DCS Training

DCS
INTRODUCTION COURSE

DCS

DIGITAL CONTROL SYSTEM

or

DISTRIBUTED CONTROL SYSTEM

Foxboro DCS I/A Series System

This course describes the physical and functional characteristics of the I/A Series System. The system processor modules, I/O modules, storage and peripheral devices are described as well as;

(1) the relationship of the physical layers with the system's mounting structures, enclosures, adapters,

(2) the functional relationship of the System bus Network, System Stations, System Integrators and Gateways, Fieldbus Modules, and System Interface.

Outline of Presentation

- Preface
- Course objective
- Learning
- Definition of DCS (Foxboro)
- DCS (Foxboro) architecture
- Overview of DCS (Foxboro)
- Summary

Objectives

- The objective of the course is to give participants the basic building blocks of the Distributed Control System and an understanding of the architecture of the system.
- This course targets Instrument technician with no previous DCS (Foxboro) experience but who are likely to be attending courses in the near future.
- At the end of this course, participants should be able to identify the hardware & understand the operation / function of each components.

Learning

- Skill development can be undertaken by residential training or directed self-study (i.e to overcome knowledge-base weakness-basic knowledge of DCS.)
- Effective training:
  - depends upon identifying the key skill of jobs.
  - exercising their performance.
  - to sharpen as well as to broaden the human capability.
  - competences.

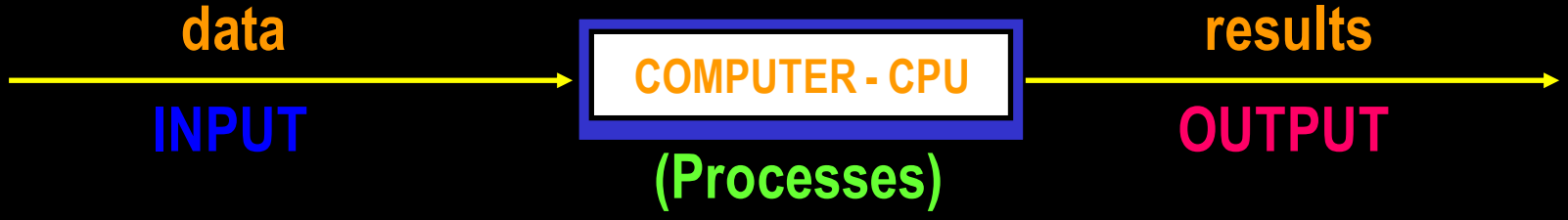
Introduction To Foxboro DCS

Definition of DCS:

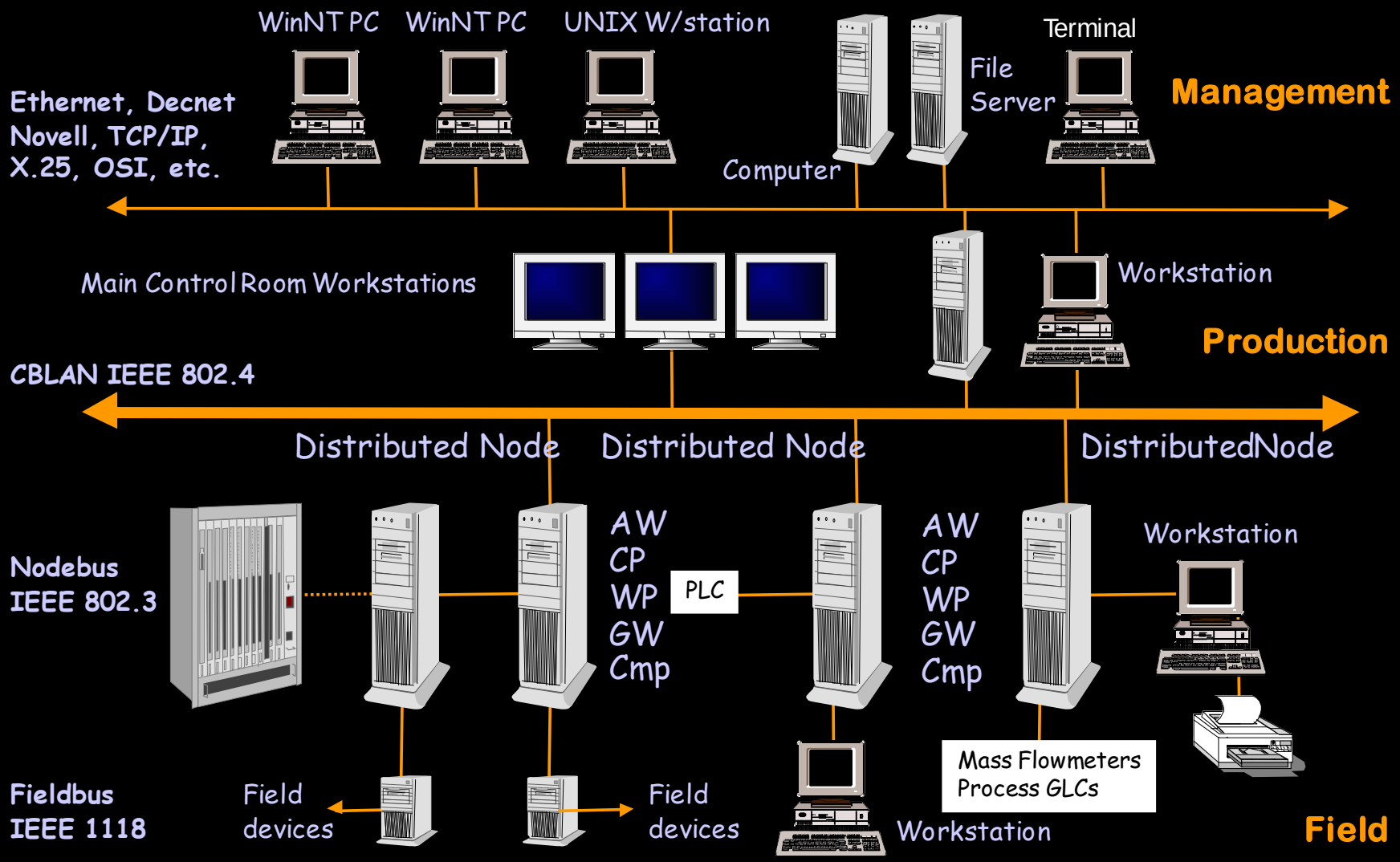
- I/A Series: Intelligent Automation Series is a state-of-art, cost effective plant automation system provided by the Foxboro Company.
- functions are distributed not centralize.
- consist of microprocessors that work together.
- is a computer network.
- does a real-time computing by scanning its inputs & updating its data several times a second.

What are computers?

A computer is an electronic machine for receiving data (INPUT). It stores this data as well as carries out any instruction concerning the data (PROCESSING). Finally, it produces the results (OUTPUT).



Foxboro I/A Series Distributed Control System



Overview of Foxboro DCS

Introduction To Foxboro DCS

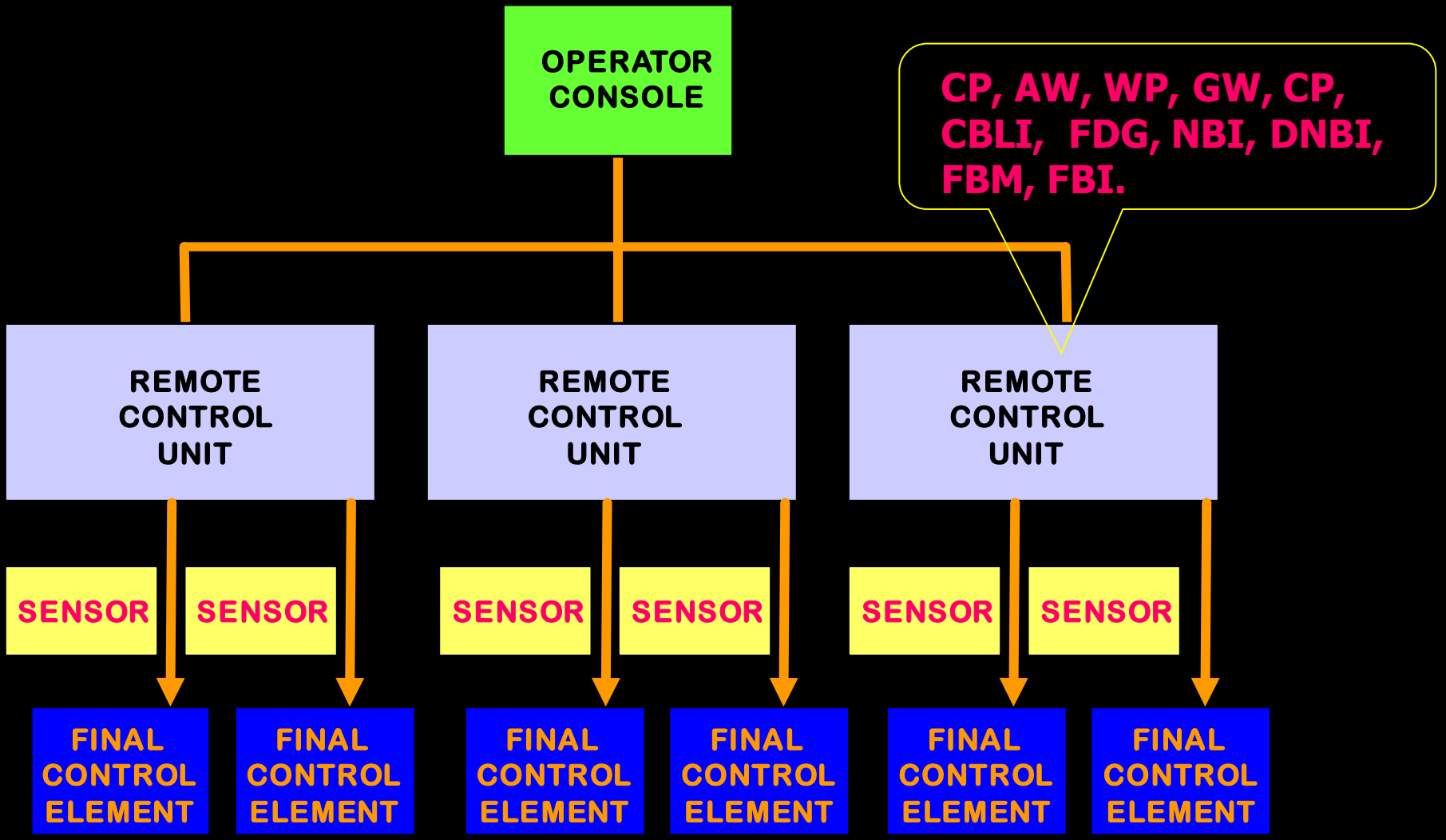
Architecture:

A DCS is a collection of microprocessor-based modules that work together through a real-time communication system to control & monitor the process operation.

Data Highway & Local I/O bus

- backbone of the system.
- pass the system messages & file transfers.
- constantly updates the consoles, gateway, etc.
- If highway fails, loss of communications.
- Very critical element, has a redundant highway.

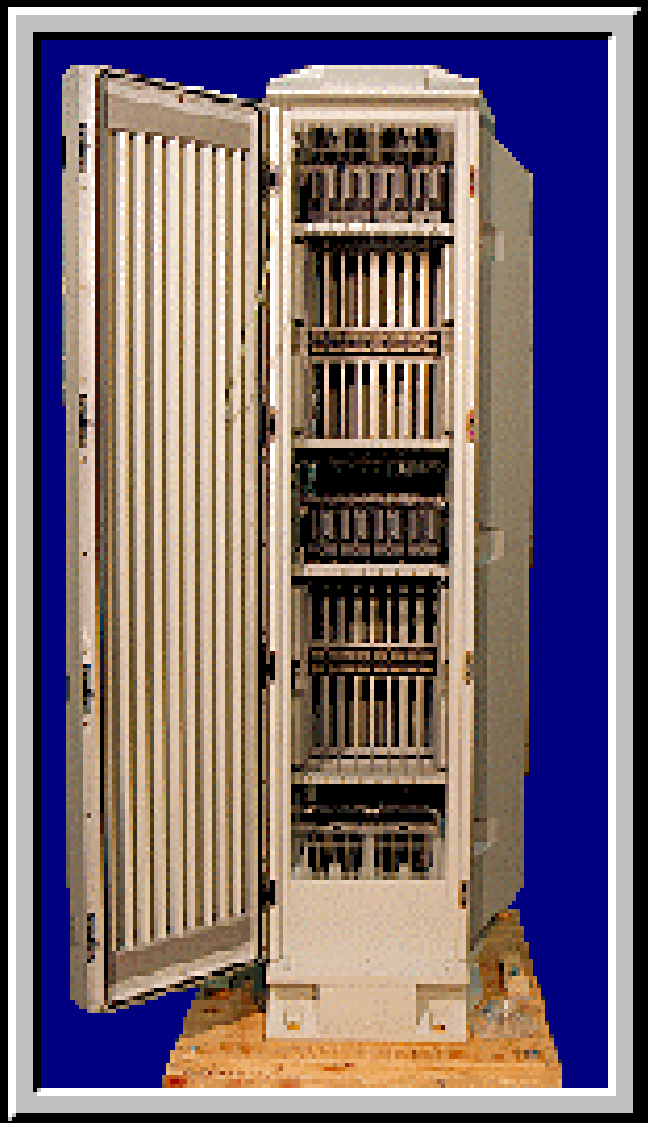
Foxboro Distributed Control System



Introduction To Foxboro DCS

A DCS consists of:

01. Dual Nodebus interface (DNBI)
02. Communication modules (Com10/15)
03. Data highway (Nodebus/Fieldbus)
04. Application Workstations (AW51D)
05. Workstation Processors (WP51D)
06. Control Processors (CP30/40/60)
07. Gateways (GW)
08. Fieldbus Modules (FBMs)
09. Transmitters
10. Valves, fans, motors, switches, etc.



Industrial Eclosure 32 or IE32

32 slots for hardware modules

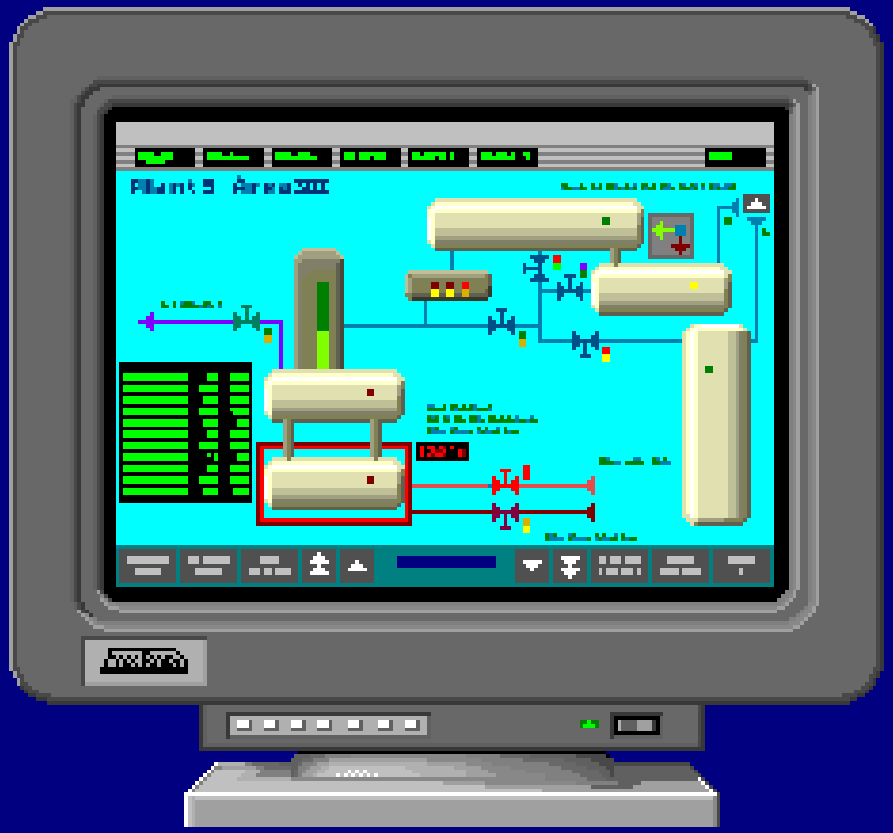
Control Processors, Application Workstation, Workstation Processors, Gateways, Communication Processors, Carrierband LAN Interface, Intergrators, Foreign Device Gateways, Nodebus Interface, Dual Nodebus Interface, Fieldbus Modules, Fieldbus Isolators.

Foxboro DCS I/A Series System

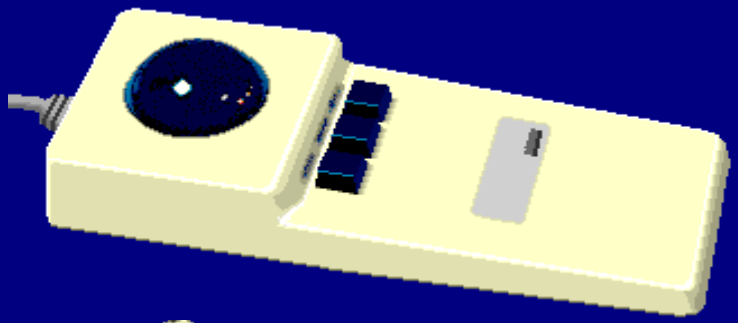
User Interfaces

- Display monitor or CRT based console or WP51 (workstation processor 51).
- Also known as VDU (video display unit) or VDT (video display terminal).
- These CRT comes in a 19" display screen.

Workstation Processor 51

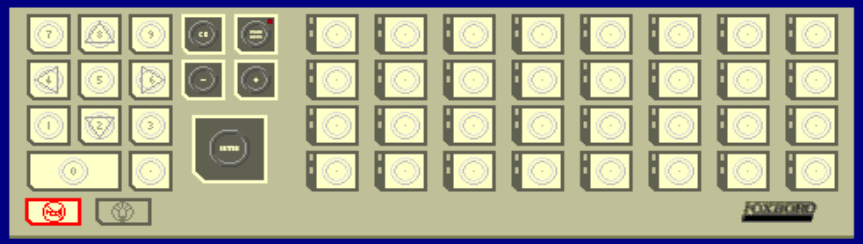


19”Monitor Workstation



Trackball or Mouse

Numeric Keyboard

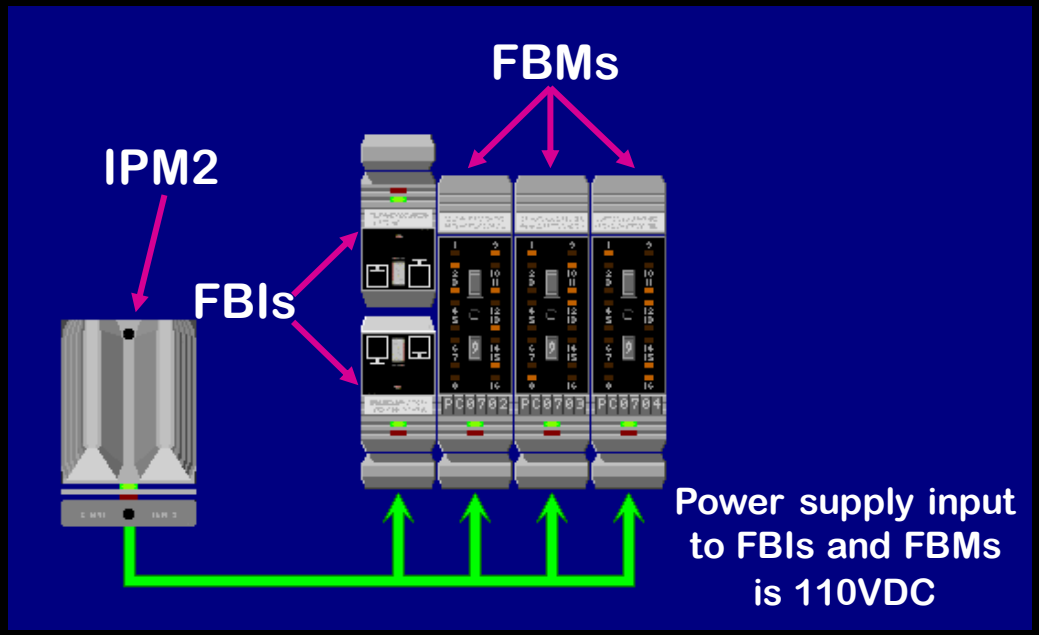


Annunciator Keypad

Industrial Power Module 2

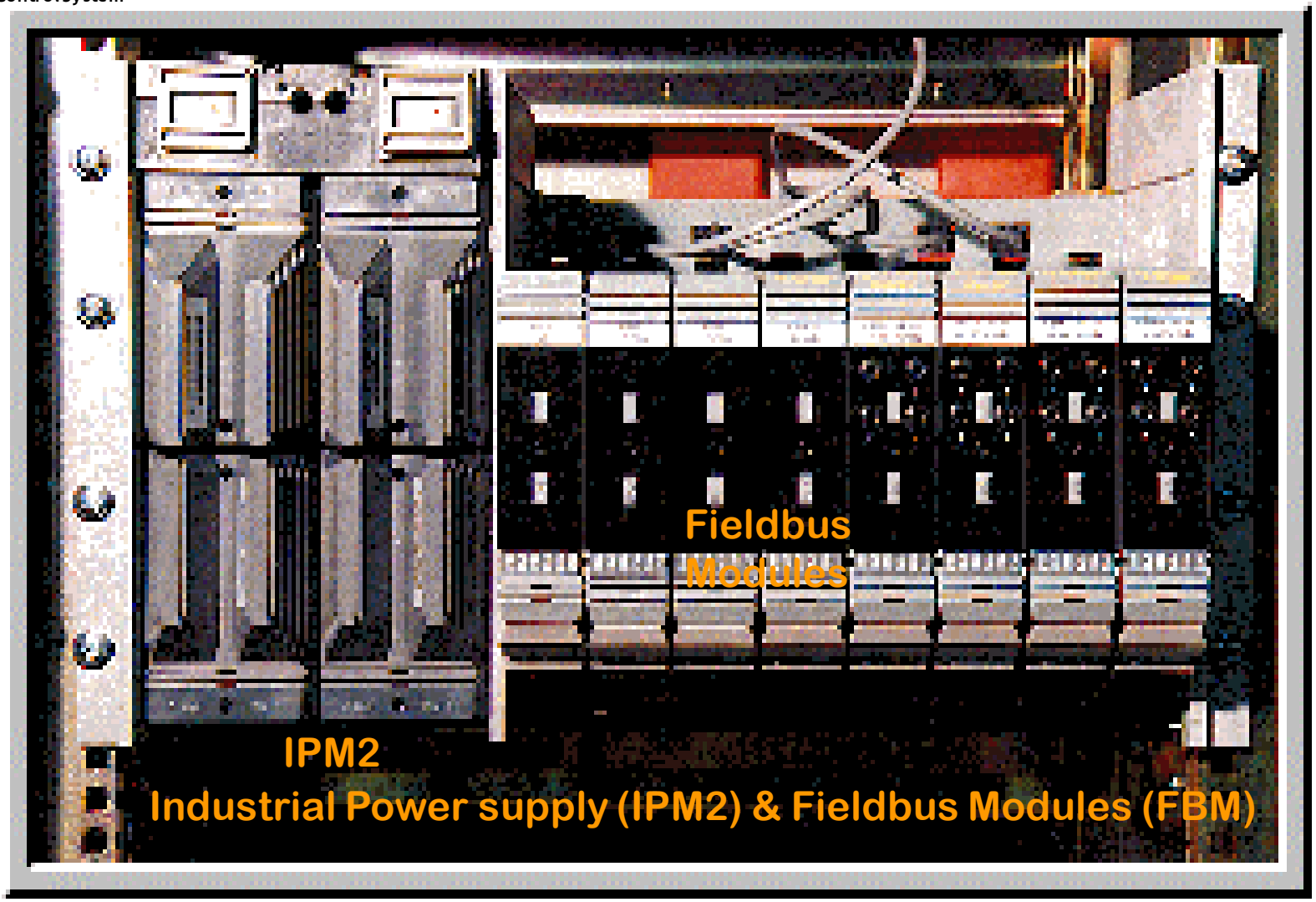
Normally installed in non-stop uninterupted Power supply configurations

Convert Input power supply of 240 VAC to 110 VDC to FBIs and FBMs.

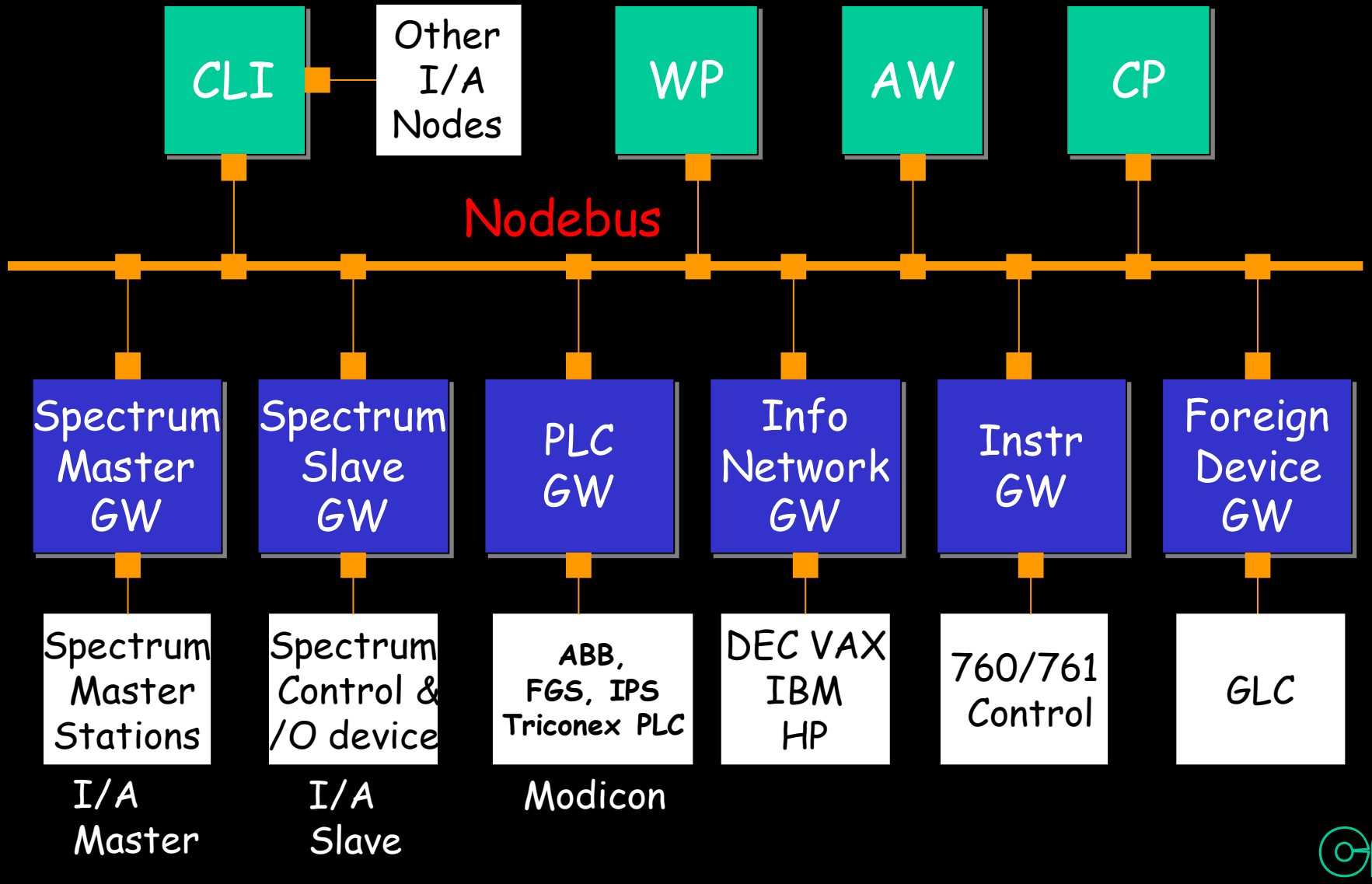


DCS

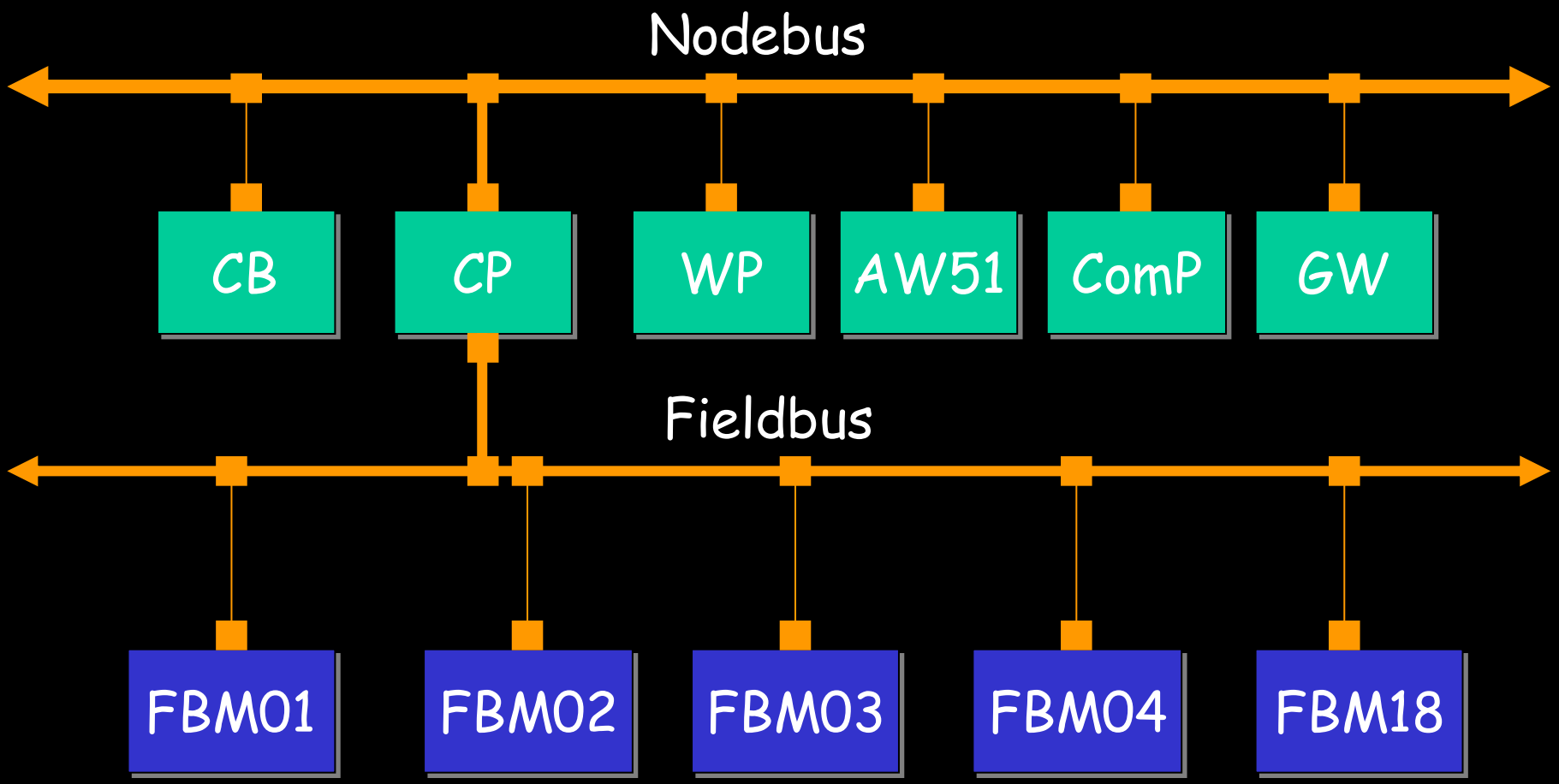
Distributed Control System



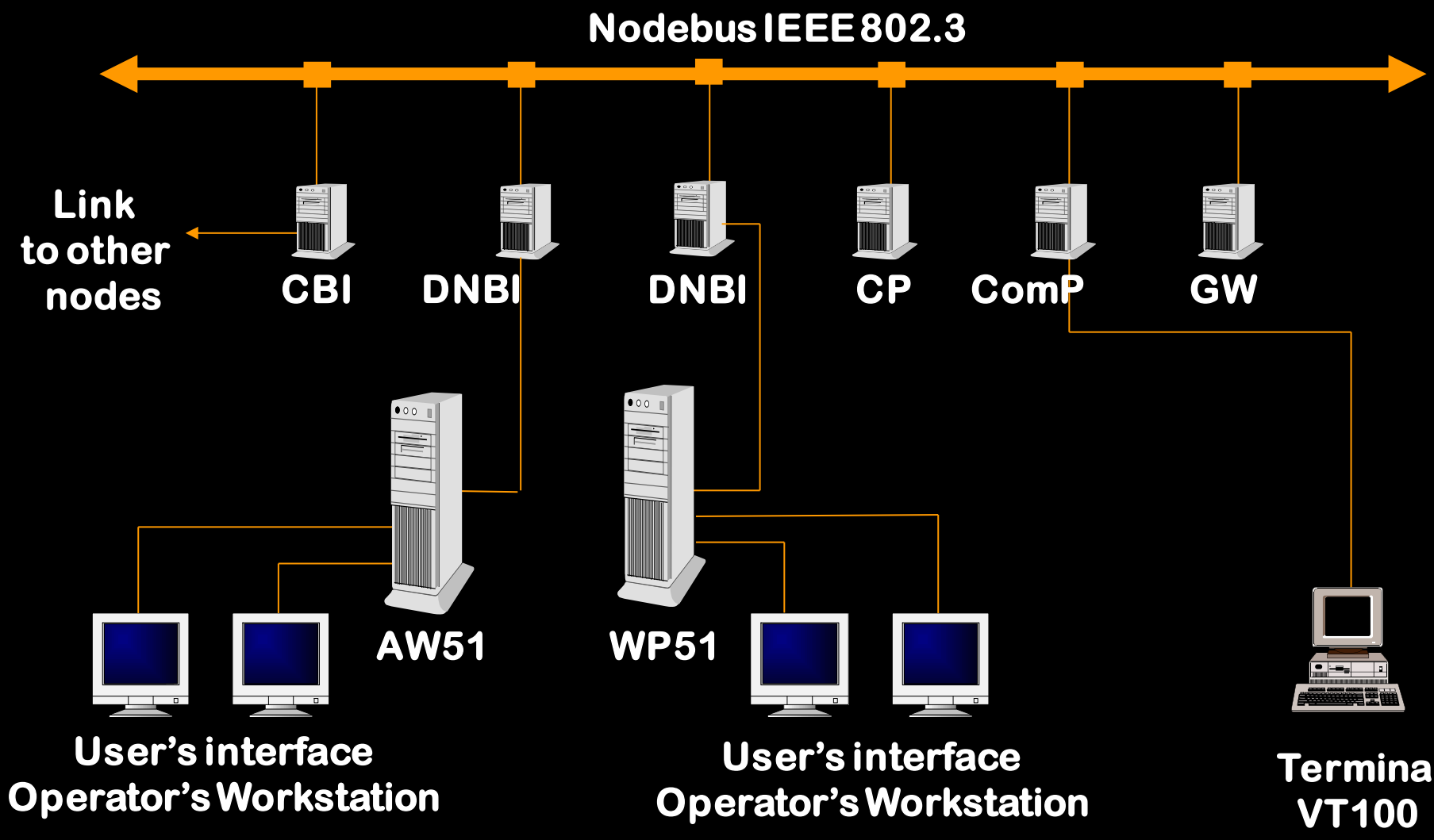
Gateway Processors(GW)



Control Processor (CP)



Foxboro DCS I/A Series System



Application Workstation 51(AW/WP51)

Foxboro DCS I/A Series System
(Control Processor)

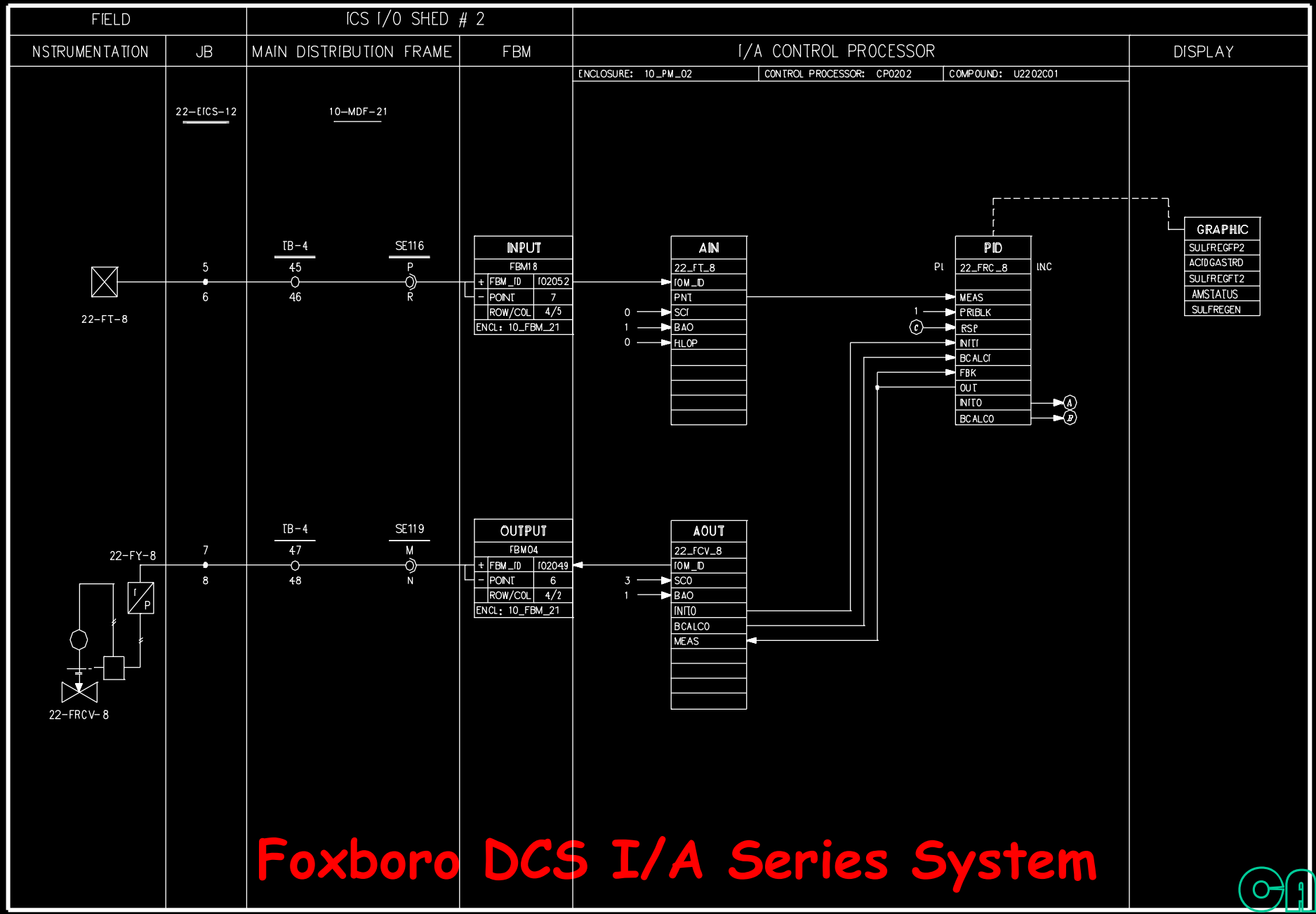
- continuously updates information from the I/O modules.
- perform regulatory, complex logic, timing & sequential control and loop calculations.
- Communicates directly with fieldbus modules.
- The only processor module which connects to FBMs.

Foxboro DCS I/A Series System
(Fieldbus Module)

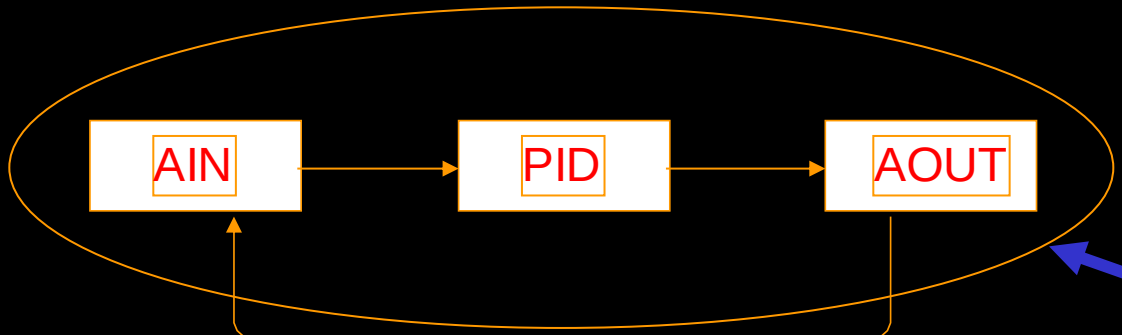
- able to read and writes both digital as well as analogues signals.
- Can be used as both input and output devices to control a process.
- 4 basic I/O modules are: analogue input and output, digital input & output.
- The input modules for example convert information from the process instruments into digital form, filter & signal characterizing.
- The FBMs communications path, the Fieldbus, is redundant.

More info on DCS

Signal Loop Diagram



Foxboro DCS I/A Series System

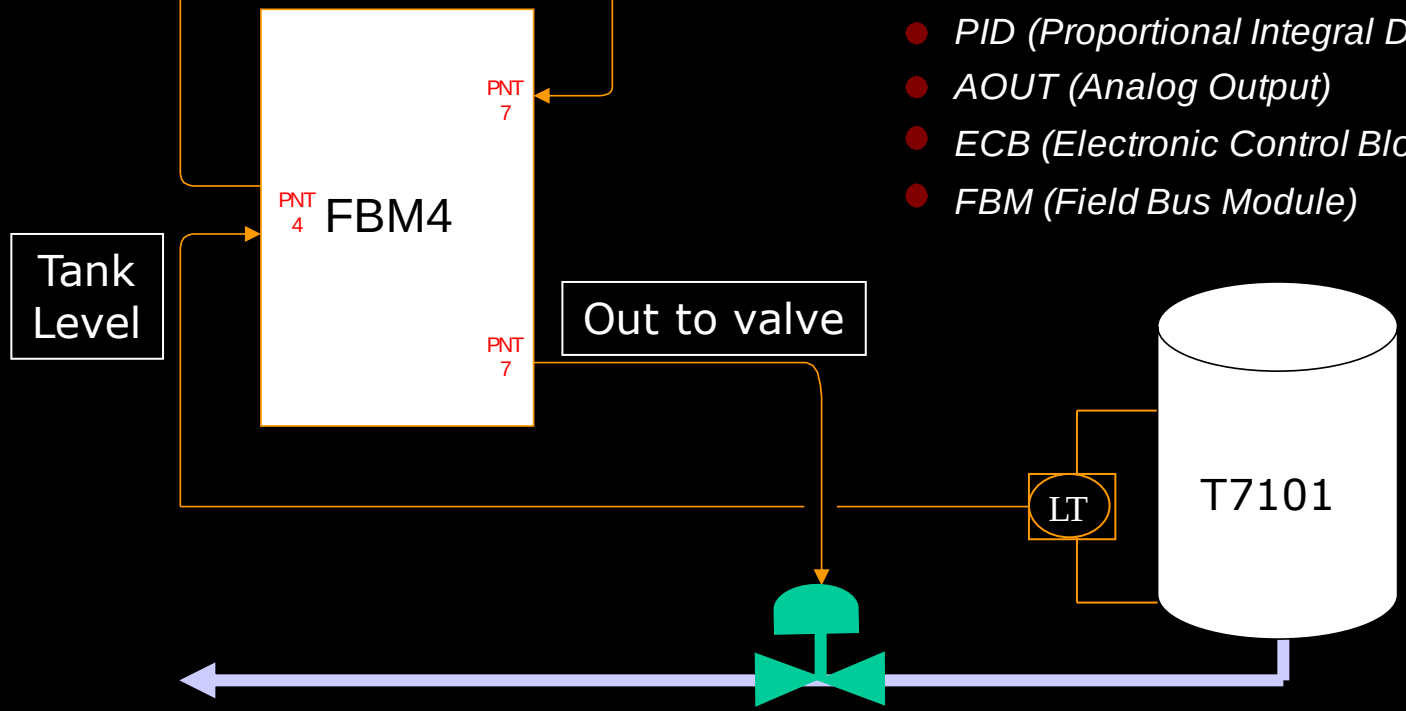


COMMONLY USED BLOCKS

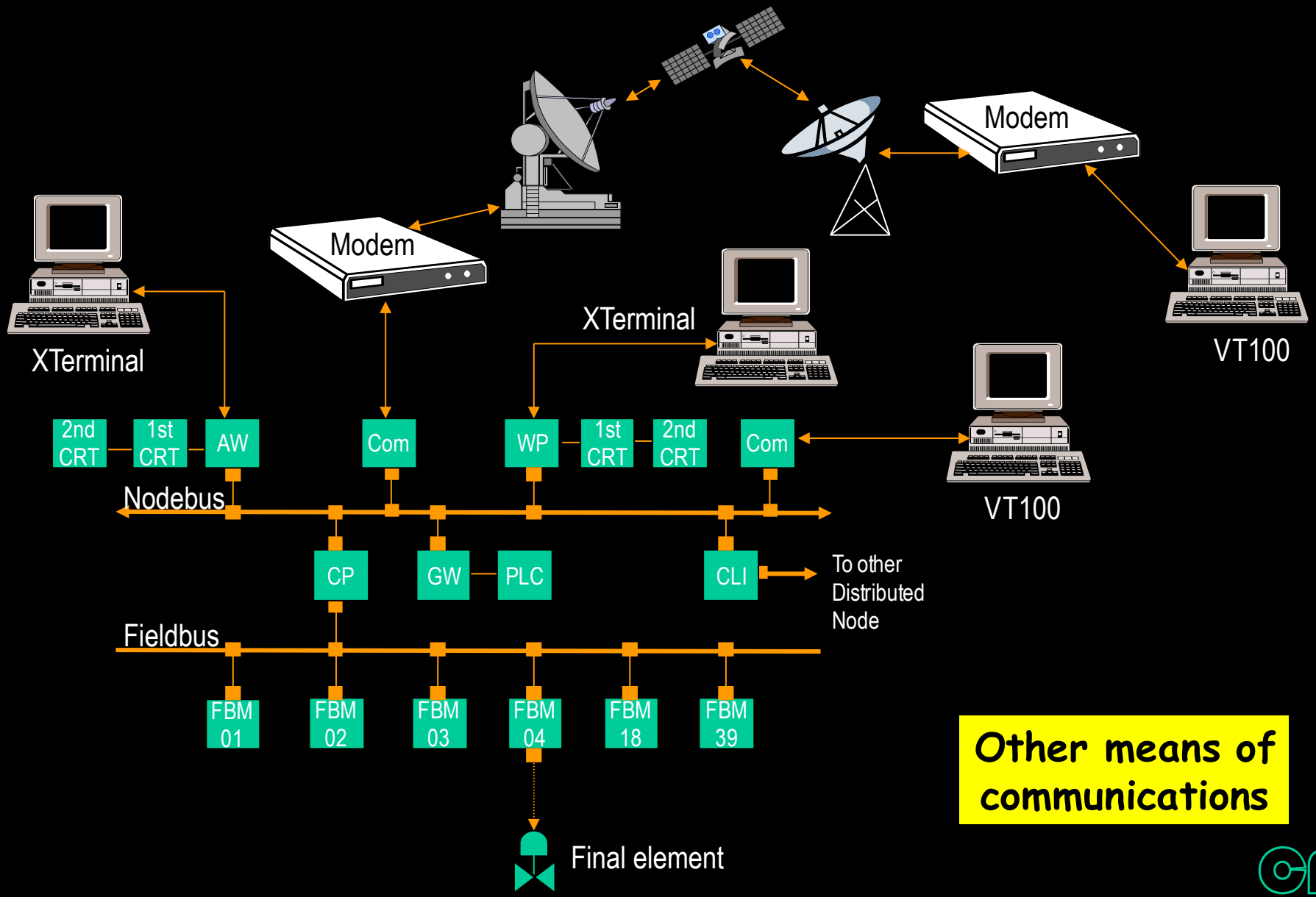
FBM4 ECB

BLOCK CHARACTERISTICS:

- *AIN (Analog Input)*
- *PID (Proportional Integral Deviation)*
- *AOUT (Analog Output)*
- *ECB (Electronic Control Block)*
- *FBM (Field Bus Module)*



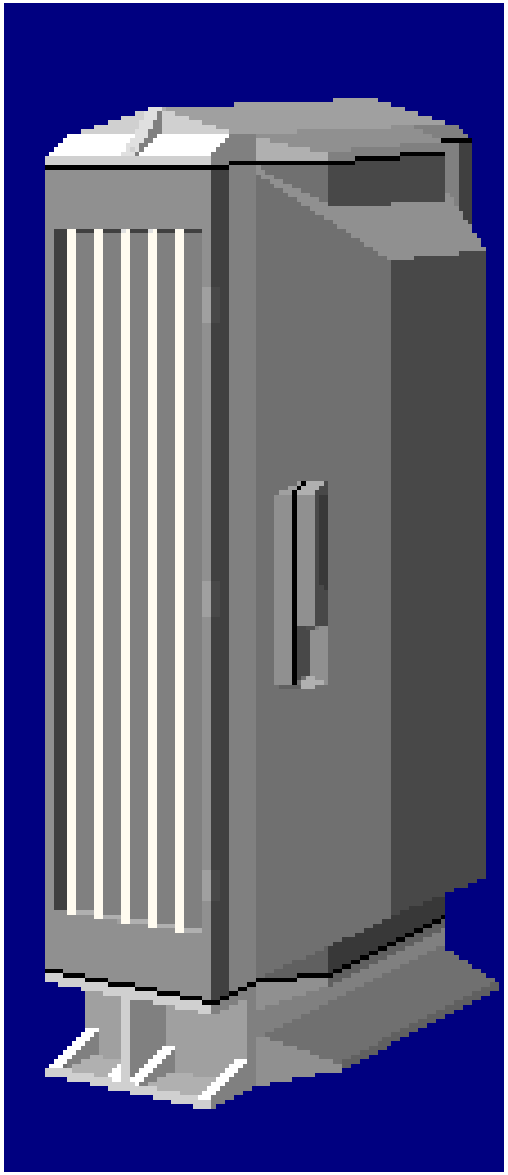
Foxboro DCS I/A Series System



Other means of communications

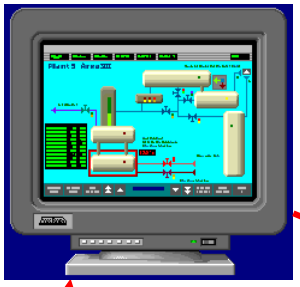
DCS HARDWARE OVERVIEW

FE-Field Enclosure
IE-Industrial Enclosure



Example of an FE8 Enclosure (FE4&8, IE16 & IE32)

SYSTEM MANAGEMENT OVERVIEW

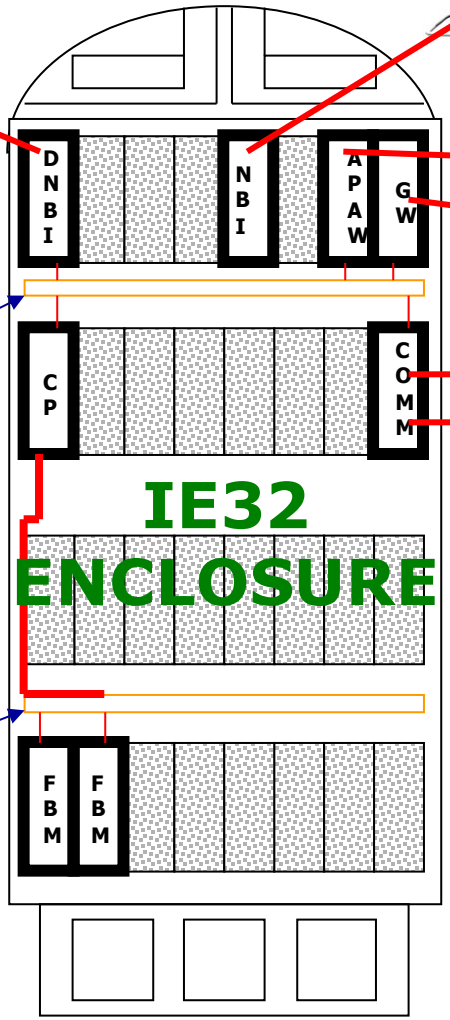


WORKSTATION
(WP,AW)

SYSTEM
MANAGEMENT
SUBSYSTEM

NODEBUS

FIELDBUS



IE32
ENCLOSURE

PW

TAPE

HARDDISK

PLC, BN,
NON DCS EQUIP

PW

PRINTER

AUTOMATIC:

- MONITOR SYSTEM HEALTH
- GENERATE SYSTEM ALARMS
- DOCUMENT SYSTEM EVENTS

OPERATOR INITIATED:

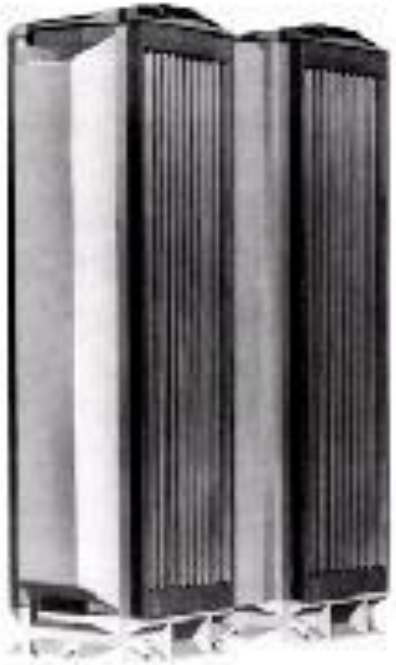
- ACKNOWLEDGE SYSTEM ALARMS
- VIEW HARDWARE STATUS INFO
- CHANGE HARDWARE STATUS
- SET SYSTEM DATE/TIME

INDUSTRIAL
ENCLOSURE 16
SEALED

INDUSTRIAL
ENCLOSURE 32
SEALED

INDUSTRIAL
ENCLOSURE 16
VENTED

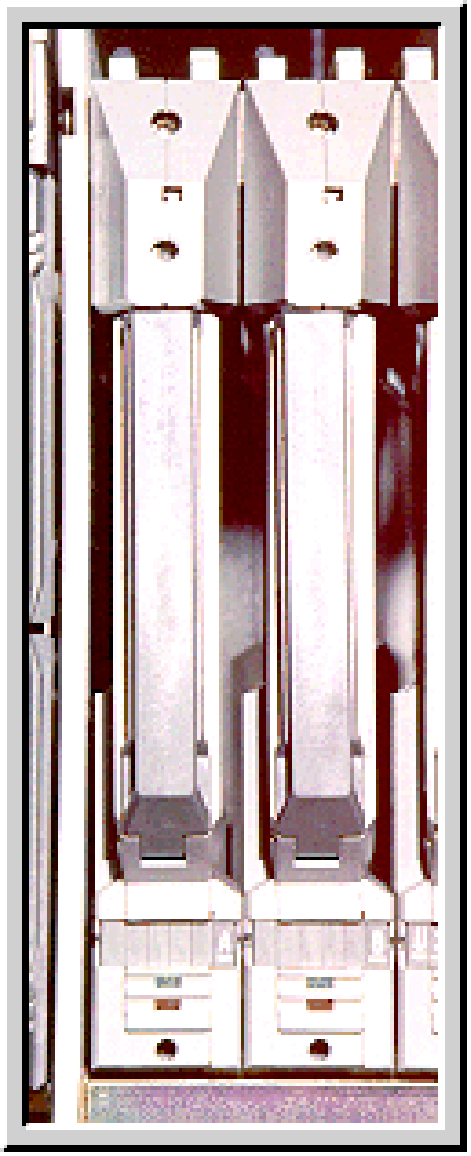
INDUSTRIAL
ENCLOSURE 32
VENTED



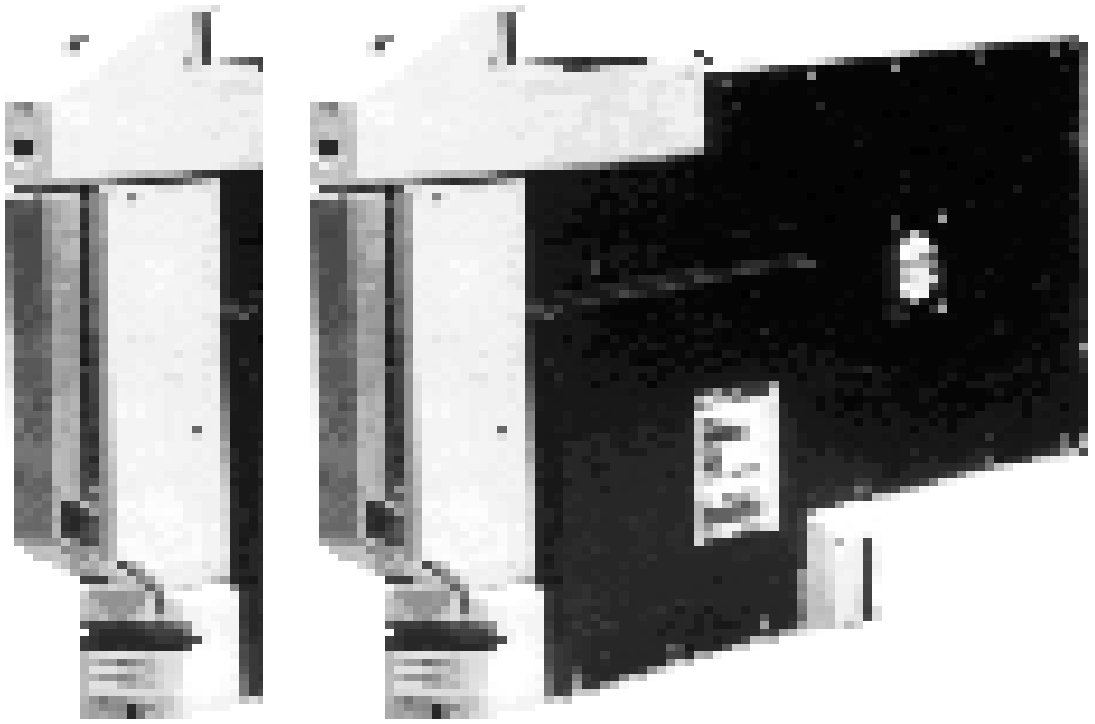
MULTIPLE (BRIDGED)
INDUSTRIAL
ENCLOSURE 32

HLD's Foxboro I/A Series System Training Simulator

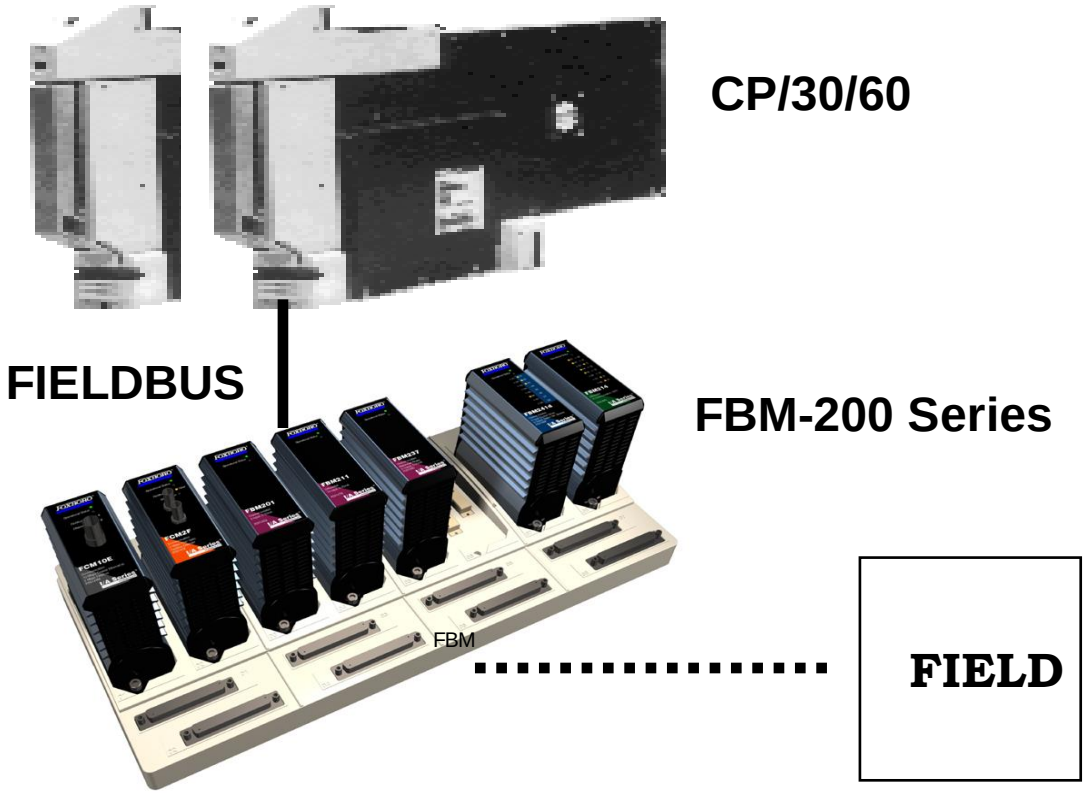
DCS Operator Workstation



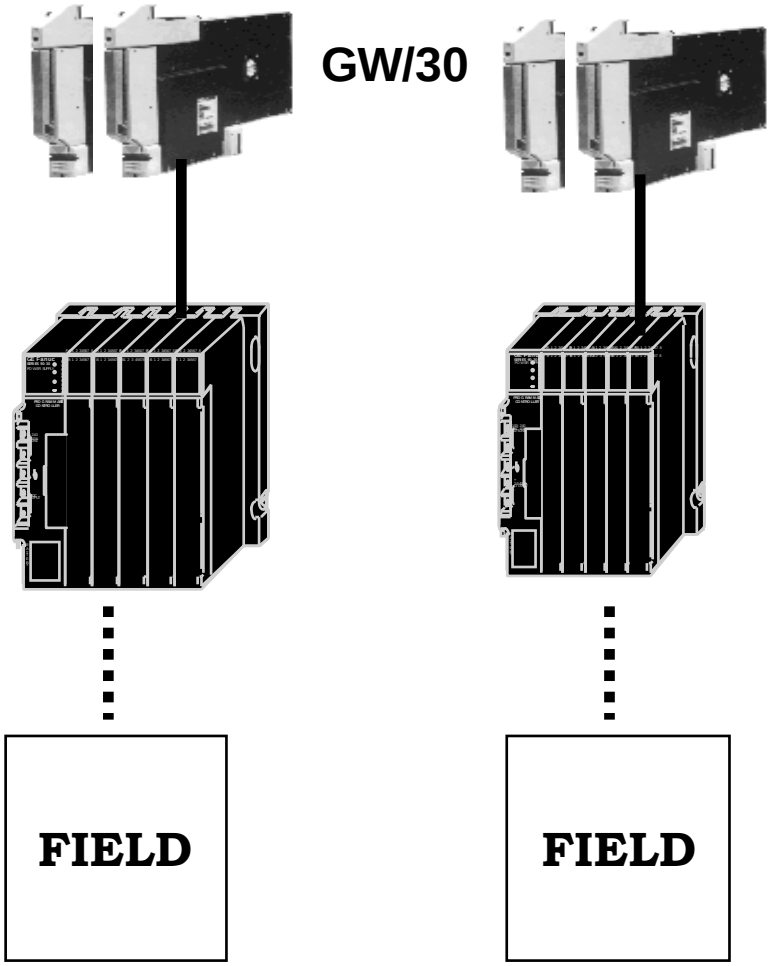
DNBI or DNBT
(Dual Nodebus Interface)



Control Processor



Control Processors with FBMs

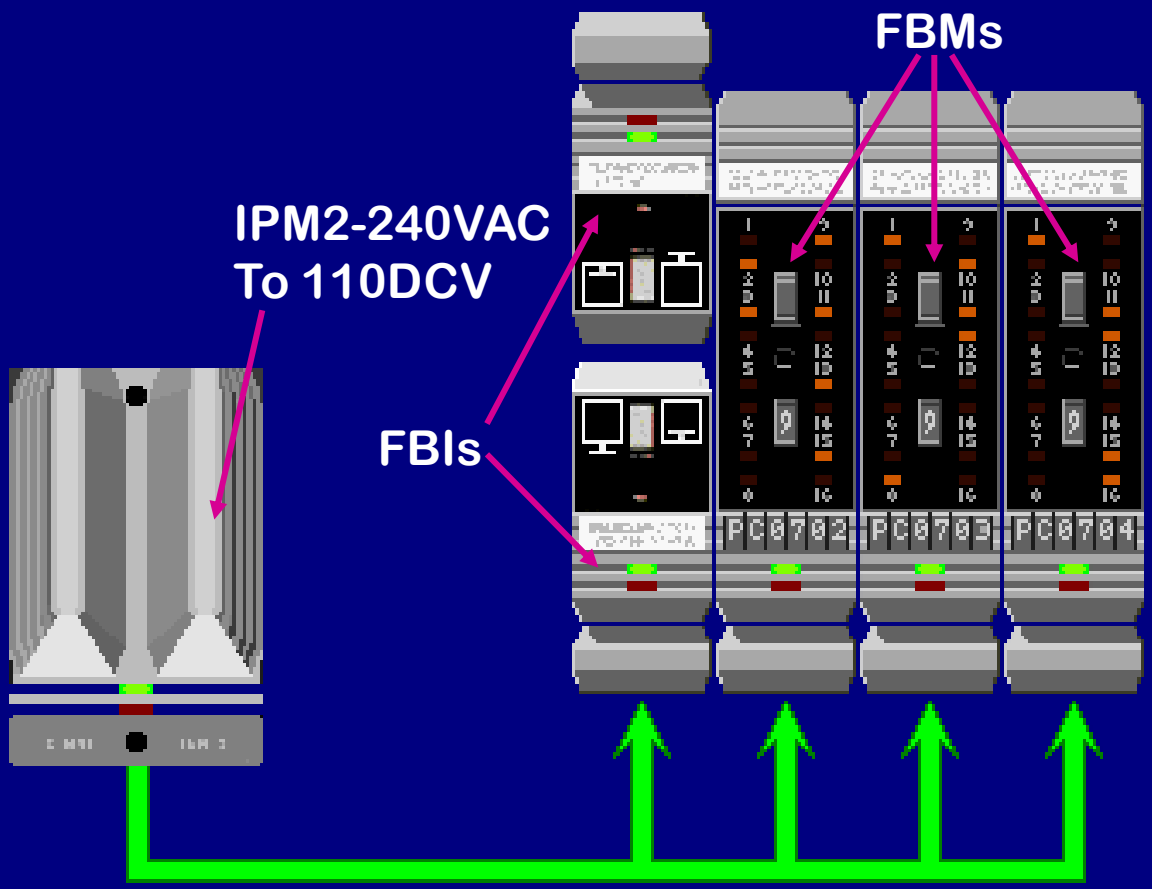

GW/30
MODBUS
IPS, FGS,
TRICONEX,
HONEYWELL,
YOKOGAWA
WESTLOCK,
PANAMETRICS,
SOLAR
FIELD
FIELD

Gateways

IPM02

Industrial Power Module2 supply 110VDC to hardware modules.
System extended 100 ms ride-through (ac) input to (dc) output current mode switching primary only type. It accepts any standard ac input and is used when wave-crest or power factor is critical. This module is preferred in applications with frequent ac line voltage drop-outs.

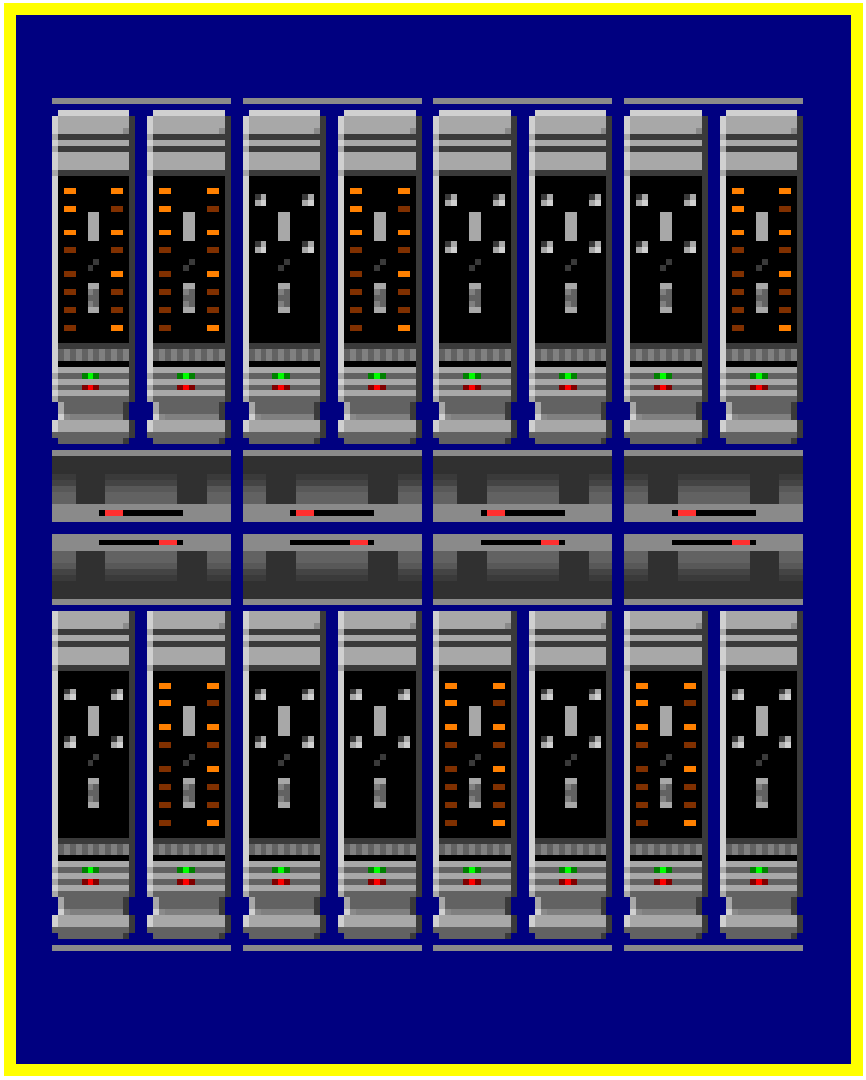
IPM-Industrial Power Module



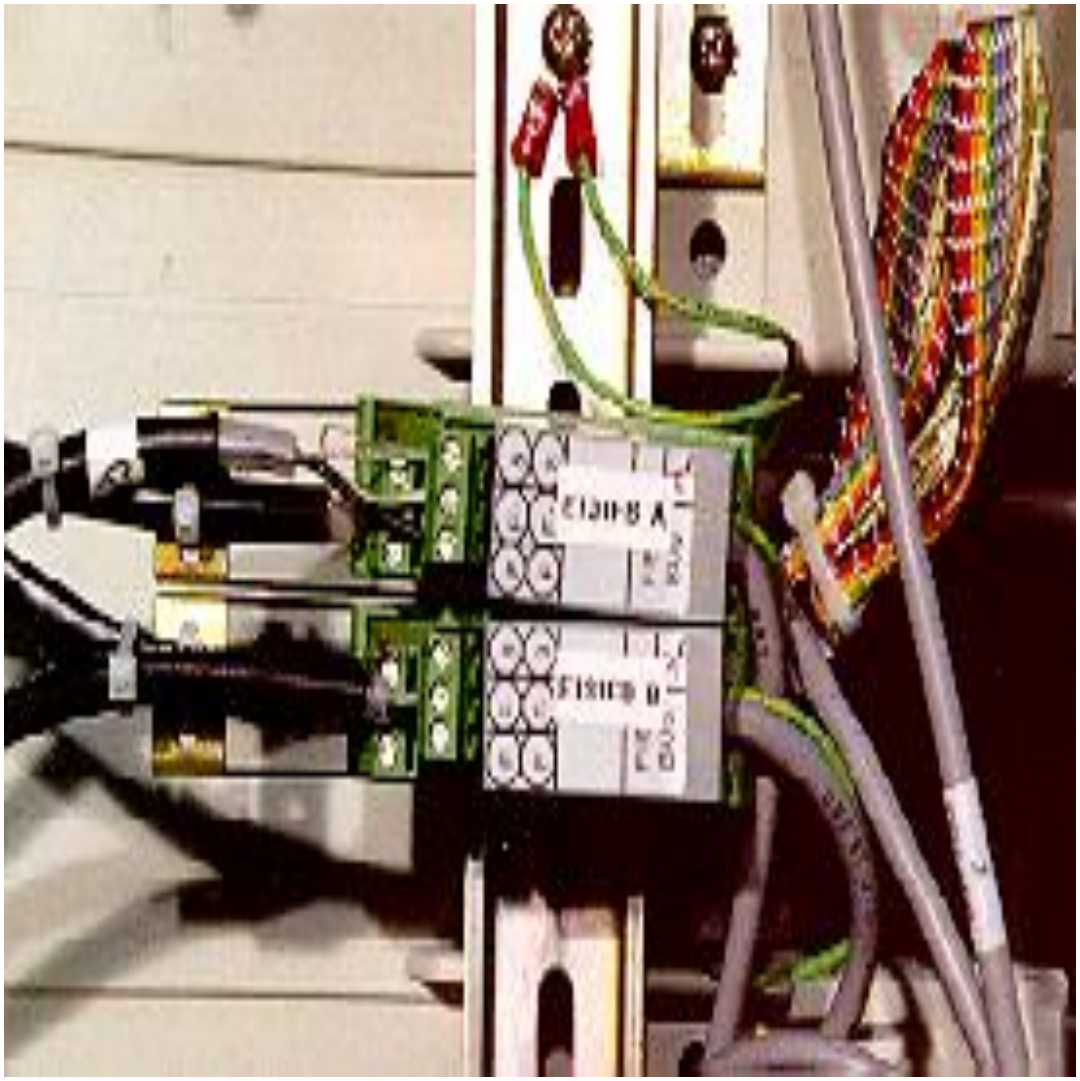
Power supply input to FBIs and FBMs is 110VDC

Power supply input to FBIs & FBMs

FBM-Fieldbus Modules



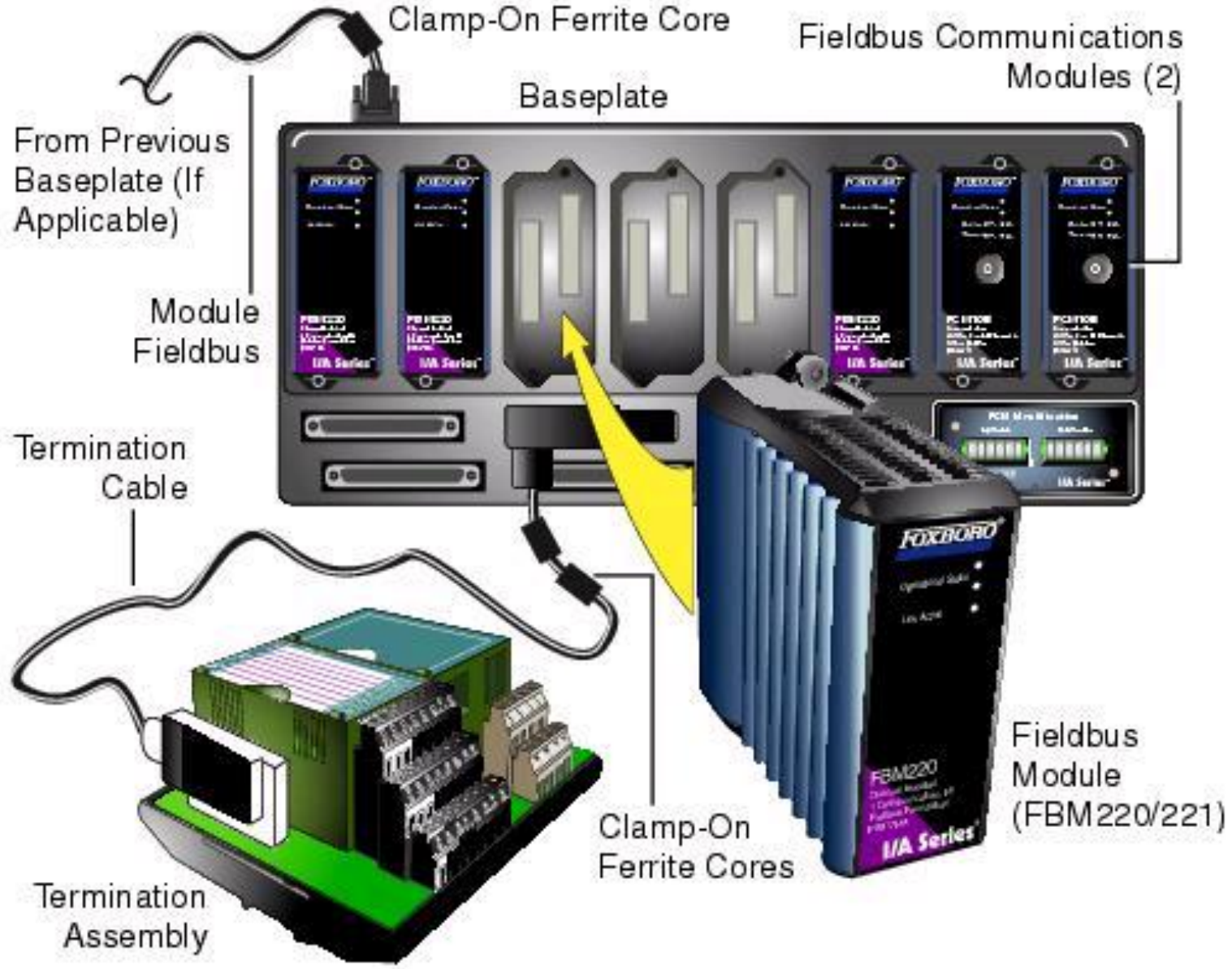
Example of an FBMs (nest in an IE32 Enclosure)



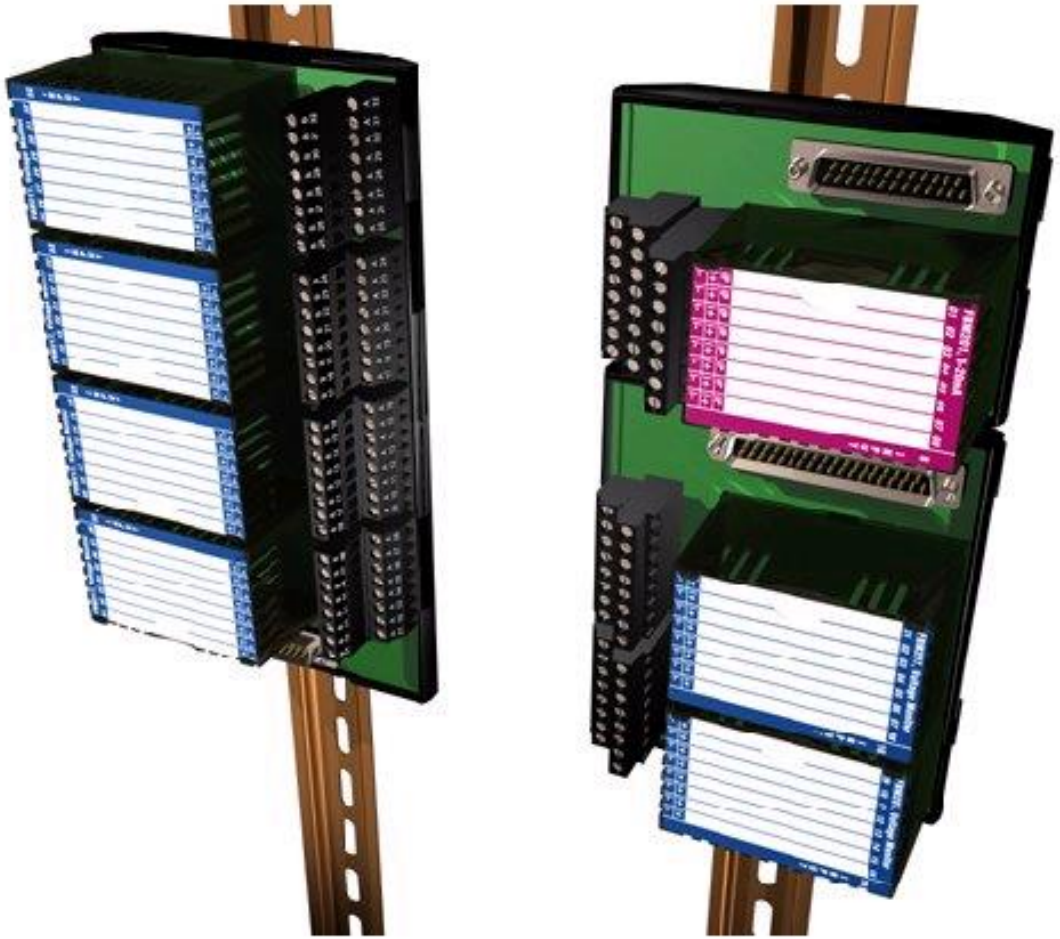
TCA on fault-tolerant Nodebus

“200 Series Products”

200 Series FBM (Field Bus Modules)


Clamp-On Ferrite Core
Fieldbus Communications Modules (2)
Baseplate
From Previous Baseplate (If Applicable)
Module Fieldbus
Termination Cable
Termination Assembly
Clamp-On Ferrite Cores
Fieldbus Module (FBM220/221)
FOXBORO
FBM220
I/A Series

200 Series Fieldbus Modules
FBM 220 & FBM 224



200 Series Fieldbus TCAs for FBM 220 & FBM 224

FCM10E

Run
Fail
Module Fieldbus (To FBMs)
Ethernet Trunk
Fieldbus, Coaxial
(to I/A Series Station)

FCM10Ef

Run
Fail
Module Fieldbus
(to FBMs)
Fiber Ethernet Trunk
Fieldbus (to I/A Series
Station)

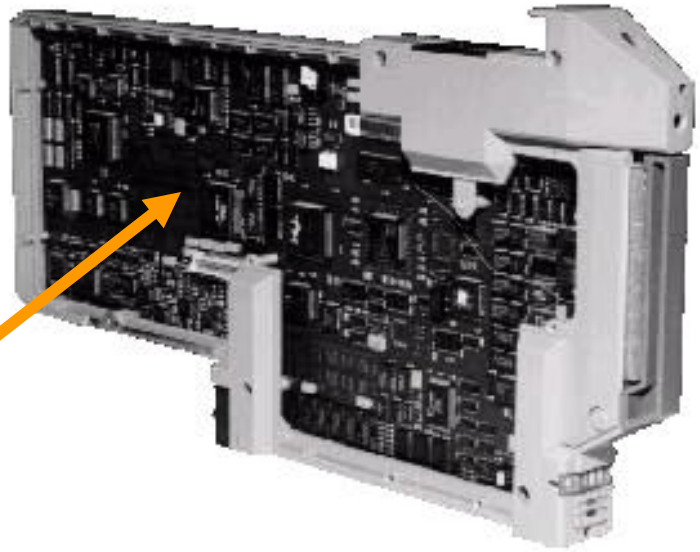
FCM2F2/4/10

Run
Fail
Module Fieldbus (to FBMs)
Fiber Module Fieldbus
(FCM2F to FCM2F)

Fieldbus Control Module (FCM)-200 Series

Fieldbus Module (FBM)

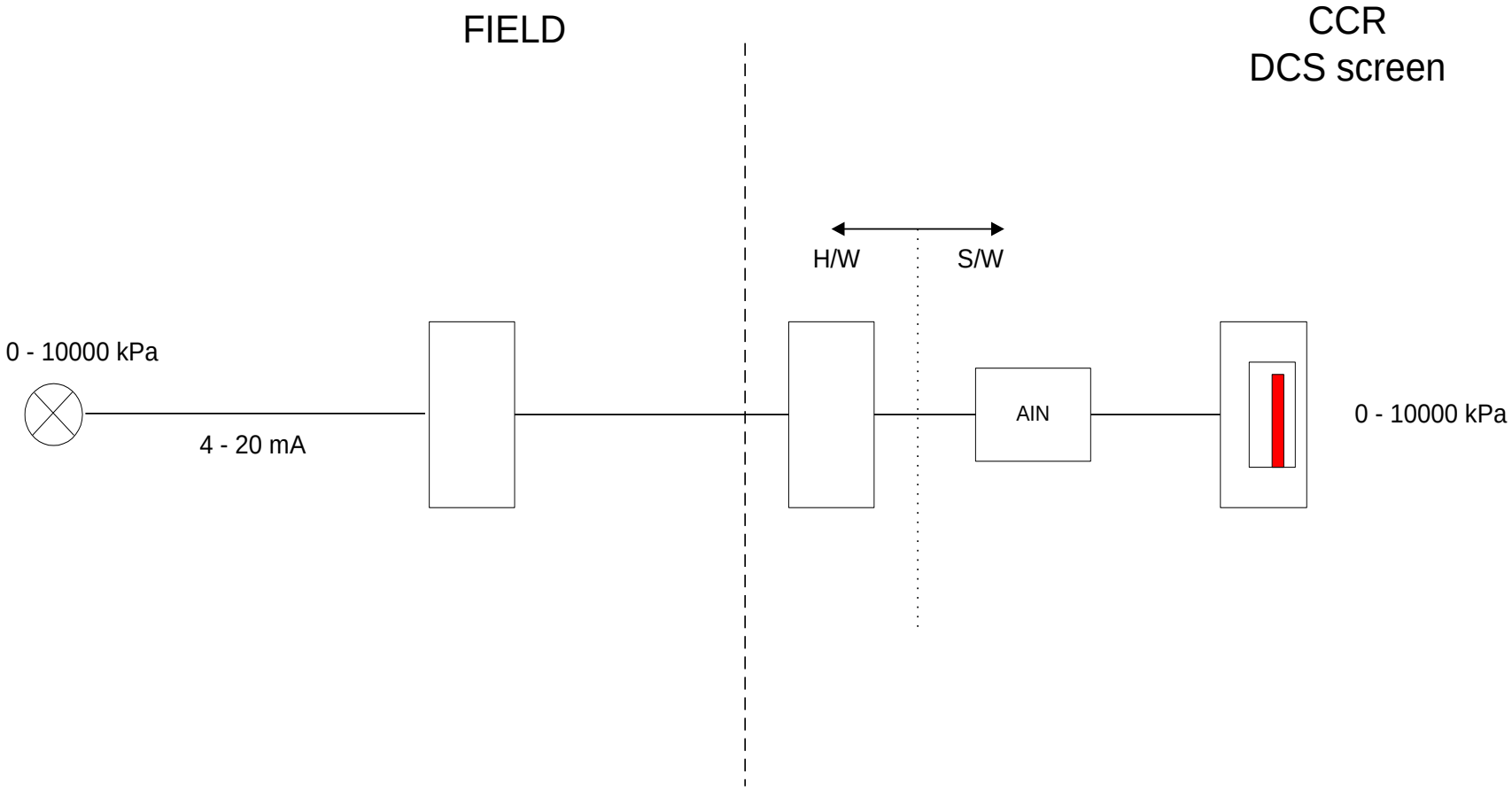
Fault Tolerant Control processor (CP)



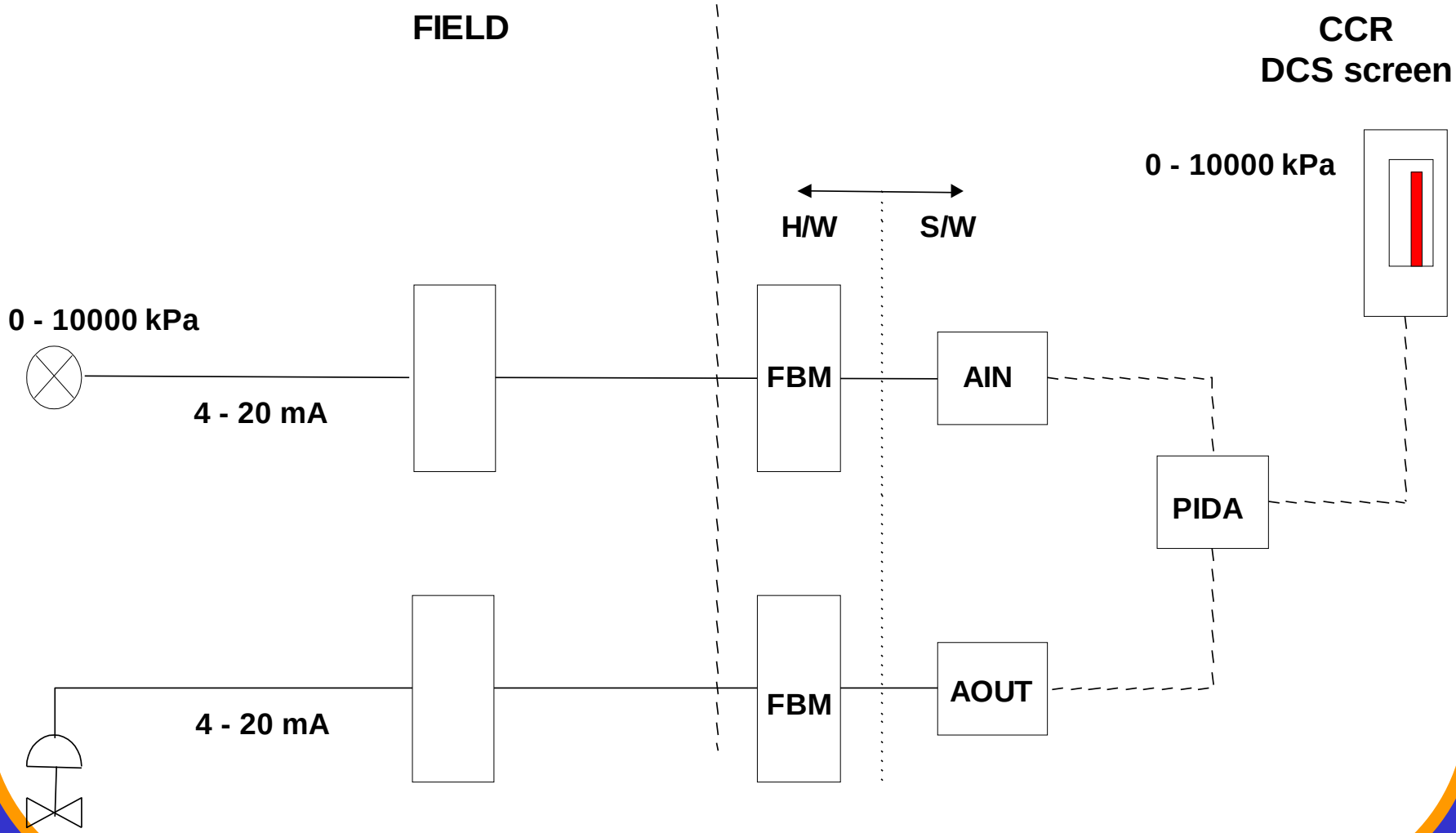
Internal view of a module processor

Control loops & problems

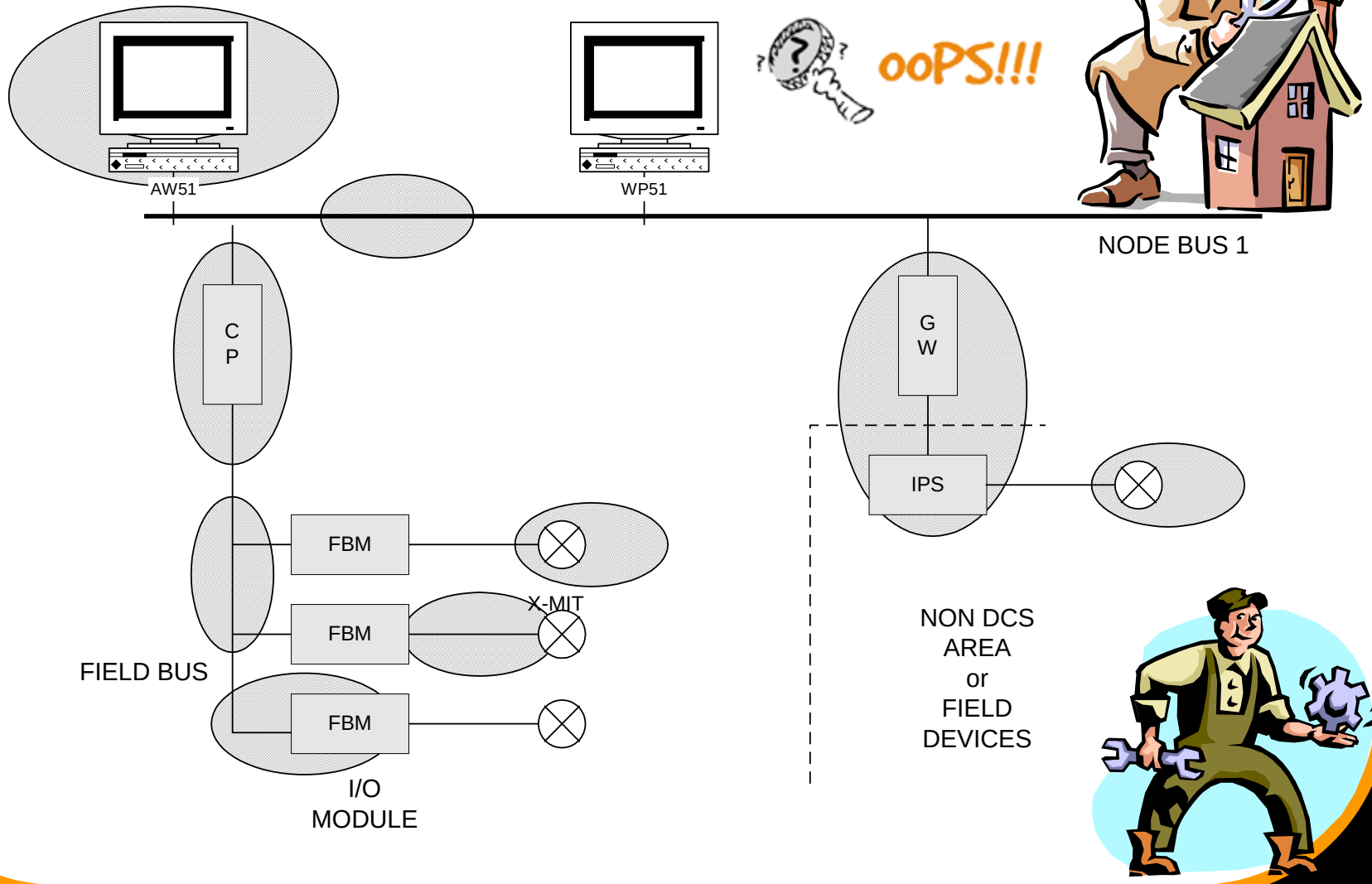
DCS Indicators



DCS Control Loop



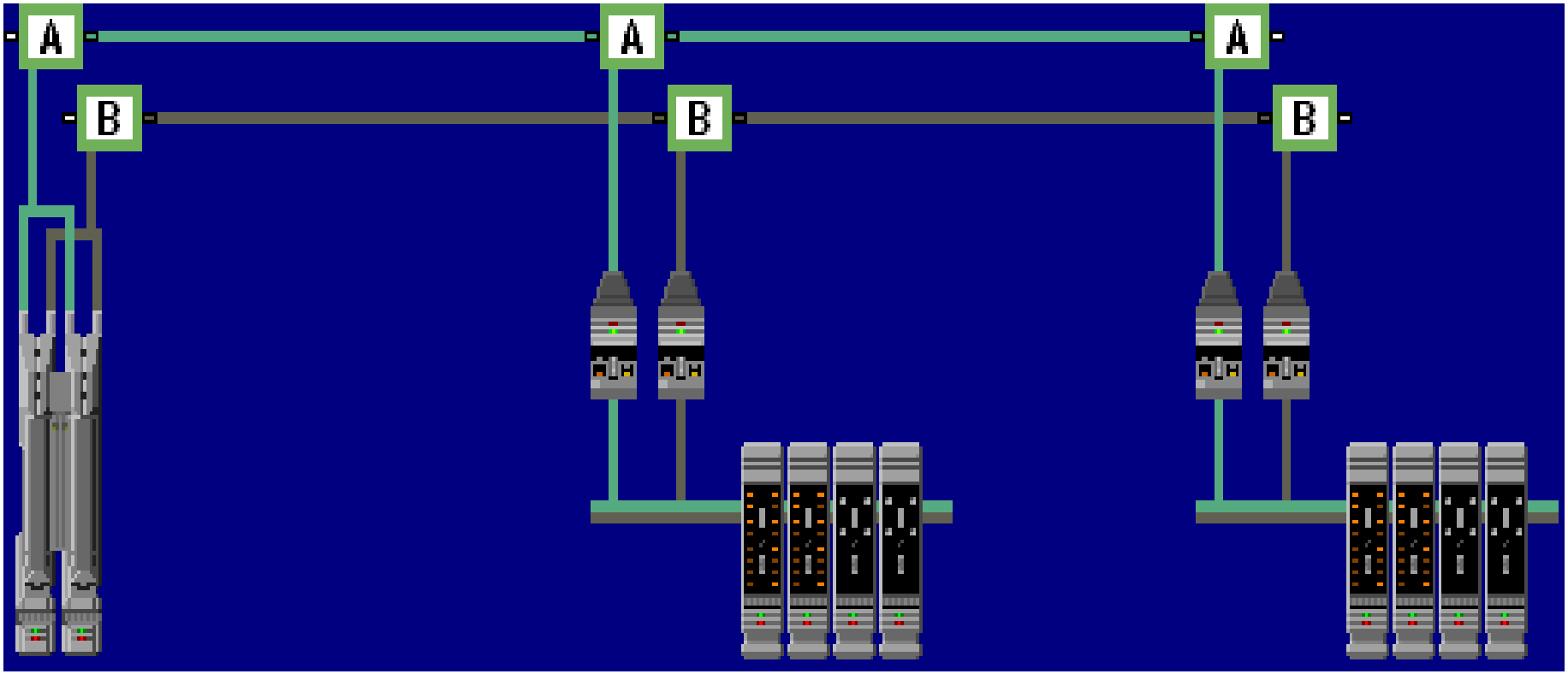
Problem areas



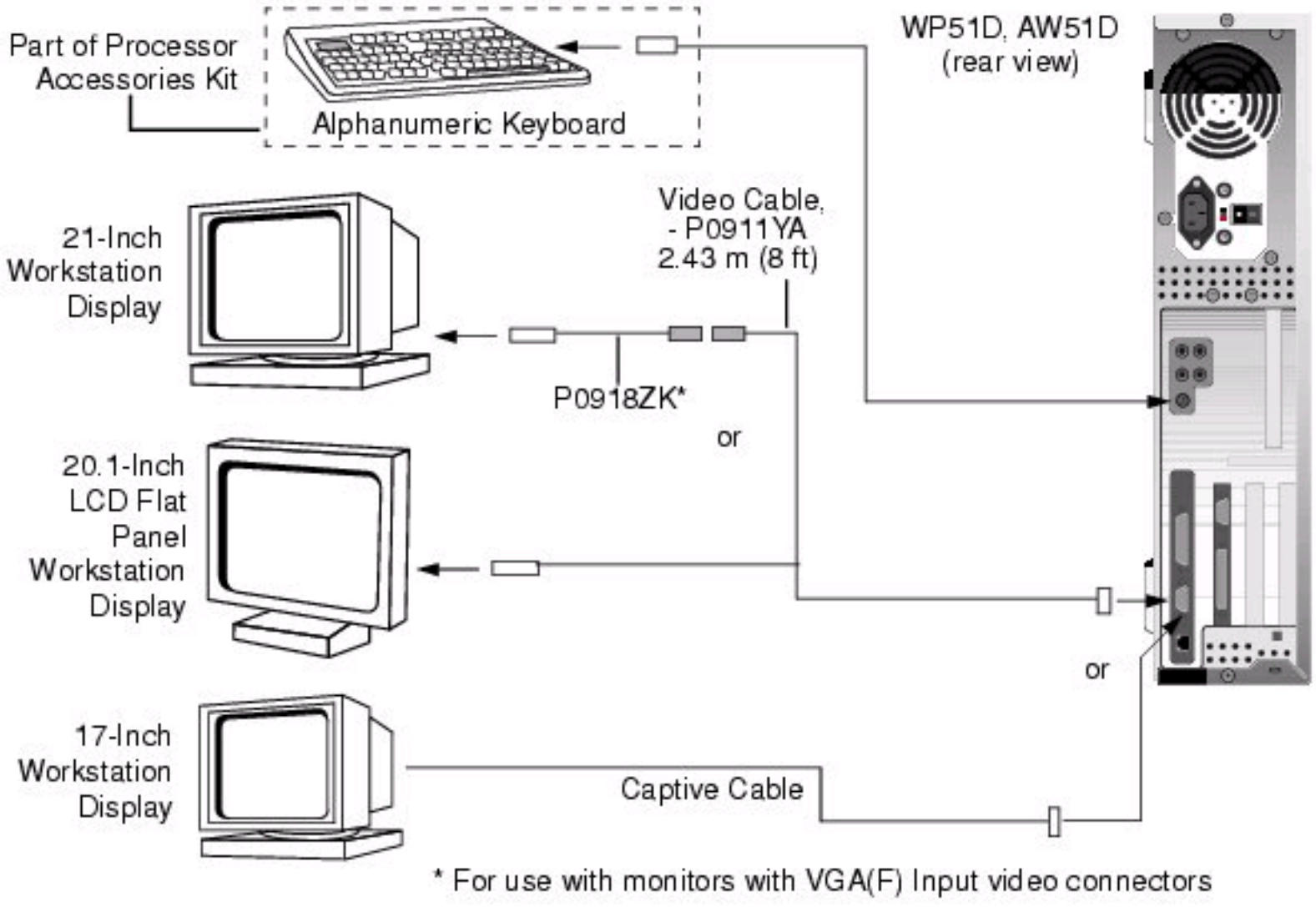

DCS
Distributed Control System
Coming up next…

DCS

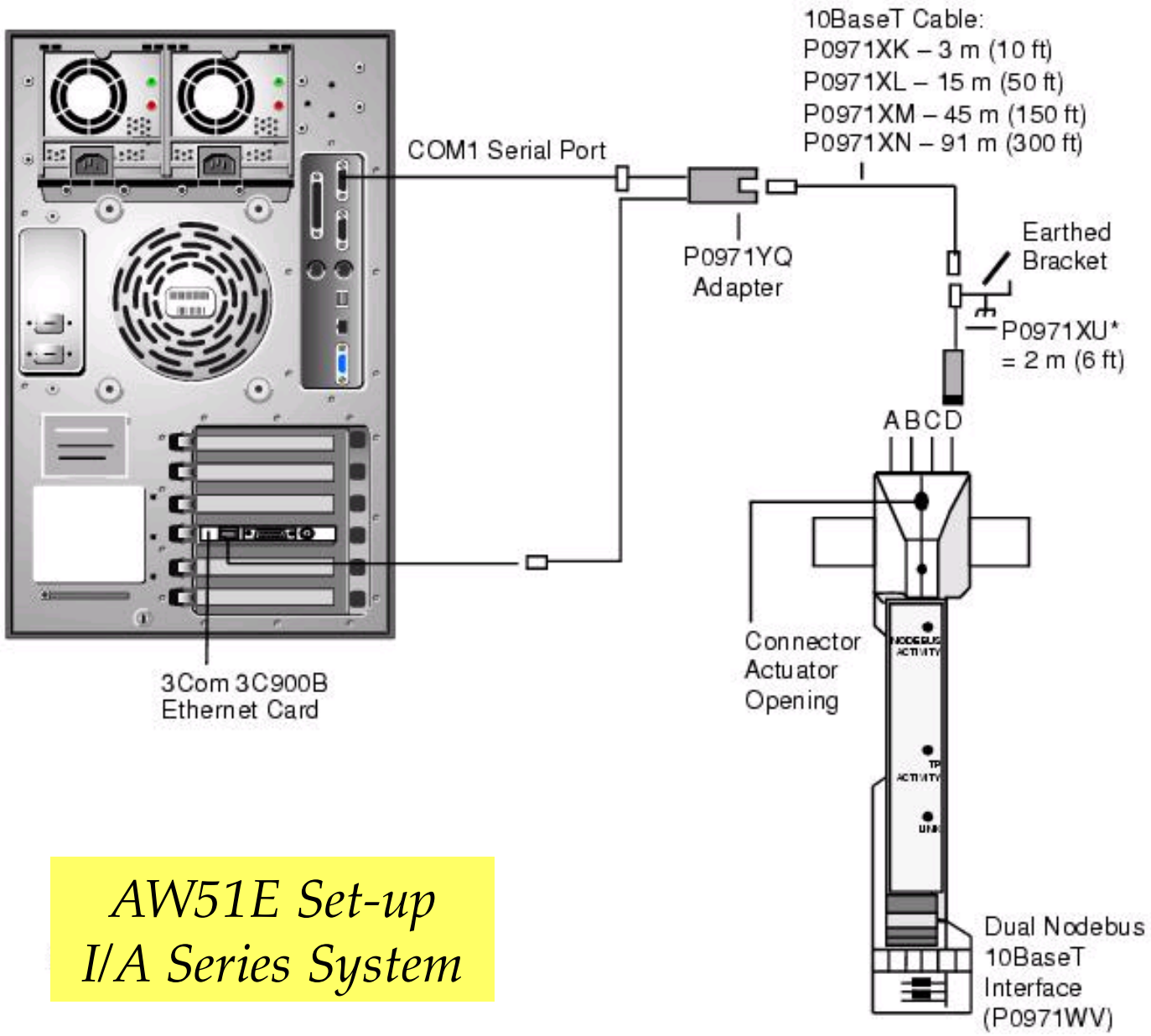
Distributed Control System



Redundant Fieldbus Modules with Fault Tolerant Control Processors


Part of Processor Accessories Kit
Alphanumeric Keyboard
WP51D, AW51D (rear view)
21-Inch Workstation Display
Video Cable, - P0911YA 2.43 m (8 ft)
P0918ZK*
or
20.1-Inch LCD Flat Panel Workstation Display
or
17-Inch Workstation Display
Captive Cable
* For use with monitors with VGA(F) Input video connectors

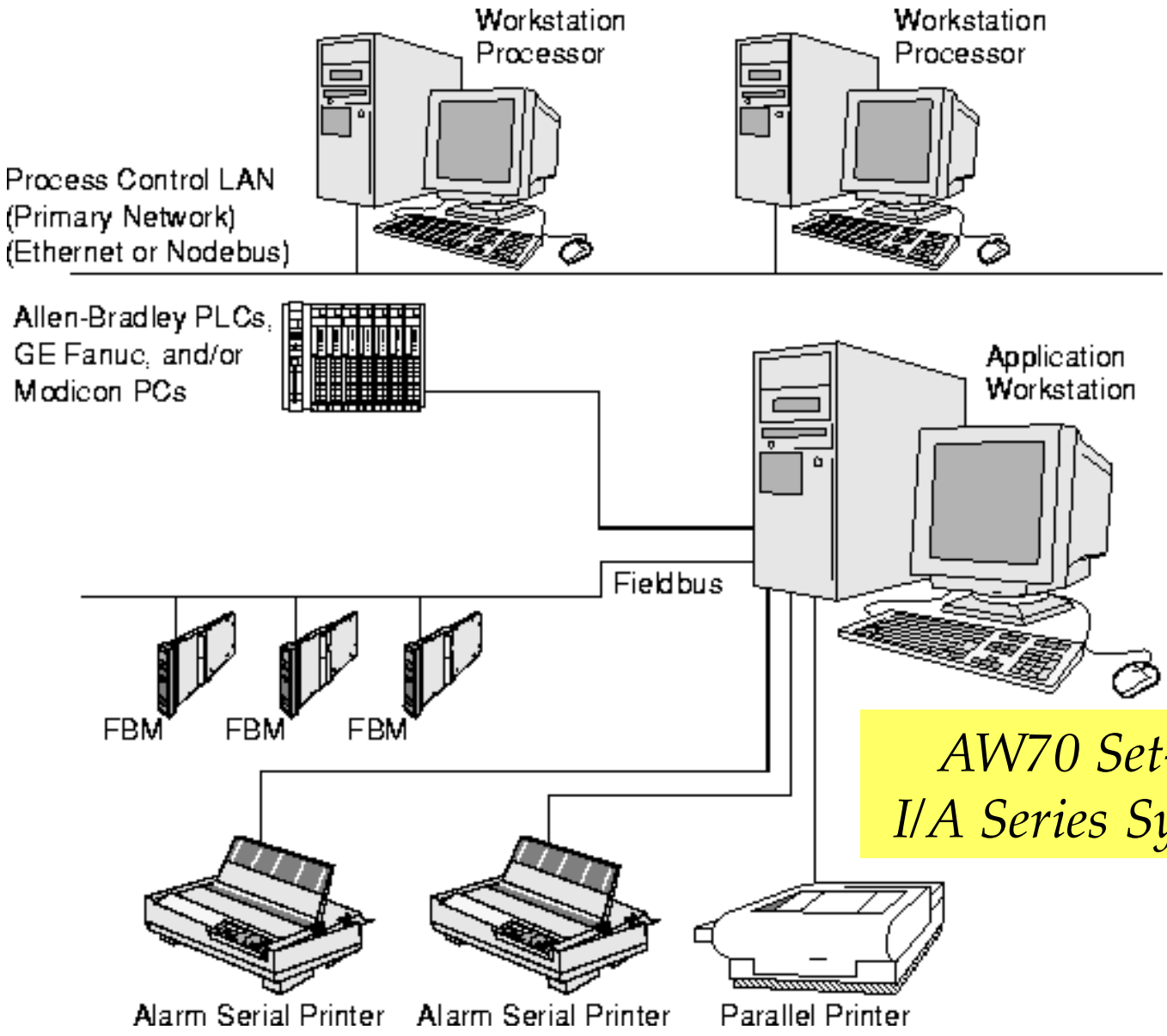
WP51D, AW51D



AW51E Set-up
I/A Series System

AW70
Workstation
Fieldbus
FBM
FBM
FBM
Alarm Serial Printer
Parallel Printer

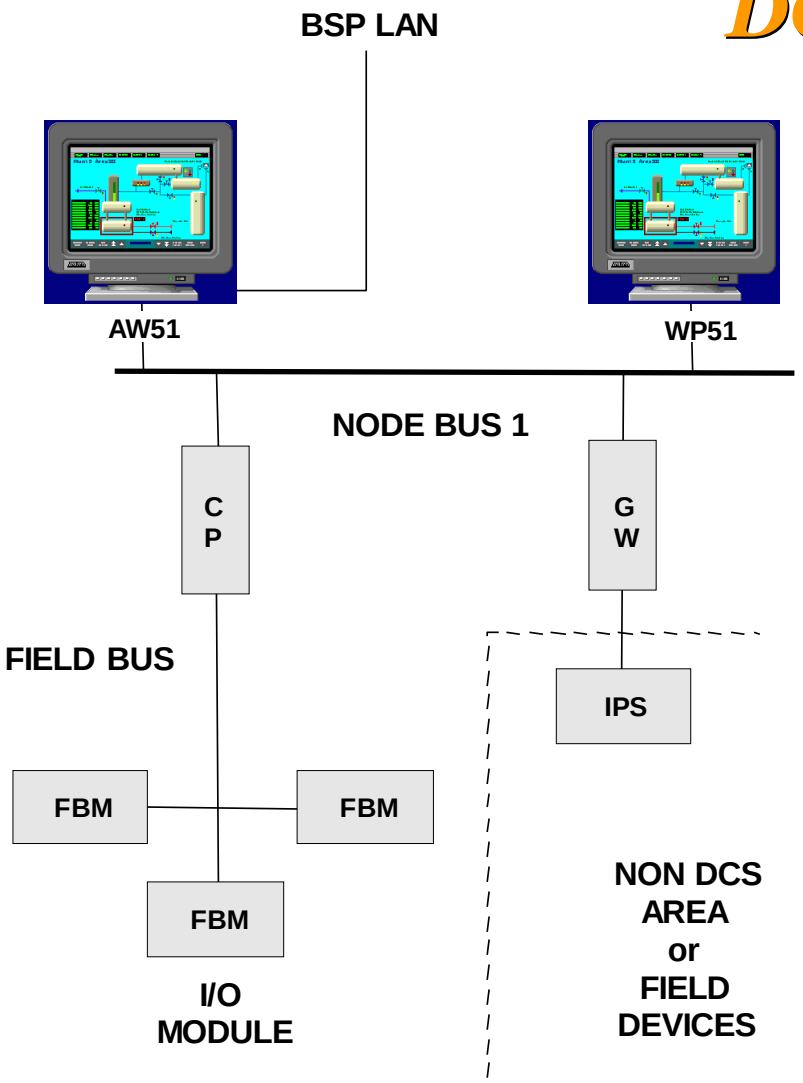
AW70 Layout



AW70 Set-up
I/A Series System


Summarise
on DCS

DCS ARCHITECTURE



HUMAN INTERFACE AND FILE SERVERS

DATA HIWAY
INTERCONNECTING BUS STRUCTURE

CONTROL PROCESSORS
GATEWAYS TO NON-DCS EQUIPMENT
SAFEGUARDING, F&G SYSTEMS, COMPRESSOR, CONTROL

FIELD INTERFACE MODULES
FIELD TRANSMITTERS, CONTROL VALVES

Foxboro DCS I/A Series System

Summarised

- A DCS is made up of many control modules that can operate simultaneously and independently.
- It has the ability to carry out rapid communications between these and other modules by means of a communications link called a real-time data highway.

Work Safely


FINISH
Thank you
and
all the best