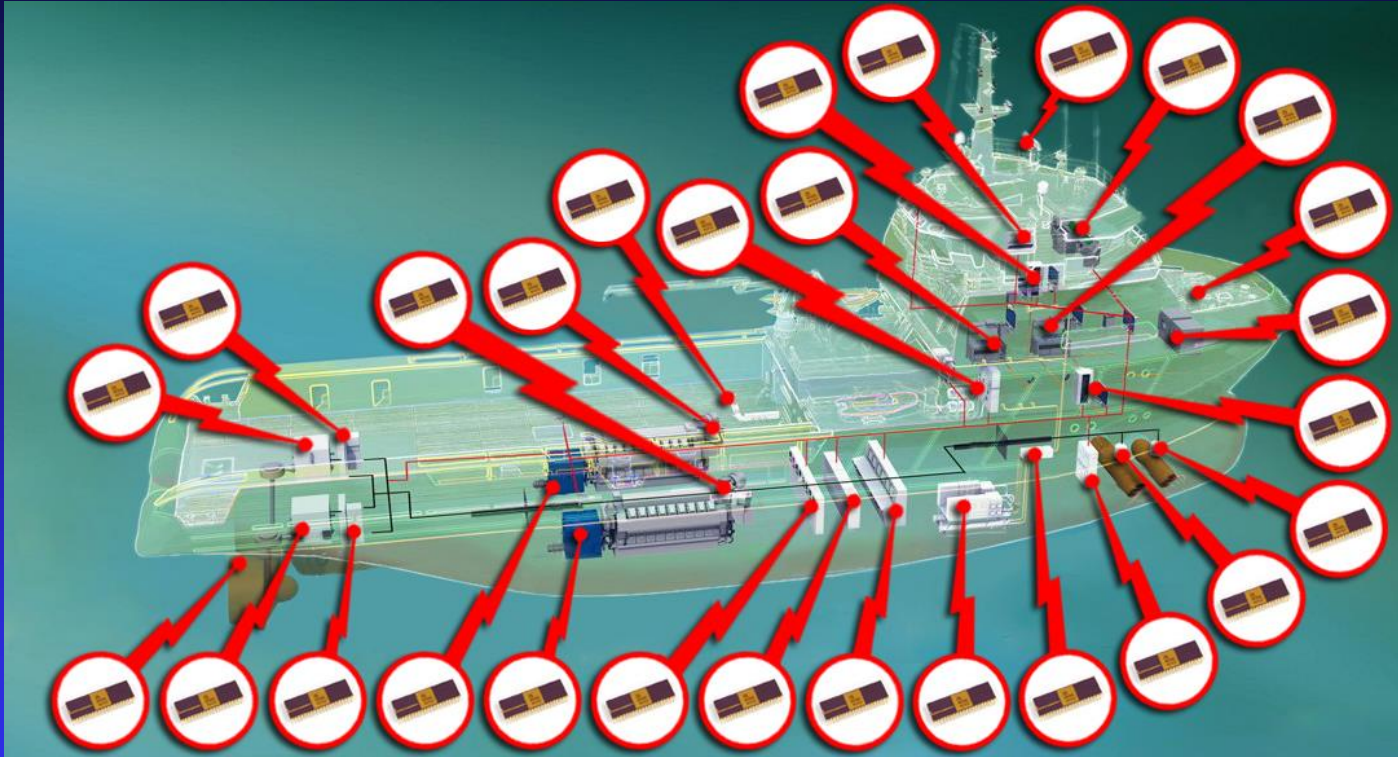


The introduction of Computer Systems in modern vessels



Are you aware of the consequences ?

By Kåre Høglund Chairman / Founder Høglund Group

Direct mechanical engine control



Computer Based engine control

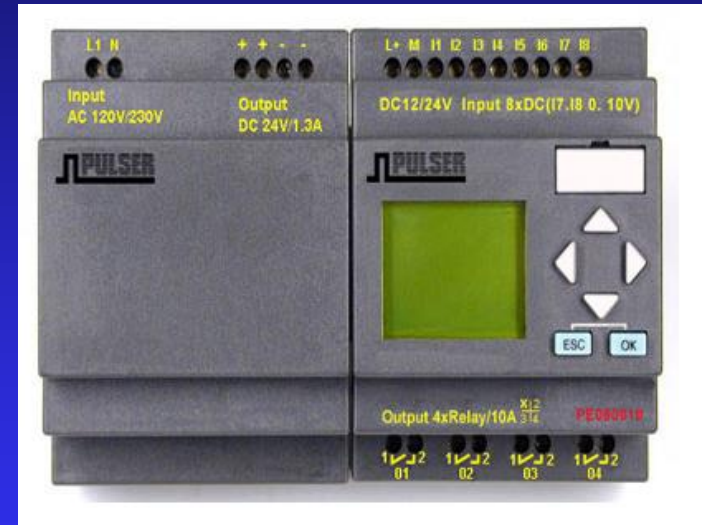


The cheap microprocessor

- One chip controller
- Complete PLC

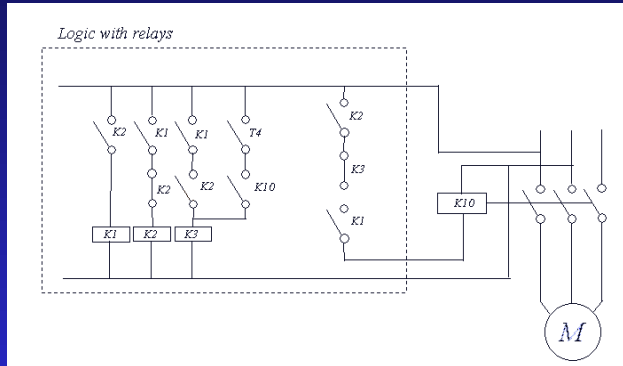


- Price \$10



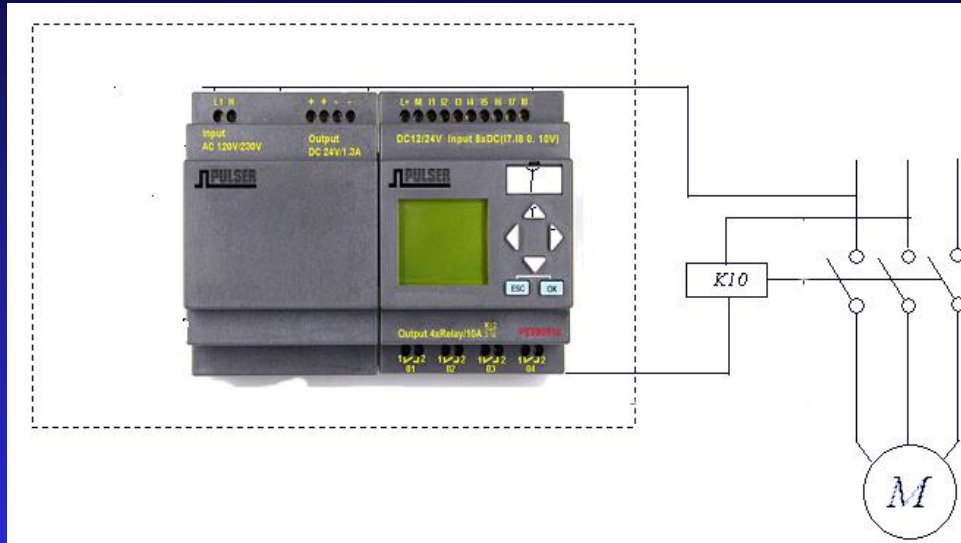
- Price \$100

Traditional relay control



- Purchase >\$500
- Connection >\$500
- Change >\$??

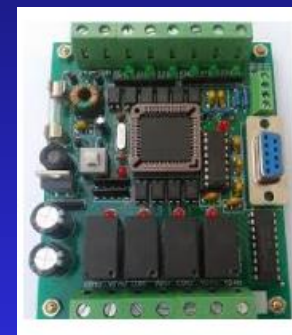
«Modern» Control



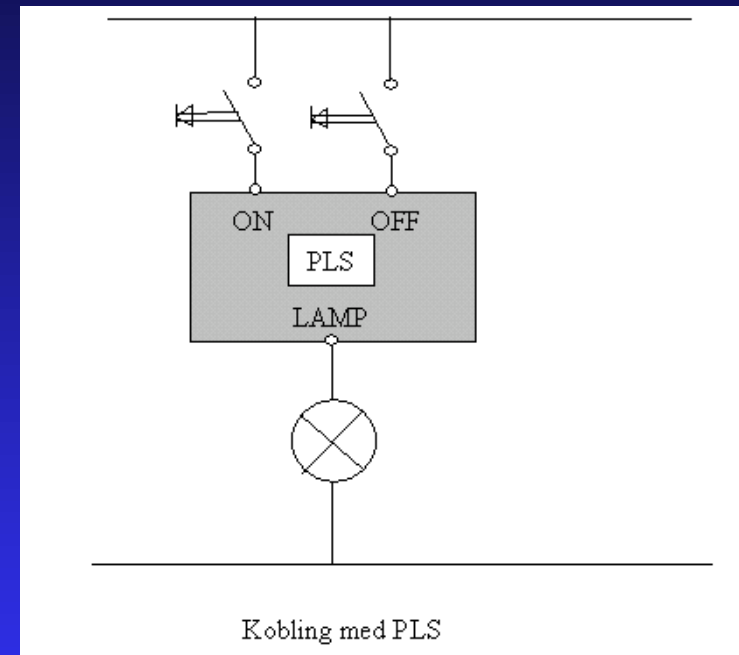
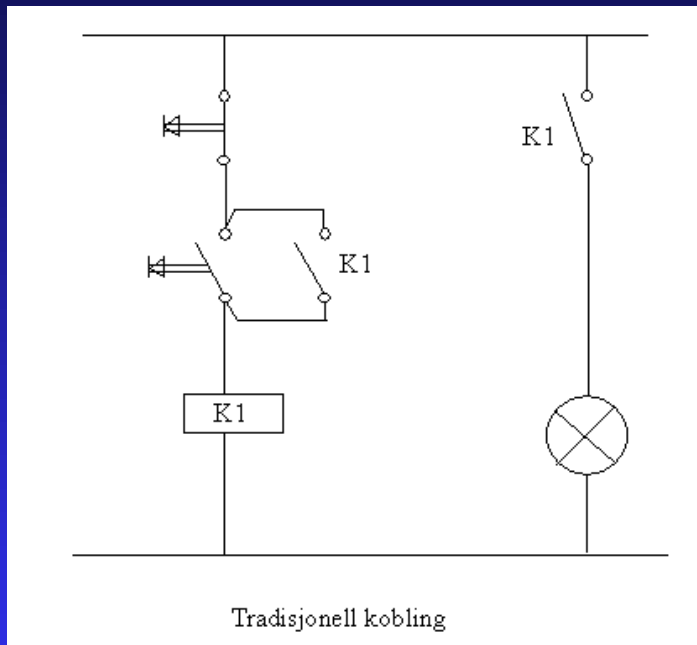
- Purchase <\$100
- Connection <\$50
- SW Change <Easy

Systems with microprocessors:

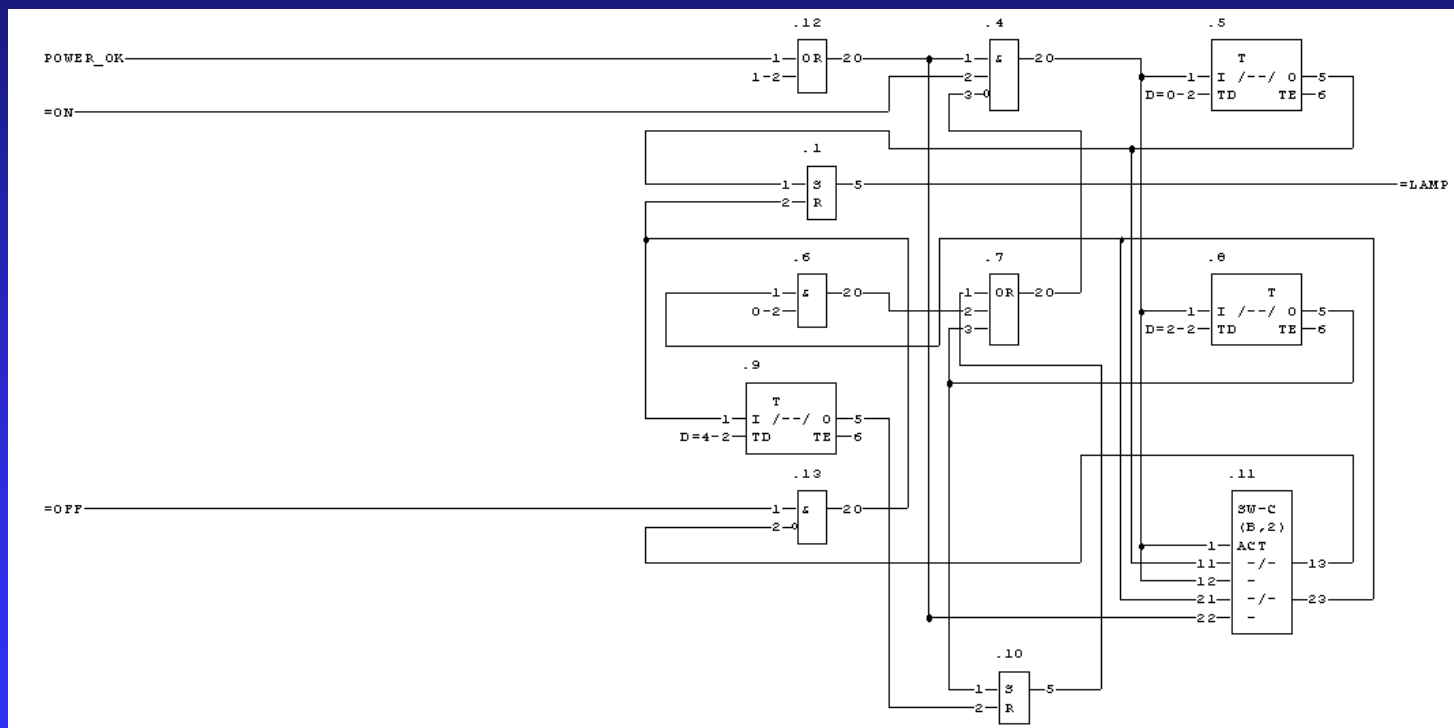
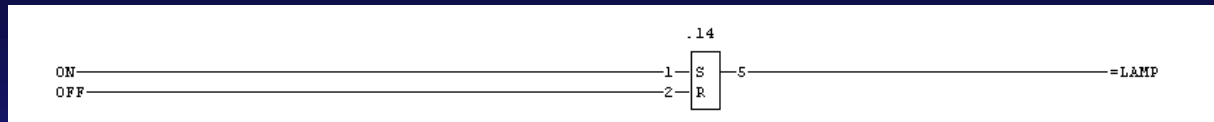
- Diesel Engine control systems
- Shut Down systems
- Governors
- Voltage Regulators (AVR)
- Power/Frequency/Current Converters
- Synchronizers
- Generator Breakers and Consumer Breakers
- Load Control / Blackout prevention systems
- Breaker interlocking systems
- Power Management Systems
- Fuel control systems
- Cooling control systems
- Propulsion Drive systems



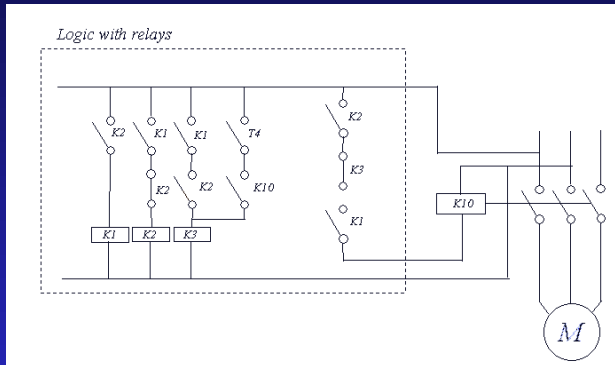
Simple Control



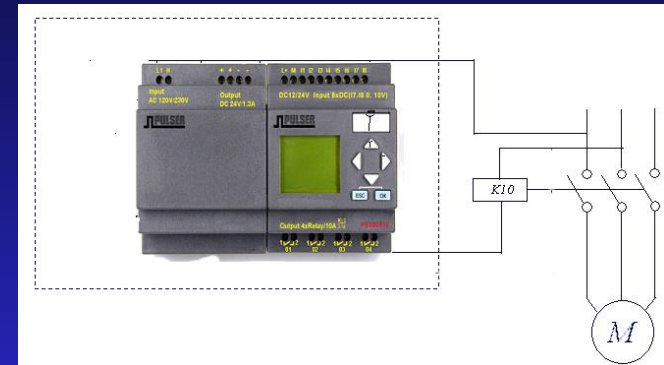
Code example



Repair / Fault Tracing



- Any electrician can fix the problem



- Rectifying action not possible without correct SW and tools

Parameters

- An advanced vessel may have 50 000 parameters
- How to keep track of these parameters?
- Do you know the consequences if one single parameter is changed?



*This is a module used for hydraulic valve control with variable opening. This unit contains a CPU and has a number of **parameters** that need to be set in order for the unit to operate correctly.*

Such units play an important role in e.g. an expensive crane installation and may cause a million-dollar damage.

The SW Quality challenge

- Lack of SW understanding throughout the whole industry
 - Due to:
 - Relatively new technology
 - Outdated education and certification rules
 - Lack of computer understanding among ship owners
 - Suppliers adopting technology far beyond their level of competence
 - Large companies offering poor solutions, covered behind a known LOGO
 - Copying earlier solutions without understanding the system
 - Inadequate methods for control and SW verification
 - Increased use of small PLCs with no way of verifying the SW

Certificates

- The Welder
- The weld can be inspected
- It can be X-rayed
- The welder still needs a

CERTIFICATE



Certificates

■ The Electrician

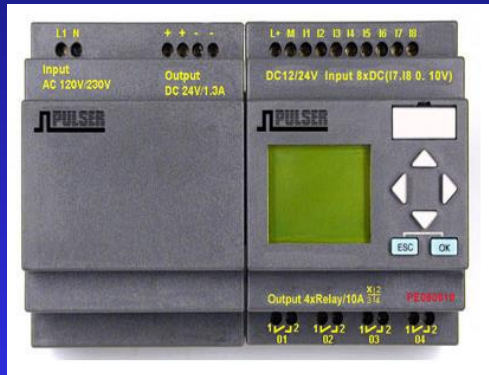
- A cable can be inspected
- Connections are visible
- The electrician still needs a

CERTIFICATE



Certificates

- The Programmer
- Code is NOT visible



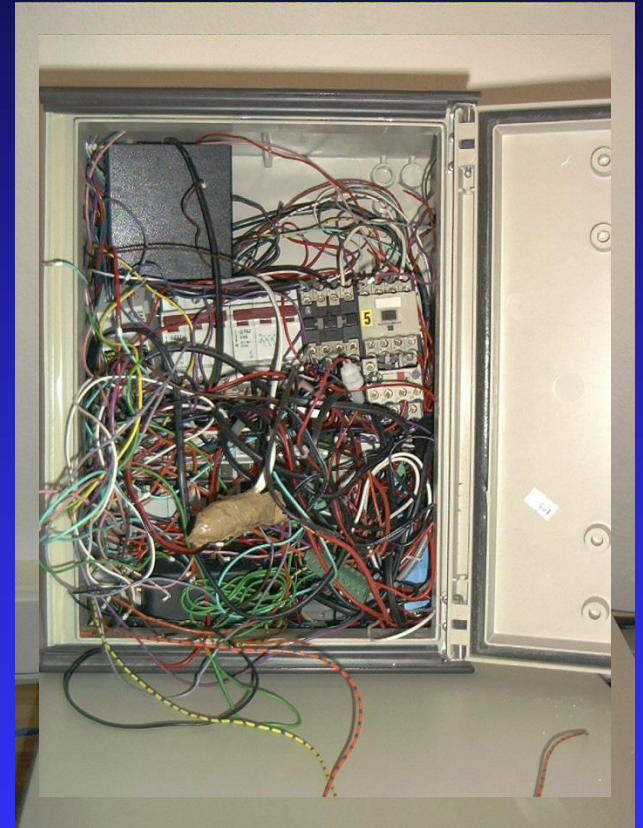
But the programmer does NOT need a
CERTIFICATE



How is the SW verified ?

Nice cabinet

Let's open the door



What is missing ?

- Skill requirements for SW/HW
- SW Test ??? HIL ?????
- SW verification – code review
- Proven track record - Online reporting - system performance

PLC Failure Story 1



PLC Failure Story 2



Mysterious Engine Shut Down



Minimum PLC requirements

- Limit the number of PLCs
- Limit the types/brands of PLCs
- Keep spare units on board
- Require Latest SW to be stored on board
- Keep necessary tools for uploading SW
- Keep track of battery replacement
- Require a revision log and parameter log
- Quality requirements to the supplier
- Update HW regularly, or check availability
- Do not accept rebooting as a solution

Thank you for listening.