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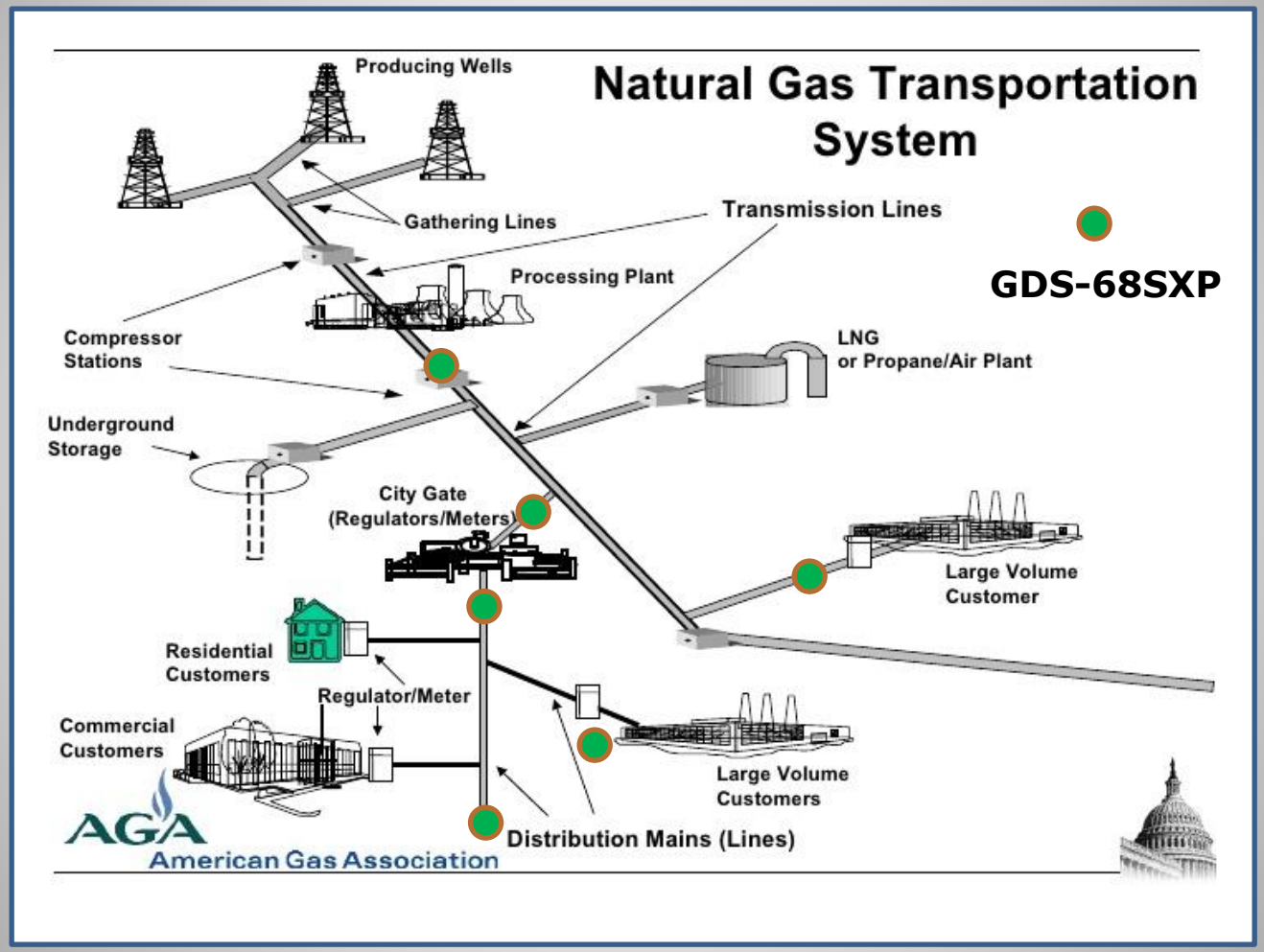
Gas and Flame Detection

GDS-68SXP Natural Gas Odorant Monitor

Odorant Monitoring in Natural Gas Distribution Systems



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Odorant Measurement

- Federal rules require gas to be detectable by human 'sniffers'
- Operation requires an operator to subjectively determine the level at which the scent of gas can be detected
- Readings range from 0.04% to 1.2% by volume, where a reading of 0.5% says, essentially, "I can smell gas at 10% LEL"
- The GDS-68SXP supplements this process with *multiple samples* and *objective odorant measurements*.

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Comparison of Measurement Techniques

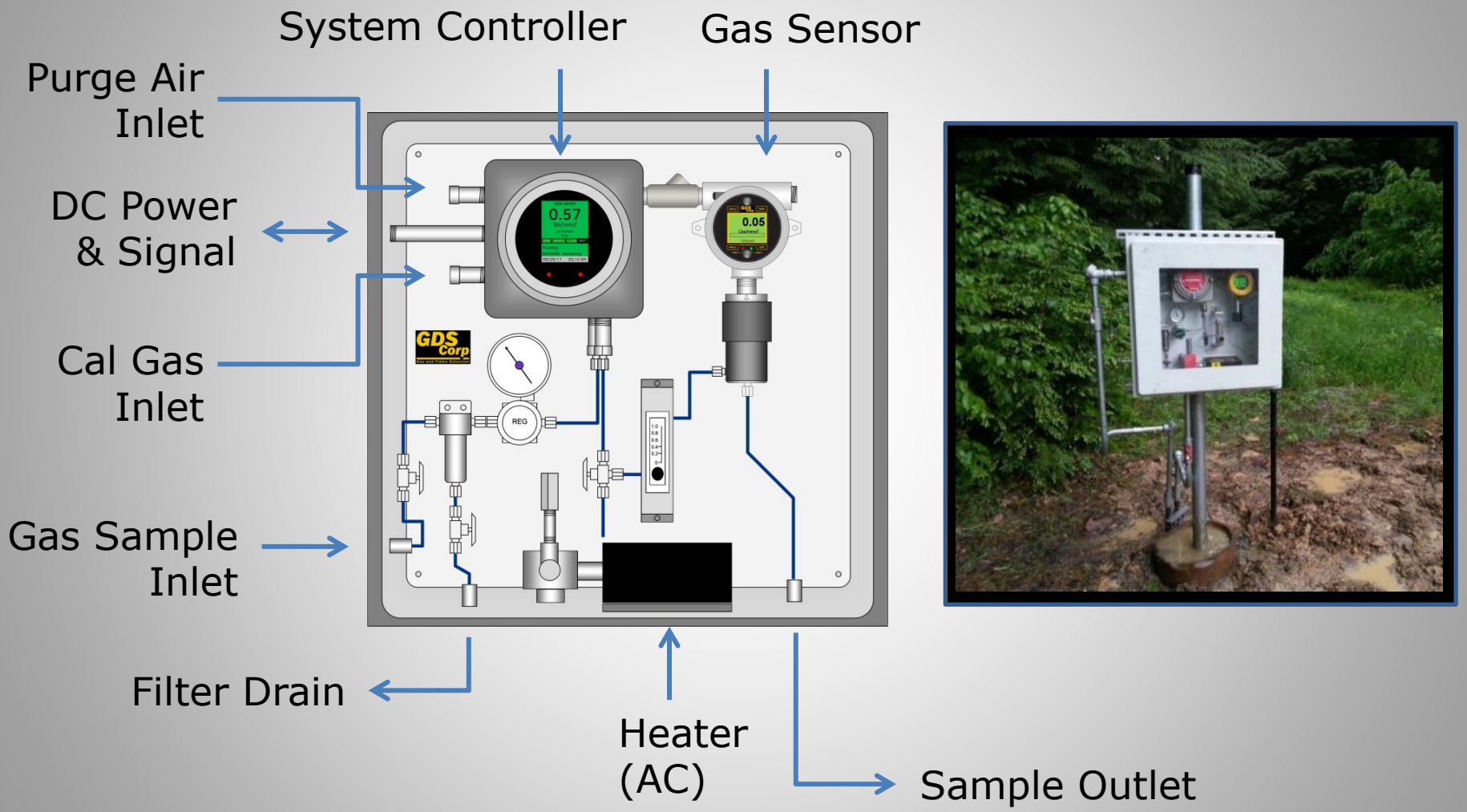
Subjective Method:

- Measures lowest detectable threshold in percent by volume where a “1%” mixture = 20% LEL
- Confirms that “gas odorant is readily detectable in air at 1/5 of the lower explosive limit by a person with a normal sense of smell”
- Low cost instruments
- “Calibration” and repeatability are subjective
- Labor intensive
- Mandated by federal law

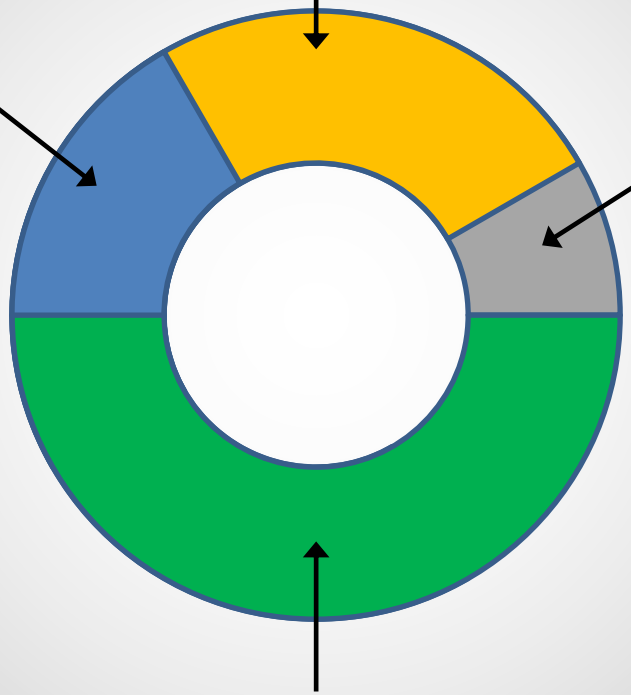
Objective Method:

- Directly measures level of odorant in calibrated units of ppm, mg/m3 or lbs/mmcf
- Ideal for substations and entry / exit points in gas distribution system
- Unattended operation
- Manual or automatic calibration
- Multiple samples per day allows hourly monitoring of injection equipment and incoming gas odorant levels

GDS-68SXP Odorant Monitor



GDS-68SXP Measurement Cycle



Measure Sample Concentration
(~3 min)

Measure Resting Zero
(~1 min)

Purge Sensor
(~2 min)

Beginning of Cycle

Display New Value
After Tests For:

- Zero Drift
- Gas and Air Flow
- Overrange Input
- Sensor Response
- Sensor Fault
- System Faults

Sample Intervals:
30 min
1 Hour
2 Hours
3 Hours
4 Hours
6 Hours
8 Hours
12 Hours
24 Hours

Resting
(Remainder of sample interval)

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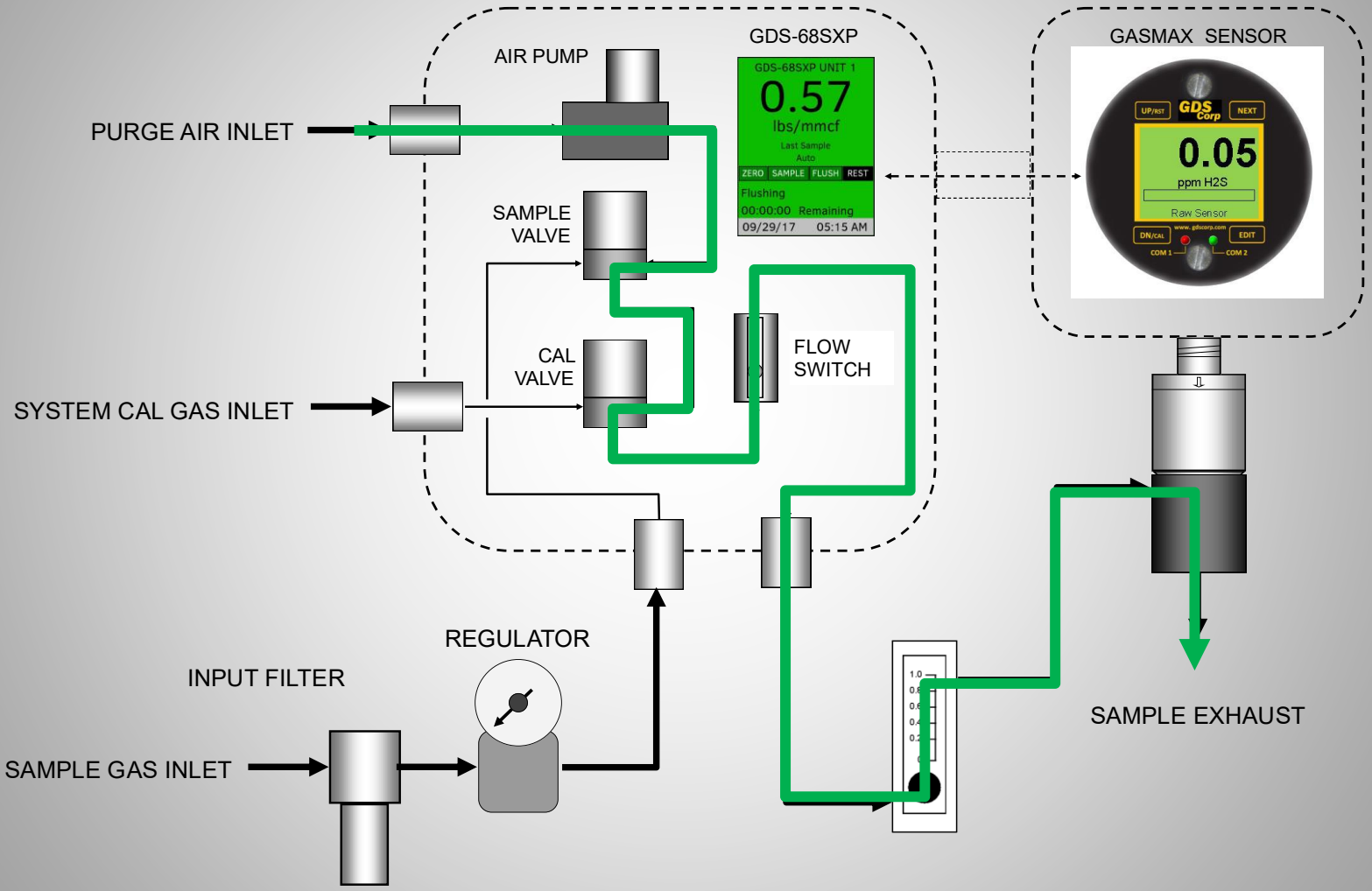
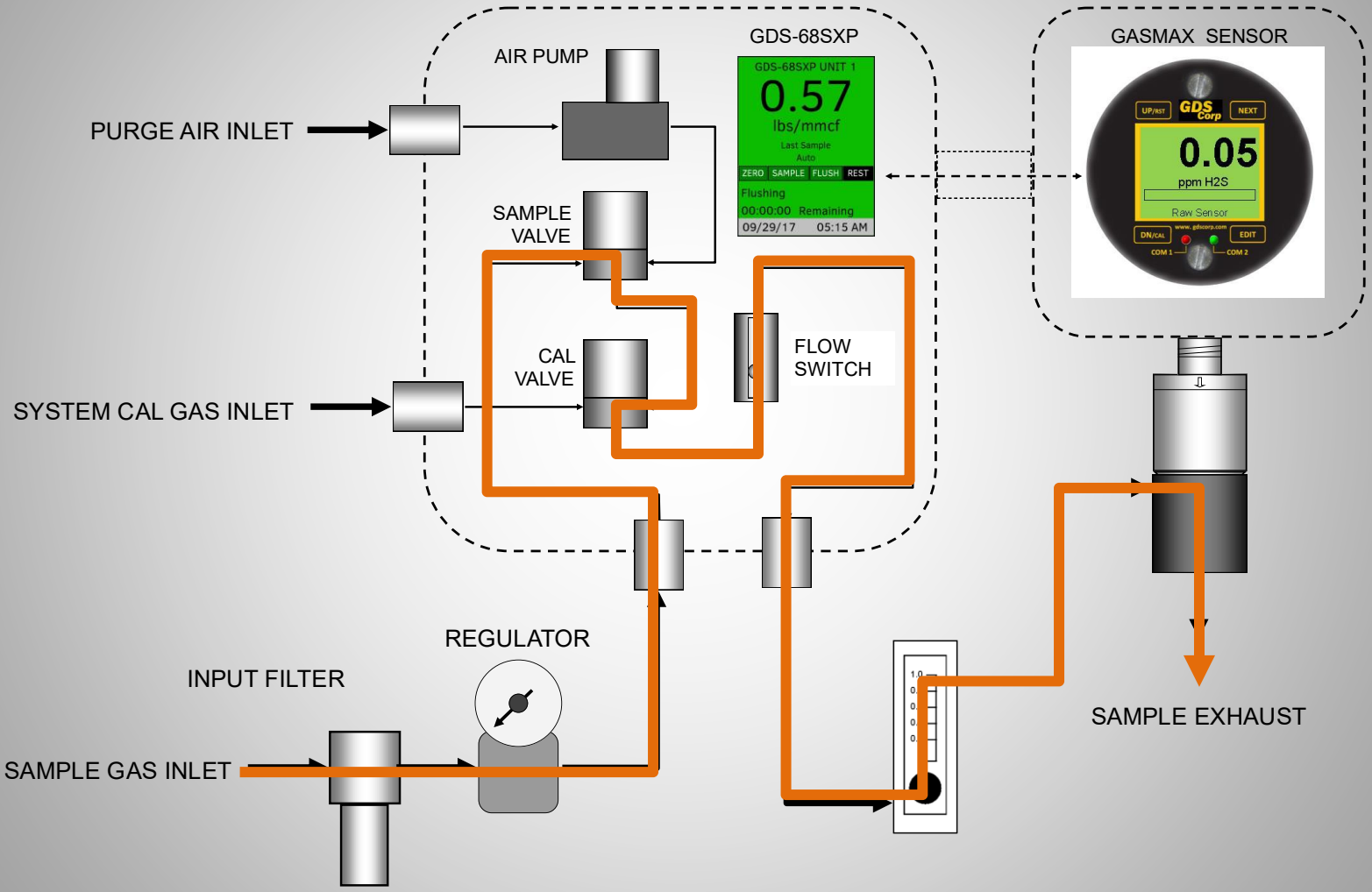
GDS-68SXP Measurement Cycle

(Resting, Zero Measurement, Purge)



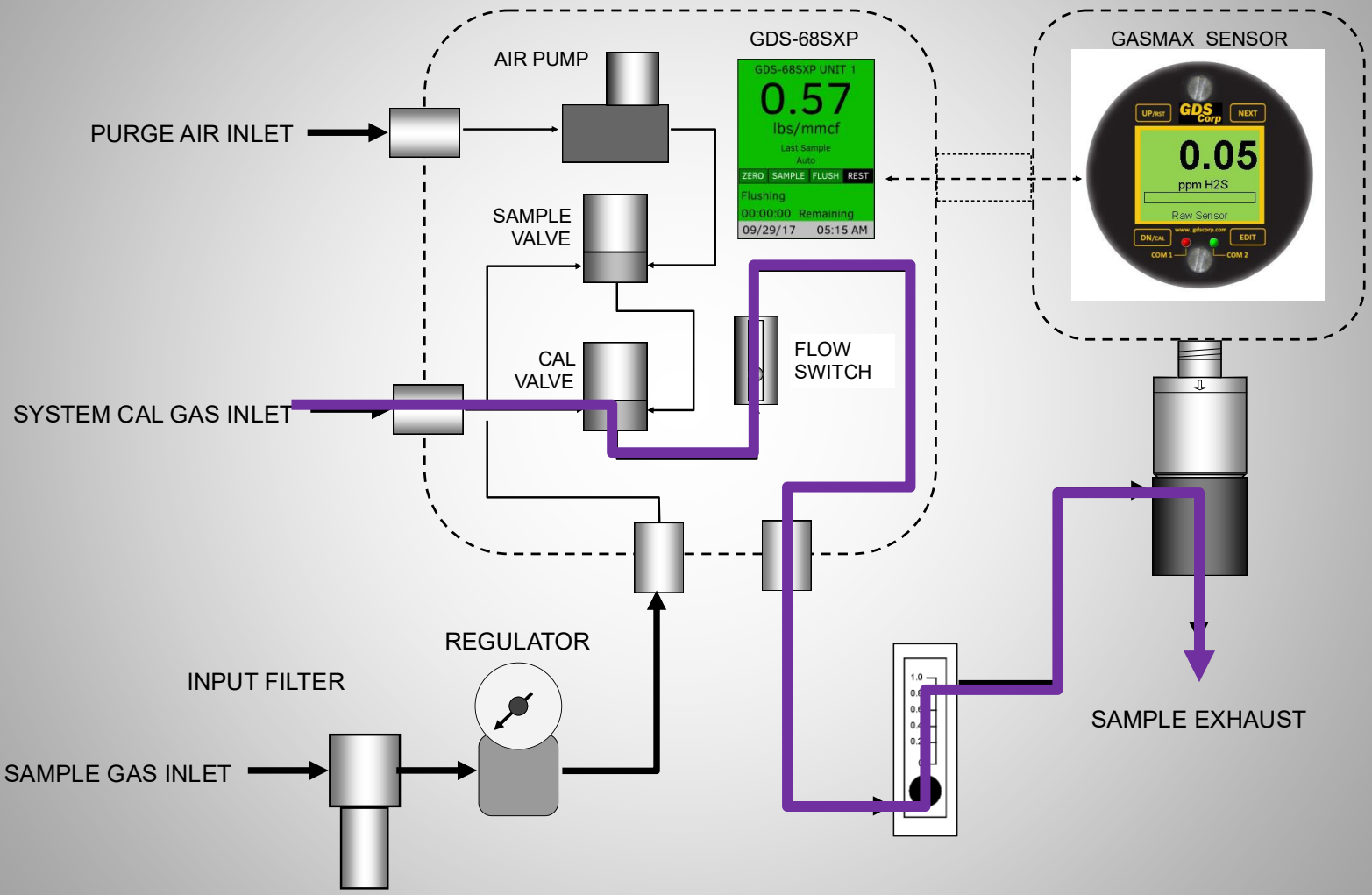
GDS-68SXP Measurement Cycle

(Sample Measurement)



GDS-68SXP Measurement Cycle

(Calibration)



GDS-68SXP System Calibration

- Performing a ***System Calibration*** generates a new *Gain* value that compensates for drift and sensitivity changes
- System Calibration can be initiated ***manually*** by the user at any time the unit is not busy
  - Cal source can be cal gas or sample gas stream
- System Calibration can be programmed to repeat ***automatically*** on daily, weekly or monthly intervals
  - Cylinder of cal gas is required
- Using the ***"Once"*** setting, calibration can be postponed until the next scheduled sample time
  - Useful to allow time for a new sensor to warm up properly before initial calibration

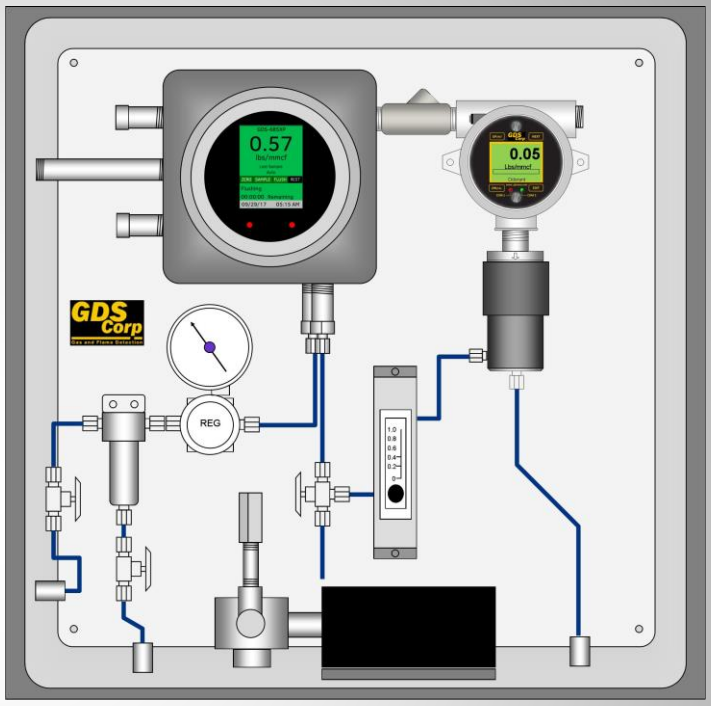
GDS-68SXP Communications Options

4-20mA Analog Output

Reading + Fault Error Codes

RS-485 Serial MODBUS

Reading + Fault Error Codes
System Settings Details
Last Sample, Last Cal Details
"Take Sample" Command
"Perform Cal" Command
(If security settings allow)



GDS Connect for iPhone® using Bluetooth® Wireless Technology

Full Read/Write Interaction with User Settings
Start/Stop Measurement, Calibration
Download & Email Settings, History, Events
(If security settings allow)

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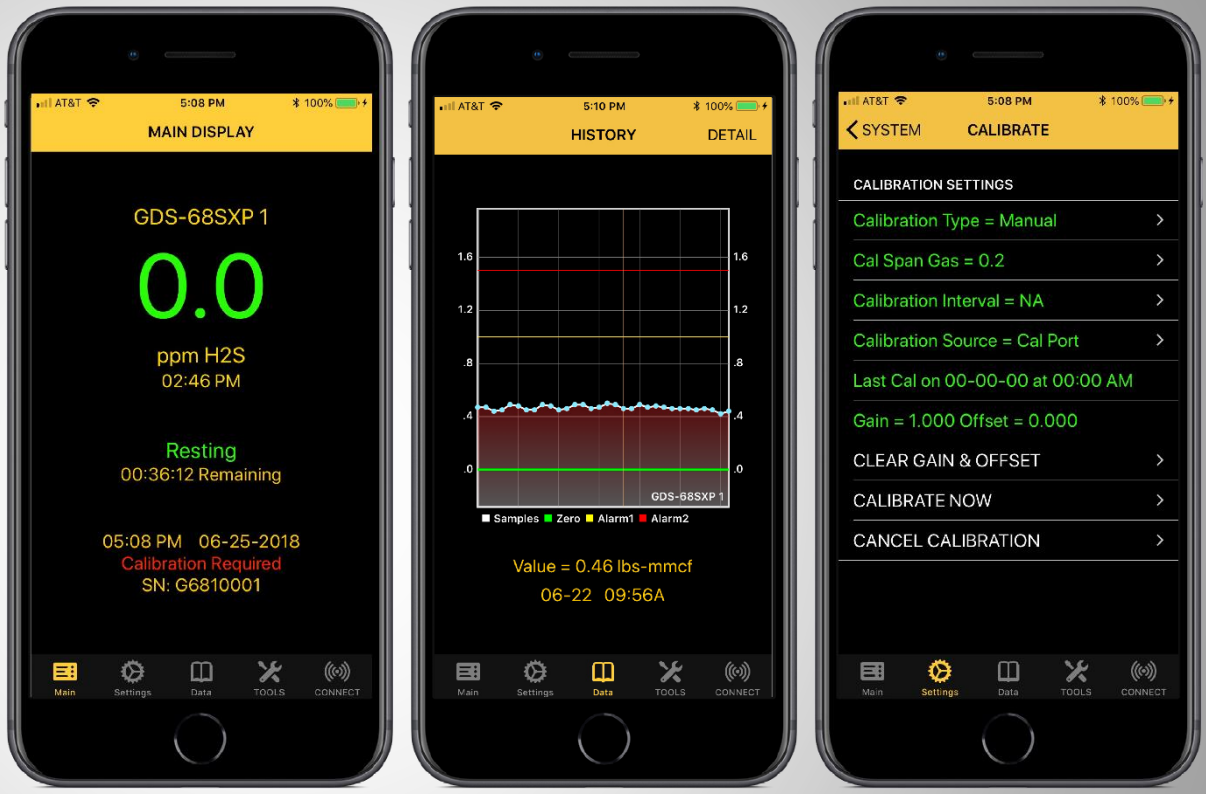
GDS Connect iOS App for iPhone®

- Access data and view settings via Bluetooth® technology
- View current readings, event log, 32-entry sample history in tabular and graphical format
- Includes User's Manual, error code listing and manual access to menu
- Can be disabled entirely or set for read-only access if necessary for security.



Download on the App Store

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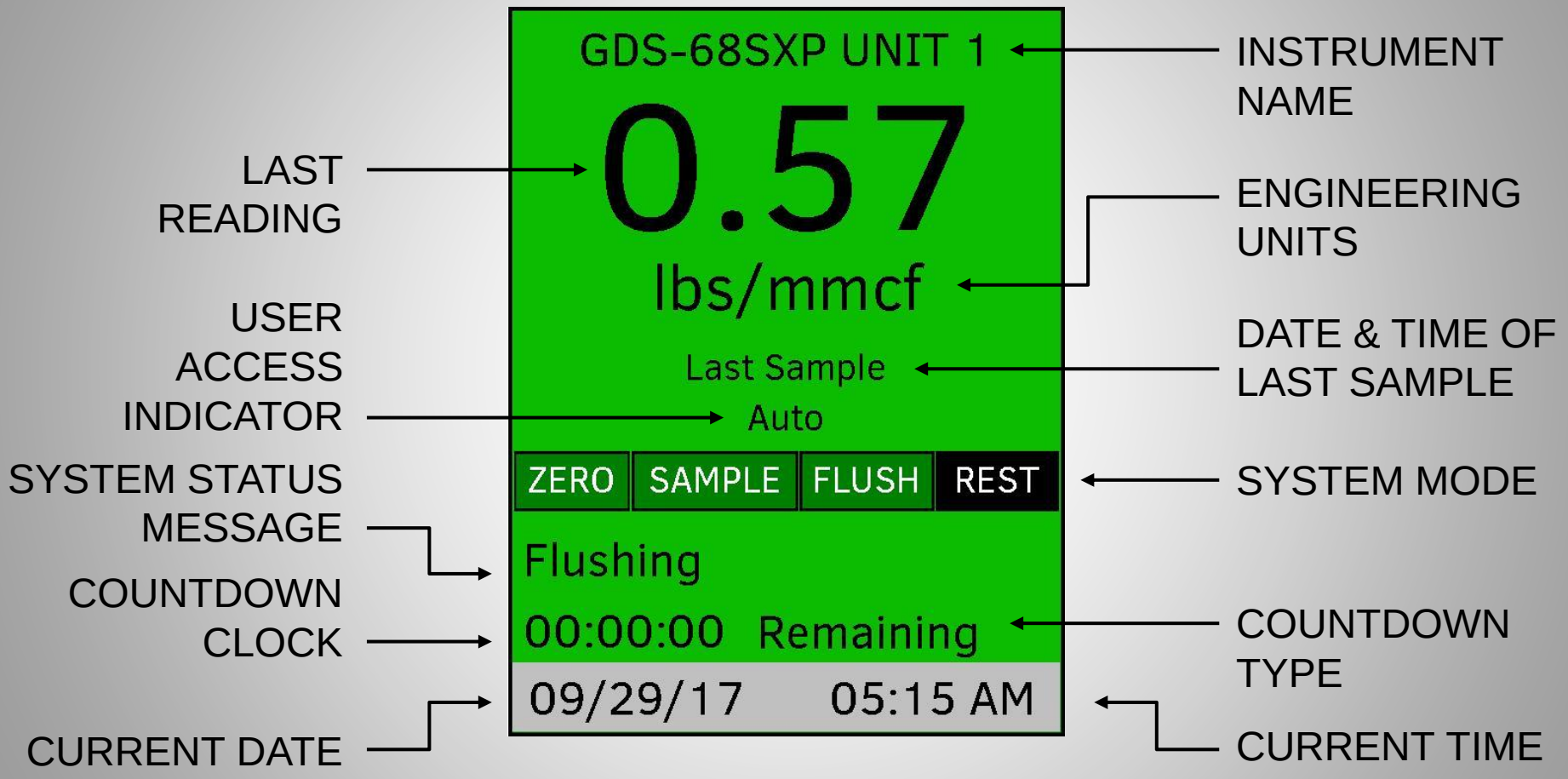
GDS-68SXP Security Settings

- Low Setting: No limitation on user access to menus, remote reads or writes
- Medium Setting: MODBUS and Bluetooth® writes disabled, reads and full menu access allowed
  - Ideal for remote installations behind “locked gates”
- High Settings: MODBUS and Bluetooth writes disabled, menu access protected by pre-programmed code
  - Calibration cycle can be initiated
- Both the MODBUS port and wireless radio can be individually disabled if desired (no advertising, no connections, no reads or writes allowed).

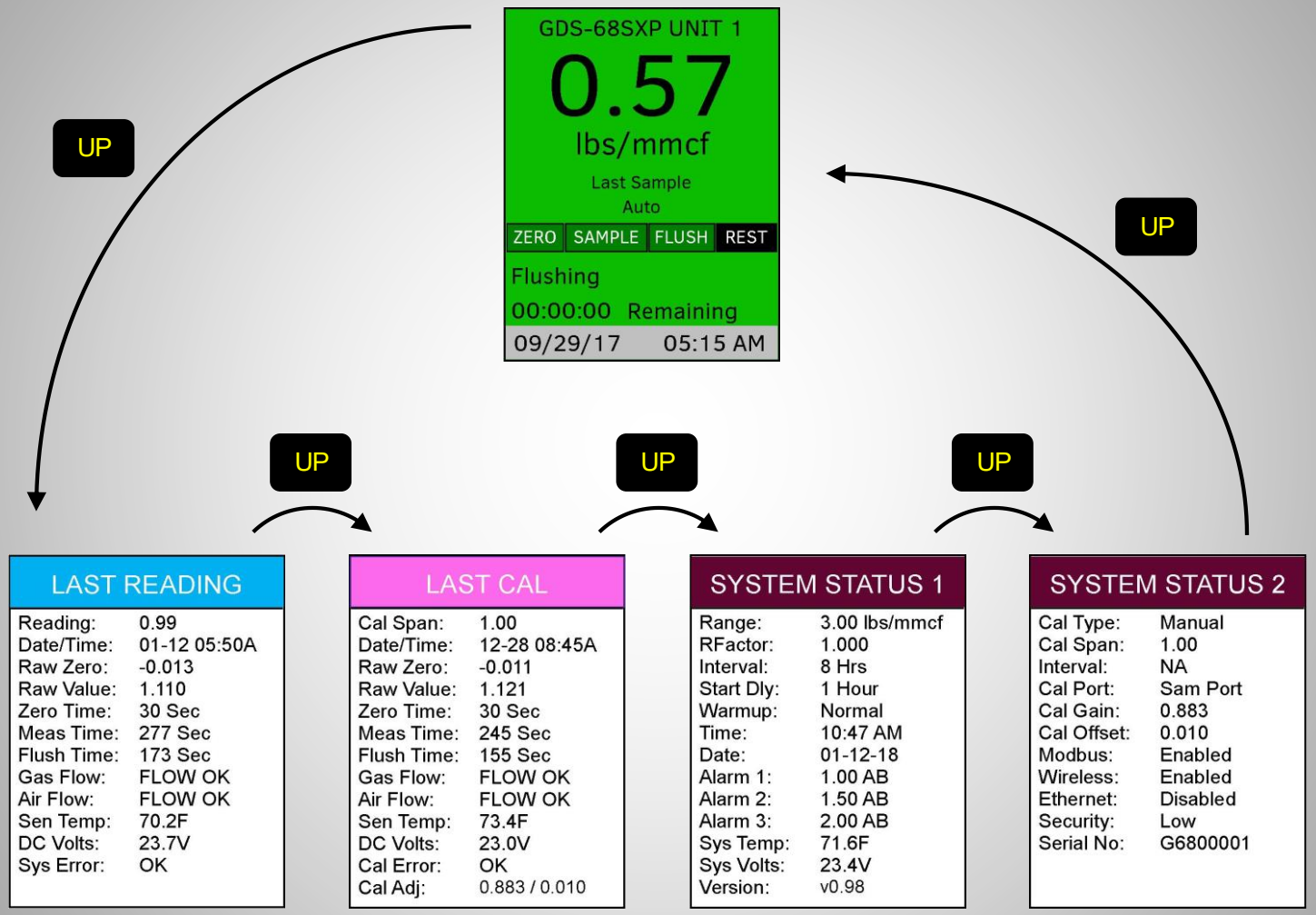
Enhanced User Interface

Know System Status Instantly

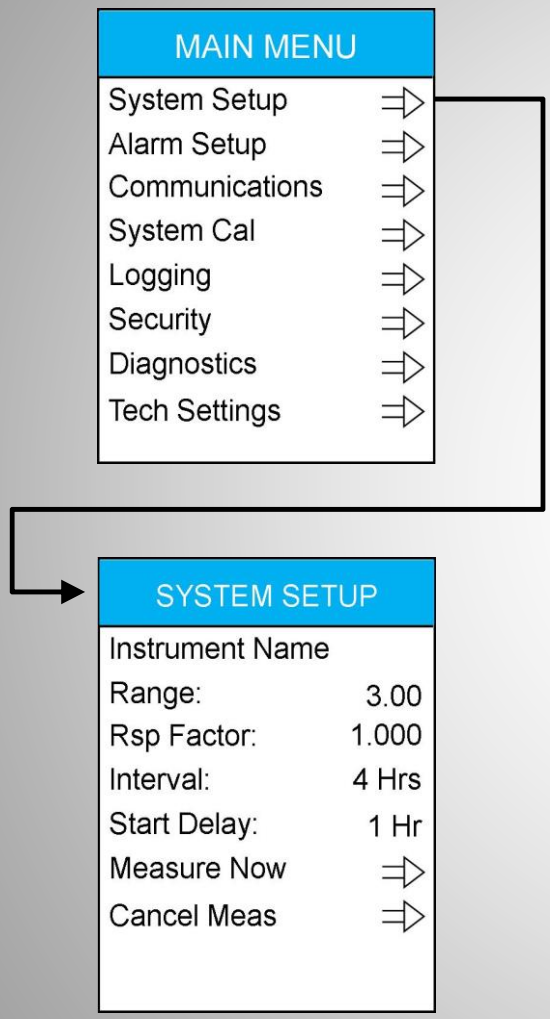


Enhanced User Interface

View Settings via Quick Menu Screens



Technician-Friendly Features



- On-screen sample countdown clock to start of next cycle
- Quick Menu screens eliminate need to access menus to check settings
- Response Factor allows adjustment for mixed odorants
- Start Delay extends sensor warm-up *before* sampling starts
- Start Delay + “Once” calibration makes it possible to *automatically calibrate system after leaving the site*
- Ability to manually *Start* and *Stop* both measurement and calibration cycles
- Warning levels give early indication of trouble before errors occur

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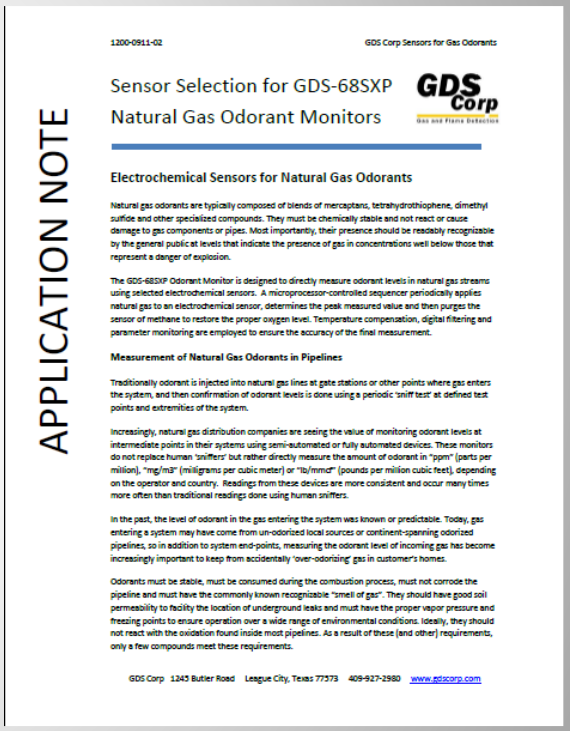
Enhanced Error Reporting

- Fault error codes force 4-20mA signal below 4mA
  - Codes for sensor timeout, gas and air flow fault, sensor fault, excessive zero offset and more
- *Warning* indications for sensor response values
  - Ex: 300 seconds = Warning, 360 seconds = Error
- "Ignore, Fail, Notify" option to monitor results of automatic calibration cycles
  - Determine consequences of failed calibration when unattended
- All failure codes affect both analog output and MODBUS database values

Types of Odorants & Sensors

- Odorant are blends of tert-butyl mercaptan (TBM), Tetrahydro-thiophene (THT), Dimethyl sulfide (DMS), methyl-ethyl sulfide (MES), ethyl mercaptan (EM) and others
- Example blends include the Spotleak® family from Arkema, Inc., and the Scentinel® family from Chevron Philips
- GDS can provide cylinders of calibration gas especially blended to match the desired odorant

List of Odorant Sensors for GDS-68SXP:



APPLICATION NOTE

1200-0911-02 GDS Corp Sensors for Gas Odorants

Sensor Selection for GDS-68SXP
Natural Gas Odorant Monitors

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Electrochemical Sensors for Natural Gas Odorants

Natural gas odorants are typically composed of blends of mercaptans, tetrahydrothiophene, dimethyl sulfide and other specialized compounds. They must be chemically stable and not react or cause damage to gas components or pipes. Most importantly, their presence should be readably recognizable by the general public at levels that indicate the presence of gas in concentrations well below those that represent a danger of explosion.

The GDS-68SXP Odorant Monitor is designed to directly measure odorant levels in natural gas streams using selected electrochemical sensors. A microprocessor-controlled sequencer periodically applies natural gas to an electrochemical sensor, determines the peak measured value and then purges the sensor of methane to restore the proper oxygen level. Temperature compensation, digital filtering and parameter monitoring are employed to ensure the accuracy of the final measurement.

Measurement of Natural Gas Odorants in Pipelines

Traditionally odorant is injected into natural gas lines at gate stations or other points where gas enters the system, and then confirmation of odorant levels is done using a periodic 'sniff test' at defined test points and extremities of the system.

Increasingly, natural gas distribution companies are seeing the value of monitoring odorant levels at intermediate points in their systems using semi-automated or fully automated devices. These monitors do not replace human 'sniffers' but rather directly measure the amount of odorant in "ppm" (parts per million), "mg/m3" (milligrams per cubic meter) or "lb/mmcf" (pounds per million cubic feet), depending on the operator and country. Readings from these devices are more consistent and occur many times more often than traditional readings done using human sniffers.

In the past, the level of odorant in the gas entering the system was known or predictable. Today, gas entering a system may have come from un-odorized local sources or continent-spanning odorized pipelines, so in addition to system end-points, measuring the odorant level of incoming gas has become increasingly important to keep from accidentally 'over-odorizing' gas in customer's homes.

Odorants must be stable, must be consumed during the combustion process, must not corrode the pipeline and must have the commonly known recognizable "smell of gas". They should have good soil permeability to facility the location of underground leaks and must have the proper vapor pressure and freezing points to ensure operation over a wide range of environmental conditions. Ideally, they should not react with the oxidation found inside most pipelines. As a result of these (and other) requirements, only a few compounds meet these requirements.

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If you have unique requirements, we can help identify sensors for your specific odorant blend

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GDS-68SXP Odorant Applications

- Installation upstream of gate station to measure odorant levels in incoming gas (pre-odorizer)
- Installation downstream of gate station to measure odorant in distribution stream (post-odorizer)
- Installation at key system end points or major users
- Temporary installation around new pipelines to measure effectiveness of initial odorant injection (“pickling”)

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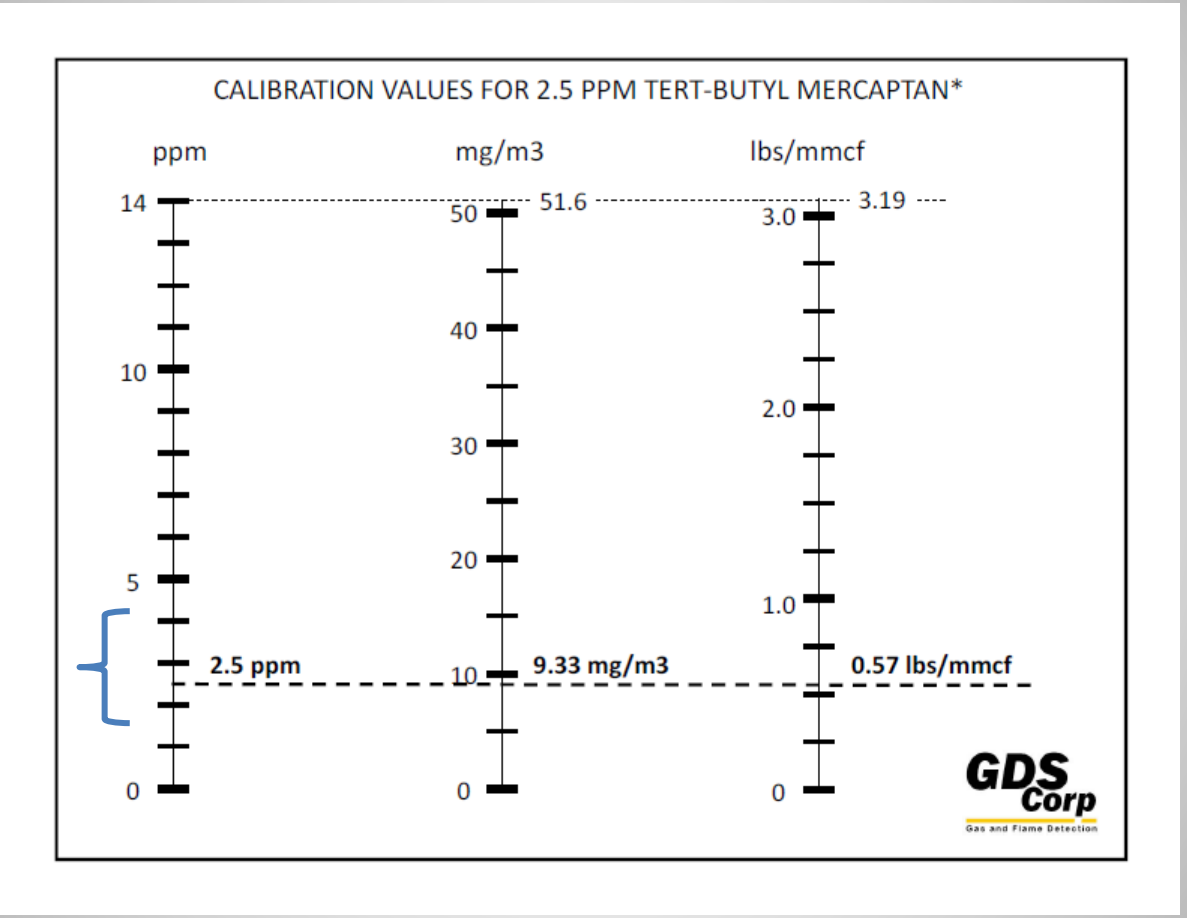
Thanks for your Time & Attention!

Discussion

Backup Materials

Odorant Measurement Range
(Mercaptan sensor)

Typical Odorant Range



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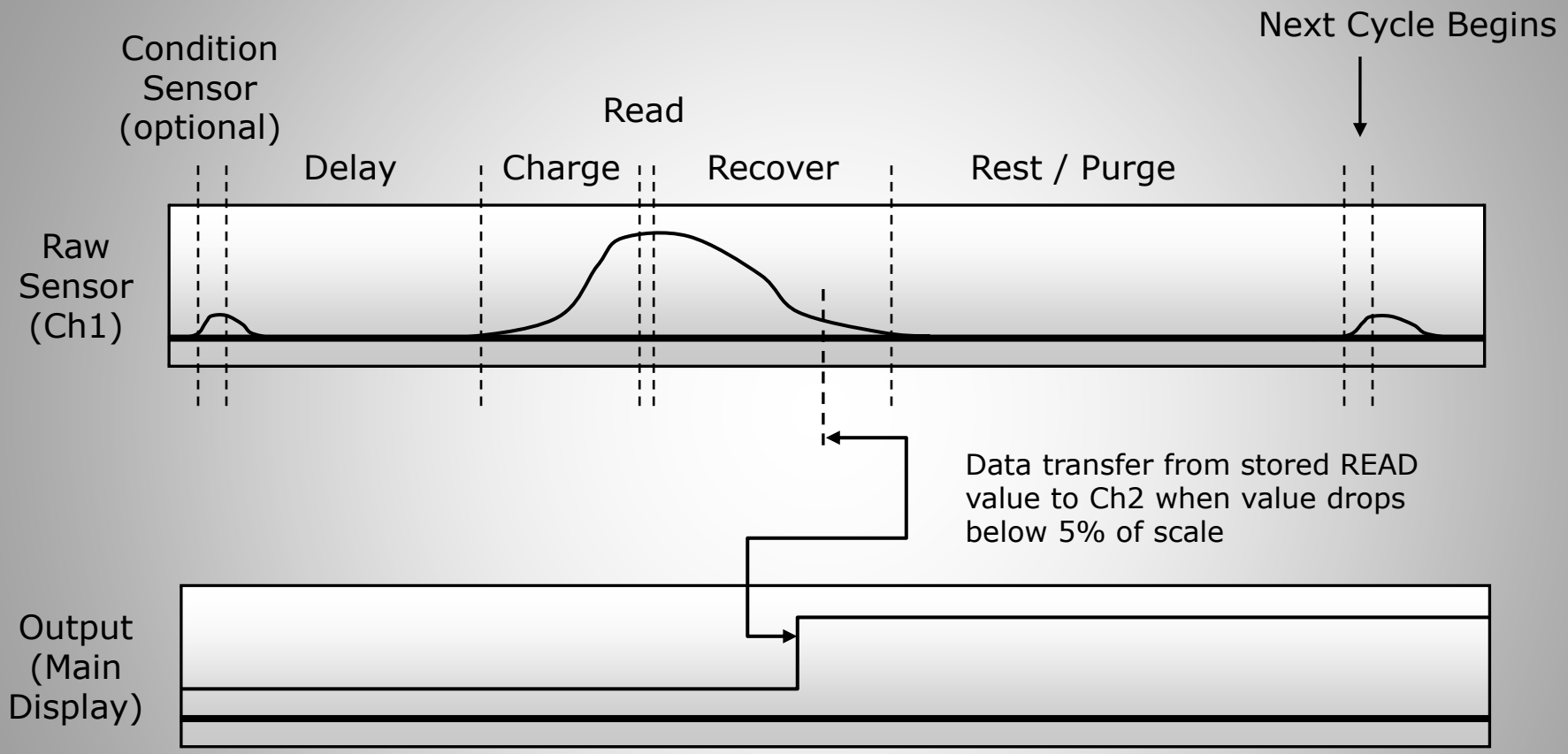
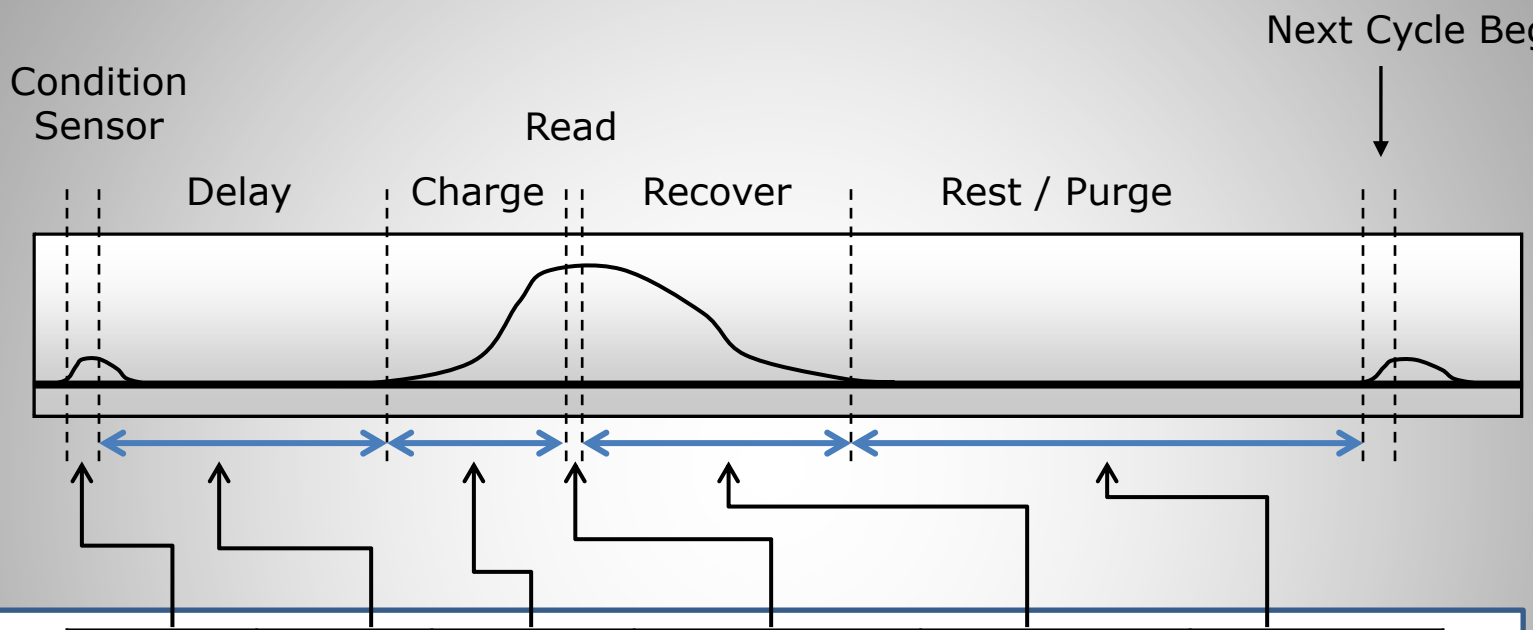
Typical Sample Sequence



Rest / purge period adjustable from 10 min to 24 hours (total cycle)

Typical Sample Sequence



Bump Sensor	Fixed Delay	Sample Charge	Sample Read	Sensor Recovery	Purge / Hold
Valve opens, sample flows to sensor	Purge air applied to sensor	Valve opens, sample flows to sensor	Sequencer finds and stores max gas reading; valve closes	Purge air applied to sensor until output < 5% of scale	Purge air applied to sensor (% on time programmable)
Fixed 5 sec (Optional)	Fixed 3 min (Optional)	Min: Program Max:	Min: Programmable Max: 6 minutes	Min: Max:	Determined by sequence

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