DCS Architecture
The Feedback Loop

- **Controller**
- **Final control element**
- **Process**
- **Sensor & Transmitter**

Flow:
- Setpoint → Controller → Final control element → Process → Load change → Process → Controlled variable
- Manipulated variable

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Transmitter & Valve

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DCS architecture 4
The Feedback Loop

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DCS architecture 5
PID Controller Implementation
Traditional Feedback Loops
Traditional Control Panel
Common Industrial Controllers

- Stand-alone controller (loop controller)
- Programmable logic controller (PLC)
- Distributed control system (DCS)
Stand Alone Controller

![Diagram of Stand Alone Controller]
The Control Station
PID Controller
DCS Feedback Loops

“Data Highway”
(Digital Communications)

Field Signals (Analog or Digital)

Control Room

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Control Room from 1955
Control Room from the 80s
Control Room from 2011
DCS Architecture

Operators’ consoles
- VDU
- VDU

Control network
- Control station
  - I/O
  - I/O
  - I/O
- Additional controllers
- To/from field devices

Special purpose processors
- (ESD, MCC, BMS)

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REAL WORLD

Field Devices

Fieldbus Modules

Control Block Configuration

Control System

Control Processors

Plant

Operator Consoles

Communications

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DCS architecture
The Big Picture

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DCS architecture
More…
Operator Console
Process Visualization
Faceplate
DCS vs. PLC

- Advanced regulatory control
- High-speed machine control

DCS

PLC

Digital Analog I/Os