



MC600 Multi-Channel Controller

Oil/gas production facilities

Electric utilities

Oil/gas refining plants

Compressor stations

Oil/gas drilling

Multi-story parking garages

Chemical processing

Pulp and paper mills

Wastewater treatment

Steel mills

Petrochemical

Sulfur recovery plants

Semiconductor manufacture



Characterizing a Multi-Channel
Controller for Hydrocarbon, H₂S and
Toxic Gas Detection and Monitoring

Throughout industry -- from chemical and petrochemical processing to automotive manufacture, hospitals, water and wastewater utilities, and pulp and paper mills -- workplaces have the potential to be exposed to toxic gases, combustible gases and vapors, and oxygen deficiency. In many cases, the primary line of defense in protecting workers and equipment from these atmospheric hazards is fixed-point gas detection safety systems. These systems typically consist of one or more catalytic-bead (CB), metal oxide semiconductor (MOS), infrared (IR) or electrochemical (EC) sensor (s) strategically placed at sensitive locations throughout the facility. In the event of a condition outside acceptable detection limits (an alarm), gas exposure data is communicated via hard wiring to a command or control station using either analog or digital signals.

While many of these systems rely on traditional 4-20 mA current loops for their operation, their electronics are often complemented by serial communications and networking. General Monitors' new full-featured MC600



microprocessor-based controller is an example of an advanced safety system that offers

industry a new standard in combustible and toxic gas detection and monitoring. By combining analog technology with new digital protocols, important safety concepts have been both maintained and/or improved. These include (1) greater reliability and operational flexibility, (2) more rapid response and recovery, (3) easy availability of process data, and

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(4) reduced installation, calibration and maintenance concerns. General Monitors, developer of the MC600 controller, has been a leading-edge manufacturer of

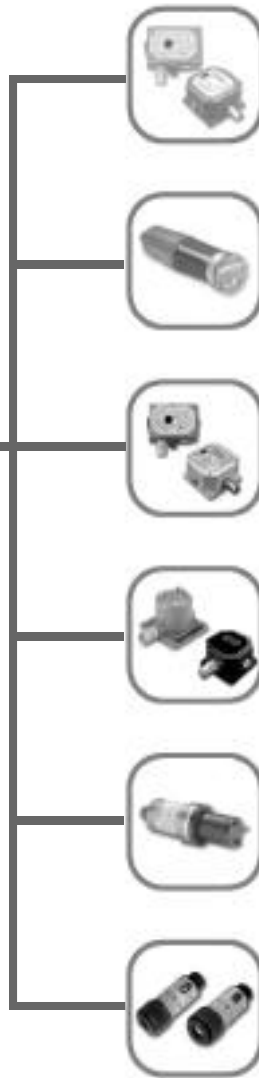
combustible gas, toxic gas and flame detection monitoring products of the highest quality since its founding in 1961. The company has been ISO 9001 certified since 1995 and is ISO 9001:2000 compliant. Headquartered in Lake Forest, California, the company also maintains a facility in Galway, Ireland to serve the EU community. Additional sales and service offices are located in Singapore, United Arab Emirates, the United Kingdom and Houston, Texas.

System scalability, flexibility, expandability

The MC600 controller provides one to six channels of continuous gas detection and monitoring in a compact, rugged control station designed for general-purpose environments. Modular, plug-in signal conditioning input cards provide for system scalability -- from simple local systems to large plant-wide distributed systems. The cards, which handle catalytic bead, MOS and 4-20 mA signals from field-mounted sensors, can easily be installed and removed from slots inside the cabinet for maximum configuration flexibility. Individual, easy-to-read, adjustable "daylight readable" LCD channel displays, LED Ready, Alarm, Warning and Fault indicators, and keypad controls offer an intuitive operator interface for setup, calibration and gas-reading functions, along with the popular ModBus protocol which provides for complete status and control via dual RS-485 serial communications. The six backlit LCDs each accommodate two lines, each with eight characters per line. An optional 95 db sounder with adjustable volume, optional onboard power supply, and remote connector facilitate installation and operating concerns. If desired, the MC600 may be remotely mounted.



The controller can operate on a "stand-alone" basis or be networked to a large plant-wide distributed control system via a standard RS-485 output. Up to 127 MC600



controllers can be linked to monitor as many as 762 fixed points.

Six auxiliary 8-amp relays are user-configurable for activating such devices as the sounder and/or beacon or any of the six channels' alarm or warning setpoints.

These relays have several independent, user-configurable options: 3-level (Warning, LO or HI) alarm activation setpoints, discrete activation setpoints for different channels, and settings for Energized vs. De-energized, Latching vs. Non-latching or Timed in the range from 1 to 120 minutes.

One common 8-amp Fault relay activates upon any system or individual channel malfunction. The Fault relay has two user-selectable

options: Activated or De-activated during setup or calibration mode operation.

Up to three zones with selectable zoning are provided with independent voting

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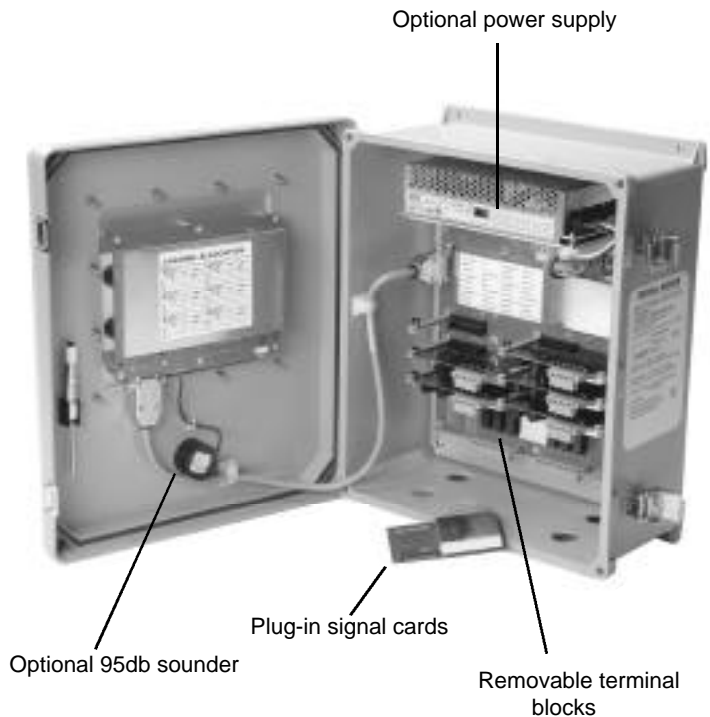
Installation, setup,
calibration, ease-of-use

Ease-of-use has been a primary design concept. Setup of the system has been reduced to a few basic steps, while menu-driven operation reduces operator training time and skill level. All detector and gas table information is preloaded and stored in the MC600 controller at the factory to simplify setup.

The MC600 is housed in a corrosion-resistant, lockable, Type 4X (weather/corrosion resistant) fiberglass cabinet designed for wall mounting in a non-hazardous area. The unit operates on nominal power of +24 VDC, while the optional onboard power supply requires 115/230 VAC. Modular design simplifies maintenance, replacement of components and system expandability. A removable back plate and removable terminal blocks ease wiring and other installation concerns. Menu formats, LCD text display messages, and front panel navigation buttons comprise the user interface for the most flexible and reliable gas detection and monitoring system available.

Standard cabling connects the signal conditioning cards in the MC600 cabinet to field-mounted catalytic HC sensors, MOS H₂S sensors and 4-20 mA instruments. When needed, a General Monitors explosion-proof junction box is available for field-mounted devices. The J-box is rated for use in Class I, Division 1, Groups B, C and D hazardous locations.

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A four-position terminal block inside the J-box is provided for routing the wiring from the sensor to the MC600 controller.

Calibration, or the process of applying a known level of gas to a sensor and having the sensor make adjustments so that its output signal matches the level of applied gas, is performed by means of a menu

option that consists of a simple-to-follow, step-by-step procedure. "Remaining Sensor Life" is established during the calibration procedure with a message that indicates the approximate percent of expected life left for the sensor.

Finally, all program and calibration data are stored in a non-volatile memory that cannot be lost when power is turned off.

Digital communications

ModBus is a widely used serial communications protocol in industrial applications. The simple master/slave protocol is well suited for complex, small-to-medium systems that do not need to pass large amounts of data.

Dual redundancy of the MC600 ModBus ensures the highest level of reliability.

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and send it to the master device as its response. ModBus provides the capability to handle illegal operations in the

The common language used by the MC600 controller is the ModBus protocol which defines a message structure that the controller will recognize and use. It describes how the MC600 will respond to requests from the other devices, and how errors will be detected and reported. A common format is established for the layout and contents of message fields.

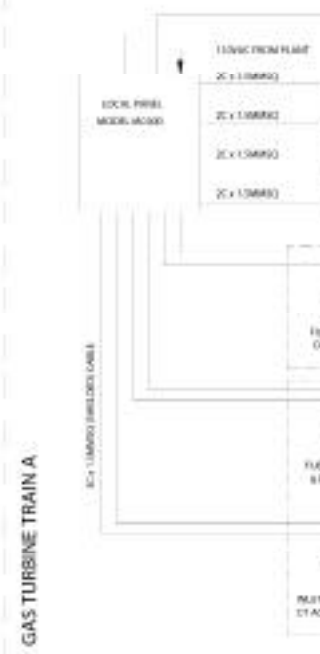
When used to control MC600 operation remotely, one can send ModBus Read and Write commands to the controller registers to perform such functions as initiating gas check tests, zeroing and calibration of connected detectors, configuring communication channels between the controller and connected units, and monitoring status information for connected devices.

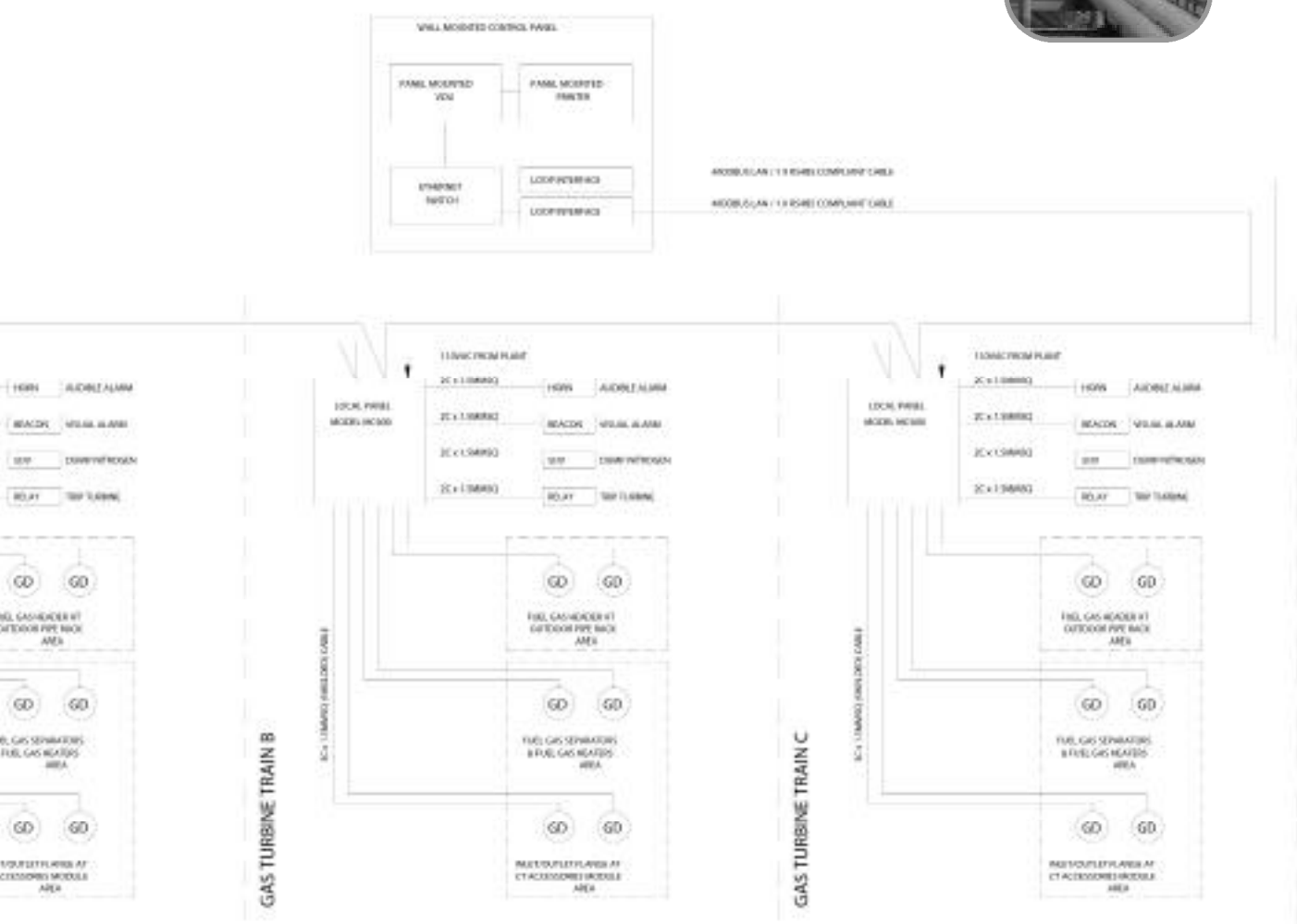
In a normal communications query and response, the ModBus (master device) sends a query to the MC600 (slave), and the MC600 receives the query without a communications error.

The MC600 then handles the query normally within the master device's allowable time-out and returns a normal response to the master. If an error occurs in receipt of the message, or if the slave is unable to perform the requested action, the slave will construct an error message

form of exception codes. Invalid, illegal or unsupported requests by the ModBus master receive an exception code in the response message. Exception codes that are supported include illegal function code, illegal register address, illegal data value and slave device busy. Exception code reply messages include the slave address, function code with the Most Significant Bit (MSB) set, the exception code and the Cyclical Redundancy Check (CRC).

An example of a networked MC600 multi-channel controller is shown in the diagram opposite.





Typical system configuration for gas turbine generators using MC600 Multi-Channel Controller and MODBUS protocol.

Compatible sensors

The MC600 controller is directly compatible with all General Monitors catalytic-bead HC and MOS H₂S sensors, all General Monitors combustible and H₂S intelligent and smart sensor instruments, IR2200, IR2100, IR7000, IRFMD, TS400 (all gases), TS420 and TSFMD instruments. Display ranges include 0-100% LEL, 0-5000 ppm, and 0-100% v/v.

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are available and the gases the system is designed to detect and monitor. Almost any industrial application is a candidate for the MC600.

Cost-effective solution

Due to its "smart" compact design, the MC600 controller, when configured with General Monitors' highly reliable catalytic-bead HC sensors, MOS H₂S sensors, and toxic electrochemical sensors, provides a genuine breakthrough in high-performance, low-cost-per-point gas detection and monitoring. Not only is the system easy to install, calibrate, operate and maintain, its long life and reduced life-cycle costs offer a cost-effective solution to personnel and property safety.

Notwithstanding the obvious safety benefits resulting from installation of a gas detection and monitoring system, the cost savings of the MC600 are apparent when one considers the wide range of detectors that

When General Monitors designed the MC600 controller, they wanted to bring every possible cost advantage to their customers. Not only were they interested in offering the most competitive price possible, they also wanted to bring value over the long term. For example, significant cost savings can be achieved with the MC600 by the fact that it is "operator friendly." Operators require only a minimum amount of specialized training before becoming proficient in its use.



Applications

There are many applications suitable for the MC600 multi-channel controller and its connected, field-mounted gas detection sensors. The following list of applications is typical.

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Summary

The MC600 controller meets most plant safety monitoring requirements today, yet is easily modified to meet the changing needs of tomorrow. The unit can simultaneously process multiple signals from field-installed sensors, yet is simple to install, calibrate and operate with the press of a few keys. And because it can respond to a digital communications device, the unit provides for reliable remote control.

Like all General Monitors products, the MC600 controller reflects the company's history of consistently supplying innovative and cost-effective solutions through its design, manufacturing and customer support. Included among the design criteria for the MC600 are (1) control and annunciation of as wide a range of combustible and toxic gases as possible, (2) ease-of-use, (3) advanced, non-volatile digital logic (microprocessor-based) design, (4) modularity for easy access, testing and service, and (5) the ability to withstand rugged environmental conditions. Finally, the MC600 controller system is designed to fulfill industrial safety monitoring needs at the lowest possible cost of ownership, and over a long economic life.

The MC600 controller is CSA and CE Marking approved with UL approval pending.

For additional information, contact Alan Austin at 949.581.4464,

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Alan Austin

Manager, Product Line Management

Alan Austin has over twenty-five years of experience with controls and instrumentation. He holds a B.S. degree in Mechanical Engineering from East Berkshire College in London, England. Prior to working at General Monitors, he held the positions of Product Manager, National Sales Manager, Marketing Manager and General Sales Manager with Bestobell Controls and Instrumentation, Fluid Components and Weber Sensors. Since 1997, he has been New Business Development Manager and Product Line Management Manager for General Monitors of Lake Forest, California. The company has more than forty years experience in the gas and flame detection market.

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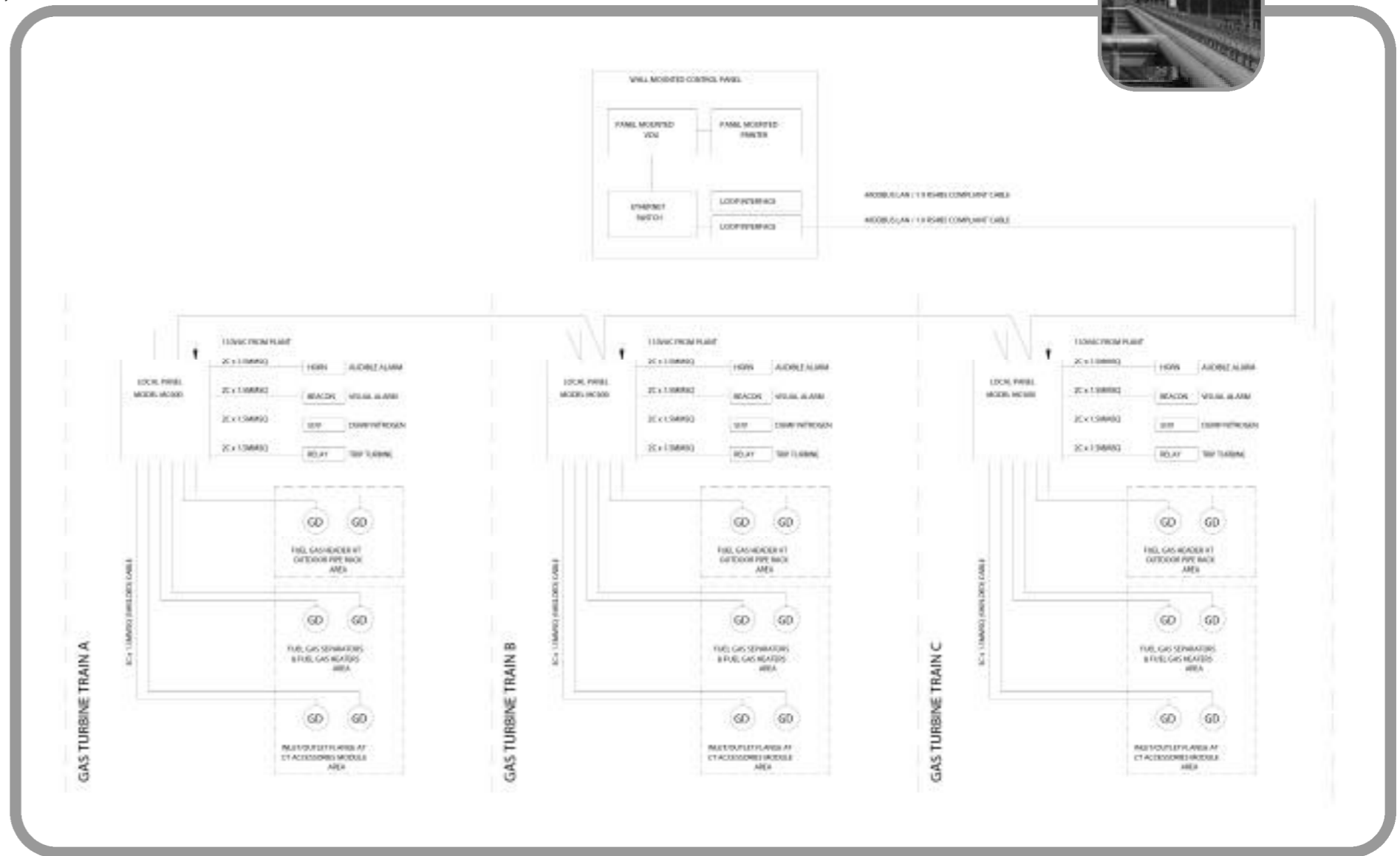
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