options are available depending upon the number and type of input/output channels required.

Consult EN 60079-29-2 for guidance on installation of fixed gas detection equipment.

⚠ WARNING!

This product is supporting life and health. Inappropriate use, maintenance, or servicing may affect the function of the SENTRY io and thereby seriously compromise the user's life.

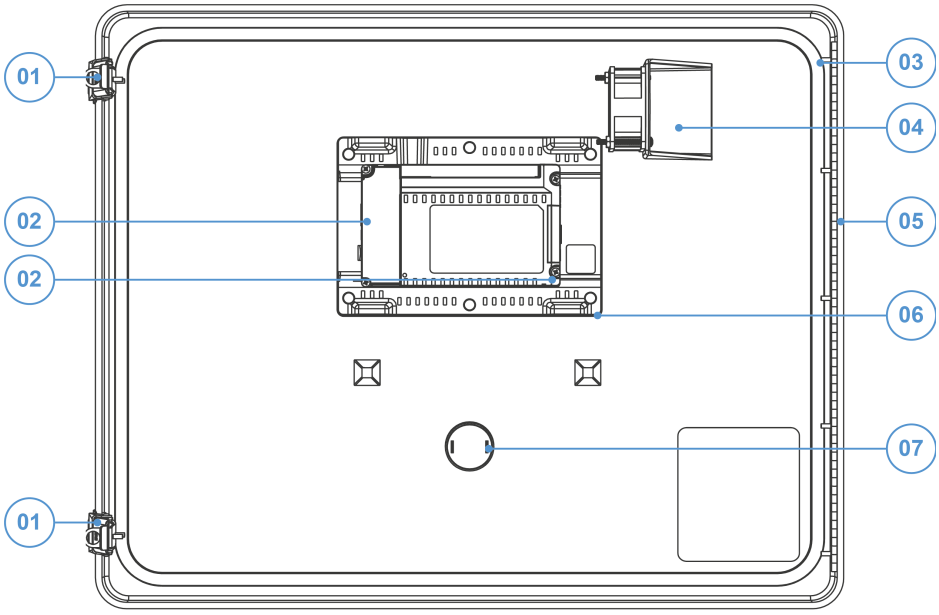
Do not operate the SENTRY io beyond the limits specified in 7 Technical Specifications.

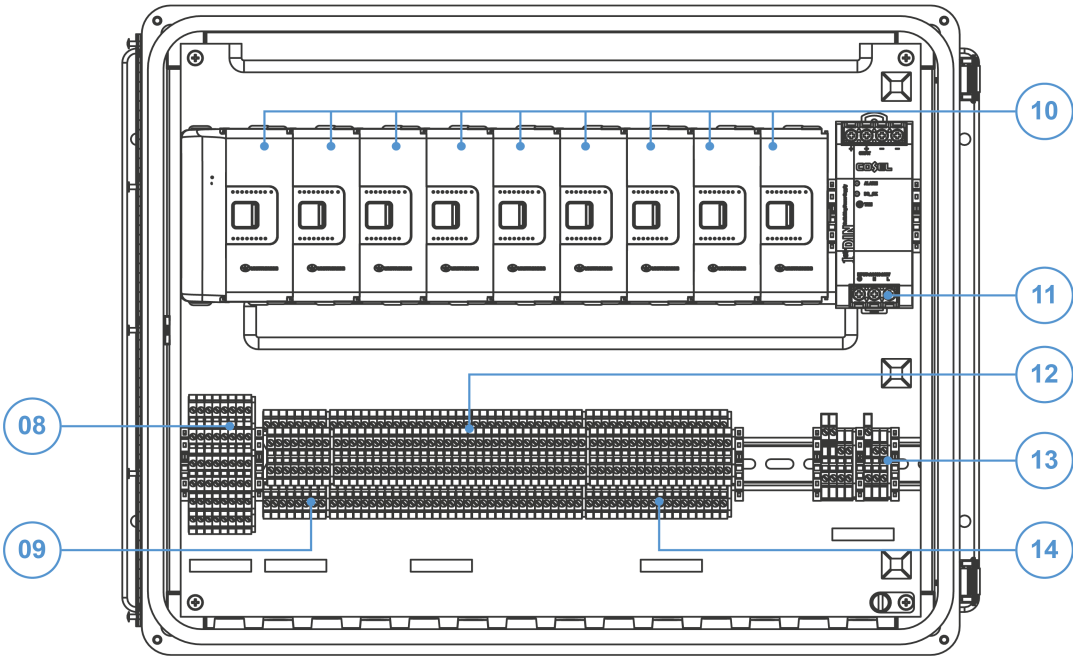
Before use, the product operability must be verified. The product must not be used if the function test is unsuccessful, the product is damaged, a competent servicing/maintenance has not been made, or genuine MSA spare parts have not been used. See 5 System Verification and 8 Maintenance for more information.

Failure to follow this warning can result in serious personal injury or death.

2 Overview

2.1 Components





1	*Buckle*	8	*Analog input terminations*
2	*SD card, Ethernet ports, USB*	9	*Digital input terminations*
3	*Gasket*	10	*Modules*
4	*Fan bracket*	11	*Power supply*
5	*Hinge*	12	*Relays*
6	*PLC / HMI*	13	*Power*
7	*Buzzer*	14	*Analog output*

2.2 Control Unit

2.2.1 Wall Mount Enclosure

The SENTRY io:

- is housed in a fiberglass enclosure with dimensions of 558.8 mm x 447.68 mm x 241.3 mm (22 in x 17.62 in x 9.5 in)
- has pre-configured holes provided on the bottom surface of the enclosure (for ¾" NPT knockout or M20)
- is mounted by four screws (10-32 or M4).

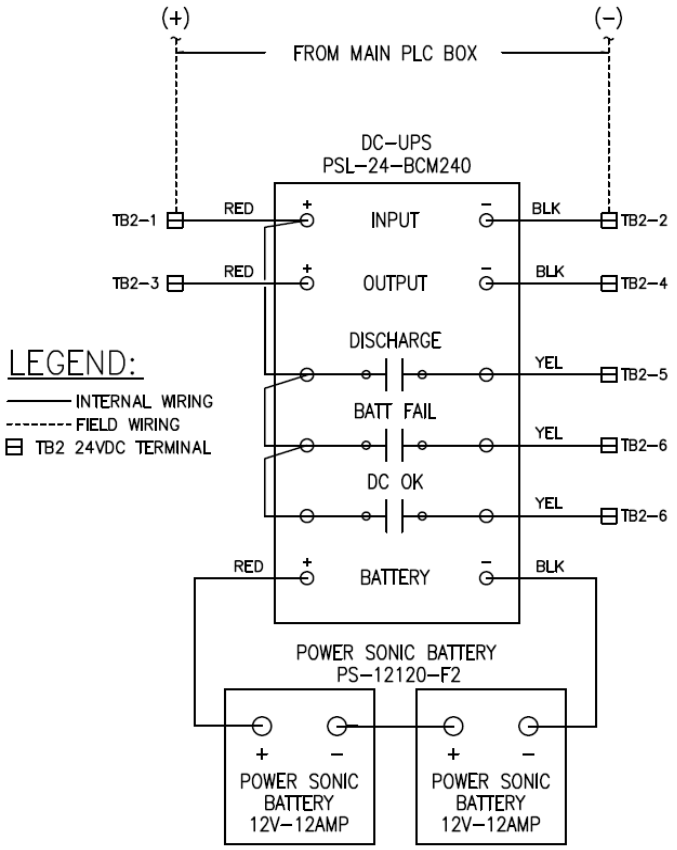
2.2.2 Power Supply

- The 24 VDC, 10A power supply accepts main AC power.
- The SENTRY io uses a COSEL power supply (PN: KHNA240F-24) or equivalent - for specifications, please refer to the COSEL product page.
- The COSEL KHNA240F-24 complies with SELV requirements as per UL 60950-1 and OSHA Class I Div. 1 requirements.
- Battery backup is an available option.

Backup Battery

The SENTRY io has an optional battery back-up package available from MSA. Consult the factory for pricing and availability. This battery back-up cabinet provides approximately 1 hour of battery run-time upon AC failure.

This battery back-up package is contained in its own enclosure and requires an interconnection between the main SENTRY io cabinet and the battery back-up cabinet. The details of that interconnection are shown below:



External Provided Power Supply

It is possible to power the SENTRY io using an external power supply. Contact the factory for details on how to implement an external power supply.

2.2.3 CPU and HMI Touchscreen Panel

The integrated CPU and 7" HMI touchscreen mounted in the enclosure door and include:

- CPU/Logic Solver
- 7" HMI touchscreen display (800x480 WVGA)
- 16 GB microSD Memory Card
- (1) Ethernet port for Modbus TCP/IP, MSA Cloud connection, remote display, or Ethernet IP based Device Level Ring (optional) connections

  NOTE: If a supplemental Ethernet port is installed on the HMI panel for additional communications, the base unit PLC Ethernet cable must be moved to the last element (supplemental port).

  If more than one physical Ethernet port is required, then use a supplemental Ethernet switch.

The front panel enables communication with the SENTRY io through the touchscreen and is used to:

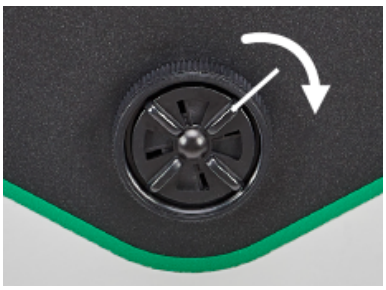
- monitor the status of all connected detectors
- configure all settings
- provide alarm and fault histories
- allow gas trending over time

2.2.4 Buzzer

The SENTRY io buzzer is designed to audibly alert you when an event occurs. The buzzer is not intended to be the primary indicator of an alarm condition.

The buzzer has distinct tones for both alarm and fault:

- Alarm—Steady tone
- Fault—Intermittent tone (1 second on, 1 second off)



The buzzer dial allows for volume adjustment. To adjust the buzzer dial, spin the tabs on the inside of the buzzer dial.

NOTE: Buzzer volume level should be adjusted for ambient environment noise level.

2.3 Input and Output Devices

The SENTRY io responds to inputs and executes outputs in less than one second. The SENTRY io will also report any fault condition or a failure in its internal communication in the same one-second time frame.

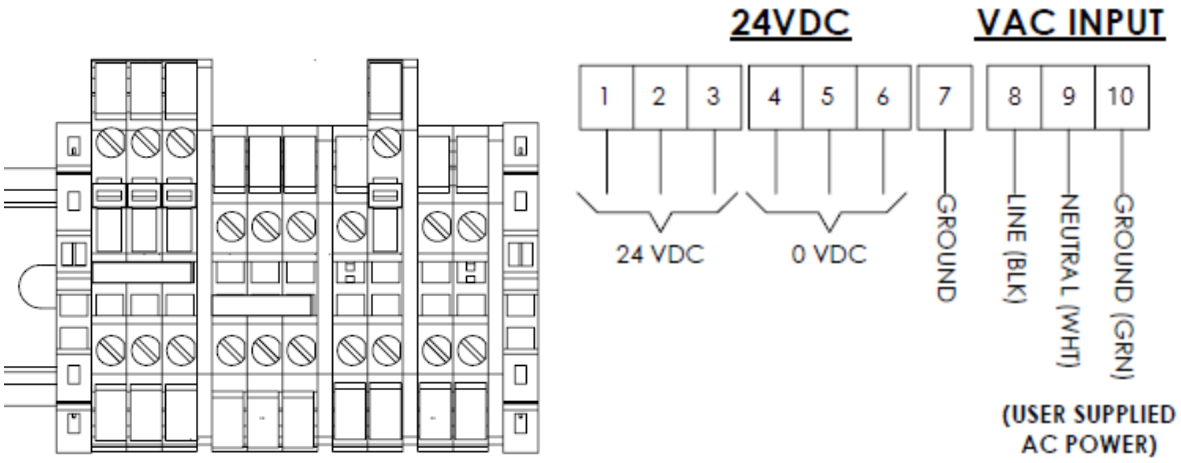
NOTE: The response time of the SENTRY io is dependent on the instrumentation connected to it.

2.3.1 Input Power Sources

The SENTRY io is designed to accept 120 VAC or 240 VAC input power sources. The input power wiring termination blocks are located in the lower right hand corner of the panel. The installer should land the main AC power source at the

proper VAC input terminals shown below. All other internal VAC and VDC power distribution wiring is factory installed.

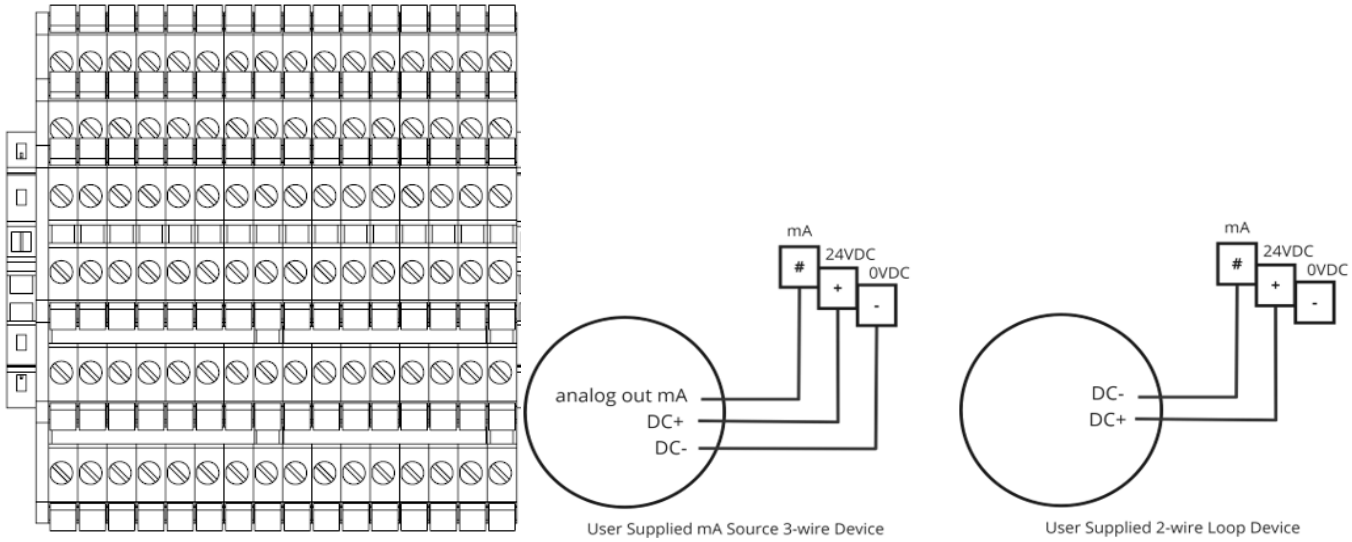
If employing the optional battery backup, consult the factory.



2.3.2 Input Devices Compatibility

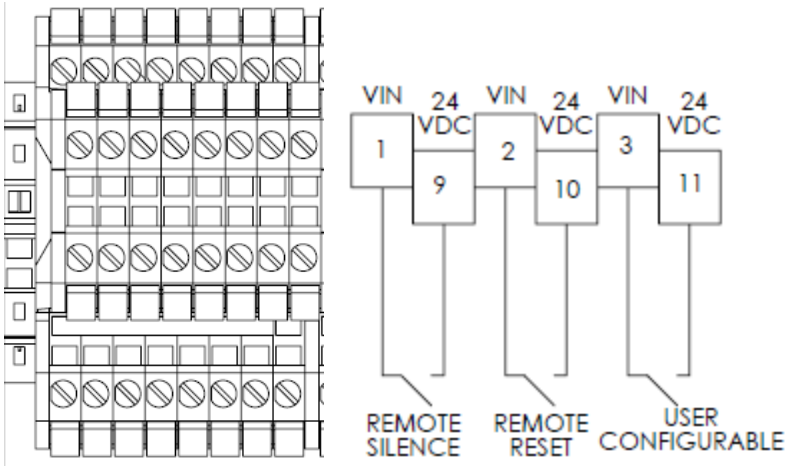
Analog Inputs

The SENTRY io is designed to provide 24 VDC field device power for connected, 2 and 3-wire 4-20 mA signal fixed gas detectors. The wiring termination blocks for connected gas detectors are located in the lower left hand corner of the panel. These inputs utilize a three-tier terminal block See the figures below for location and typical wiring connection.



Digital Inputs

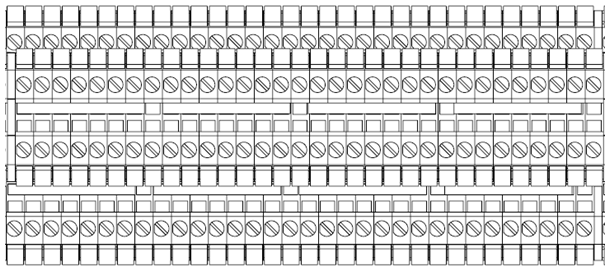
The SENTRY io also supports connection to discrete dry contact (on/off) input devices. These inputs are 24 VDC input signals. The wiring termination blocks for discrete input device connections are located to the right of the 4-20 mA signal input terminal blocks and utilize a two-tier terminal block. The SENTRY io enables the internal 24 VDC power to be used for the discrete 24 VDC signal inputs. See the figures below for location and typical wiring connection.



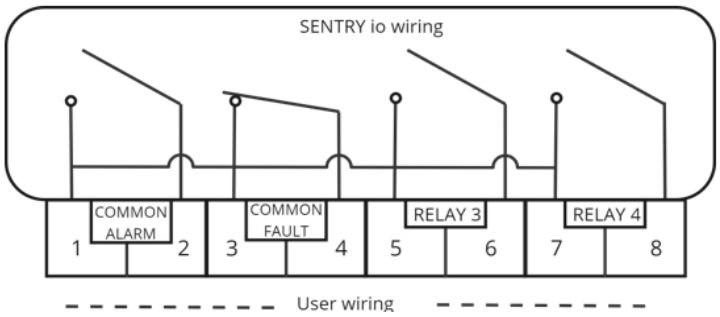
NOTE: Input 1/9 is pre-programmed for Remote Silence and input 2/10 is pre-programmed for Remote Reset. The balance of discrete inputs are user configurable in the SmartStart configuration wizard.

2.3.3 Output Devices Compatibility

The SENTRY io provides relay contact outputs for energizing external devices and equipment when an alarm or fault condition is identified. The SENTRY io relay contact outputs can switch either 24 VDC provided by the internal power supply or from a user-supplied external power source. See the figure below to identify dry and wetted/powered pre-wired contacts:



NOTE: Each bank (x4) of relays shares a common feed/connection at the terminal block, as shown in these figures below.

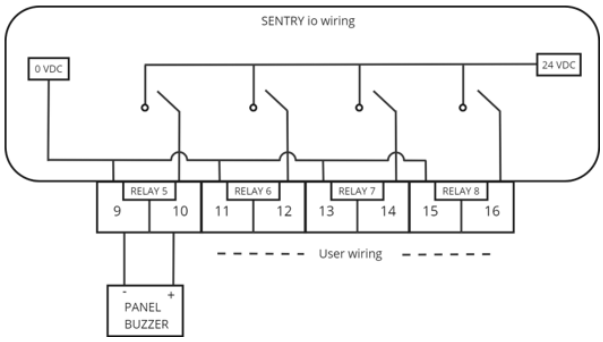


Module 1, relays 1-4 are dry contacts.

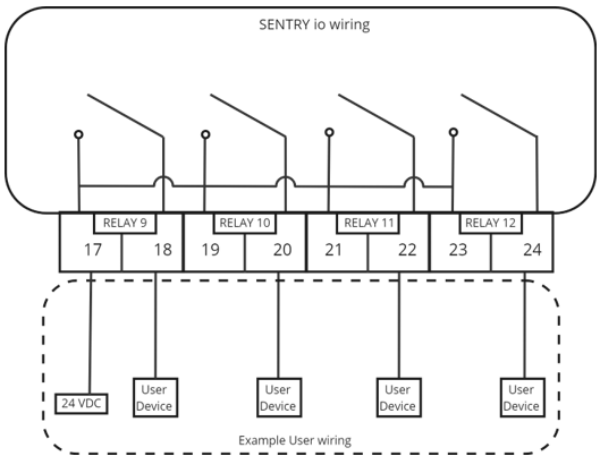
- Relay 1 is pre-programmed as common alarm
- Relay 2 is pre-programmed as common fault
- Relays 3 and 4 are user configurable

NOTE: The SENTRY io provides only normally de-energized relay coils. The only exception is the common fault relay which is normally energized.

The SENTRY io comes pre-wired with all contacts dry except Module 2 (relays 5-8) which are powered and include the panel buzzer on relay 5 (see figure below). If additional powered relays are needed for devices like horns and strobes, user wiring may be required for specific application needs(refer to example below for relays 9-12).



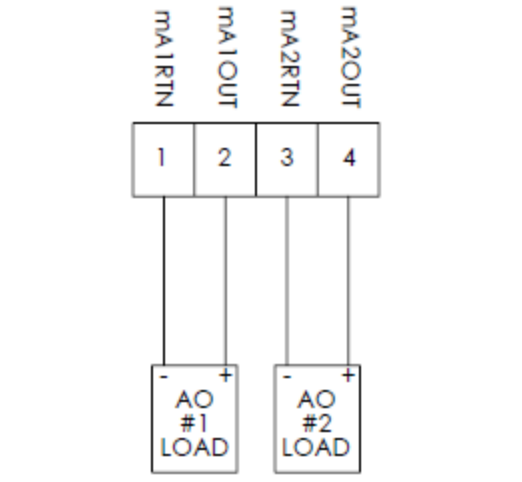
Module 2, relays 5-8 are powered contacts.



This image displays the existing pre-wired powered contacts.

The SENTRY io also supports optional analog 4-20 mA signal outputs. These signals are current sources and should be used with sinking signal receivers only. These signal outputs are used to retransmit the analog input signals to another control system. These analog outputs are a 1:1 mapping of all the input analog signals to the SENTRY io. Analog signal outputs are sourced using the internal 24 VDC power supply.

Analog Outputs



(USER LOAD CONNECTIONS TO mA OUTPUT)

2.3.4 Gas Reading Conversion

Combustible, toxic, and oxygen gas readings use the following equation:

*Gas Reading = [(Io-4)/16] * Full Scale*

2.3.5 Faults

The Sentry io displays a general sensor fault when the gas detector analog value dips into fault condition. This fault is shown on the home screen and in the alarm log with a time stamp.

For MSA's HART enabled detectors, certain fault codes are shown in the Sentry io diagnostics tab for the detector. These fault codes should be referenced against the MSA instrument's instruction manual for the relevant fault code explanation.

The Sentry io also shows a general fault if there is an internal error or PLC failure.This fault is shown on the home screen and in the alarm log with a time stamp.

2.4 Power Source Compatibility and Budgeting

2.4.1 Power Compatibility

SENTRY io is available with a factory-installed 24 VDC power supply compatible with main power sources as described in 7 Technical Specifications.

Ensure your system does not exceed rated total current output capacity of the 24 VDC power supply.

2.4.2 Power Budgeting—Connected Field Device Power Allocation Calculation

The SENTRY io internal power supply is provided to enable powering 24 VDC field input and output devices connected to the panel. The SENTRY io internal modules will consume a certain portion of the available amperage. In all cases, the user must ensure the total amperage load of all connected input and output devices do not exceed the remaining amperage capacity of the SENTRY io power supply.

Calculate total power requirements of all connected analog signal input devices and total 24 VDC power load of all connected output devices from cold start. The sum total power draw of all connected input and output devices must not exceed unallocated, available amperes of available 24 VDC power. Use the power consumption worksheet in the SENTRY io Online Help to calculate the power load requirements and available budget for field devices.

NOTE: If the SENTRY io relay output contacts will be switching DC or AC power supplied from an external source, these power loads will not be included in your calculation.

2.5 Installation Recommendations

For SENTRY io installation, MSA recommends the following:

- Only located in areas that comply with SENTRY io specifications. See 7 Technical Specifications.
- Located in areas that allow for easy access to the touch screen and internal components as necessary to configure, view, and service.
- Access to open the door
- Access to power source, breaker, etc.
- Access to field cabling trays/exit points—select location with consideration to wiring routes
- Out of direct sunlight

  NOTE: The SENTRY io internal temperature can depend on system electrical load as well as thermal loading from direct sunlight. It is best to not mount in direct sunlight or near other excessive heat sources.

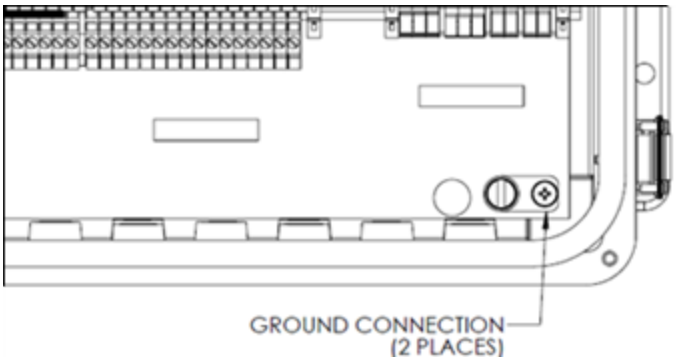
2.6 Field Cabling

Adhere to local building codes and individual field device recommendations when wiring the SENTRY io on site.

Cable shielding for all input and output devices must be connected to SENTRY io chassis ground.

NOTE: SENTRY io terminal blocks can accept a maximum wire gauge of 12 AWG and a minimum gauge of 18 AWG, one wire per terminal.

- Earth ground—Make solid ground connection to one of the panel ground lugs



- Panel power input cabling
  - 120 or 220 VAC acceptable
  - Orange power shut-off knife switch is included within panel power terminals
- Field device signal input cabling
  - Analog 4-20mA current signals—Recommended type is stranded copper 3-conductor with overall foil shield

    NOTE: Do not exceed the maximum loop impedance of the analog input and analog output channels listed in 7 Technical Specifications.
  - Discrete Input signals—Recommended type is stranded copper 2-conductor
- Field device output cabling
  - Relay output signals—Recommended type is stranded 2-conductor with overall foil shield

    NOTE: Be aware of voltage drop on DC cable runs. Select proper cable size to prevent excessive voltage drop.
  - Analog 4-20mA current signals—Recommended type is stranded copper 3-conductor with overall foil shield
- Digital Communications cabling
  - Modbus RTU—Should utilize a twisted shielded cable. Belden 3105A cable or similar cable is acceptable.
  - Modbus TCP/IP—Should utilize CAT 6 Ethernet cables
  - Device Level Ring (DLR)—Can be implemented using either copper or fiber media. Contact MSA Customer Support for assistance with DLR implementations.
- Expansion enclosure cabling may be required

2.7 Configuration and Programming

System configuration and programming is accomplished using the SmartStart configuration wizard on the 7-inch touchscreen located on the door of the SENTRY io panel. To simplify configuration and programming of your system, it is recommended to plan and document each of the following identifiers for all connected field devices and operational relationships between each input and output device:

- Analog Input Device Identifiers include:
  - Channel # for each field device
  - Tag name for each field device (maximum characters: 11)
  - Location description (maximum characters: 11)
  - Type of field device (examples include comb gas detector, toxic gas detector, low O2 detector, Open Path, etc.)
  - Type of Gas to be detected (examples include methane, propane, H2S, HF, etc.)
  - Units of Measurement (examples include % of LEL, PPM, % Volume, LEL-M, etc)

    - Full Scale of Measurement (examples include 100 %LEL, 100 PPM, 50 PPM, 25 PPM, 5 LEL-M, etc)
    - Alarm Levels 1 (low), 2 (medium), and 3 (High) setpoints for input devices in proper units and measurement scale
- Digital Input Device Identifiers include:
    - Input Channel #
    - Input Tag Name
    - Input Enabled or Disabled
    - Input Latching or Non-latching
- Relay Output identifiers include:
    - Relay Module and Channel #
    - Relay Name
    - Relay Description
- Relay Zone Voting Requirements
    - If selected, user must define Voting Zones required and names of each Zone
    - User must define which Discrete signals and Analog Alarm signals shall be evaluated within Zone voting logic

For assistance, use the Cause and Effect Planning spreadsheet in the SENTRY io Online Help to do your cause and effect pre-planning.

3 Installation

3.1 Warnings

⚠ WARNING!

- A qualified electrician must do electrical wiring.
- All wiring must comply with all applicable NEC/CEC and local electrical safety codes.
- To prevent electrostatic discharge (ESD), connect an ESD wrist strap to the ESD connection point inside the SENTRY io enclosure before doing work inside the enclosure. ESD can damage the SENTRY io.
- The input/output modules are NOT field serviceable. Do NOT disassemble or modify the modules.
- Do NOT install or operate the SENTRY io if it is damaged.
- Disconnect AC power before opening the SENTRY io enclosure. Failure to do so can result in electrical shock. Electrical shock can damage the SENTRY io and injure personnel.
- Ensure the enclosure door seal is free from debris before closing and latching the SENTRY io door.
- Never operate the SENTRY io without a connection to ground. Failure to connect the device to ground can result in electrical shock. Electrical shock can cause damage to the SENTRY io and injury to personnel.
- Do NOT use the SENTRY io in hazardous environments beyond the limits indicated on the product label.
- Ensure the SENTRY io is NOT located in areas that contain a flammable mixture of gas and air. Otherwise, an explosion can occur.

Failure to follow these warnings can result in serious personal injury or death.

3.2 Preparing for Installation

Before installation, ensure the following:

- Packaging materials are removed from inside the SENTRY io

⚠ CAUTION!

Due to the weight of the SENTRY io, unpacking and removing it from the container may require an additional person to assist.

Failure to follow this caution can result in minor or moderate injury.

- Remove protective film from touchscreen
- Modules are locked in place with no red displaying on the module locking tabs
- All module and wiring terminal blocks are secured
- Module dust covers are secured
- Buzzer shutter is open or not dampened
- Hinges and latches are intact and operational
- All internal components are attached to a DIN rail
- Enclosure door seal is intact

NOTE: To prevent unauthorized or untrained personnel from opening the SENTRY io enclosure, it is recommended that you install a locking mechanism through the metal loop on either latch on the right side of the device.

3.3 Mechanical Installation

3.3.1 Mounting Guidelines

When mounting the SENTRY io:

- Select a location that is easy to access and visible to personnel before they go into the area being monitored.
  - Do not mount in direct sunlight or near other excessive heat sources
  - Away from wet or damp conditions
  - Away from areas that are dirty or exposed to oils or chemicals

  NOTE: The SENTRY io requires programming and viewing the graphic user interface (GUI) from the touchscreen on the front of the enclosure. It is recommended that the installation location selected enables easy viewing and programming of the GUI.
- Mount the enclosure to a wall or other rigid surface that is not prone to vibration or mechanical shock.
  - Approximately 5 feet (1.5 meters) above the ground.
  - With at least 3 inches (about 8 cm) of clearance around all sides for proper ventilation, calibration, and servicing. Ensure there is adequate space to connect the external wiring.
- Use hardware that is suitable for the mounting surface and can withstand 70 lb (32 kg) without loosening or causing damage to the hardware or mounting surface. Use all four mounting holes provided on the SENTRY io.

3.3.2 Wire Entry Penetrations

For the SENTRY io wire entry penetrations:

- Remove the red plugs from the bottom of the enclosure
- Ensure holes are cleanly cut and can form an adequate seal as required for intended application
- Install properly rated conduit, glands, or plugs as required for intended application.

NOTE: Drilling of additional holes is not recommended.

3.4 Electrical Installation

⚠ WARNING!

- A qualified electrician must do electrical wiring.
- Wiring must comply with all applicable NEC/CEC and local electrical safety codes.
- Never operate the SENTRY io without a protective ground. Operating the SENTRY io without a protective ground can result in electrical shock. Electrical shock can cause damage to the SENTRY io and injury to personnel.
- Disconnect AC power before opening the SENTRY io enclosure. Failure to do so can result in electrical shock. Electrical shock can damage the SENTRY io and injure personnel.
- To prevent electrical shock, avoid contact with electrical conductors and termination points when energized.
- To prevent electrostatic discharge (ESD), connect an ESD wrist strap to the ESD connection point inside the SENTRY io enclosure before doing work inside the enclosure. ESD can cause damage to the SENTRY io.
- Do not touch the electronic circuit boards.
- When closing and latching the SENTRY io door, ensure the enclosure door seal is free from debris and the door is tightly sealed.

Failure to follow these warnings can result in serious personal injury or death.

3.4.1 Electrical Power Supply Requirements

The SENTRY io uses a power supply that accepts inputs of 100–240 VAC, 50/60 Hz, 200 VA maximum. Consider the following recommendations:

- Connect the SENTRY io directly to the AC power source through a dedicated circuit breaker.

  NOTE: Install either a standard 15 A circuit breaker or a 10 A slow–blow fuse.

- Use an approved 3-conductor wire (minimum 14 AWG), rated 300 VAC at 221°F (105°C), to complete the AC power connection.
- Use only conduit hubs and hardware that are suitable for fiberglass enclosures.

3.4.2 Electrical Installation Procedure

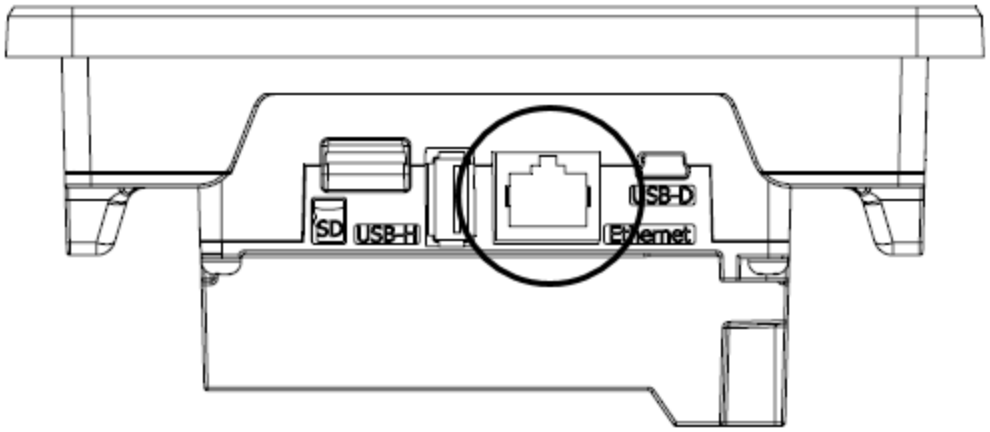
To wire the SENTRY io:

1. Disconnect electrical power.
2. Release the two latches on the right side of the SENTRY io and open the enclosure.
3. Attach the ESD wrist strap to the ESD connection point inside the enclosure.
4. Remove the AC power wiring hole plug.
5. Install conduit hubs that are suitable for fiberglass enclosures and rated for both environmental and hazardous areas classifications.
6. Put the AC power wiring through the conduit.
7. Connect the AC power wiring to the #1 AC terminal block (HOT) and #2 AC terminal block (NEUTRAL) input terminals. Make sure the connectors are seated securely.
8. Connect the AC power ground wire to the ground lug so the SENTRY io chassis ground is connected to the earth ground.
9. Close the enclosure and latch the two latches.
10. Supply electrical power to the SENTRY io.

3.5 Communications

3.5.1 Modbus TCP

The SENTRY io comes standard with Modbus TCP communication. The Ethernet port is located on the side of the touch screen inside the enclosure.



The SENTRY io operates as a MODBUS peripheral.

The SENTRY io Modbus address list includes addresses for discrete alarms, discrete inputs, relays, voting zones, system faults, and analog. View this section in the SENTRY io Online Help to download the spreadsheet.

3.5.2 Modbus RTU (RS485 Serial)—Optional

The SENTRY io has an available Modbus RS485 capability by adding the optional communication module—P/N: 10221943.

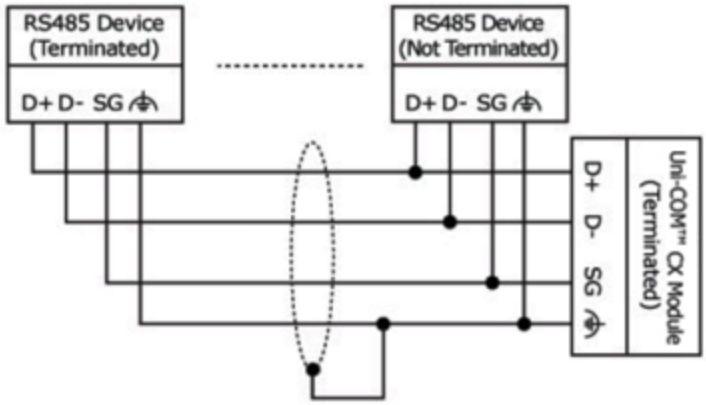
The RS485 module clips on to the back of the SENTRY io touchscreen.

Installing the Modbus RTU Module

1. Check the controller to verify that its COM jack is not covered.
2. Insert the module's connection plug into the jack until it is firmly seated (as shown).

This Modbus RS485 is unidirectional and provides diagnostic and alarm data about the SENTRY io's alarm faults and detector status to third party systems (such as PLC, DCS systems). View the *Resources* section in the SENTRY io Online Help to download the Modbus address list.

The Modbus RTU plug in module is shipped with a 4-pin RS485 terminal block. This connector is marked with a pin assignment that is identical to the corresponding marking on the module. Termination should be made in accordance with the diagram below.

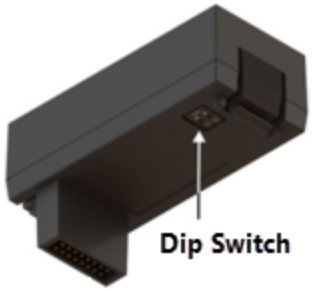


RS485 Modbus Wiring Guidelines

- Use shielded twisted-pair cable in compliance with EIA RS485 specifications.
- When wiring each node, connect the cable shield to the functional ground point of the RS485 terminal block.
- In order to avoid ground-loops, do not connect the RS485 functional ground terminal to the Earth of the SENTRY io as it is internally connected to the SENTRY io's functional ground point.

RS485 Dip Switch Settings

Use the DIP switches shown in the table below to set the RS485. The device is shipped with both its DIP switches set to the ON position; change settings to the OFF positions if there are no devices (PLC, HMIs, or DCSs) communicating on this Modbus RTU network.

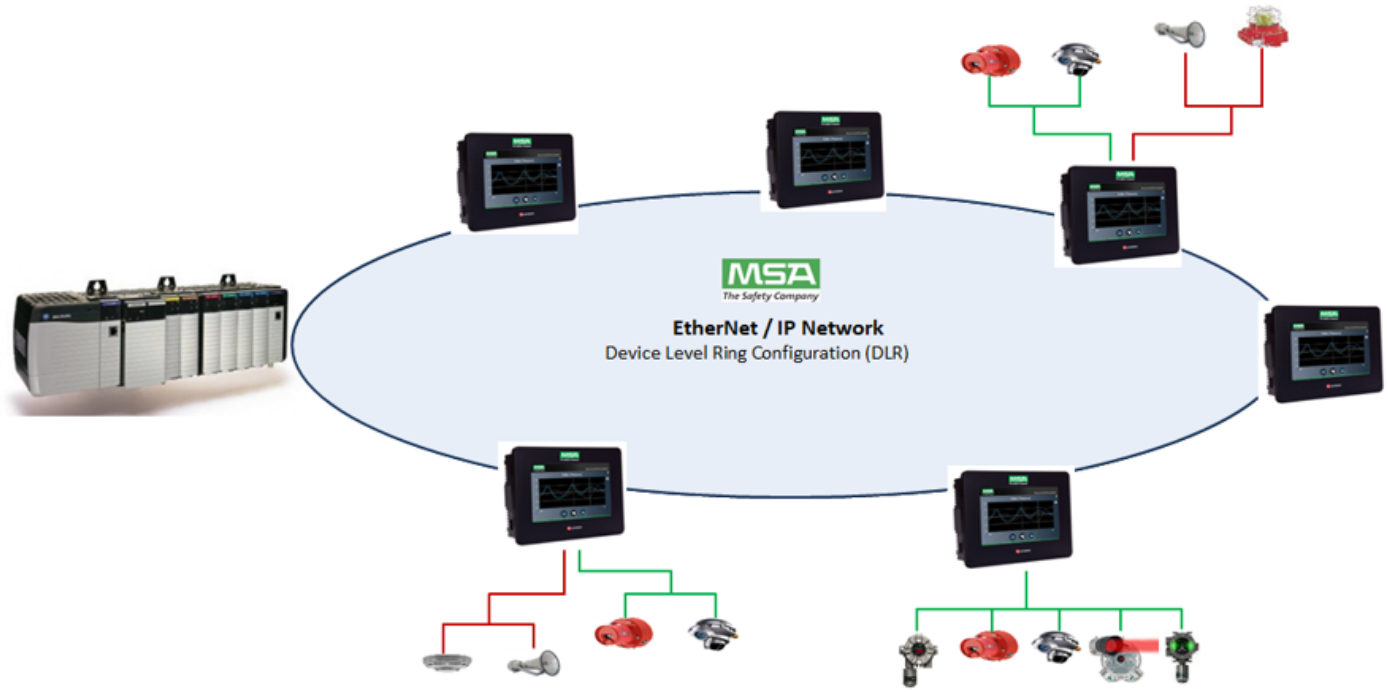


Position		DIP Switch State
1	2	
ON	ON	Terminated (factory default)
OFF	OFF	Not Terminated

3.5.3 Device Level Ring (DLR)

The SENTRY io can be configured to become a stand-alone node on an EtherNet/IP network using Rockwell Automations device level ring (DLR) protocol. This DLR communication provides a fault tolerant self-healing ring network that is capable of being run over Ethernet cable or multi-mode fiber optics.

This topology is detailed below, and can be utilized with MSA's HazardWatch platform. Please consult the factory for assistance with this configuration.



3.6 Remote Displays

SENTRY io has the ability to support a remote display over Ethernet. A remote display will act and function the same way as the primary SENTRY io display. Both the primary and remote displays will have the ability to function simultaneously.

To establish a remote display you must install an Ethernet link between the main SENTRY io controller and the remote display. This link can either be over CAT 6 cable (max distance 100 meters) or via multi-mode fiber optic cable (max distance 2 km). If the single Ethernet is already being utilized for other communications (such as Modbus TCP/IP or MSA Cloud connection) or you are using a fiber link, then a supplemental Ethernet Switch will need to be provided.

Remote Display Power

The remote display must be sourced with its own 24 VDC power source. This remote display draws 1 amp at 24 VDC.

Establish Communication

To establish communication between the SENTRY io and remote display, please contact MSA Customer Support.

3.7 Wiring and Grounding

Refer to the *Installation Outline* drawing (SK3015-1071) for details on the wiring requirements for the SENTRY io.

⚠ WARNING!

Ensure the SENTRY io chassis is connected to the earth ground at the groundlug.

Failure to follow this warning can result in serious personal injury or death.

3.8 Relay Outputs

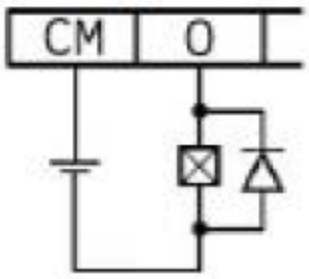
NOTICE

To avoid risk of fire or property damage, always use a limited current source or connect a current limiting device in series with the relay contacts.

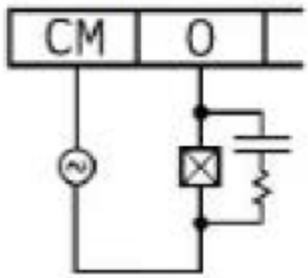
To increase the lifespan of the relay contacts and protect the module from potential damage by reverse EMF, connect:

- A clamping diode in parallel with each inductive DC load.
- An RC snubber circuit in parallel with each inductive AC load.

DC Load



AC Load



Refer to the *Installation Outline* drawing (SK3015-1071) for additional details on the relay outputs.

4 Configuration

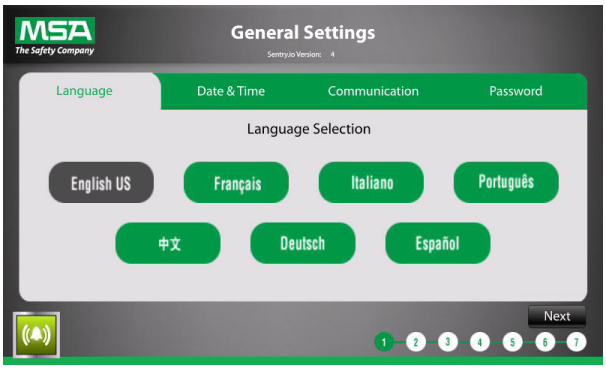
The first time the SENTRY io is connected to power, the SmartStart configuration wizard displays upon initialization. Before normal operation of the SENTRY io, you must proceed through the steps of the SmartStart configuration wizard.

The configuration involves input steps for the following system parameters:

1. General Settings: Language, Date & Time, Communications, and Password
2. I/O Configuration: Analog Input, Relay Outputs, and Analog Outputs
3. Detectors and Alarm Setpoints
4. Digital Inputs
5. Relays
6. Voting
7. Cause and Effect

4.1 General Settings

4.1.1 Setting the System Language



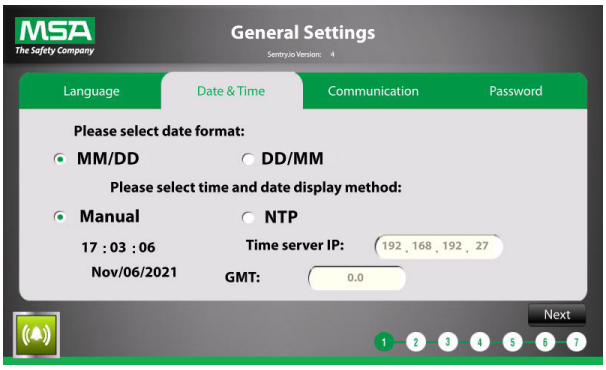
1. Select the language in which you want to configure and operate the SENTRY io.
2. Tap the **Date & Time** tab to proceed to the Date and Time screen.

   —or—

   Tap **Next** to end the General Settings configuration and proceed to the I/O configuration.

   NOTE: You cannot go back in the process once you tap **Next**.

4.1.2 Setting the Date and Time



1. Select a date format.
2. Select the time and date setting method:
   - **Manual**—Manually set the time and date.
   - **NTP**—Network Time Protocol (NTP). If using NTP, select the method, the IP, and the GMT. An example time server address is 132.163.97.4, which is located at NIST WWV, Fort Collins, Colorado, USA. See Table 1 GMT Zones

   NOTE: NTP cannot be used if your site employs a firewall that blocks communication with external servers.
3. Tap the **Communication** tab to proceed to the Communication screen.

   —or—

   Tap **Next** to end the General Settings configuration and proceed to the I/O configuration.

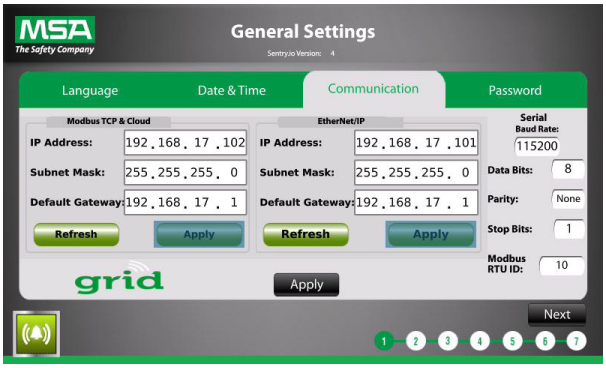
   NOTE: You cannot go back in the process once you tap **Next**.

GMT	Location	GMT	Location
0	Western Europe	-3	Argentina
1	Central Europe, West Africa	-4	Atlantic
2	Eastern Europe	-5	Eastern US
3	East Africa, Western Russia	-6	Central US
8	China	-7	Mountain US
9	Japan, South Korea	-8	Pacific US
12	New Zealand	-9	Alaska, US

Table 1 GMT Zones

4.1.3 Setting the Communication Information

The communication fields use default values until you change them. You can establish the communication for both Modbus TCP & Cloud and EtherNet/IP.



1. Complete the information for Modbus TCP & Cloud, EtherNet/IP, or both.

   To enter information into a textbox, tap the textbox, enter the digits in each field, and tap **Ok**.

2. Both the Modbus TCP & Cloud and DLR based Ethernet I/P sections have Refresh and Apply buttons within their sections.

   If you make updates to the textboxes for a section but then want to revert back to values saved in the database, tap **Refresh** in that section.

   If you make updates to the textboxes for a section and want to save them to the database, tap **Apply** in that section.

3. Complete the information for the Serial section.

   To enter the information into a textbox, tap the textbox, select a value from the list or enter the digits in the field (where applicable), and tap **Ok**.

   Tap the black **Apply** button to save the Serial changes.

4. Tap the **Password** tab to proceed to the Password screen.

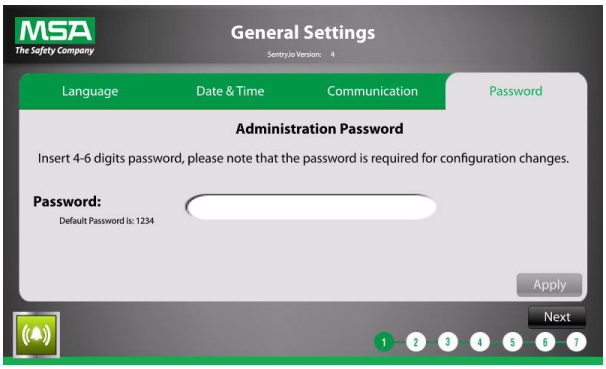
   —or—

   Tap **Next** to end the General Settings configuration and proceed to the I/O configuration.

   NOTE: You cannot go back in the process once you tap **Next**.

4.1.4 Setting the Administration Password

The SENTRY io must have an administration password. The password is required for updating the settings and configuration in the future.



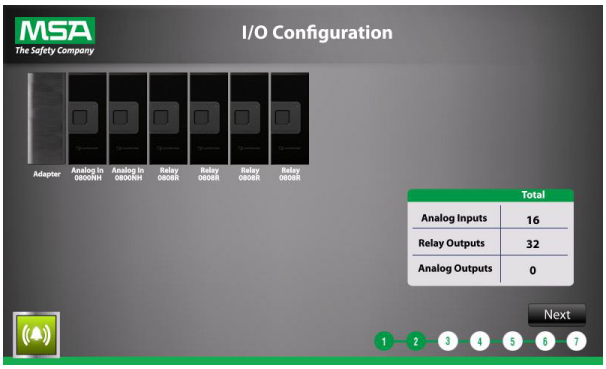
1. Tap the **Password** textbox.
2. Enter a 4-6 digit password and tap **Ok**.
3. Tap the **Confirm Password** textbox, enter the same 4-6 digit password, and tap **Ok**.
4. Tap **Apply** to save the password.

   —or—

   Tap **Discard** to cancel the changes to the password and revert to the password on file in the database.
5. Tap **Next** to end the General Settings configuration and proceed to the I/O configuration.

   NOTE: You cannot go back in the process once you tap **Next**.

4.2 Input/Output Configuration

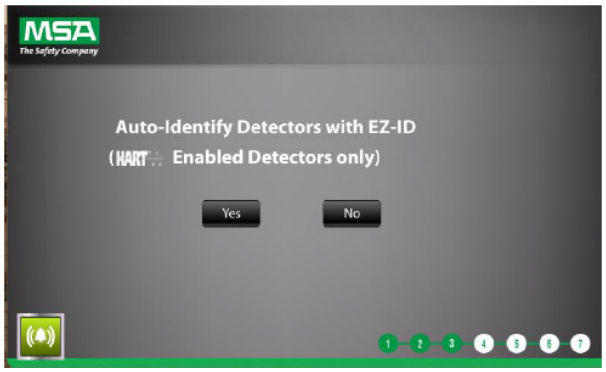


1. Verify the number and type of Input/Output modules displayed on the screen match those inside the SENTRY io.
2. Tap **Next** to end the I/O configuration and proceed to the Detectors and Alarm Setpoints configuration.

   NOTE: You cannot go back in the process once you tap **Next**.

4.3 Detectors and Alarm Setpoints

4.3.1 Auto Identifying Detectors



Select whether or not you want to auto identify the detectors.

- **Yes**—Initiate EZ-ID to auto identify MSA HART-enabled detectors. The EZ-ID runs and then the Detector Summary screen displays. See 4.3.3 Detectors Summary for more information.

  NOTE: If you have a mix of HART and non-HART enabled detectors, you can initiate EZ-ID for your HART detectors, and then manually identify the non-HART enabled detectors after.
- **No**—Manually set detector type, gas, units, and scale. See 4.3.2 Manually Identifying Detectors for more information.

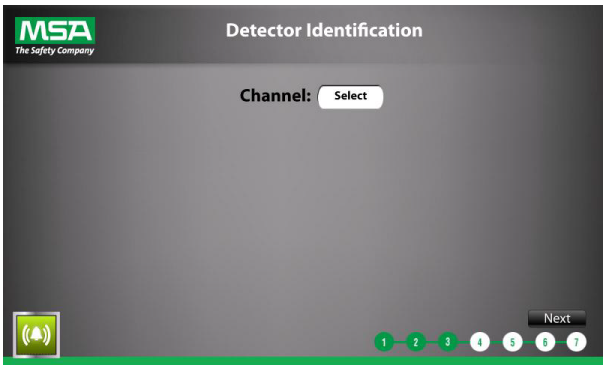
NOTE: The SENTRY io EZ-ID process uses preset full-scale instrument ranges, therefore do not rescale the range at instrument. If rescaling is necessary, manual identification may be needed.

NOTE: For auto-identified sensors, the SENTRY io uses default mA fault levels for instruments. Therefore the default mA output fault levels at the instrument should not be changed. If this is necessary, manual identification may be needed.

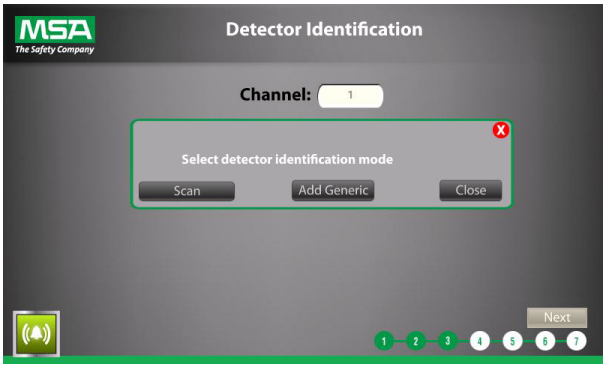
NOTE: For dual sensor configurations on Ultima X5000 and S5000, SENTRY io auto identification will only load information for sensor #1. You can manually add sensor #2.

4.3.2 Manually Identifying Detectors

If you chose to manually identify your detectors or if you have additional detectors that could not be automatically identified, you perform the manual identification on the Detector Identification screen.



1. Tap the **Channel** textbox.
2. Select a channel by swiping or using ▲ and ▼ to locate the desired channel number.
3. Tap **Ok**

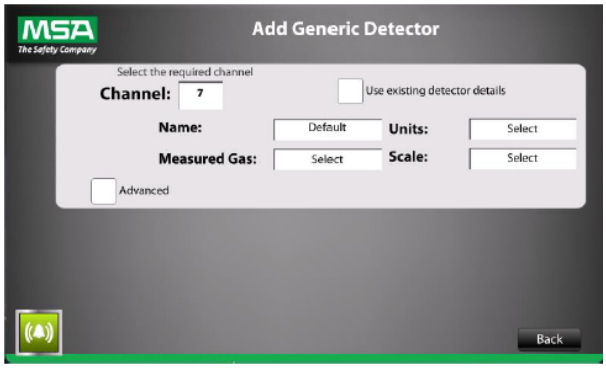


4. If a detector is found in the selected channel, you can:

   Tap **Scan** to attempt to automatically identify the detector.

   —or—

   Tap **Add Generic** to continue with the manual identification and proceed to step 5.



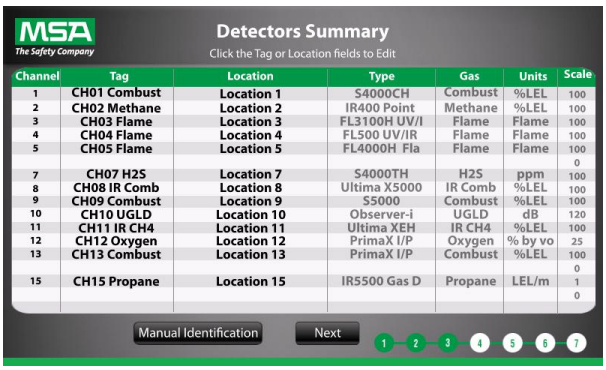
5. Complete the fields for the generic detector entry and tap **Apply**.

   Repeat the steps for all generic detectors.

6. Tap **Next** to proceed to the Detector Summary screen.

4.3.3 Detectors Summary

The Detectors Summary screen displays a summary of all connected detectors.

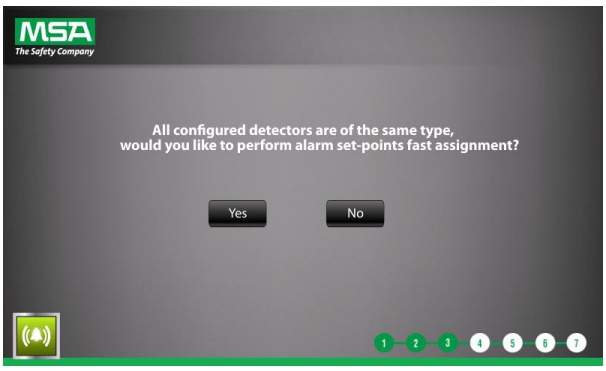


If you need to edit the tag or location details for a detector, tap in the desired Tag or Location cell and update as needed.

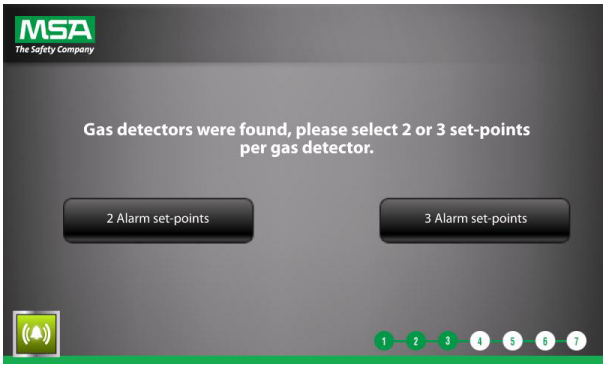
If a detector is not present in the summary, tap **Manual Identification**.

If the information in the summary is accurate, tap **Next** to proceed to the Alarm Setpoints configuration.

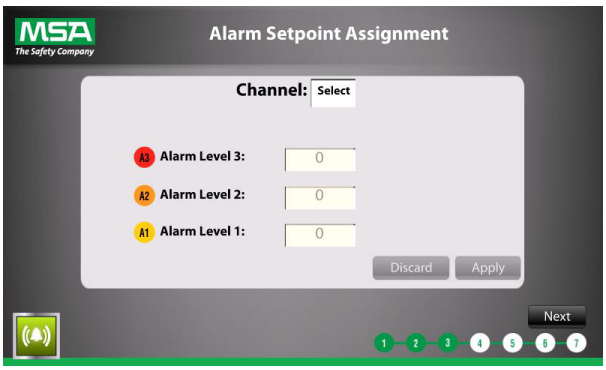
4.3.4 Alarm Set-points



1. If all detectors are of the same type, choose whether to perform alarm set-points fast assignment. If you select Yes, the same alarm set-points (2 or 3 set-points) are inserted for all detectors.

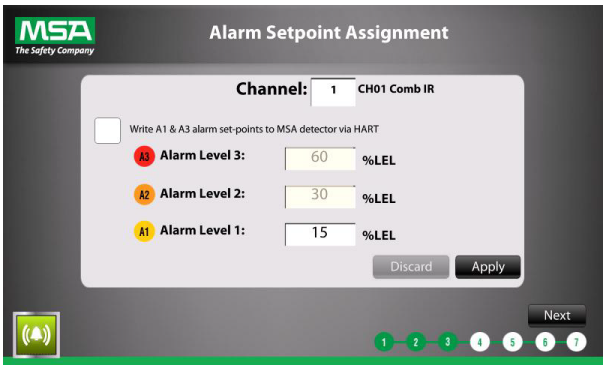


2. Choose whether to use 2 alarm set-points or 3 alarm set-points per detector.



3. If you did not choose fast assignment, tap the **Channel** textbox to select a channel that corresponds to a detector.
4. Select a channel by swiping or using ▲ and ▼ to locate the desired channel number.
5. Tap **Ok**.

   Once you select the channel, the alarm levels auto populate with default values.



6. Select **Write A1 & A3 alarm set-points to MSA detectors via HART** if you want the SENTRY io to automatically write the set-points selected on the SENTRY io to the MSA detector.

   If this is not selected, then the SENTRY io and MSA detector can maintain different set-points.

   NOTE: Alarm set-points for Oxygen sensors cannot be written to the detectors. Refer to 9 Troubleshooting.
7. If you want to change the alarm level values, they must be changed in order. Tap the **Alarm Level 1** textbox, enter a new value, and tap **Ok**.

   Repeat this step as needed for the additional alarm levels.
8. Tap **Apply** to save the alarm levels for the selected channel.

   —or—

Tap **Discard** to cancel the changes to the alarm levels and revert to the default values for the selected channel.

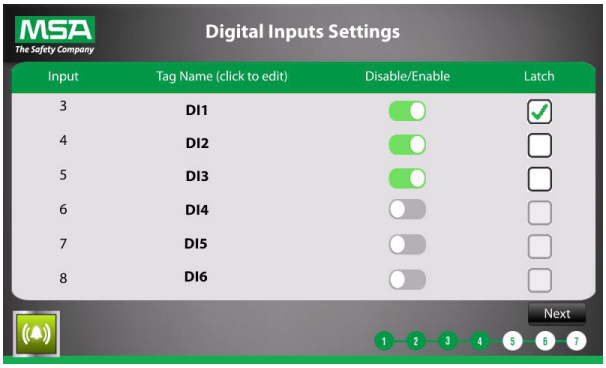
NOTE: For ease of commissioning, verify that the alarm setpoints are set to desired levels before enabling the system.

If you did not choose fast assignment, repeat steps 3-7 for all connected channels.

9. Tap **Next** to proceed to the Digital Input Settings configuration.

   NOTE: You cannot go back in the process once you tap **Next**.

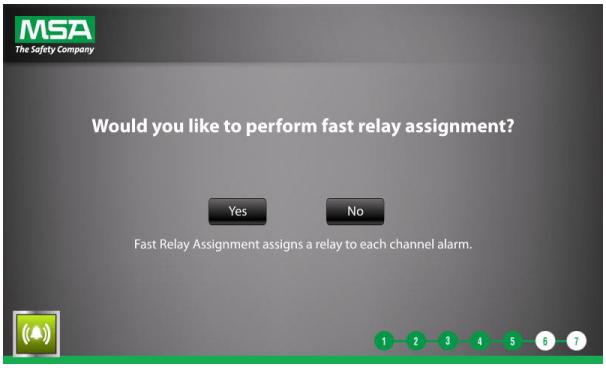
4.4 Digital Inputs



1. If you need to edit the tag name for an input, tap the desired tag name, enter a new name, and tap **Ok**.
2. To enable/disable an input, tap the **Enable/Disable** slider for the desired input to toggle the setting.
3. To latch an input, select **Latch** for the desired input.
4. Tap **Next** to proceed to the Relays configuration.

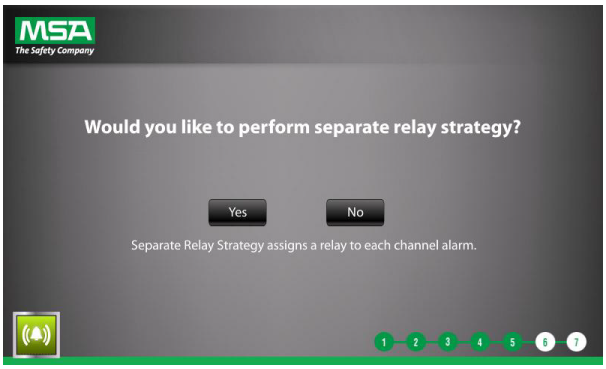
   NOTE: You cannot go back in the process once you tap **Next**.

4.5 Relays

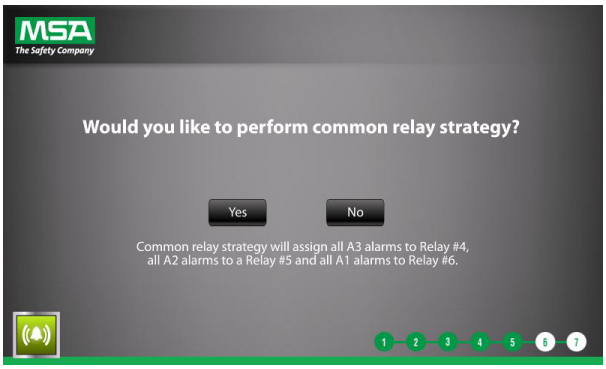


1. Choose whether to perform fast relay assignment.

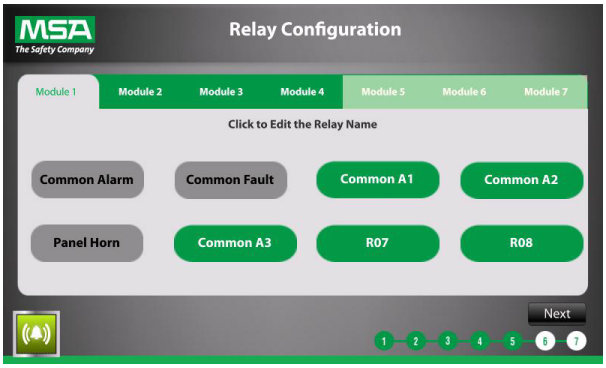
   NOTE: Use this function if it is desired to automatically assign detector alarms to relays. The user can select Separate or Common relay strategy for automatic assignment. Separate strategy assigns a separate relay to every alarm. Common strategy assigns one relay to each level of alarm across devices.



2. If performing fast relay assignment, choose whether to perform separate relay assignment.

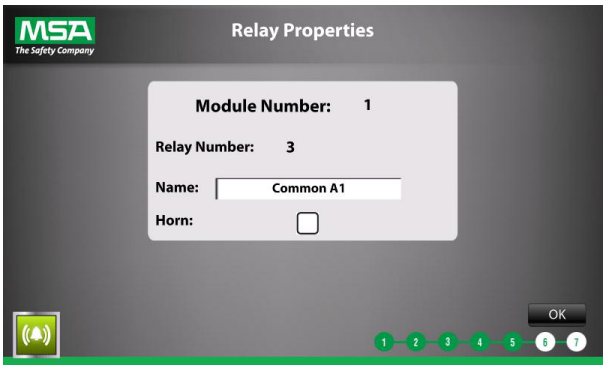


3. If performing fast relay assignment but not performing separate relay assignment, choose whether to perform common relay assignment.



4. Select the desired module tab to view its relays.
5. Tap a relay to edit it.

   NOTE: Relays with a grey background cannot be edited.



6. Tap the **Name** textbox to rename the relay.
7. Select the Horn checkbox, as needed.
8. Tap **OK**.
9. Repeat steps 1-5 as needed.

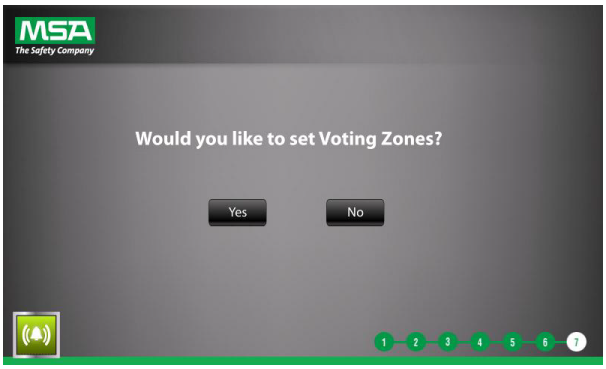
10. Tap **Next** to proceed to the Voting Zones configuration.

    NOTE: You cannot go back in the process once you tap **Next**.

4.6 Voting Zones

The SENTRY io logic programming supports “OR” gate and “AND” gate logic functions in the SmartStart setup wizard. Any OR gates may be selected in zoning logic section, or “2 of N” or “3 of N” are also selectable to achieve limited “AND” gate functions.

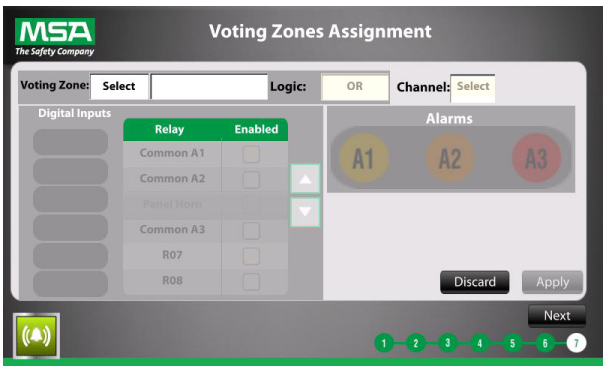
Voting zones are only needed if you want to achieve “OR,” “2 of N,” or “3 of N” logic voting . " AND" logic can be achieved in the cause and effect logic configured after voting zones.



1. Select whether or not you want to set voting zones.

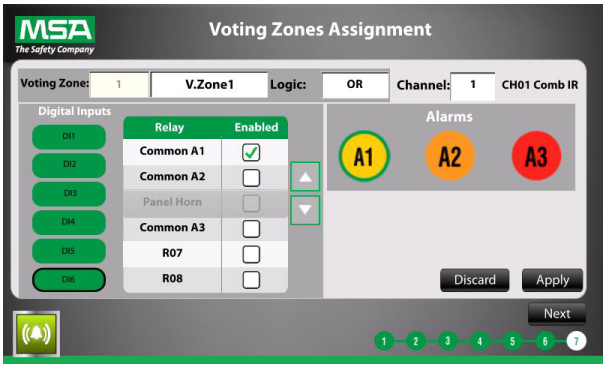
   If **Yes**, proceed to step 2.

   If **No**, you automatically proceed to the Cause and Effect configuration. See 4.7 Cause and Effect for more information.



2. Tap the **Voting Zone** textbox, select a zone by swiping or using ▲ and ▼ to locate the desired zone number, and tap **Ok**.
3. If needed, tap the name of the voting zone to rename it.
4. Tap the **Logic** textbox, swipe or use ▲ and ▼ to select "and," "or," "2 of n," or "3 of n," and tap **Ok**.
5. Tap the **Channel** textbox, select a channel by swiping or using ▲ and ▼ to locate the desired channel, and tap **Ok**.

   Once a channel is selected, the digital input, relay, and alarm selections are available.



6. Select the desired digital inputs, relays, and alarms.
7. Tap **Apply** to save the changes to the selected voting zone and channel combination.

   Repeat steps 2-9 for all desired voting zone and channel combinations.

   —or—

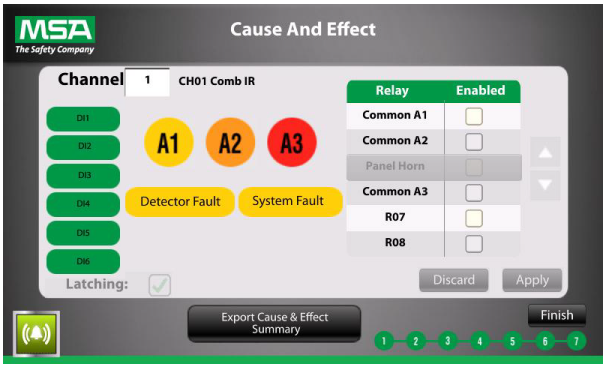
   Tap **Discard** to cancel any current changes and re-enable the **Voting Zone** textbox to make a new zone selection.

   —or—

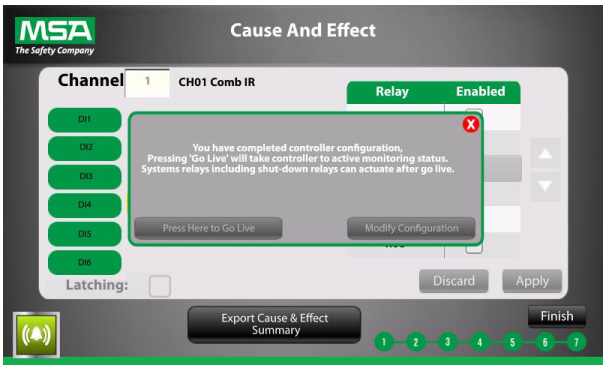
8. Tap **Next** to proceed to the Cause & Effect configuration.

   NOTE: You cannot go back in the process once you tap **Next**.

4.7 Cause and Effect



1. Tap the **Channel** textbox to select a channel.
2. You can add one or more causes to each channel. Select the digital inputs, alarm icons, **Detector Fault**, or **System Fault** to add it as a cause. You must select Apply for each selected cause.
3. Select **Enabled** for the relay(s) that will be the effect of the cause.
4. Tap **Apply**.
5. Repeat the previous steps for all cause and effect relationships you need for each channel.



6. Tap **Finish**.
7. Tap **Press Here to Go Live** to complete the SmartStart configuration wizard.

   —or—

   Tap **Modify Configuration** to go back to the Detector Identifications screen and modify any necessary items of the configuration.

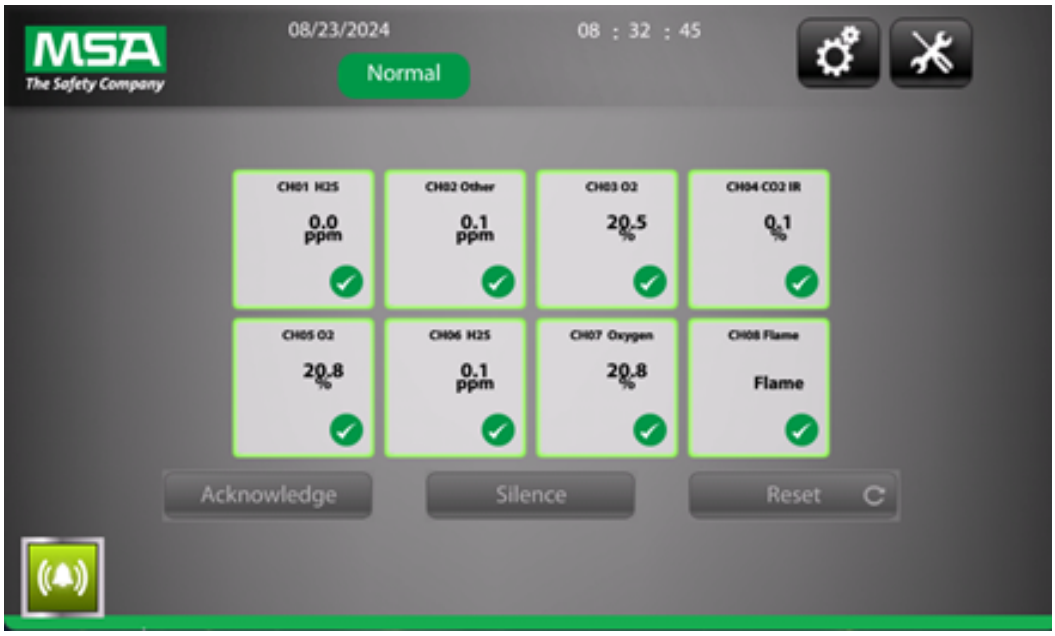
5 System Verification

1. Connect the detector(s) to the SENTRY io.
2. Configure the SENTRY io.
3. Verify detector information on the dashboard.
4. Test the detector alarm setpoints with the application or simulation of gas.
5. Test the buzzer response to alarm state. Verify the volume level of the buzzer is sufficient for the ambient noise level in the environment.
6. Exercise the FAULT relay to ensure proper activation.
7. Export the .csv file to review the cause and effect relationships.
8. Verify the Cause and Effect logic actions to ensure all consequences execute as intended.

See 8 Maintenance for information on when to verify the system after initial verification.

6 Operation

6.1 Dashboard



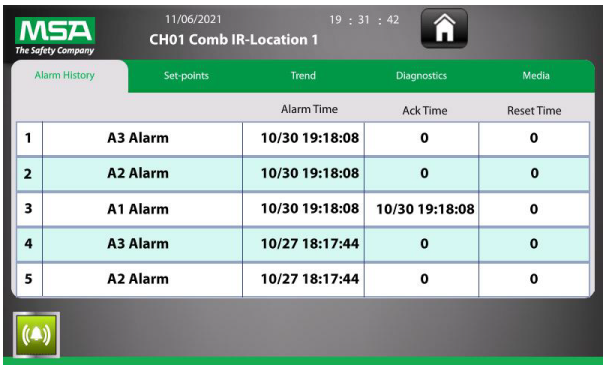
NOTE: On some instruments, CLO2 and CO2 show as two decimal places (x.xx). The SENTRY io is limited to one decimal place (x.x).

NOTE: Some Oxygen instruments have a calibration output signal >20mA and may display as "overrange" on the SENTRY io or they may have a calibration output of 4mA and may trigger a low alarm. Consider inhibiting the sensor during calibration if this is a concern.

6.1.1 Viewing Detector Details

You can view the details of any of your detectors from the dashboard. To do so, tap on the desired detector tile.

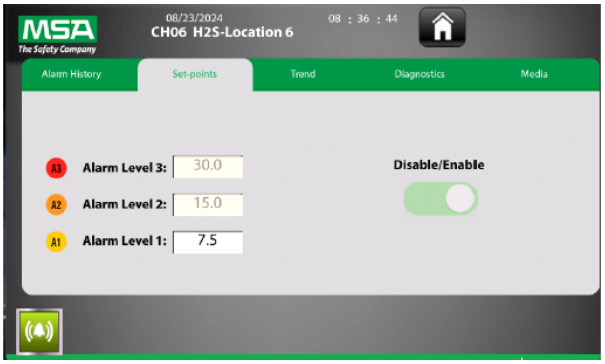
Alarm History



		Alarm Time	Ack Time	Reset Time
1	A3 Alarm	10/30 19:18:08	0	0
2	A2 Alarm	10/30 19:18:08	0	0
3	A1 Alarm	10/30 19:18:08	10/30 19:18:08	0
4	A3 Alarm	10/27 18:17:44	0	0
5	A2 Alarm	10/27 18:17:44	0	0

View the alarm history for the selected detector, including which alarm went off and the date and time of the alarm, acknowledgment, and reset.

Set-points



View the set-points for the selected detector.

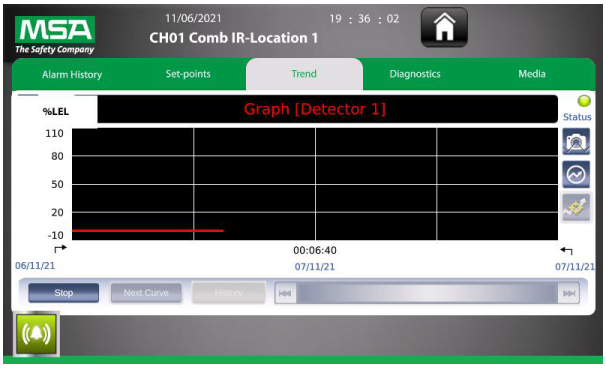
NOTE: The set-points can be edited from this screen with the administrative password.

When editing set-points, select **Write A1 & A3 alarm set-points to MSA detectors via HART** if you want the SENTRY io to automatically write the set-points selected on the SENTRY io to the MSA detector.

If this is not selected, then the SENTRY io and MSA detector can maintain different set-points.

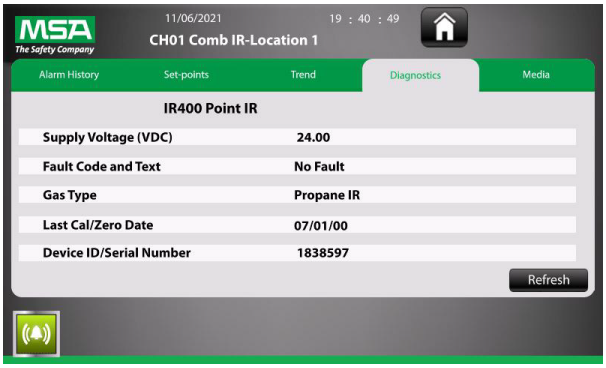
To disable a SENTRY io alarm output for maintenance related field work, Use the Disable/Enable toggle. When disabled, that specific input device or detector's associated relay logic will not be executed. There is no capability provided to bypass the relay outputs directly; this can only be achieved by disabling the input device and the associated relay output and/or logic.

Trend



Trend displays the historical gas data for the selected detector as well as the current state of the detector. Use the camera icon to the right of the graph to save a screenshot of the Trend graph on the SD Card.

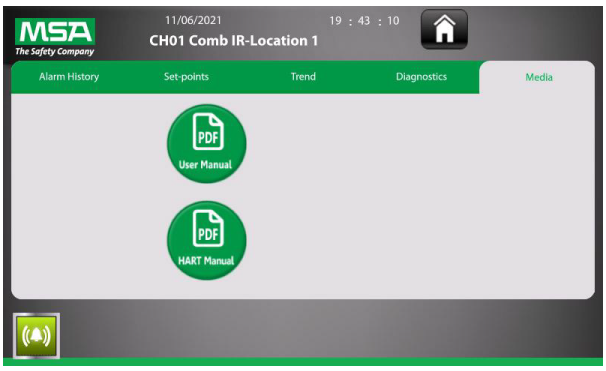
Diagnostics



View important details and status information about the selected detector.

NOTE: This is only for HART detectors.

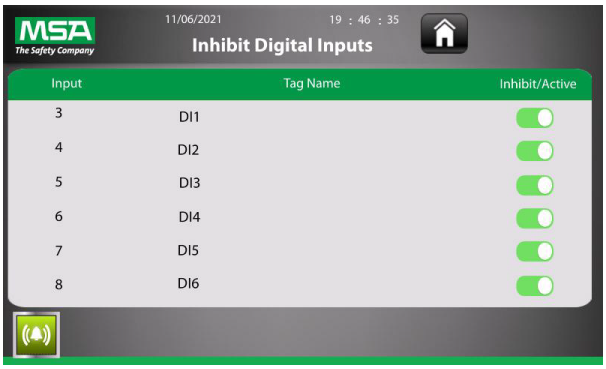
Media



User Manual files are pre-loaded based on the connected instrument but can be replaced by modifying the files in the SD Card. Any uploaded manuals must be in PDF format.

6.1.2 Inhibiting or Activating Digital Inputs

The digital inputs set up in the SENTRY io SmartStart configuration process display across the top of the dashboard. You can inhibit or activate them from the dashboard with admin access.



1. Tap one of the digital input indicators on the dashboard.
2. Enter the admin password.
3. To inhibit or activate an input, tap the **Inhibit/Active** slider for the desired input to toggle the setting.
4. Tap the **Home** icon  to return to the dashboard.

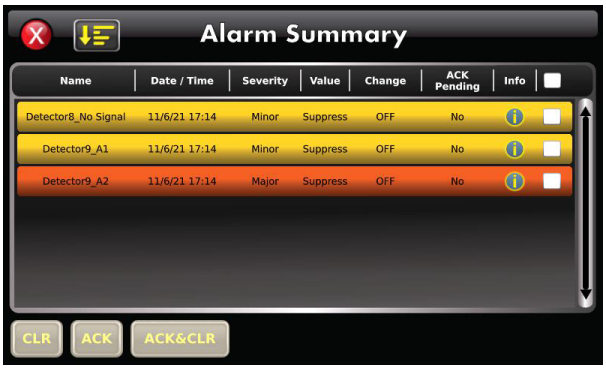
6.1.3 Acknowledging, Silencing, and Resetting Alarms

The SENTRY io dashboard has Acknowledge, Silence, and Reset buttons that allow you to quickly respond to an alarm.

- **Acknowledge**—De-energizes the Panel Horn relay and silences the local buzzer. Active only when an alarm or fault is active.
- **Silence**—De-energize the Horn relays. Active only during an alarm, and configured in the SmartStart wizard.
- **Reset**—Resets latching alarms.

NOTE: The buzzer dial allows for volume adjustment. To adjust the buzzer dial, spin the tabs on the inside of the buzzer dial.

6.1.4 Viewing the Alarm Summary

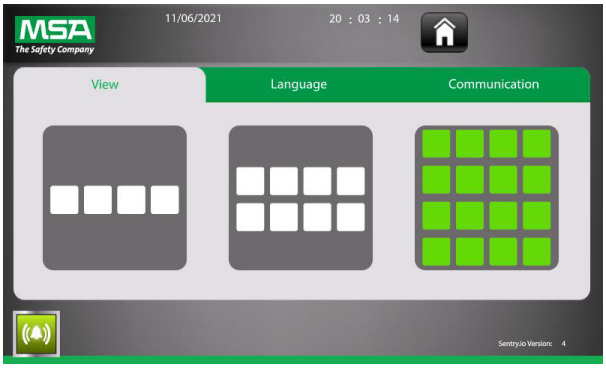


1. Tap the **Bell icon** in the bottom left corner of the dashboard to open the Alarm Summary.
2. The Alarm Summary shows a list of all alarms registered by the SENTRY io in reverse chronological order. The list is color-coded based on severity:
   - **Red** = Critical
   - **Orange** = Major
   - **Yellow** = Minor
3. Alarms can be acknowledged and cleared through the Alarm Summary screen. Use the checkbox on the right to select the alarm to which you want to apply the action.
4. Tap **CLR** to clear, **ACK** to acknowledge, or **ACK & CLR** to do both. You can select multiple alarms to perform bulk actions.

6.2 Tools

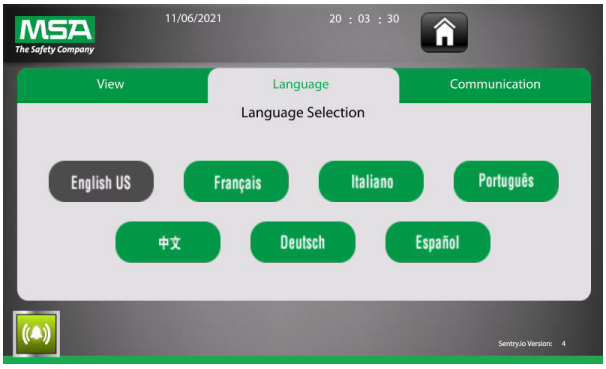
The SENTRY io Tools screen contains configuration options for the dashboard view, system language, and communication type.

6.2.1 Updating the Dashboard View



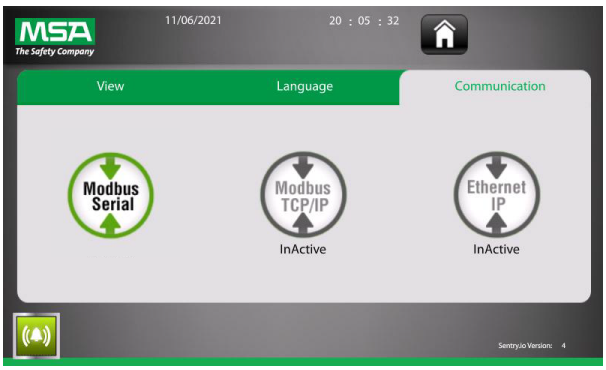
1. From the dashboard, tap the **Tools** icon .
2. In the View tab, tap on the desired dashboard view. This will determine the size of the detector tiles and how many display on the dashboard at one time.
3. Tap the **Home** icon to return to the dashboard.

6.2.2 Changing the System Language



1. From the dashboard, tap the **Tools** icon .
2. In the Language tab, tap on the language.
3. Tap **Apply**.
4. Tap the **Home** icon to return to the dashboard.

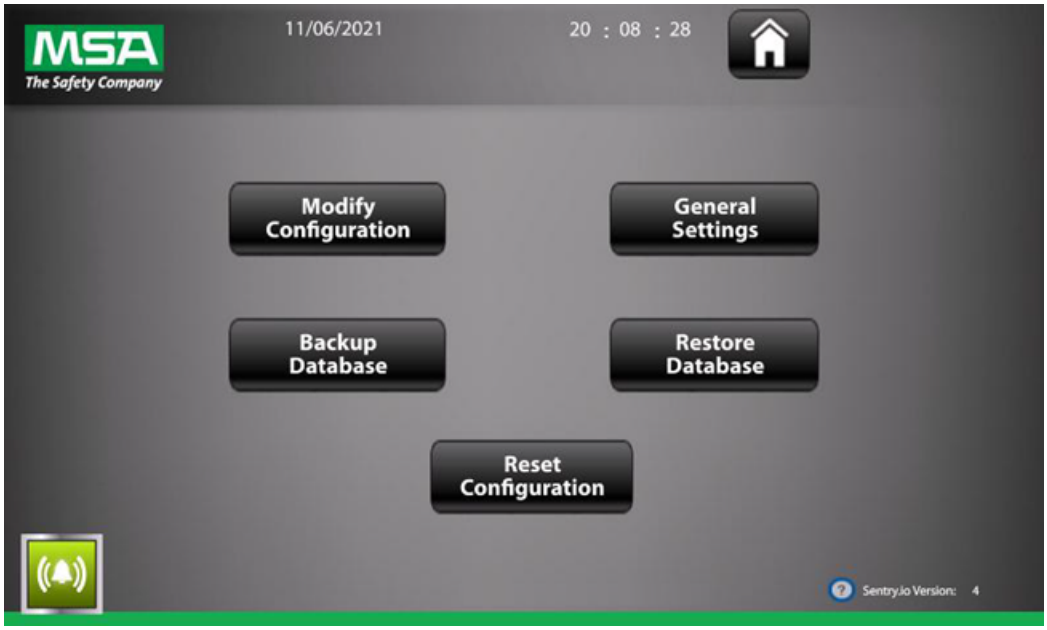
6.2.3 Updating the Communication Type



1. From the dashboard, tap the **Tools** icon .
2. In the Communication tab, tap the desired communication type.
3. Tap the **Home** icon to return to the dashboard.

6.3 Settings

The SENTRY io Settings screen contains admin-only options for the SmartStart configuration, general settings, and database.



6.3.1 Modifying the Configuration

You can return to the SmartStart configuration wizard to modify the configuration without having to reset the SENTRY io.

1. From the dashboard, tap the **Settings** icon .
2. Tap the textbox, enter the administrator password, and tap **OK**.
3. Tap **Modify Configuration**.
4. Review the warning and tap **Ok** to proceed.

   The SmartStart configuration wizard opens to the detector identification screen. For more information on completing detector identification and the follow-on steps of the SmartStart configuration wizard, see 4.3.2 Manually Identifying Detectors.

   NOTE: Do not use Modify Configuration for changing an existing sensor type and use Reset Configuration instead. New sensors should only be added to unpopulated channels. This prevents inadvertent changes to Cause & Effect or Voting. Other items such as alarm values can be changed with Modify Configuration.

6.3.2 Updating the General Settings

You can return to the SmartStart configuration wizard to modify the general settings.

1. From the dashboard, tap the **Settings** icon .
2. Tap the textbox, enter the administrator password, and tap **OK**.
3. Tap **General Settings**.

   The SmartStart configuration wizard opens to the General Settings section. For more information on completing the general settings in the SmartStart configuration wizard, see 4.1 General Settings.

6.3.3 Backing Up the Database

You can back up your user configurations on the SD card.

1. From the dashboard, tap the **Settings** icon .
2. Tap the textbox, enter the administrator password, and tap **OK**.
3. Tap **Backup Database**.

   The database is backed up to the SD card.

6.3.4 Restoring the Database

You can restore your database configurations from the SD card.

1. From the dashboard, tap the **Settings** icon .
2. Tap the textbox, enter the administrator password, and tap **OK**.
3. Tap **Restore Database**.

   The database is restored to what is on the SD card.

6.3.5 Resetting the Configuration

If necessary, you can erase all configuration settings and reconfigure the system.

1. From the dashboard, tap the **Settings** icon .
2. Tap the textbox, enter the administrator password, and tap **OK**.
3. Tap **Reset Configuration**.
4. You have the option to keep the administrator password during the reset.

   Tap **Yes** to keep the administrator password and proceed with the configuration reset.

   Tap **No** to clear the administrator password and proceed with the configuration reset.

   Tap **Cancel** to cancel the configuration reset.

6.4 SD Card

Each SENTRY io comes with an SD card installed that houses HART detector data, media/pdf files, and other data required for certain SENTRY io features to be functional.

The SD Card can be found below the USB Port on the left side of the back of the display module. Position SD card with label facing user, push in on SD card to install or eject.

6.5 Software Update Process

The SENTRY io software may require updating over time. If you are notified that a new software update is available for your unit, please contact MSA Customer Support.

7 Technical Specifications

Mechanical Specifications	
SENTRY io size	558.8 mm x 447.68 mm x 241.3 mm
SENTRY io weight	20 kg
Materials	Fiberglass
Ratings	NEMA-4X, IP65
Operating and storage temperature range	-20 °C to 65 °C
Humidity	20-90% relative humidity (non-condensing)
Atmospheric pressure range	86 kPa – 108 kPa
Electrical Specifications	
Input power types and ratings	100-240 VAC 50/60 HZ (autoswitching input)
Power consumption (controller alone)	1.4 amps at 24 VDC
Power capacity – max field device power available at 24 VDC	8.6 amps at 24 VDC
Maximum number of inputs	16 analog or 16 analog with HART gas detectors 6 discrete dry contact inputs
Input types supported	Analog with HART, Discrete dry contact
Maximum number of outputs	56 relays 16 analog outputs
Output types supported	Relays, Analog outputs
Output relay contacts	Maximum load: • 2 A at 240 VAC resistive • 2 A at 30 VDC resistive Minimum load: • 1 mA, 5 VDC
Ground fault monitoring?	No
Maximum loop impedance	251 Ohms
Display/Functional Indicators	
Touchscreen size and type	178 mm LCD
Functional Indicators	System Normal, Alarm, and Fault (located on touchscreen)
Pre-programmed functions	Remote Reset and Remote Silence dry contact inputs
Remote access capability	Remote display is an available option through Ethernet connection

Programming and Configuration	
Programming logic functions supported	AND, OR, 2 of N, and 3 of N logical equations
Program storage/retrieval/back up options	USB or SD card
Digital communications supported	MODBUS TCP/IP, MODBUS RTU (optional), Ethernet IP/DLR (consult factory)

Certifications
Certified for installation and use in Class I, Div. 2, Group A, B, C, D, Class I, Zone 2 Group IIC classified areas.
Certified by FM Approvals for US, Canada (FM22CA0007), ATEX (FM22ATEX0006), IECEx (IECEx FMG 22.0007), UKCA (FM23UKEX0046)
Performance certification includes: IEC/EN/UL/FM 60079-29-1, IEC/EN 60079-29-4, EN 50104, FM 6320, FM 6325, FM 6340, ANSI/FM 12.13.04, ANSI/ISA 92.00.01, and ANSI/ISA 92.04.01, UL/FM/EN/IEC 62990-1 as a safety monitor (SM)
EMC Directive, REACH Regulation and RoHS Directive compliant

8 Maintenance

The SENTRY io does not require any special maintenance except for cleaning and periodic functional checks.

8.1 Periodic Functional Test

The following functional tests should be performed at least annually:

- Verify wiring, terminal connections, and stability of mounting for all integral safety equipment, including, but not limited to:
  - Power supplies
  - Control modules
  - Field detection devices
  - Signaling/output devices
  - Accessories connected to field and signaling devices
- See 5 System Verification for initial verification steps.
- Verify proper system operation by performing a full, functional test of all component devices of the safety system, ensuring that the proper levels of alarming occur.
- Fault/Malfunction circuit operation should be verified.

8.2 Calibration Check

Check the calibration of the sensor(s) connected to the input(s) of the SENTRY io according to the recommended schedule in the device manual(s).

8.3 Cleaning

Ensure that any cleaning or maintenance operations on the SENTRY io and sensor accessories follow ESD-safe procedures.

⚠ WARNING!

If cleaning requires the use of conductive liquids, ensure that the SENTRY io is fully powered off. Ensure that instruments and accessories are fully dry before use.

Failure to follow this warning can result in serious personal injury or death.

8.4 Storage

The SENTRY io enclosure should be stored in a clean, dry area that is within the temperature and humidity ranges quoted in 7 Technical Specifications. You should insert dust caps into any vacant cable entry holes during storage.

9 Troubleshooting

	Condition	Corrective Action
1	Unit does not have power	• Check physical connection—Confirm internal cabling is not frayed or disconnected • Check power supply LED indicators • Check power supply load—Confirm the power load was properly calculated
2	Instrument was not auto-detected	• Ensure instrument supports HART—If not HART supported, used generic configuration **NOTE:** The X5000/S5000 second sensor does not auto detect with HART and must be manually added as a generic sensor. • Ensure instrument is properly wired
3	Buzzer is not working or is not loud enough	• Ensure damper is not closed • Ensure buzzer is properly wired
4	Channel does not appear to be showing proper reading	• Ensure instrument is properly wired • Ensure there are no faults with instrument • Ensure input module is properly secured and connected to bus • Ensure detectors are set in default analog settings **NOTE:** For X5000 and S5000 sensors, the 0 value is 4.04 mA so the readout at the SENTRY io might be slightly higher than 0 – this is normal operation.
5	Failed to recognize hardware	Ensure input module is properly secured and connected to bus
6	Touchscreen not responding	• Ensure user is not wearing touch-resistent gloves • Clean hands and clean screen
7	Relay not operating as expected	• Ensure relay module is properly secured and connected to bus • Ensure all preceding modules are properly secured and connected to bus • Ensure relay condition is properly configured in relay assignments and cause & effect programming • Ensure relay is properly wired for configuration • Ensure relay is wetted, if required by application • Ensure current is not below minimum requirement for relay • Ensure relay configuration meets system specifications (example: less than 2 amps) • Check for damaged equipment
8	Analog output is not working	Ensure wiring is properly installed to support desired configuration
9	Local transmitter settings do not match controller settings (example: set-points, scale, units)	• Ensure controller settings match expected values for connected instruments • On the Setpoints screen in the SmartStart configuration wizard, select **Write A1 & A3 alarm set-points to MSA detectors via HART**
10	Instrument reading	• Ensure instrument is properly wired

Condition		Corrective Action
	does not match controller reading	• Ensure instrument is properly configured • Check instrument voltage • Ensure detectors are set in default analog settings
11	Channel not reporting an alarm	• Ensure instrument is properly wired • Ensure alarm condition is properly configured in relay assignments and cause & effect programming • Ensure local and controller set-points are configured as expected • Ensure alarm condition is not inhibited
12	Discrete/Digital Input not working	• Ensure input is not inhibited • Ensure input is properly wired • Ensure input is enabled • Check local vs. SENTRY io setpoints
13	System time incorrect	• Check settings • Check NPT setting
14	Communication output not working	• Check settings (IP address, etc) • Check wiring/cableing
15	Forgotten/lost password	Call MSA
16	TagName is not correct	Check setting for instrument on channel
17	Manual Identification	Refer to detector for necessary manual identification information
18	Wrong instrument connected to channel	• Check wiring • Check proper instrument is connected to proper wire terminals
19	Sensor 2 not displayed for dual sensor transmitter (X5000 and S5000)	HART devices only report sensor 1. Use the generic setup to manually configure sensor 2.
20	Wrong user manual shown for channel	• Check correct instrument is connected • Check correct manual is uploaded
21	Change from 3 to 2 setpoints (or vice versa)	Check configuration and change, if needed
22	Discrete/digital input not latching	Check settings on controller **NOTE:** Once 3 alarm setpoint configuration is selected, 2 setpoint configuration is not allowed due to inadvertent changes to Cause & Effect and Voting. Changing to 2 setpoint configuration requires Reset Configuration.
23	Remote silence not working	Check wiring

Condition		Corrective Action
24	Remote reset not working	• Check wiring • Check active alarms
25	Relay contact not powered	Most relays are dry—Check manual for wetting contact
26	View/export program logic	• Check logic in cause & effect settings • Export logic in cause & effect settings
27	Cannot configure "two relay voting" scheme	Create second voting scheme that uses same inputs with a different output
28	Not all channels displayed on dashboard	• Change view configuration • Follow arrow to next screen showing additional channels
29	Fault code on screen	Any fault code shown is derived from HART command 48. See instrument display for more information
30	Can I export trends	Copy file from SD card directory <dir>
31	Can I export cause & effect	Copy file from SD card directory <dir>
32	Oxygen Alarms can't write to detectors	Note that Alarm set-points for Oxygen sensors cannot be written to the detectors. This is because some Oxygen sensors utilize upward acting alarms and SENTRY io uses only downward acting alarms for Oxygen therefore this rule prevents inconsistencies in operation. Setpoints at these detectors need to be altered manually.

10 Ordering Information

10.1 Controller

Description	Part Number
CONTROLLER,SENTRY io,16PT,32RLY,0AO,M20	10211160
CONTROLLER,SENTRY io,16PT,32RLY,0AO,STD	10214619
CONTROLLER,SENTRY io,16PT,32RLY,16AO,M20	10211161
CONTROLLER,SENTRY io,16PT,32RLY,16AO,STD	10214620
CONTROLLER,SENTRY io,16PT,56RLY,0AO,M20	10211162
CONTROLLER,SENTRY io,16PT,56RLY,0AO,STD	10214621
CONTROLLER,SENTRY io,16PT,56RLY,16AO,M20	10215686
CONTROLLER,SENTRY io,16PT,56RLY,16AO,STD	10215687
CONTROLLER,SENTRY io,8PT,32RLY,0AO,M20	10211156
CONTROLLER,SENTRY io,8PT,32RLY,0AO,STD	10214615
CONTROLLER,SENTRY io,8PT,32RLY,8AO,M20	10211157
CONTROLLER,SENTRY io,8PT,32RLY,8AO,STD	10214616
CONTROLLER,SENTRY io,16PT,32RLY,16AO,M20, SILICONE FREE	10223690

10.2 Accessories/Spare Parts

Description	Part Number
ANALOG OUTPUT MODULE,24VDC,6 CHANNEL	10246522
BUZZER	10246523
DISPLAY,24VDC,7",TFT LCD	10246524
EXPANSION MODULE,END,UNITRONICS	10246525
FAN,DC BRUSHLESS,24VDC,60mm SQX25mm DP	10246527
KIT,PLUG,IP66, M20	10218716
KIT,PLUG,IP66,¾ KNOCKOUT	10218717
KIT,TERMINAL BLOCK, TWO LEVEL,SENTRY io	10218719
KIT,TERMINAL BLOCK,THREE LEVEL,SENTRY io	10218718
MEMORY CARD, MICRO SD, 16GB	10246529
POWER SUPPLY,24V,10A	10246526
RELAY MODULE,24VDC,8 I/O	10246528
M20 CABLE GLAND KIT	10090929

11 MSA Permanent Instrument Warranty

Warranty

MSA the Safety Company warrants that this product will be free from mechanical defect or faulty workmanship for a period of two (2) years from the date of delivery, provided it is maintained and used in accordance with MSA's instructions and/or recommendations.

This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year, such as, but not limited to, nonrechargeable batteries, filament units, filter, lamps, fuses, etc. MSA shall be released from all obligations under this warranty in the event that repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee, or representative of MSA has any authority to bind MSA to any affirmation, representation, or warranty concerning the goods sold under this contract. MSA makes no warranty concerning components or accessories not manufactured by MSA, but will pass on to the Purchaser all warranties of manufacturers of such components.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedy

It is expressly agreed that the Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of the Seller, or for any other cause of action, shall be the repair and/ or replacement at the Seller's option of any equipment or parts thereof, which after examination by the Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to the Purchaser, F.O.B. Seller's Plant. Failure of the Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.

Exclusion of Consequential Damage

The Purchaser specifically understands and agrees that under no circumstances will the Seller be liable to the Purchaser for economic, special, incidental, or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct, or any other cause of action against the Seller.

12 Resources

12.1 Cause and Effect Planning

⚠ WARNING!

The Cause and Effect Planning spreadsheet is provided as a documentation aid to pre-plan the programming of the SENTRY io. The spreadsheet does not validate the programming logic or confirm that the programming is appropriate and sufficient for your application.

- Confirm fitness of the spreadsheet for your specific application prior to use.
- Configuration of the SENTRY io must be validated by full functional testing once complete.
- Downloading of the .csv file with your configuration after completing the set-up wizard is not a replacement for a full functional test.
- If you are copying, saving or modifying the spreadsheet, do not delete the warnings from the spreadsheet.

Failure to follow this warning can result in serious personal injury or death.

Use the Cause and Effect Planning spreadsheet in the SENTRY io Online Help to do your cause and effect pre-planning.

12.2 Power Consumption Calculation

Use the power consumption worksheet in the SENTRY io Online Help to do your power consumption calculations.

12.3 Modbus Address List

The SENTRY io Modbus address list includes addresses for discrete alarms, discrete inputs, relays, voting zones, system faults, and analog. View this section in the SENTRY io Online Help to download the spreadsheet.