SIEMENS

Practical Applications of NeSSI Generation 2 Concepts

NeSSI-Enabled Smart Components Will Provide Improved Analyzer System Performance

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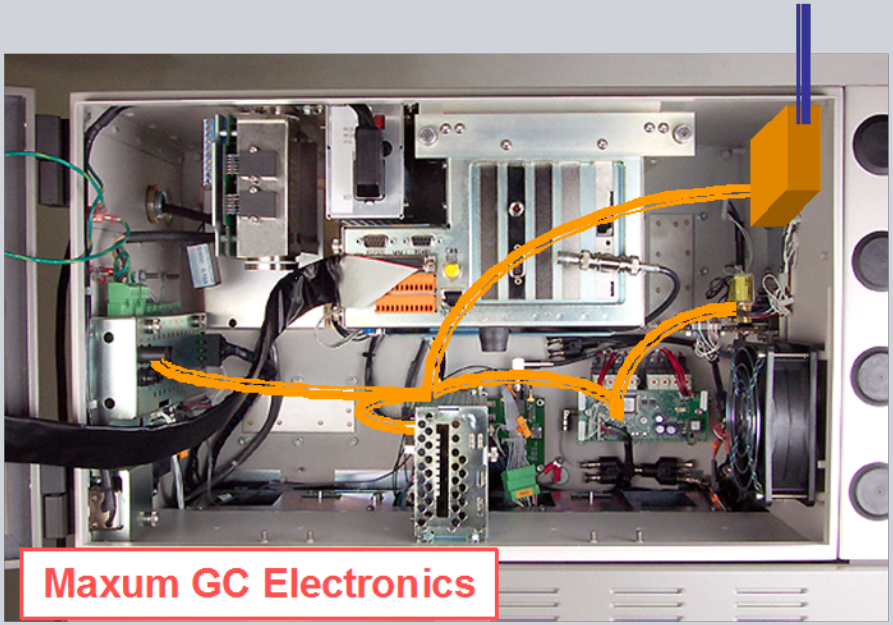
Project Report: Smart Sampling Systems

A discussion of objectives and for Smart Sampling System components based on NeSSI Generation 2 concepts.

- Purpose of process analyzers
- SSSI project description
- Component information
- Smart Sampling Systems
- An example with explanation
- How it works
- Benefits



Why Use Process Analyzers?

Closed loop control
- Process optimization
- Product specification optimization

Quality control and documentation
- ISO procedure compliance

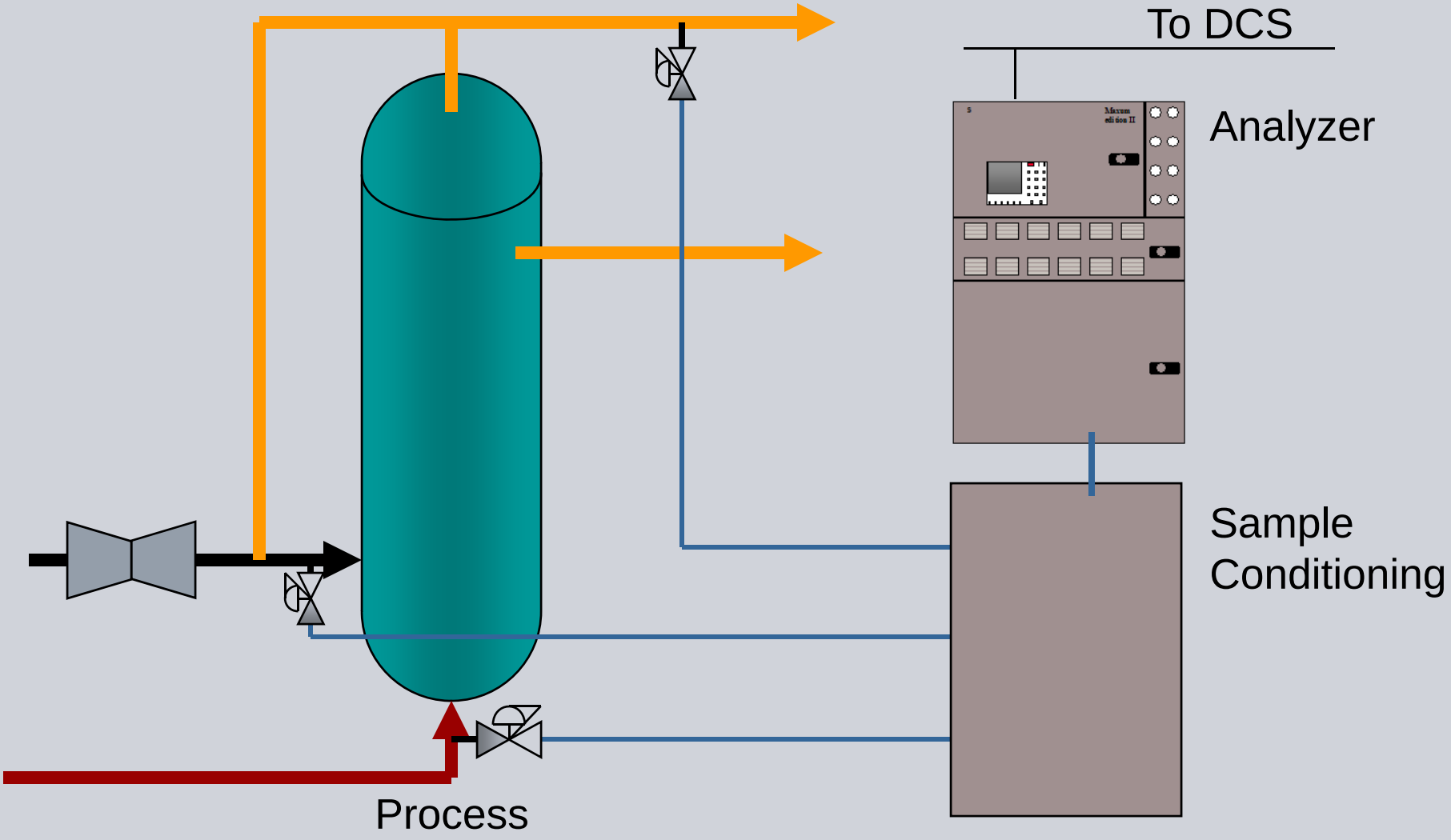
Plant monitoring and alarms
- Safety
- Reduction of hazards

Emission control

ANSWER:

Process Analyzers are used to improve the financial performance of the process!

Process Analysis Is ALWAYS a System!



Some Issues In a Complete Analyzer System

Analyzer

- Stream composition
- Desired measurement
- Desired time and other conditions of analysis

Control System

- Reporting requirements
- Protocols
- Maintenance management

Sampling System

- Probes and probe location
- Sample point pressure and temperature
- Sample point physical condition
- Transport distance, conditions, heat tracing
- Return point, distance, pressure, conditions
- Stream selection, cross contamination, interference
- Sample cabinet heating
- Sample venting and pressure relief
- Filtration requirements
- Longevity
- Chemical reactions affecting components and materials

Classic Analyzer System Design

Analyzer	20%	of maintenance
Sampling System	80%	of maintenance

Analyzer	100%	of diagnostic tools and “intelligence”
Sampling System	0%	of diagnostic tools and “intelligence”

RESULT – Sampling Systems are:

- Highest maintenance cost
  - Walk-by inspection
  - Repair
- Lowest reliability point
- Lowest predictability point

So, What To Do?

The obvious answer:

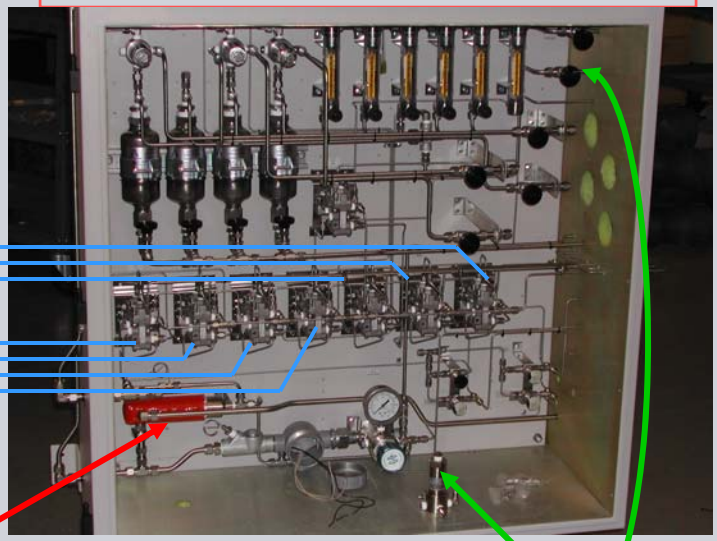
- Add instrumentation and sensors to the Sampling System;
- Incorporate this information into the complete Analyzer System solution.
- Provide for automatic and remote monitoring of this information
- Use this to enable maintenance management

But, why hasn't this been done already?

“Smart” Systems – The Situation

Air tubing bundle to operate valves; electrical pilot valves are mounted inside GC

Sample system with mechanical components inside cabinet



High Voltage electrical power in Explosion Proof housings for heat. No automated control or sensing.

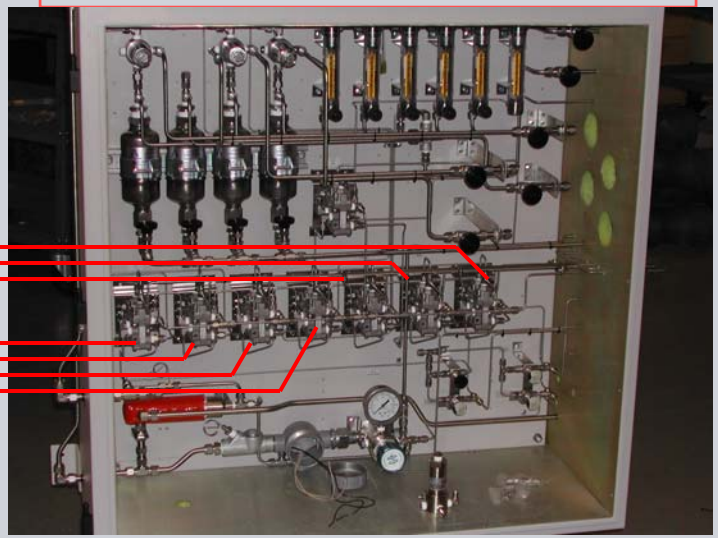
Mechanical regulators, flow indicators and gauges with no electrical interface.

“Smart” Systems – The Traditional Problem

Process Analyzer

No electronic sensors because they are expensive – cumbersome – unreliable.

Sample system with mechanical components inside cabinet

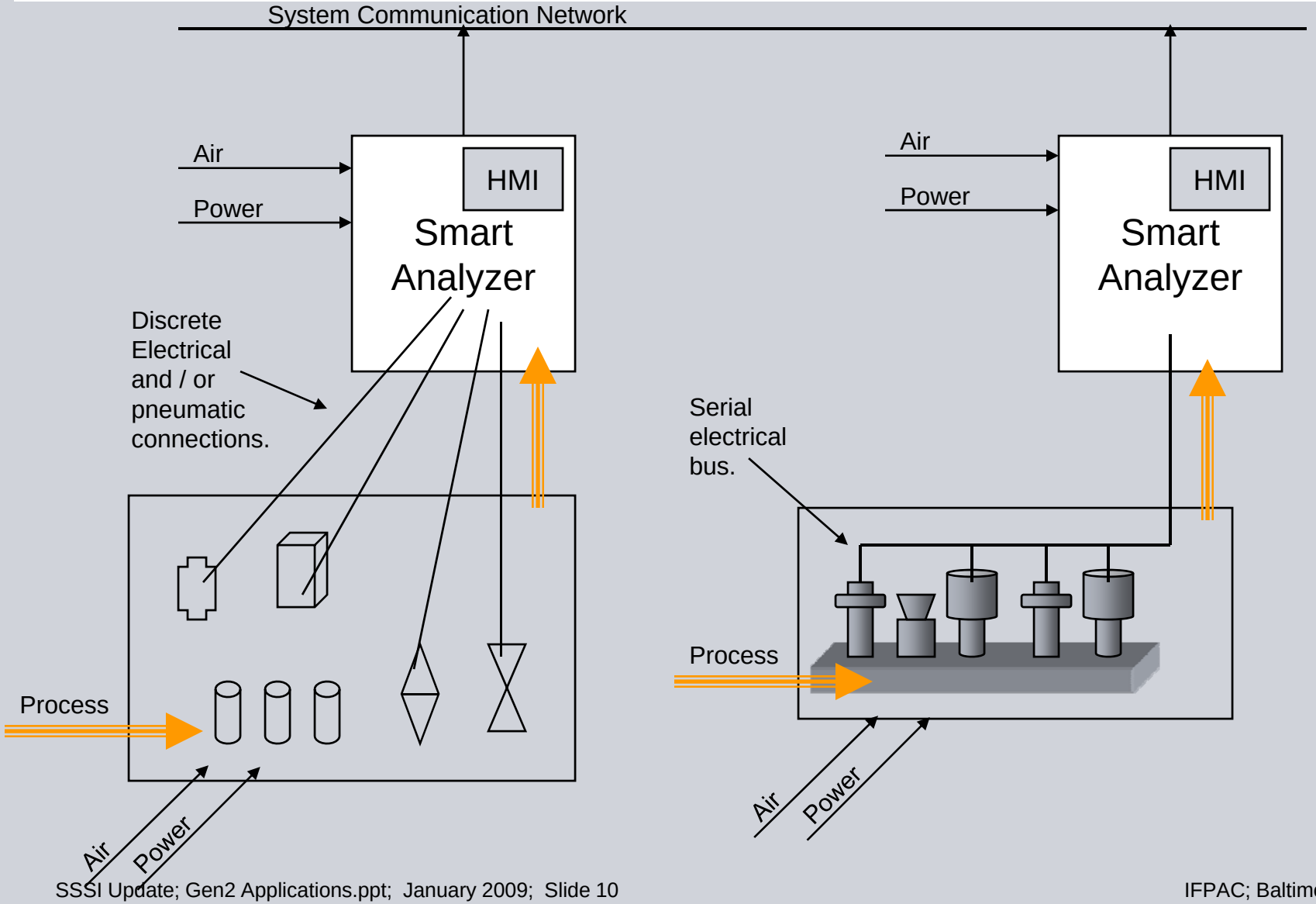


Traditional Options:

1. Purge the Sample Cabinet
2. Use Explosion-Proof Components and wiring
3. Use individual I.S. barriers on each signal

Each solution has “problems.”

A NeSSI Concept Of the Problem



Some Problems in the NeSSI Concept

Bus requirements

- Intrinsically safe
- Capable of sourcing power and signal to “a large number” of components (>>10; >30; up to 200)
- Inexpensive on a “per component” basis
- No special software or driver hardware requirements
- Permits “live” maintenance
- Rugged, reliable

Result:

Bus requirement issues have caused long times to pass before implementation.

Bus Implementation Options

Fieldbus (Profibus, Foundation Fieldbus)

- High line voltage (17v / 12v) ➔ Low line current (110ma)
- Limited number of devices per instance
- Component physical size
- Cost
- Large installed base
- IS existing
- Designed for the purpose

CAN

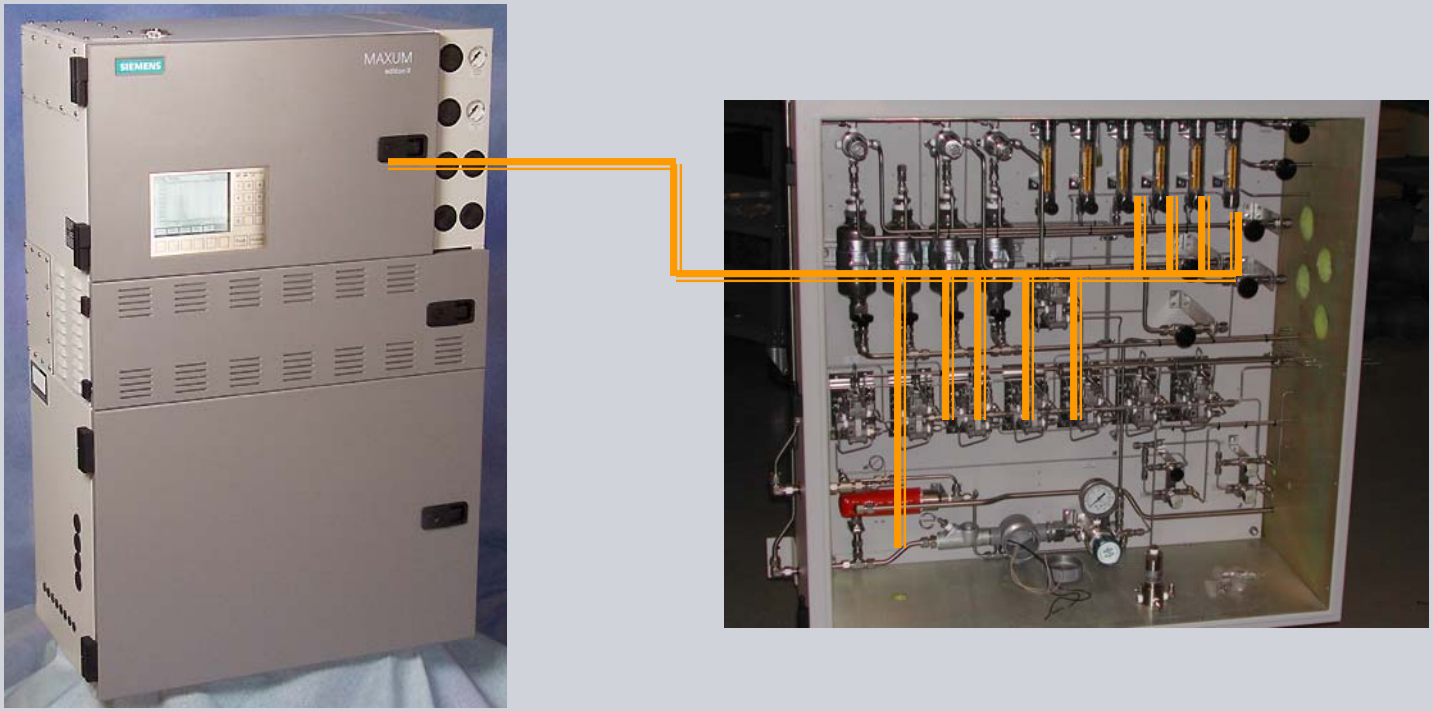
- No IS standard existing – but working committee is solving this issue
- Not “necessarily” a process standard system
- Hugely distributed and supported world wide
- Low cost controllers
- Fully existing standard software

Others?

Maxum Smart Sampling Systems

Now in development

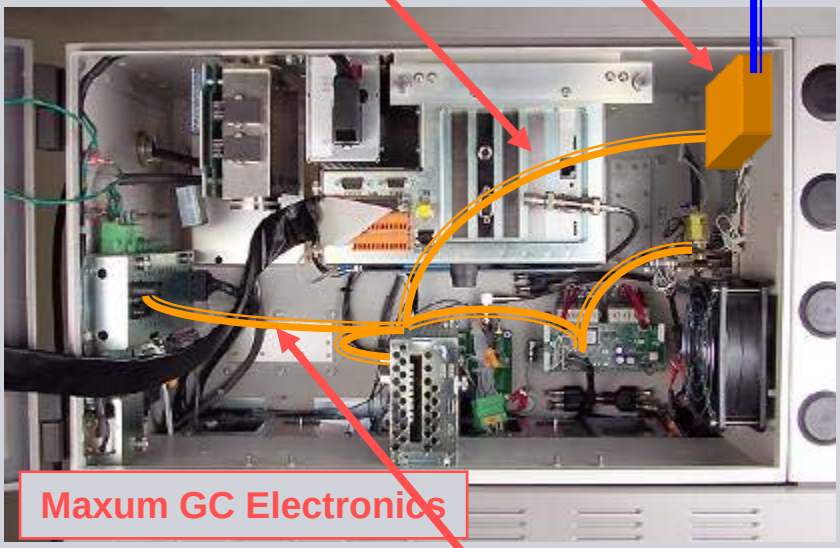
- Fully integrated Sampling System Control
- Smart Sampling Systems become reality



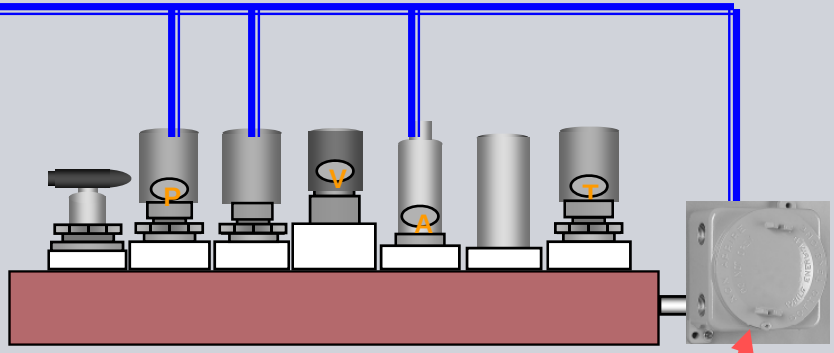
Bus Electrical Implementation

Existing I/O link connected to new module.

New module with power drivers and Intrinsic Safety Barriers.



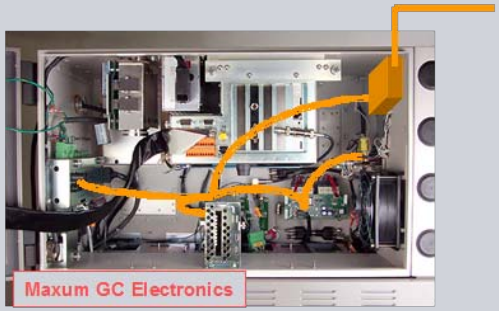
- NeSSI Generation 2 Bus;
- Intrinsically safe;
- carries signal and power for devices.

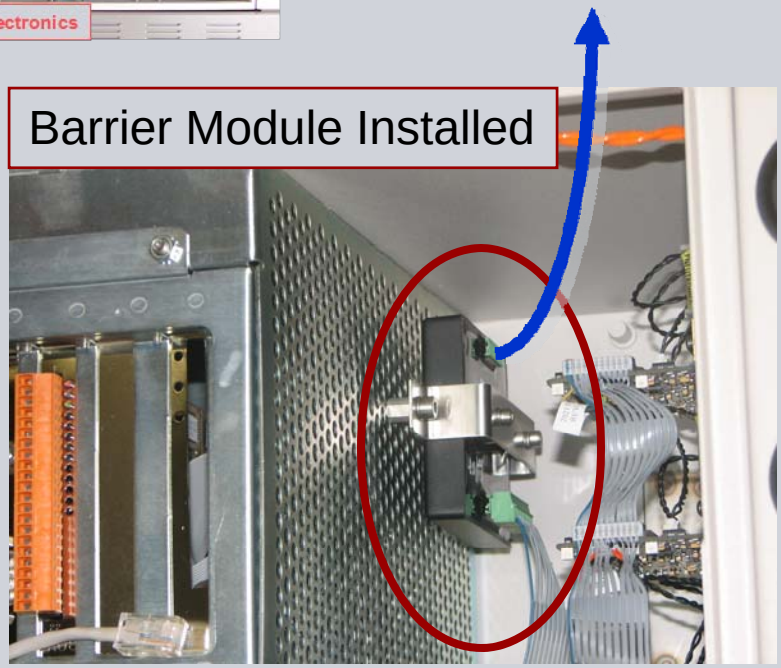


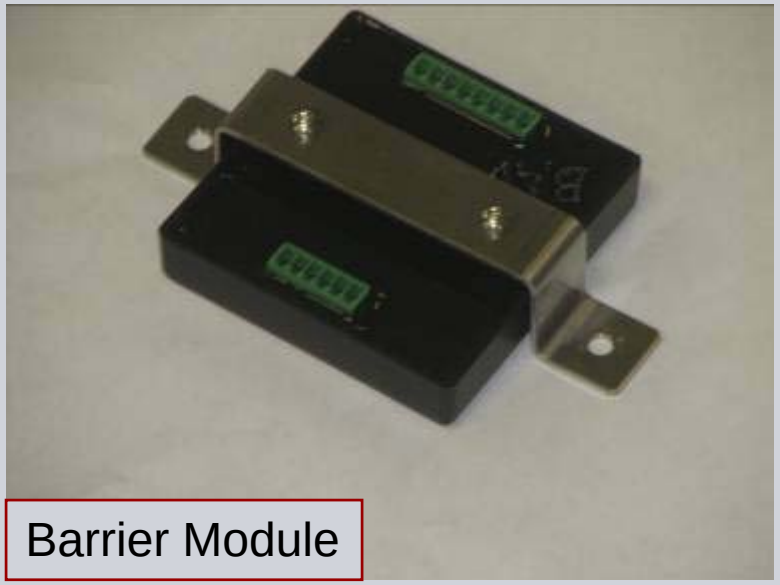
- Existing I/O link used for control of GC Inputs and Outputs.
- Existing protocol supports several hundred I/O channels.

- Pepperl-Fuchs Intrinsically Safe Power supply: 9.5v at 1 Amp.
- Powers I/O link and components.
- Use additional power supplies as needed for large numbers of components.

Maxum GC Components to Support NeSSI Bus







Component Description

I²C Barrier Module

Multi-variable Sensor

- Internal technology made by CIRCOR Tech.
- Measures sample flow, pressure and temperature

Pressure / Temperature Sensor

- Internal technology made by Swagelok
- Measures sample pressure and sample or cabinet temperature

Pilot Valve Module

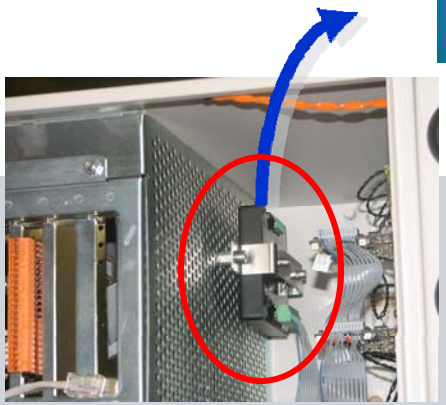
- Internal technology made by Swagelok
- Provides individual control of up to 6 stream select valves or block valves (SSO and ARV)

Intrinsically Safe Power Supply

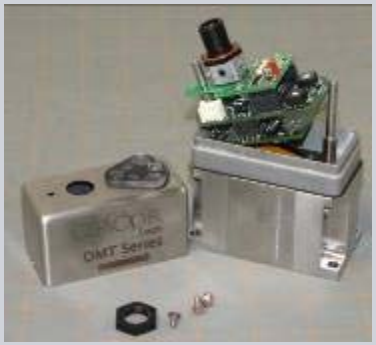
- Pepperl & Fuchs supply provides 7 watts

ALL COMPONENTS

- Make I.S. connection directly to SSSI bus
- Are rated for cabinet temperatures up to 85°C



I²C Barrier Module mounted inside Maxum GC



CIRCOR Multi-Variable Sensor for Siemens SSSI

Swagelok Pressure-Temp. Sensor for Siemens SSSI

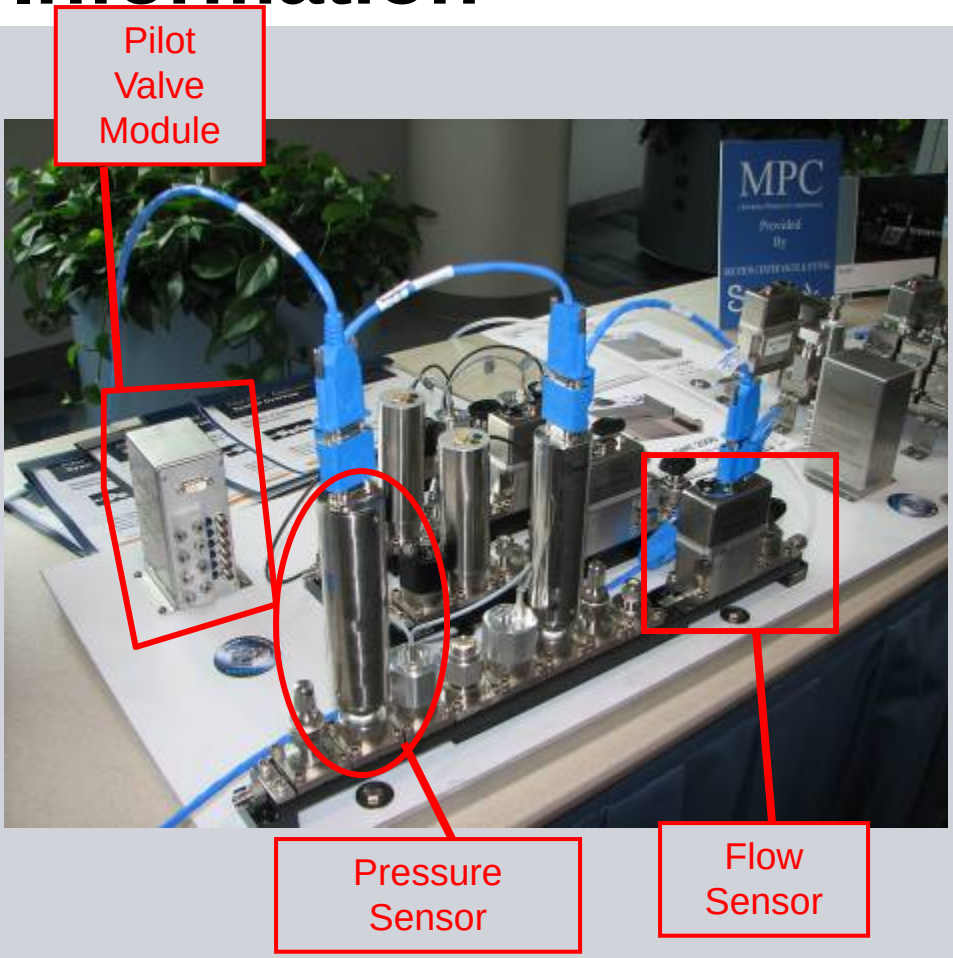
Component General Information

Components developed consistent with industry “NeSSI” standards

- Small
- Designed explicitly for sample conditioning systems
- High reliability, rugged, capable of mounting in severe environments

Components can also be used on traditional sampling systems

- Modular construction technique not required
- Can be used on traditional-construction sampling systems with standard tubing



Prototype components are shown.

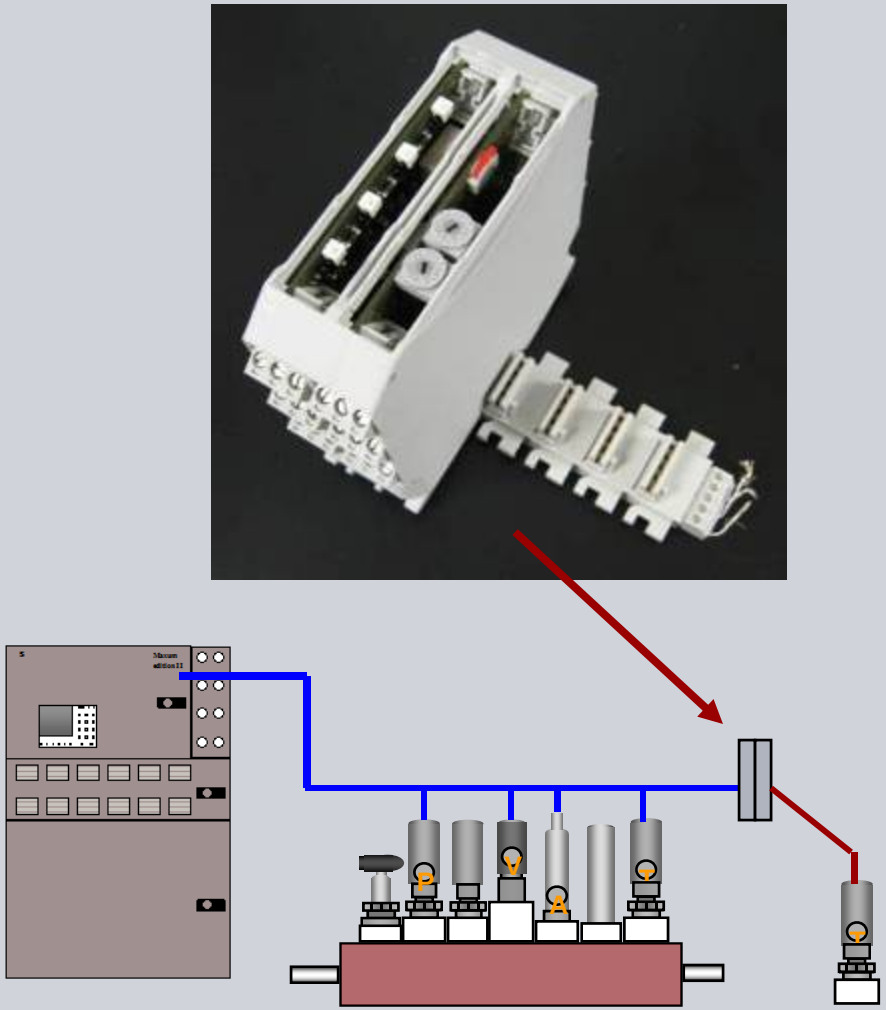
Handling Other Input Signals on Siemens Bus

Siemens SSSI bus includes a "multi-purpose" I/O module

- Multiple analog and digital I/O channels
- Connects directly to Siemens SSSI bus
- Mounts on DIN rail inside sampling system
- Intrinsically safe module (may require site approval with any particular connected component)

I/O Extension Module certified for use in hazardous and rugged environment

Module also soon-to-be available for use with MicroSAM



Siemens SSSI Features

Direct connect from analyzer to components:

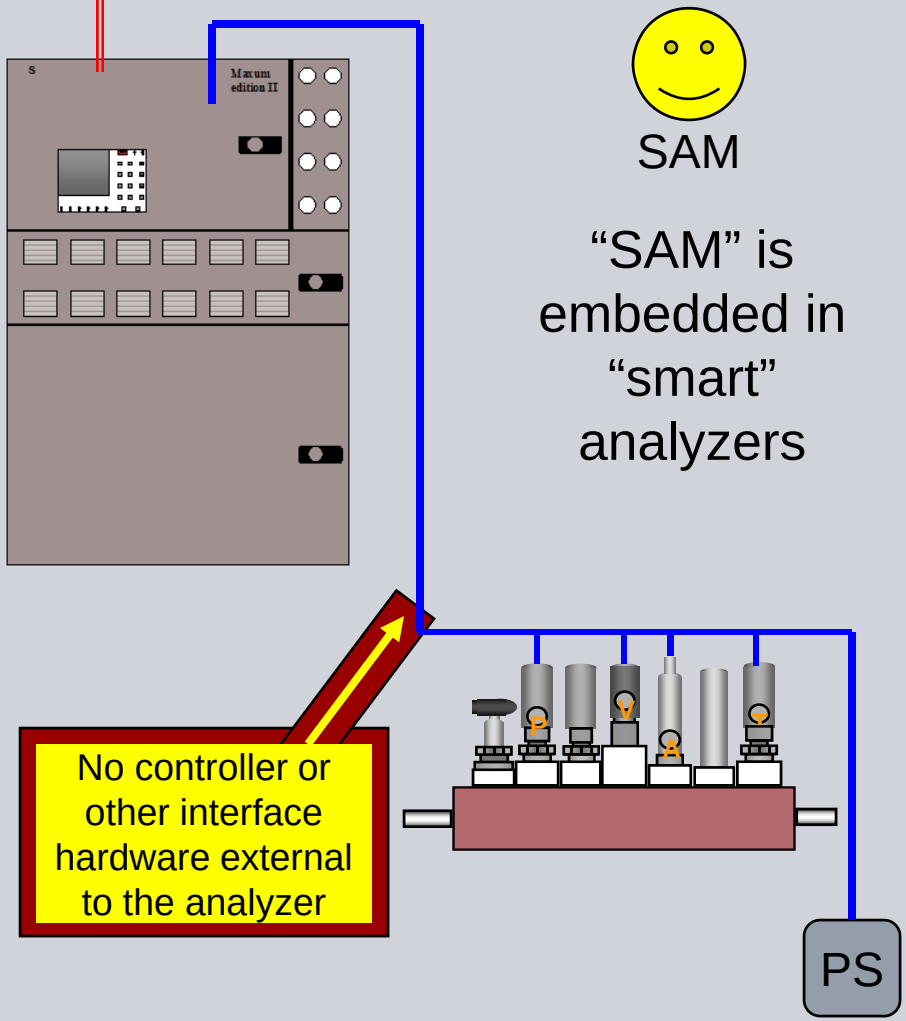
- No intervening electronics, buffer or protocol conversion
- No intervening housings requiring special grounding
- Absolutely simple cabling installation and maintenance

Supports a large number of components

- Simply add additional IS power supplies as needed
- All one “instance” of the bus

Rugged, field proven

- Already used in thousands of analyzers world wide
- Certifications for CSA Div. 2, Div. 1; ATEX Zone 2, Zone 1 (in progress)

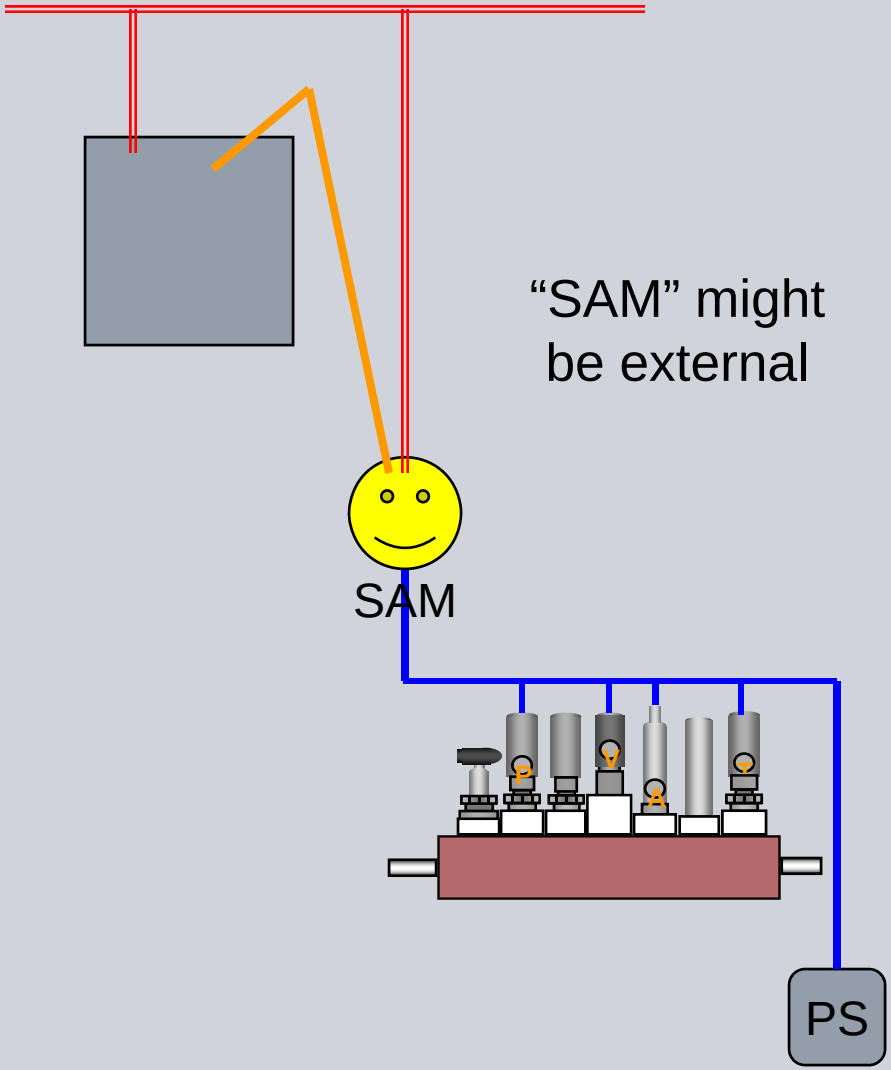


But What If the Analyzer Is Not “Smart”

Separate electronics can be used to provide “SAM” functions

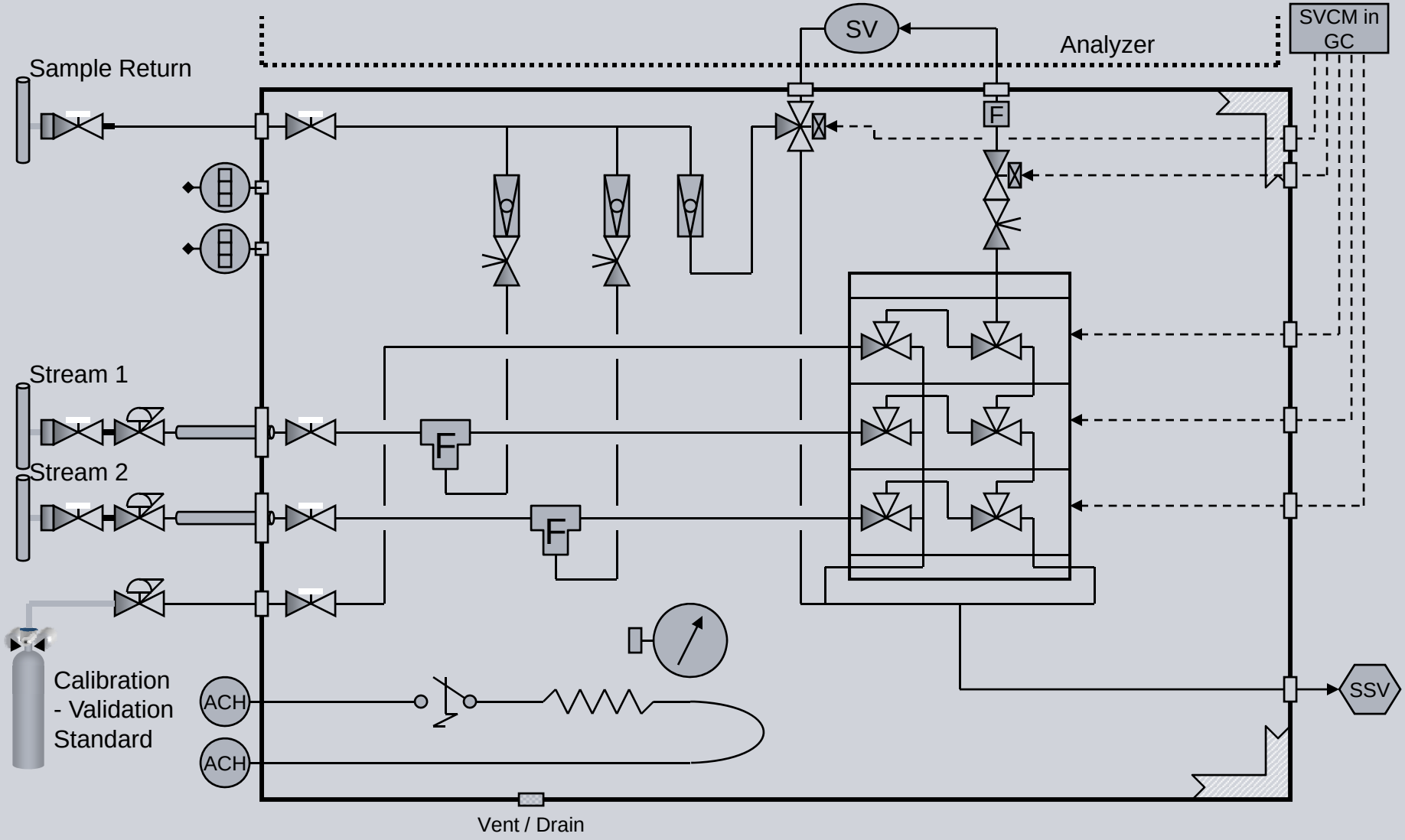
- Interface to the local I.S. bus
- Interface separately to the rest of the world
- Separately packaged, powered and grounded
- Provides local I.S. protection

- Connection to the world
- Possibly by connection to the analyzer
- Possibly by direct connection to the primary information network



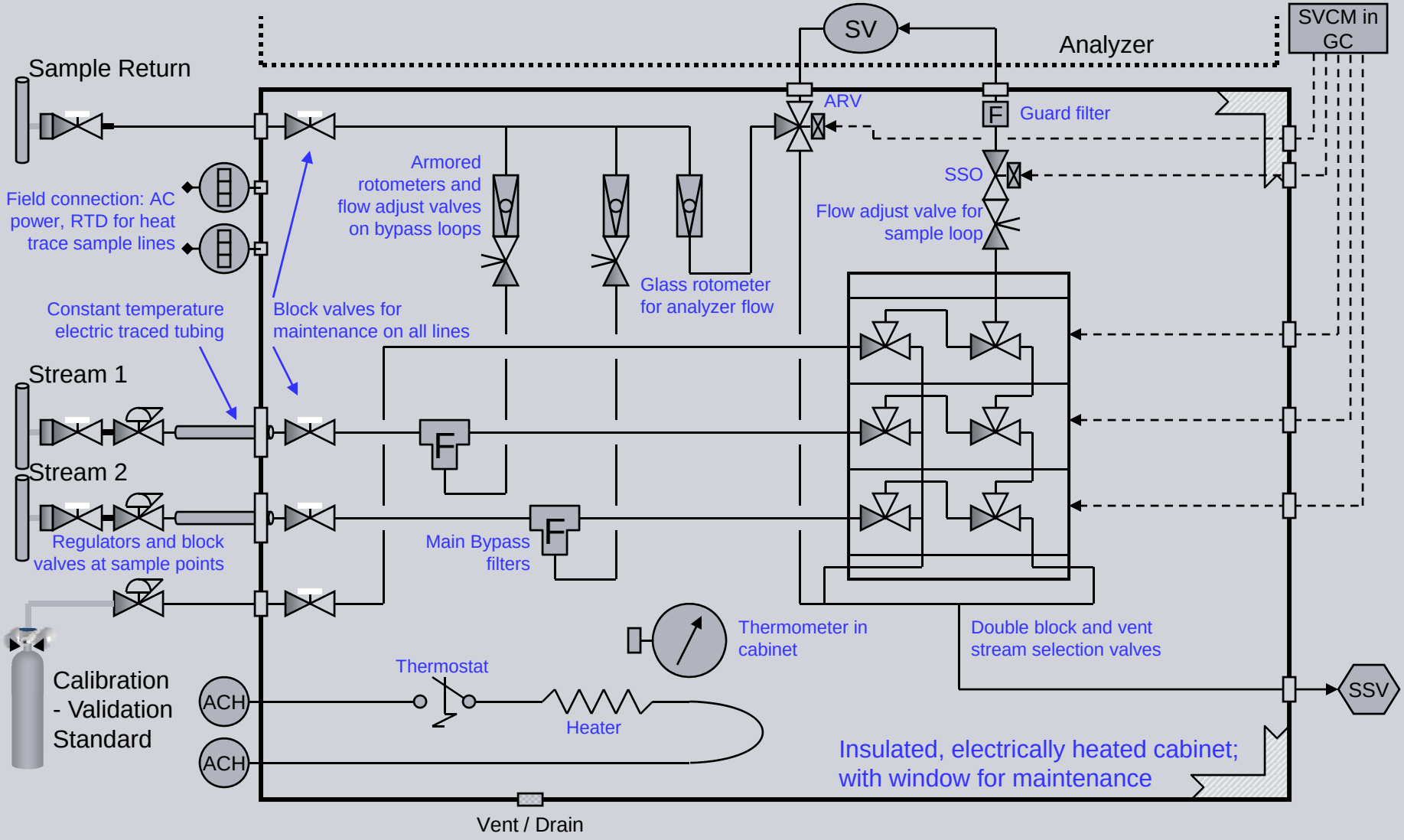
Sampling System Example

Traditional Sampling System (2 vapor process + 1 auto-cal stream)



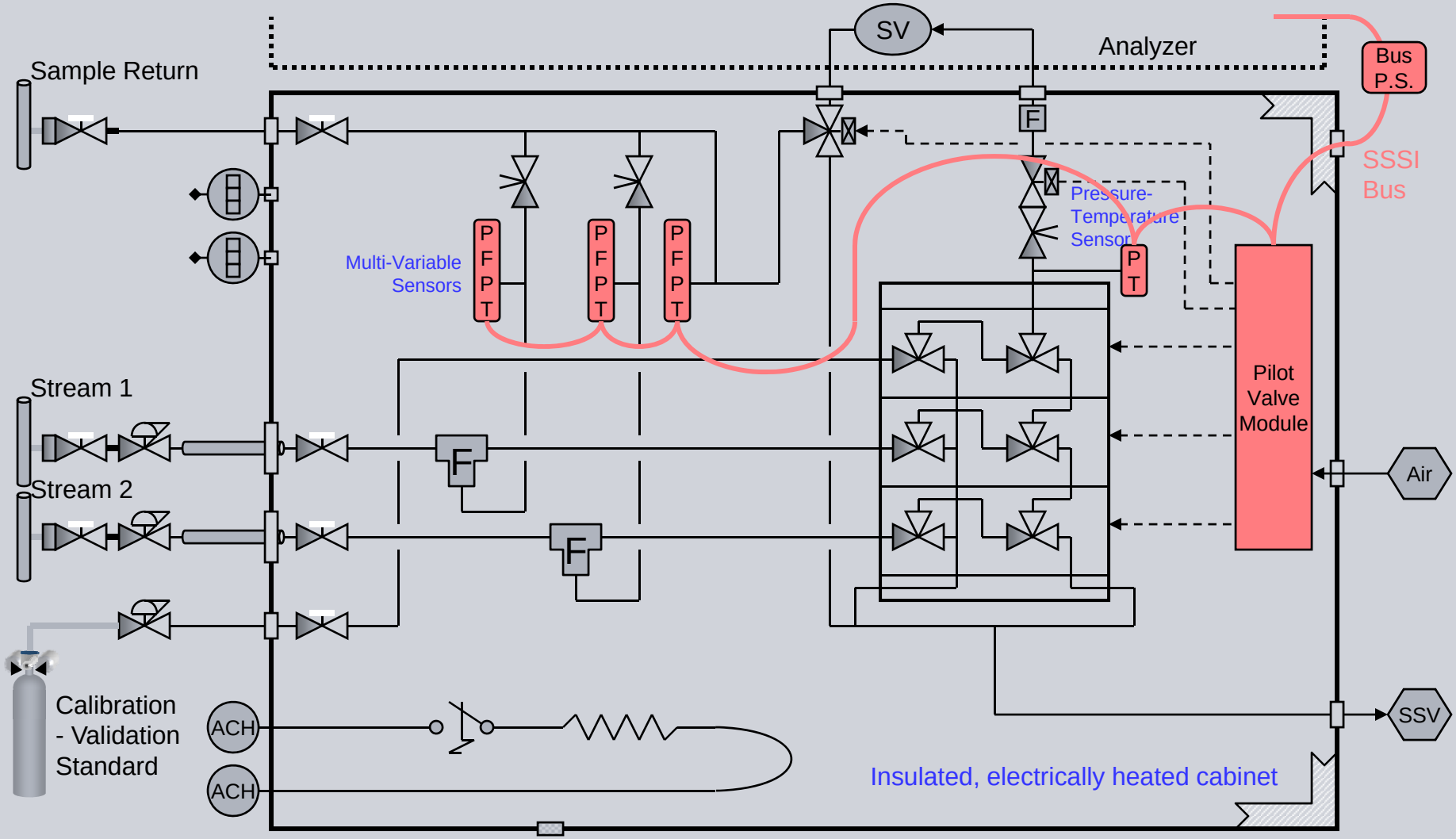
Sampling System Example (with notes)

Traditional Sampling System (2 vapor process + 1 auto-cal stream)



Smart Sampling System Example

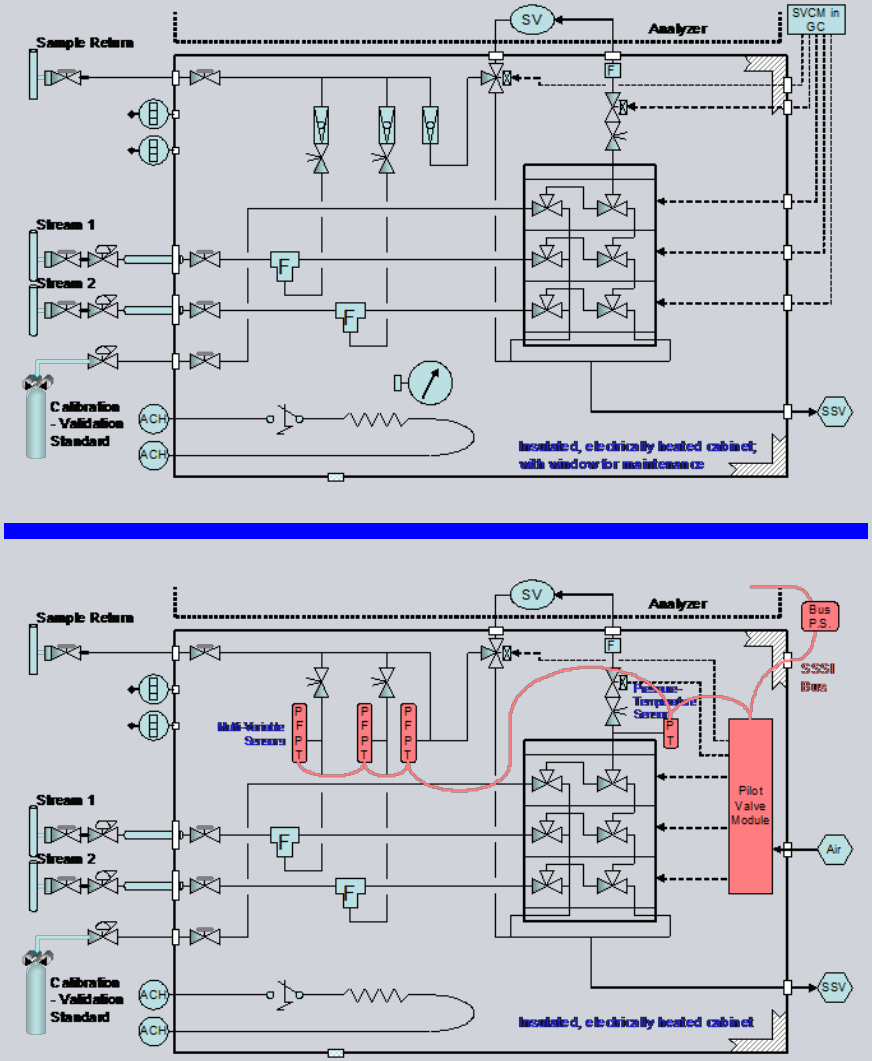
Smart System With Siemens Sensors and SSSI Bus



What's Going On…?

What changed?

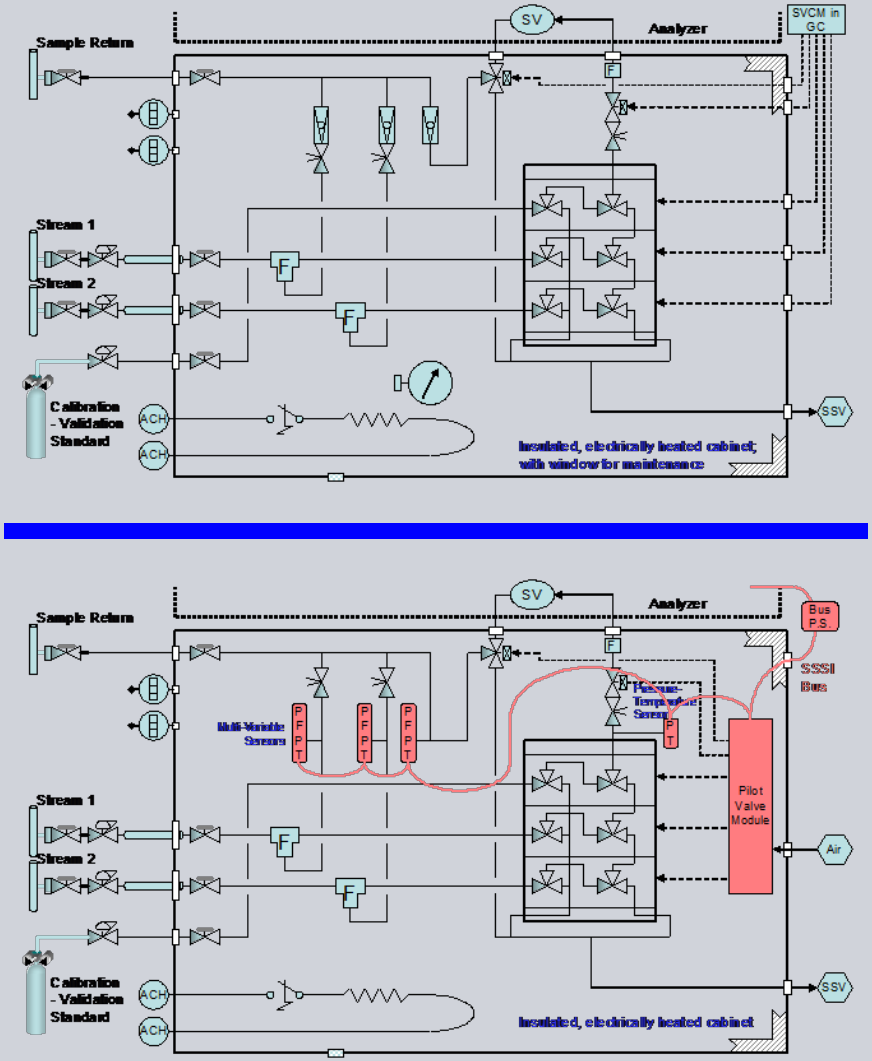
- Rotometers eliminated; replaced with Flow-Pressure-Temperature Sensors
- Thermometer eliminated; replaced with Temperature Sensor
- Pressure Sensors added to standard bottle inlet and inlet to analyzer
- SVCM in analyzer eliminated; replaced with Pilot Valve Module
- Cabinet window eliminated; all sensors can be read from outside and remote
- All new Sensors and Pilot Valve Module connected to analyzer by single I.S. bus cable



What's Going On…?

How does it work?

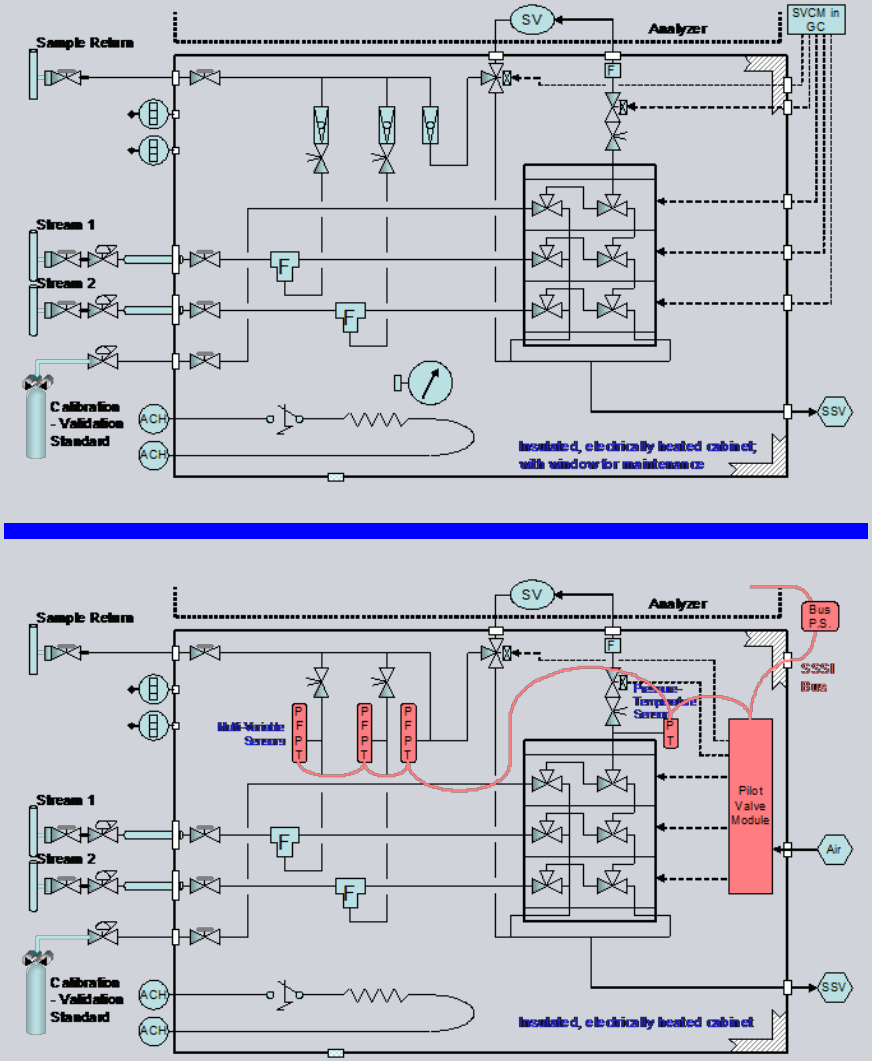
- Any blockage of bypass loops diagnosed by in-line flow and pressure sense
- Heat tracing and speed loop temperature diagnosed by in-line temperature sense on each process gas
- Main stream filters diagnosed by differential pressure across filter to selected stream
- Blockage of analyzer loop in SV diagnosed by in-line sample flow and inlet and outlet pressures



What's Going On…?

How does it work?

- Fluctuations of return pressure diagnosed by in-line Pressure Sensor
- Standard bottle checked by inline pressure sensor
- SSO, ARV and Select valves switched inside cabinet
- Cabinet heater diagnosed by Temperature Sensor



Why? Benefits To the User

System Enables Remote, Automated Monitoring of Key Operating Parameters

Personnel safety

- All flow and pressure sensors are high-pressure safe and suitable for toxic samples
- Mechanical security; cabinet simplified by elimination of window
- Lock-out practical because maintenance inspection does not require internal access

Reduced installation and engineering cost

- Stream select tubing to SVCM in GC is eliminated
- Any analog electrical connections to GC are eliminated

Improved measurement validity and reliability

- Continuous monitoring of system automatically vs. periodic check by human walk-by
- Validity assured during upsets, bad weather or storm conditions, holidays and other times of lowered maintenance
- Continuous data validation possible on critical or quality-mandated measurements

Maintenance cost reduction

- Elimination of periodic human walk-by inspection
- Capability for preventative and predictive maintenance
- When maintenance is required, personnel know maintenance situation, parts and tools required before going out to system

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Thank you for your attention!

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