

Sentry IT Fire and Gas Detection Overview

2015.r2



- Founded in 1979
- Listed on US Stock Exchange - SRMC
- HQ in Milpitas, Silicon Valley
- Sales offices around the world

SMC addresses the industrial and commercial *facilities management* market with *Industrial Internet of Things (IIoT)* solutions that *connect and protect* high-value infrastructure assets

CONNECT
Protocol
Gateways



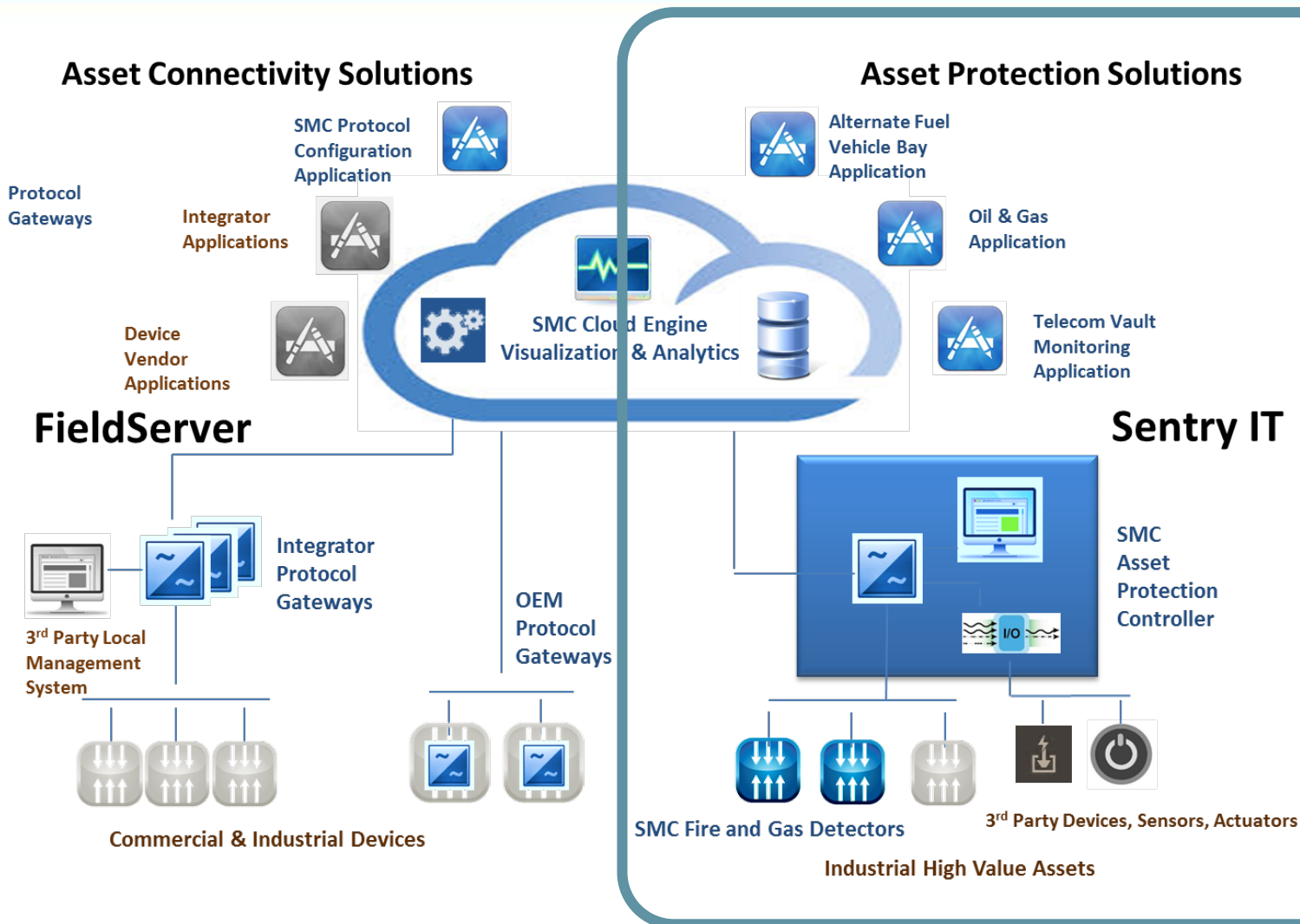
FieldServer

PROTECT
Fire & Gas
Detection Solutions



SentryIT

IIoT Solutions Architecture





**>100,000 detectors
INSTALLED**





Why Fire and Gas Detection?

- It saves lives and protects valuable assets
- Many applications require fire and gas detection systems by regulations and laws
- Systems must be approved by required agencies otherwise creates immense liability for the user



UL 2075



IECEX
CERTIFIED

What is Sentry IT?

- Products and solutions for detecting fire and toxic and combustible gases
- State of the art sensors and detectors
- Scalable and flexible architecture including IP connectivity and cloud applications
- Safety and regulatory approvals with NRTLs



▶ Combustible Gases

- ▶ Explosion or fire hazard
- ▶ Must maintain concentration below lower explosive limit (LEL)

▶ Toxic Gases

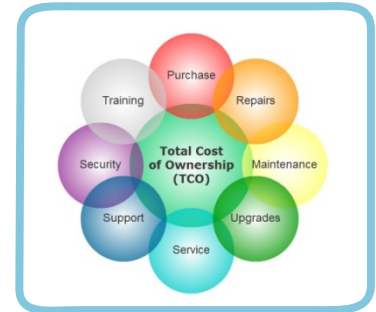
- ▶ Hazardous to human health and safety
- ▶ Employee exposure must be limited

▶ Oxygen Displacing Gases

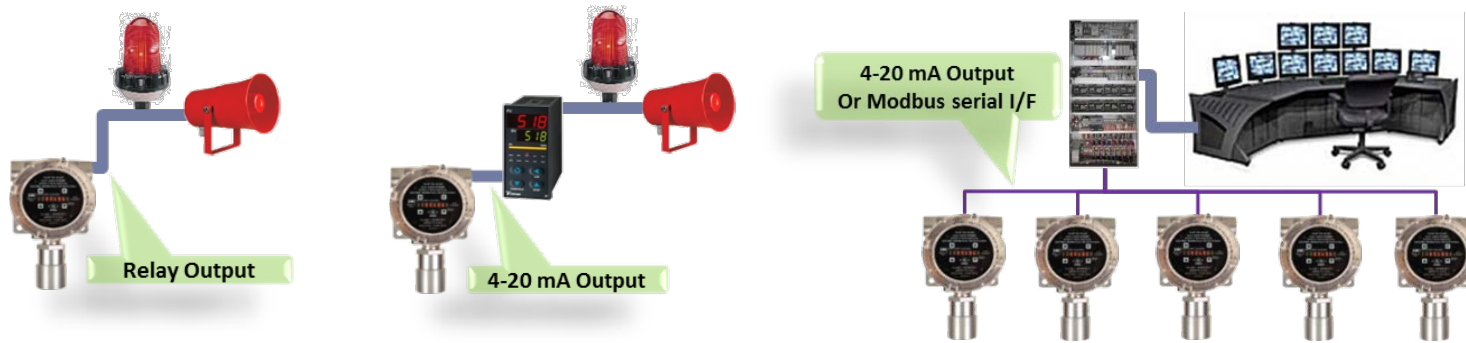
- ▶ Indirect human health hazard
- ▶ Deficiency of breathing Oxygen

Why Sentry IT?

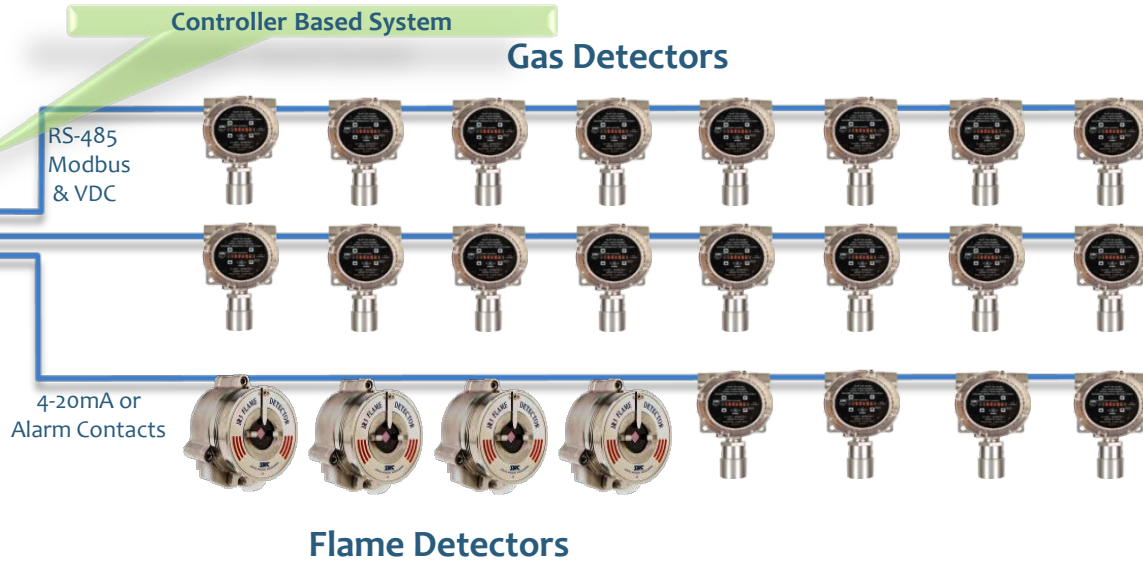
- 35 years of experience
 - Key agency approvals like FM, ATEX, UL, CCCF and others...
- Flexible and scalable
 - From stand-alone detectors to advanced controller-based systems
- Lowest Total Cost of Ownership (TCO)
 - Fast installation and commissioning, infrequent calibration and low ongoing maintenance
 - Features like GlobalCal™ and SenseSafe™ ensures performance
- Distributed intelligence
 - Maximum performance and ability to collect sensor data for advanced analytics
- Integration with control systems and cloud for remote monitoring and analytics
 - Integrated FieldServer gateway provides the industry's leading multi-protocol interface



Scalable: Stand-alone to Advanced

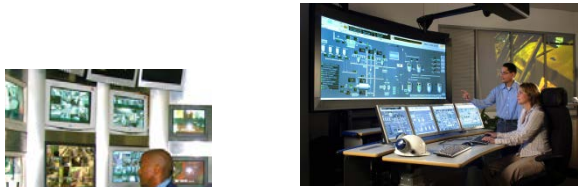


Horns and Strobes



Integration: Beyond The Controller

Building and Industrial Control Systems

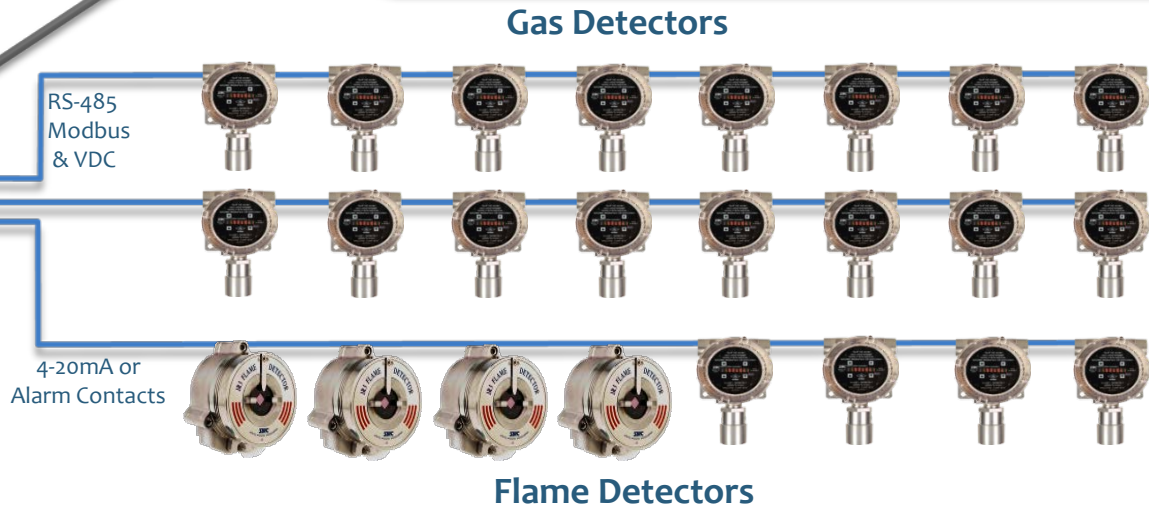


BACnet/IP
Ethernet/IP
140+ Other Protocols

Cloud Applications and Data Storage



Horns and Strobes



Sentry IT Cloud Solution

SMC Cloud OpenSite™



- SMC OpenSite™**
- All Sentry InSite™ functions
 - Aggregation of Sentry ITs
 - Monitoring dashboards
 - Geo mapping
 - Long term trending
 - Advanced security
 - Analytics
 - Cross-site benchmarking
 - Custom apps



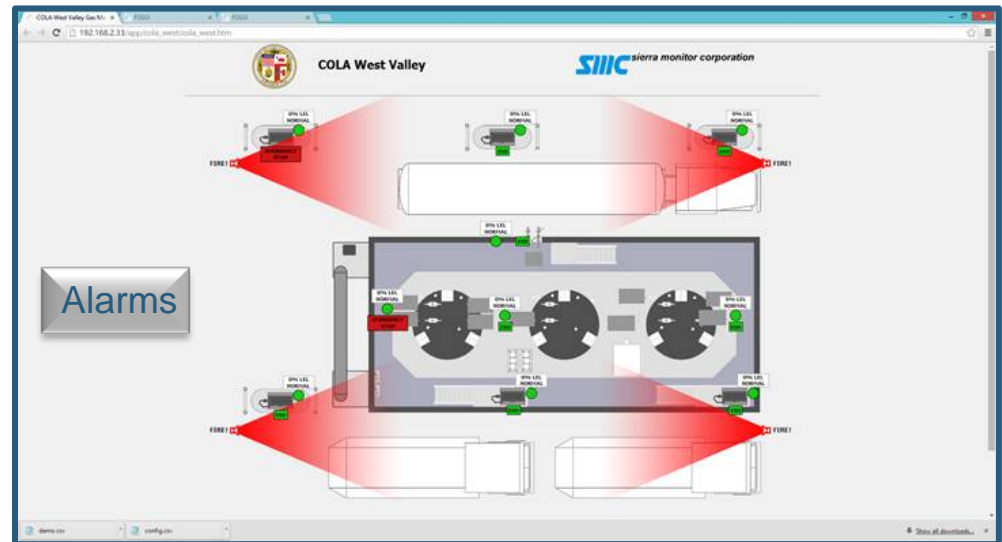
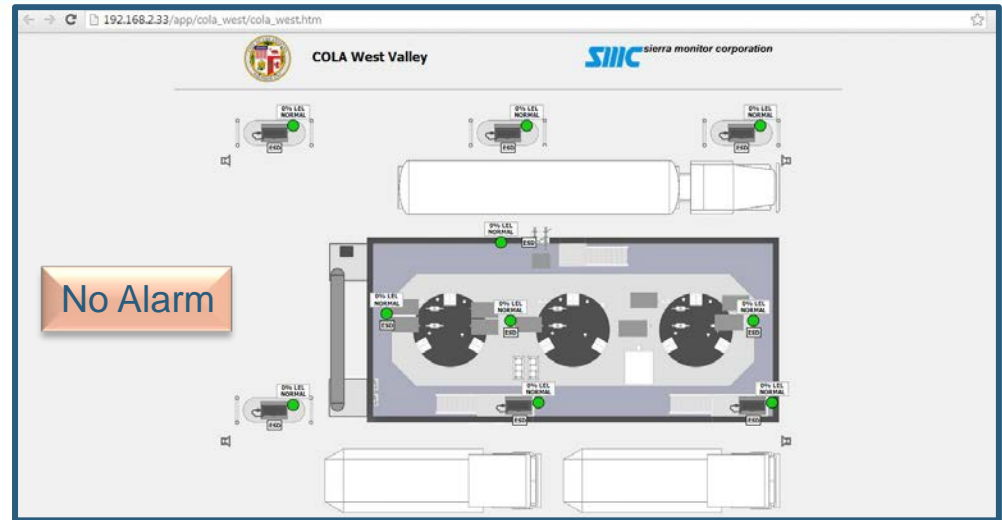
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- Sentry IT InSite™**
- Local website
 - Auto generated apps
 - Application monitoring
 - System status
 - Alarms
 - Events



- Remote monitoring using the capabilities in Sentry IT
- Dynamic updates with details immediately displayed on any web browser
- Mass-notification on Smart Phones and Tablets



- Sentry IT Smart Controller
- Sentry IT Smart Gas Detectors
- Sentry IT Flame Detectors
- Sentry IT Summary
- Legacy Sentry Retrofit Solution



Sentry IT Smart Controller

Sentry IT Controller Overview

Flexible

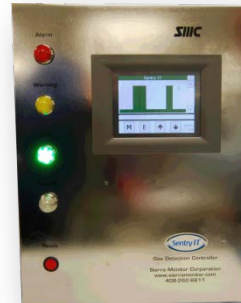
- ▶ 32 Universal Inputs
 - ▶ Modbus RTU, RS485
 - ▶ Analog 4-20 mA
 - ▶ Classic Sentry PSG
 - ▶ Conventional Relay input
- ▶ Universal Outputs
 - ▶ High & Low amp relays
 - ▶ Analog 4-20 mA
 - ▶ Modbus TCP, Ethernet IP
 - ▶ FieldServer Gateway
 - ▶ Webserver



Easy to Use

- ▶ Convenient Touch Panel Operator interface
- ▶ Remote Touch Panel option
- ▶ USB for file transfer & history download
- ▶ Multi Protocol Gateway
 - ▶ Ethernet
 - ▶ Serial
 - ▶ Web Server
 - ▶ Cloud Applications

Modular



Sentry IT Smart Controller Highlights

- Scalable – expand with additional I/O blocks
- Multiple power options
 - AC only, DC only, AC with DC back-up
- Auto Discovery of Sentry IT smart detectors
 - Rapid commissioning of system with minimum downtime
- GlobalCal™, single person auto-adjusting calibration
 - Non-intrusive feature reducing calibration labor costs up to 75%
- SenseSafe™ integration of Sentry IT Smart Detectors
 - Monitoring of sensor performance for safety and maximum lifetime
- Built-in Webserver for remote access to controller
 - Allows remote monitoring of system and ability to customize web pages
- Plant wide system and cloud integration
 - Including Modbus TCP, EtherNet/IP, SNMP, DNP, BACnet, LonWorks and many more protocols
 - Provide ability for remote monitoring, dashboards, mass-notification, analytics and other cloud applications



Intuitive Touchscreen User Interface



Sierra Monitor Corporation Sentry IT

Set Display Defaults ?

- Display Zones with Banner
- Display Zones without Banner
- Display Modules with Banner
- Display Modules without Banner

Select Home Page, E when done

M E ↑ ↓ 11/26/12 15:19

Configuration

Maintenance

Trouble Conditions

Alarm Management

System Management ?

- Configuration
- Maintenance
- View System Trouble Conditions

Press E to configure

M E ↑ ↓ 11/30/12 16:44

System Management ?

- Configuration
- Maintenance
- View System Trouble Conditions

Press E to perform Maintenance

M E ↑ ↓ 11/30/12 16:45

System Management ?

- Configuration
- Maintenance
- View System Trouble Conditions

Press E to View System Trouble

M E ↑ ↓ 11/30/12 16:45

Sierra Monitor Corporation Sentry IT

Sentry IT ?

- 485 Loop-A Lower Safe
- 10-Card 2 Lower Safe
- 10-Card 3 Lower Safe

M E ↑ ↓ 11/26/12 14:12

Configuration ?

- Set Time & Date
- Set Controller Id
- Set Password
- Set Module
- Commander Logic
- Set Display Defaults
- Initiate Module Discovery

Touch option then press E

M E ↑ ↓ 11/30/12 16:46

Maintenance ?

- Manual Control
- Calibrate 20mA Input

Press E to perform manual control

M E ↑ ↓ 12/04/12 13:05

Trouble Conditions ?

As of 11/30/12 18:49:57:

- B01(IT_LOOPB01):TROUBLE CLEARED
- B01(IT_LOOPB01):TROUBLE bits=512

M E ↑ ↓ 12/02/12 15:19

Sierra Monitor Corporation Sentry IT

Sentry IT ?

Gas Detection System Condition: Safe

M E ↑ ↓ 11/26/12 14:09

GlobalCal™ and SenseSafe™ Features

GlobalCal™ Calibration

- Simple three step calibration
- Single person procedure
- Remote sensor calibration, no need for detector access
- Multiple gases can be calibrated simultaneously

providing:

- Reduced labor cost
- Improved uptime
- Lower TCO

SenseSafe™ Monitoring

- Resident DSP (Digital Signal Processing) in each detector for comprehensive and continuous monitoring
- Controller based networked diagnostics with remote command capability
- Logging of all error conditions available for statistical analysis

providing:

- Longer time between calibrations
- Pro-longed sensor life
- Lower TCO



Sentry IT Smart Gas Detectors

Sentry IT Smart Gas Detector Overview

Easy to read scrolling LED display

Optional 8 amp alarm relays

3- Wire or 4-Wire isolated 4-20 mA



RS-485 Modbus RTU

Sentry PSG interface to existing and new Sentry IT systems

Optional Remote Sensor

- Smart stand alone or system based operation
 - Built-in processing for intelligent operation
- Multiple communication choices
 - Modbus, PSG, HART and 4-20mA
- SenseSafe™ feature continuously analyzes detector parameters
 - Provides performance data for maximum life
- Intuitive non-intrusive menu based operation
 - Enables fast commissioning
- Proprietary sensor DSP enables half the calibration interval compared to other vendors
 - Up to one year compared to other vendors 3 months
- Broad Range of gases and technologies:
 - Combustible, Cat Bead, LEL
 - Combustible, Infrared , LEL & %Vol
 - Toxic, Electrochemical, 0-100 ppm



Sentry IT Smart Gas Detectors Enclosures

- ▶ 316 SS or Aluminum Enclosures, ¾” NPT or M20



Enclosure Ratings

- ▶ SS Class 1, Div 1, Grp B,C,D
 - ▶ Source IME
- ▶ AL Class 1, Div 1, Grp A,B,C,D
 - ▶ Source Limatherm



Remote sensor kit

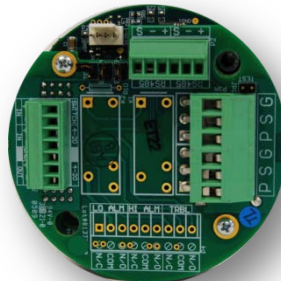
- ▶ Combustibles
- ▶ -03,-04,-05 Modules Only

Sentry IT Smart Gas Detector Internals

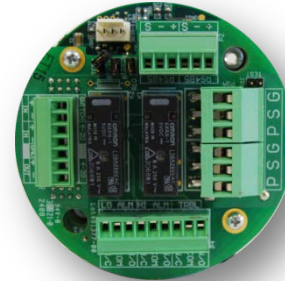
Enclosure



Transmitter



Field Termination Options



Sensor Assembly

Standard

- ▶ RS-485/Modbus
- ▶ PSG
- ▶ No Relays

Option 1

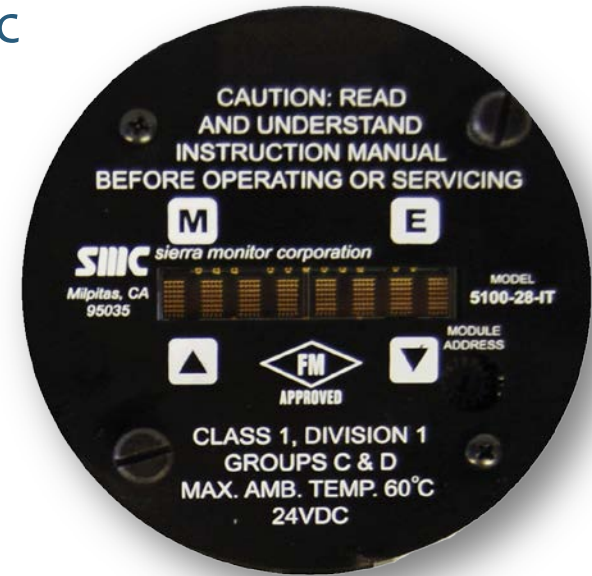
- ▶ RS-485/Modbus
- ▶ PSG
- ▶ 8 A Relays

Option 2

- ▶ HART
- ▶ RS-485/Modbus
- ▶ 3A Relays

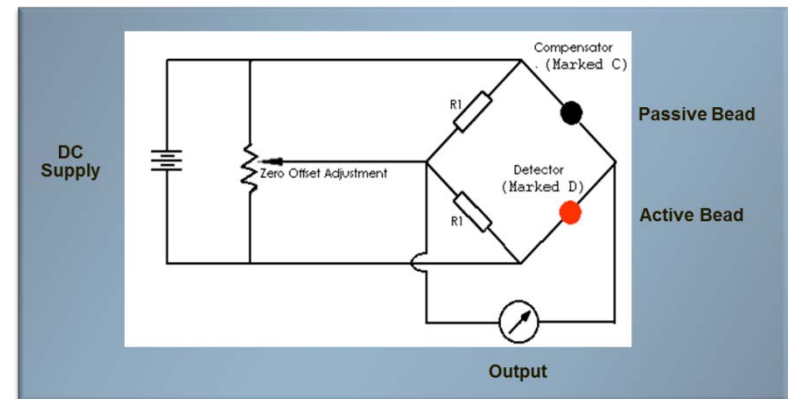
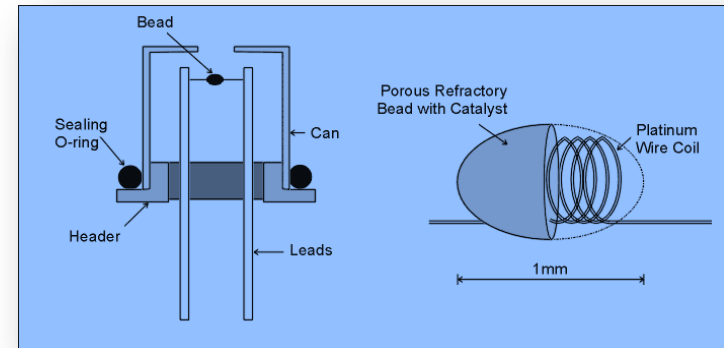
- Non-Intrusive configuration using magnetic tool for configuration of:

- Alarm set-points
- Alarm acknowledge
- Calibration
- Engineering Units
- Digital/Analog communications setup



Catalytic Bead: Principle of Operation

- Two alumina beads surrounded by platinum wire
- Bead 1 passivated
- Bead 2 catalyzed to react
- Catalyzed bead heats up with combustible gas, increasing output of Wheatstone bridge signal



Catalytic Bead Combustible Gas Detector

- Sentry IT Smart Detector uses proven Catalytic Bead technology
- 0-100% LEL
- FM Approved for performance, operation and environment for Combustible gases (Class I, Div. 1, Groups B, C, and D)
- FM Approved with 6 month calibration interval
- SIL-2 Certified
- UL2075 Certified



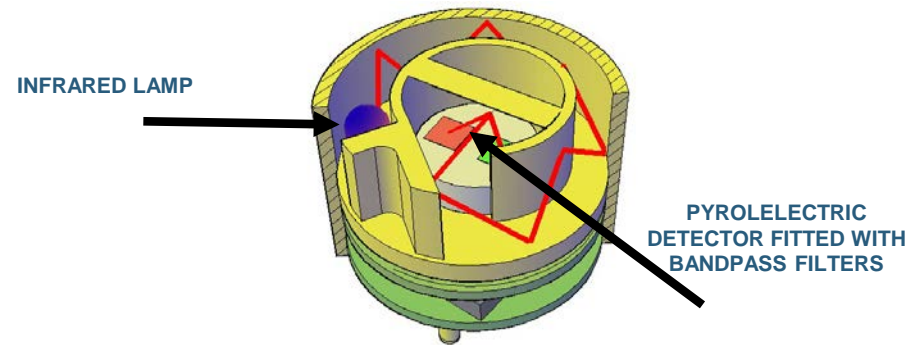
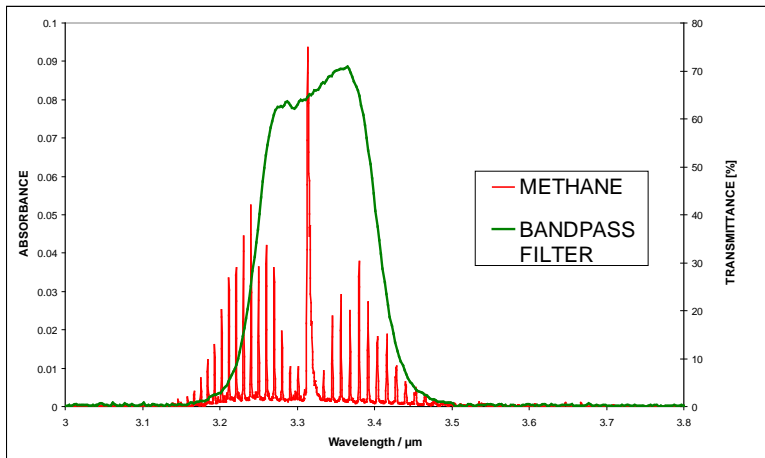
Model 5100-02-IT



Infrared (IR): Principle of Operation

- Combustible gases absorb IR light energy at defined wavelengths
- Higher concentration results in greater absorbance
- Detector measures energy from the IR light and compares to the energy emitted by source
- Difference in energy received indicates level of gas concentration

- Detects Hydrocarbons but not Hydrogen
- Accurate & stable
- Calibration interval : 1 Year
- Low maintenance, Long Life
- Immune to catalytic bead poisons
- Range: % LEL or % Vol
- Operates in high combustible gas and/or low oxygen environment
- Rapid recovery after exposure to 100% concentrations of hydrocarbon gas
- Monitor in 0-100% LEL or 0-100% Volume ranges



Infrared (IR) Combustible Gas Detector

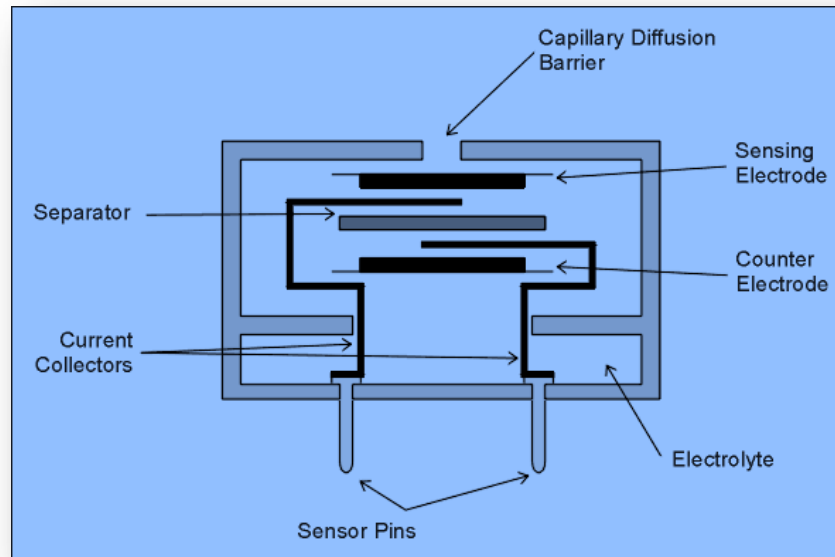
- Non-Dispersive Infrared technology
- 0-100% LEL or 0-100% by volume
- Methane (FM Approved)
- Other combustible gases including:
 - Ethane
 - Propane
 - Butane
 - Pentane
 - Hexane
 - and others
- SIL-2 Certified
- UL2075 Certified



5100-28-IT

Electrochemical: Principle of Operation

- Current generating electrolytic reaction
- High sensitivity for PPM levels of Toxic gas
- Specificity to gas of interest
- Percent volume for Oxygen measurement



- Toxic Gas Monitoring in PPM Range

- Highly reliable electrochemical sensors, thousands deployed over more than a decade around the world
- FM Approved 6 month calibration interval, twice as good as other vendors
- Optional remote sensor– for hard to access areas
- FM and ATEX approvals for H₂S
- SIL-2 for H₂S



5100-05-IT

- Toxic Gases

- O₂ – 5100-03-IT
- CO – 5100-04-IT
- H₂S – 5100-05-IT
- Cl₂ – 5100-06-IT
- SO₂ – 5100-10-IT
- NO₂ – 5100-12-IT
- HCl – 5100-21-IT
- NH₃ – 5100-25-IT
- HF – 5100-26-IT
- CO₂ - 5100-88-IT

Two Wire Analog Detector

- Hydrogen Sulfide (and other Toxic gases)
- Low maintenance costs due to FM Approved 180 day calibration interval (longest in the industry)
- Low installation costs due to 2-Wire design
- Durability of available Stainless Steel transmitter/sensor enclosure
- Application adaptability with variable range selection and mounting configuration



4501-05

Open Path Gas Detector

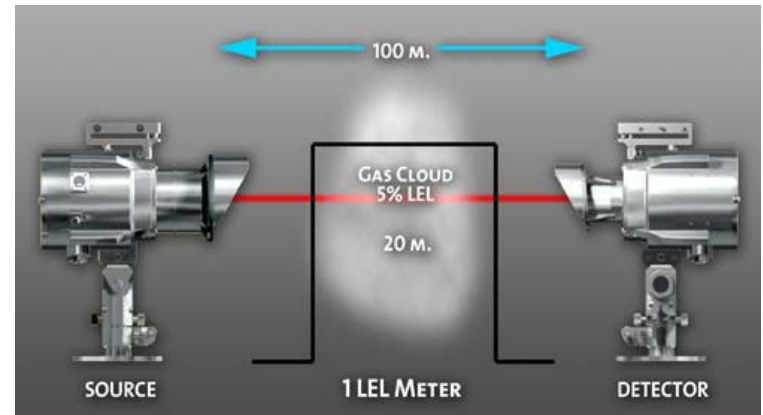
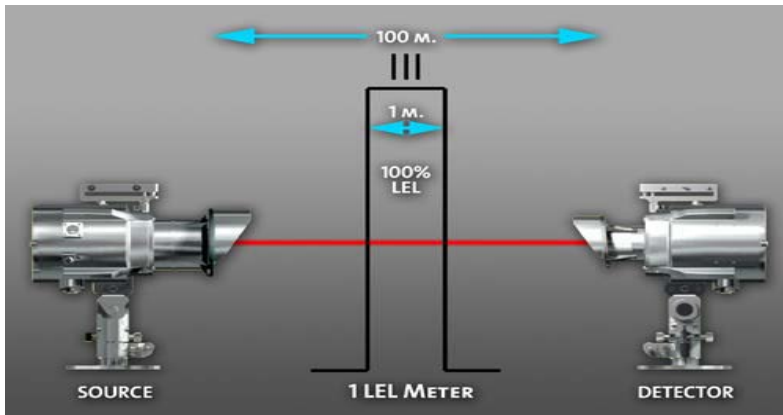
- Long range up to 200m
- High sensitivity and high resolution
- FM and European performance approved & tested
- Fast response <3sec
- Operating temperatures -55°C to +65°C
- Continuous operation in extreme environmental conditions
- Built-in event recorder – real time record of the last 100 events
- Compact design



Open Path : LEL Meter Concept

1 LEL meter (1 LEL.m) = a cloud of 5% methane (100% LEL) gas that is 1 meter wide.

1 LEL meter = a cloud of 0.25% methane (5% LEL) gas that is 20 meters wide



Same measurement – Different reality

- Factory Mutual (FM) requires that all approved sensors be calibrated periodically
- Sensor must be exposed to live gas standard to validate performance
- Regular calibration compensates for environmental changes
- Records must be maintained to meet OSHA Due Diligence requirements
- Calibration gas must be certified as primary gas standard



SMC provides procedures and certified calibration kits



Sentry IT Flame Detectors

Proactive vs. Reactive

- Gas Detectors are Proactive

- Respond to event before it becomes a life hazard or fire
- Ventilate area to remove unwanted gas

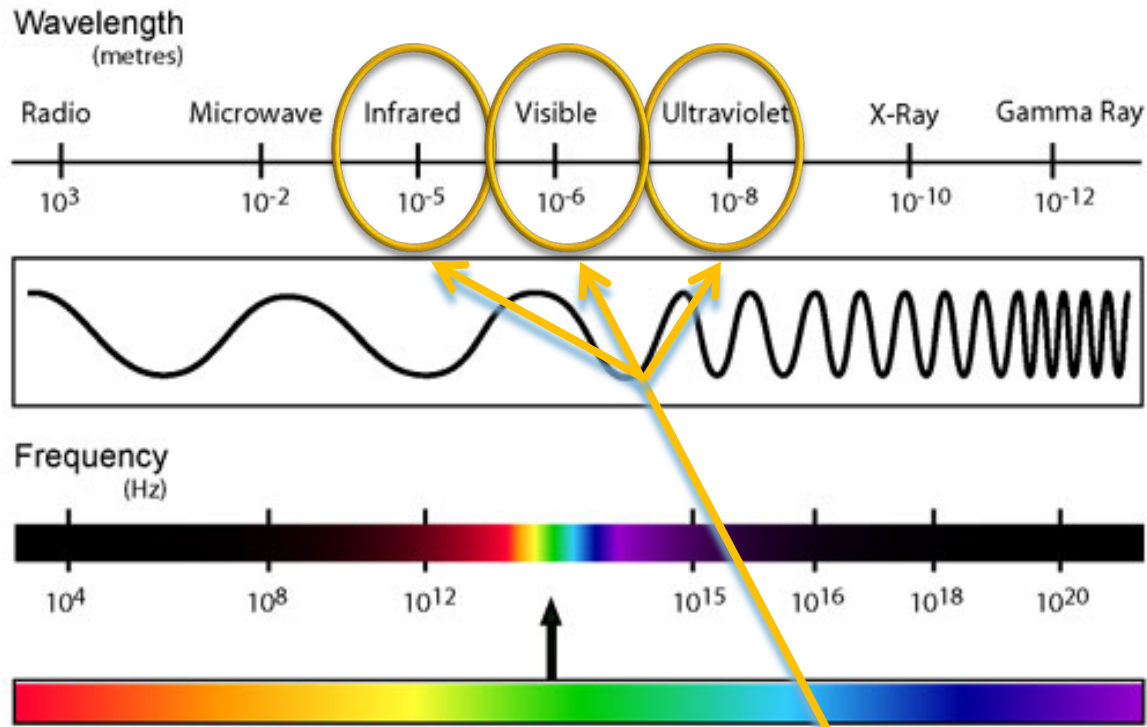
- Flame Detectors are Reactive

- Respond to the fire event once it has occurred
- Suffocate area during a fire event (no ventilation)



Electromagnetic Spectrum: Flame Detection

THE ELECTRO MAGNETIC SPECTRUM



- Common Fire Detection Spectrum

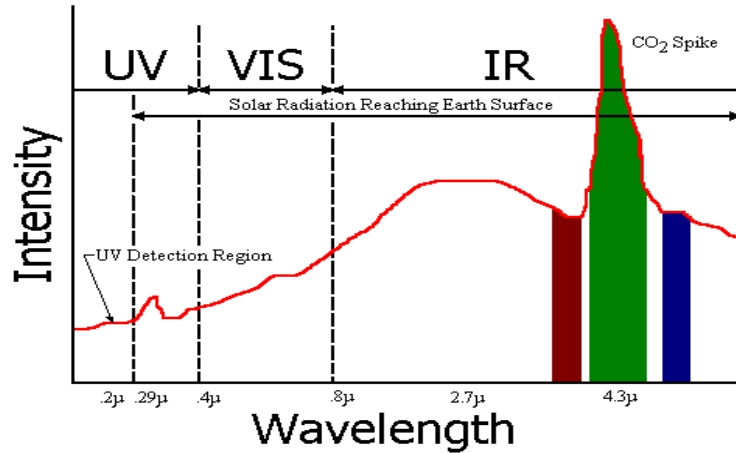
- Infrared (IR)
- Ultraviolet (UV)
- Visible Light (Vis)
- Combination UV/IR
- Triple IR
- Combination UV/IR/Vis

- Cone Angle and Distance

- 90 & 120° cone of vision
- 40 to 80' common

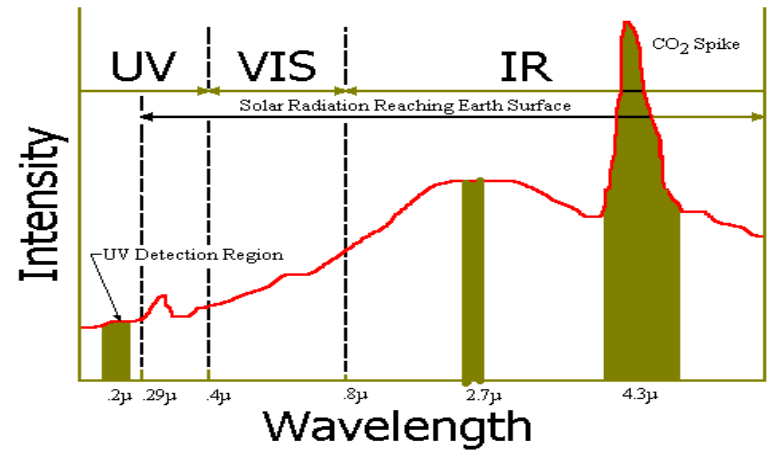


Triple IR



Detection of the flame's characteristic CO₂ emission line by the use of three wavelength bands

UV/IR



Detection of the simultaneous existence of typical infrared and ultraviolet radiation

Sentry IT Optical Flame Detectors



UV/IR/Vis 3100

- Advantages:
 - Widest cone of vision
 - Low false alarm rate
 - Unaffected by solar radiation
 - Multiple fuel types
 - FM and CSFM approvals
- Applications:
 - Hydrocarbon fires and Non-Hydrocarbon fires
 - Hydrogen, Silane and other Hydrogen fuels
 - Indoors or Outdoors



Triple IR 3600

- Advantages:
 - Moderate speed
 - Moderate sensitivity
 - Low false alarm rate
 - Unaffected by solar radiation
 - Long distances to 300 feet
- Applications:
 - Hydrocarbon fires
 - Indoors or outdoors



Multi IR 3600

- Advantages:
 - Moderate speed
 - Moderate sensitivity
 - Low false alarm rate
 - Unaffected by solar radiation
 - Long distances to 300 feet
- Applications:
 - Hydrocarbon fires
 - Hydrogen Fires
 - Indoors or outdoors



UV/IR 3600

- Advantages:
 - Low false alarm rate
 - Moderate speed
 - Unaffected by solar radiation
 - High immunity to false alarms
- Applications:
 - Hydrocarbon fires
 - Hydrogen, Silane, Ammonia and other Hydrogen-based fires
 - Metal fires
 - Indoor & Outdoor

- Best of Class

- 35 years of experience providing reliable and safe solutions



- Lowest Total Cost of Ownership (TCO)

- From commissioning to on-going calibration Sentry IT provides features and technology to lower TCO



- Integration – Industrial Internet of Things

- Integration with building, industrial control systems and cloud for remote monitoring and analytics





Legacy Sentry to Sentry IT Smart Controller Retrofit

Legacy Sentry Retrofit

- Thousands of Legacy Sentry Controllers are installed
 - However, today's sensor technology and data management demand more functionality
- SMC now offers an easy and cost-effective upgrade path
 - Removes potential obsolescence issues

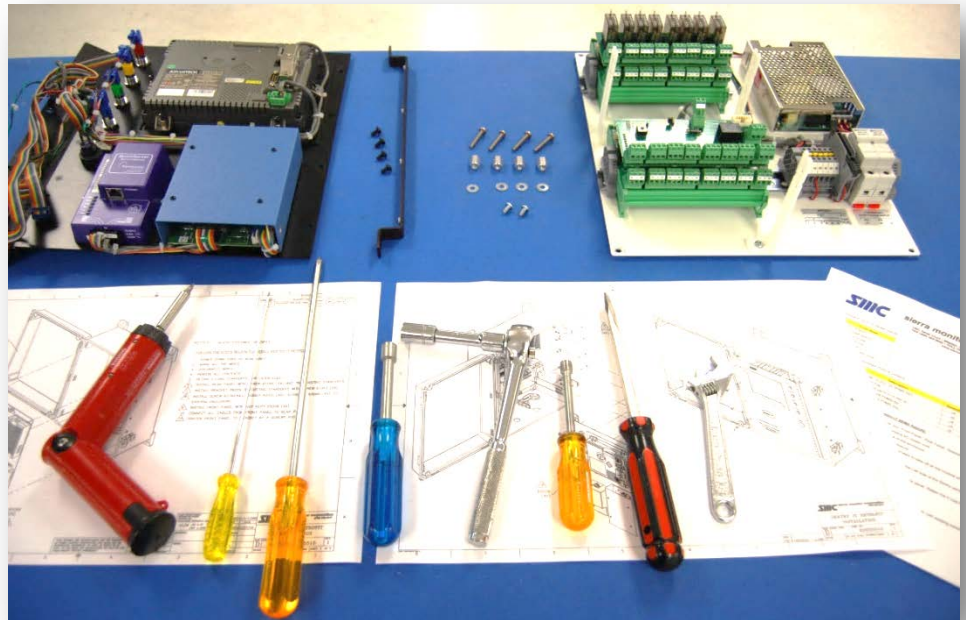


Legacy Sentry to Sentry IT Upgrade

- Enhance your gas safety with modern technology
- Keep your installed sensors – no need for new wires
- All Sentry IT Smart Controller functionality included:
 - Additional sensor capacity
 - Modbus communication
 - More outputs
 - Web browser interface
 - Interface to hundreds of protocols
- Minimal downtime – keep your plant operating
- Easy upgrade

Easy Upgrade

- Order the upgrade kit you need for your application, selecting options such as Modbus, additional relays and more
- Sierra Monitor provides all instructions, fittings and panels in the upgrade kit



Sentry IT Use Cases

Application

- Hazardous gas monitoring in bus maintenance facility used for CNG buses

Problem

- Central Ohio Transit Authority (COTA) starting to switch buses to CNG fuel needed to upgrade safety system in maintenance facility.

Solution

- Sierra Monitor Sentry IT system with combustible and Carbon Monoxide detector system integrated to central control via FieldServer gateways to meet local fire marshal requirements.

Results

- SMC provided a complete system with quick installation and approval that took into account all safety, notification, alarm and mitigation requirements.



Application

- Monitor for hazardous gases throughout expansive Wastewater Treatment plant interfaced to EtherNet/IP system.

Problem

- Update aging infrastructure with advanced gas detection while minimizing costs.

Solution

- SMC Sentry provided wide-spread gas detection capability with minimal wiring costs due to multiplexing from controller to sensors and Ethernet transmission from remote controllers to central system.

Results

- Customer pleased with low cost installation and operation yet able to handle both analog and alarm relays remotely with ability to interface to Allen Bradley EtherNet/IP central system.



Application

- Monitoring for Methane gas leaks from closed landfill

Problem

- A landfill closed in the 70s was leaking Methane into nearby homes and business. Gas leaks required person to drive to site to check out problem.

Solution

- SMC provided both CatBead and IR gas sensors at vent pipes around the site. This data interfaced to Sentry system that provide information remotely via web browser. This reduced maintenance costs.

Results

- Customer states, “This is simply amazing, the web server provides the ability of remote oversight of landfills that we have desired for quite some time.”



Application

- Monitoring Sulfur Dioxide gas leaks in residential area near a chemical plant

Problem

- A safety engineer had very specific need to monitor for low levels of SO₂. It had to be wireless, remote, 0-20 ppm range, non-intrusive calibration and delivered soon.

Solution

- A custom modified 4501-10 with non-intrusive calibration, 0-20 PPM range installed in NEMA 4X box with a wireless transmitter interfacing to base station in plant central.

Results

- Sierra Monitor was able to quickly and effectively make the necessary changes to an existing product to meet the customer's very specific requirements enabling this major chemical manufacturer to meet their safety needs and effectively satisfy both safety and community requirements.



Methane Gas Mitigation – Playa Vista

Application

- Protect homes built in Los Angeles basin 1.3 square mile Methane district. Current population 6,000+ people

Problem

- Major luxury home development project in area with concentrations of methane gas in the soil from decomposing flora and fauna buried underground for over 100,000 years.

Solution

- Sentry system able to meet local Fire and Building Safety requirements for monitoring gas in enclosed hard-to-reach area and monitor remotely via the internet, plus record conditions.

Results

- Sierra Monitor was chosen because of the ability to accommodate many different size applications economically as well as ability to communicate serially to FieldServer webserver to provide event logging and internet connections.



Application

- Monitoring for hazardous gas and fire conditions in pipeline booster station

Problem

- Required comprehensive detection package with point gas, open path gas and flame detection, plus other devices.

Solution

- SMC provided over \$2.5 million in equipment to meet their needs including detectors for flame, combustible gas, open path, and H₂S, plus strobes, alarms and other devices..

Results

- Sierra Monitor won the project not only due to the reputation and quality of our gas and flame detection products, but also due to capability to consolidate the wide range of products necessary and meet the extensive requirements for documentation and testing.



Thank You

Connecting and Protecting High-Value Assets

www.SierraMonitor.com