

Working principle diagram of the wiring cabinet in the dispatch room



Overview

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Key Takeaways

A wiring cabinet in a dispatch room organizes power, control, and signal flow from field devices to the PLC and HMI, ensuring safe, efficient, and centralized process control.

- **Signal and Power Flow**
 - **Field Devices to Junction Box:** Sensors and transmitters in the field measure parameters like temperature, pressure, or flow. Each device connects to a field junction box using branch cables, typically one pair per signal for analog 4-20mA devices .
 - **Junction Box to Marshalling Cabinet:** Signals from multiple junction boxes are combined into main or homerun cables and routed to the marshalling cabinet in the dispatch room. The marshalling cabinet organizes and redistributes these signals to the appropriate I/O channels in the system cabinet .
 - **System Cabinet Processing:** Inside the system cabinet, analog input cards convert incoming signals to digital form. The CPU or processor card executes programmed logic, processes signals, and communicates with the HMI for operator monitoring and control .

- **Power and Safety Layers:** The cabinet includes power supply units, circuit breakers, and leakage modules to protect the system from overloads or faults. Relays, contactors, and motor protectors form the control and execution layer, driving actuators and motors as per PLC commands .
- **Wiring and Transmission Layer:** Terminal blocks, DIN rails, and organized wiring ensure neat signal routing, easy maintenance, and minimal interference. Power and signal cables are separated to prevent cross-talk and overheating .
- **Drive and Remote Layer:** Frequency converters and remote I/O modules allow motor speed control and remote signal acquisition, extending control beyond the cabinet while maintaining centralized logic .

Key Components

- **PLC/CPU:** Brain of the system, executing logic and coordinating devices.
- **Analog/Digital I/O Modules:** Interface between field devices and PLC.
- **Marshalling Cabinet:** Signal organization and redistribution.
- **Power Supply & Protection:** Circuit breakers, fuses, and relays.
- **HMI:** Operator interface for monitoring and control.
- **Wiring Infrastructure:** DIN rails, terminal blocks, and cable management.

Working Principle Summary

The wiring cabinet acts as a central hub where field signals are collected, organized, and processed. Power is supplied safely, control commands are executed, and signals are transmitted to the HMI for operator interaction. The cabinet ensures efficient signal routing, protection, and maintainability, forming the core of industrial automation in the dispatch room .

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