



## 16 K-Chief 700

16.26 Redundancy

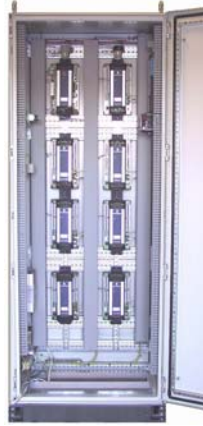
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Document name:     **Wiring Diagram**  
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## Objective

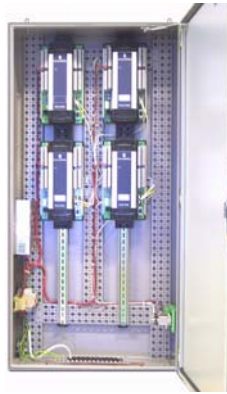


- Be familiar with the redundancy terminology and types
- Know the difference between shared and redundant RIO
- Know how to look for status and operate in "PS Operation" dialogue box
- Know how to look for status and operate in "Redundant stations" dialogue box

## Field Station Cabinets



FS-400  
FS-400C  
FS-400C-R1



FS-240  
FS-240C  
FS-240C-R1



FS-120  
FS-120C  
FS-120C-R1

FS-60  
FS-60C

## Terminology



- Redundancy Group
  - A set of PSEs, each equally equipped and able to solve a task alone, but working together in the purpose of solving the task with a greater degree of reliability and availability.
  - Identified typically as RCU A and RCU B
- Redundancy types
  - Hot Standby
  - 1oo2
  - DpDual
  - DpTriple

## Terminology



- **PS Capability**
  - Reflects if the PS and its associated IO equipment is technically capable to fulfill its intended purpose
  - Master PS will be the most capable RCU in the group

| Capability   | Description                  |
|--------------|------------------------------|
| OK           | A PS without errors          |
| Common error | A PS with only common errors |
| Degraded     | A PS with separate errors    |
| Incapable    | An incapable, but running PS |

## Terminology



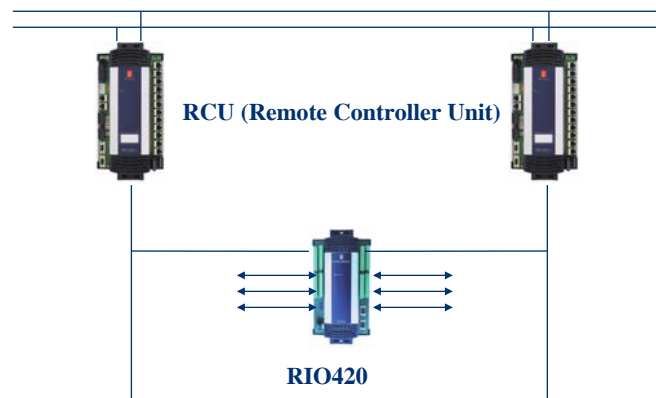
- **Master PS**
  - One PS is always selected master
  - Master PS is designated for a specific task only done by a single PS on behalf of the group
- **Control States**
  - Online - Contributing to the control of the process
  - Offline - Not contributing to the control of the process
- **Redundancy Switch**
  - The mechanism that decides which PS is master and which PSes are online, either automatically or as a result of an operator intervention

## Redundancy Types

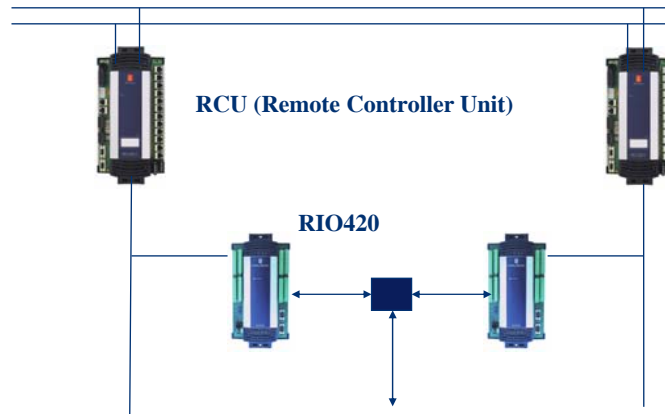


- Hot Standby (dual)
  - Pure master/slave redundancy
  - Used in normal, high demand control systems to increase system availability.
  - The master PS controls the process
  - Slave is running as Hot Standby, ready to take control if the current master detects errors or fails completely.
- 1oo2 (dual)
  - Two-channel redundancy used in low demand, shutdown type safety systems
  - Each PS evaluate process input independent of the other, executes the safety logic and contributes to the control of outputs through worst-case voting
  - In the event of a PS failure, the failing PS will step back and let the other control the process alone.
  - This redundancy type is limited to digital output signals.

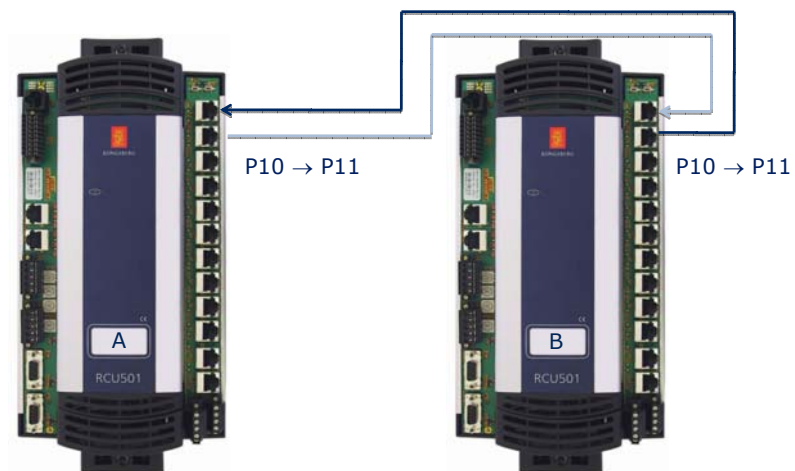
## Redundant RCU and shared RIO



## Redundant RCU and dual RIO



## RCU501 RedNet



## RedNet



- Local Communication between members of the Redundancy Group
- Two Crossover UTP Cables ( $\geq$  CAT5)
- Synchronization Purposes
  - Redundancy switchover
  - Scan control
  - Control logic
  - IO data
- RedNet Backup
  - RBUS (HotStandby)
  - Process Nets (1002)

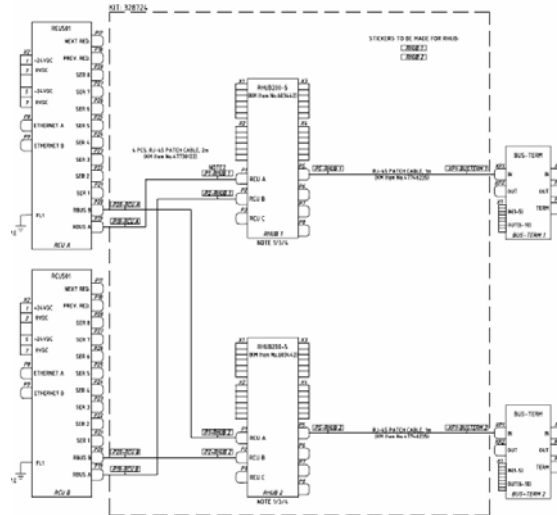


## Switch Criteria

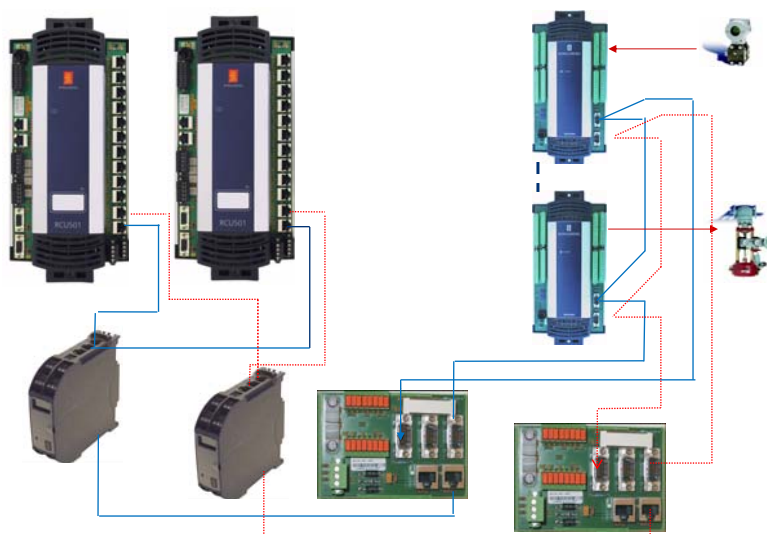


- PS-, and IO- file inconsistency
- RBUS Access is missing
- Access to Process Network is missing
- RedNet is missing
- Missing access to Serial Lines
- Online Configuration
  
- System will switch to the most capable PS
  
- Errors on sensors and RIO modules will NOT lead to a redundancy switch since they are shared between PSes

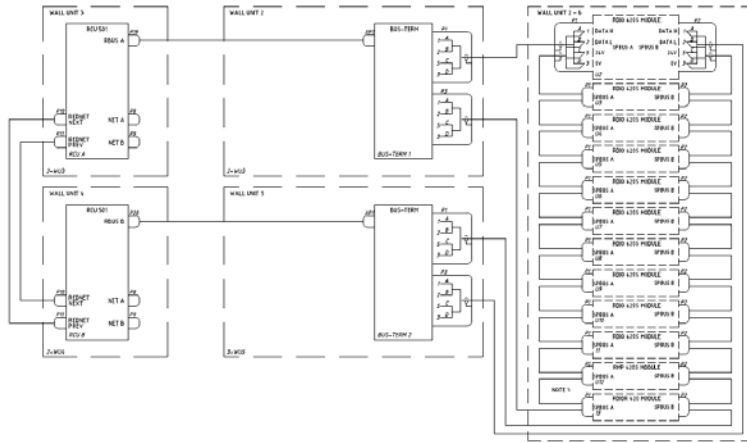
# Power and Wiring with R-Hub - Hot Standby



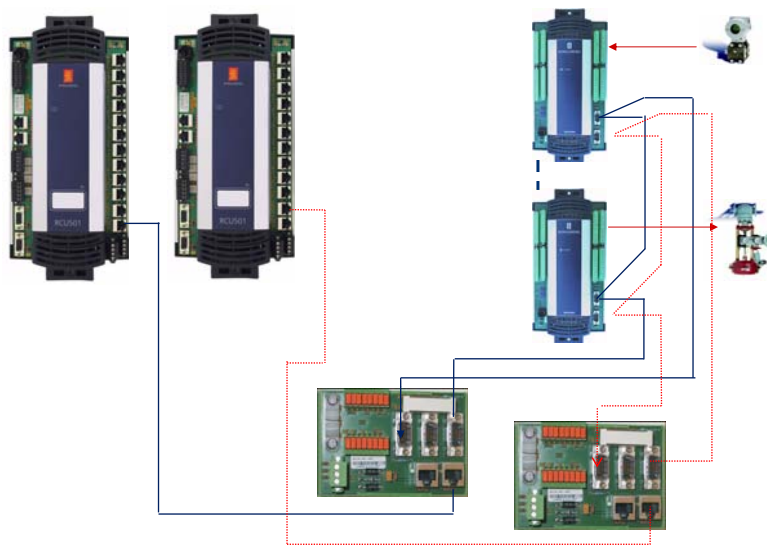
# R-BUS Redundancy – Hot Standby



## Wiring Diagram without HUB - 10o2



## R-BUS Redundancy – 10o2





## System Status – PS Redundancy



| Station | Status      | Redundancy group | Role | Capability   | Master  | Running mode | Type        |
|---------|-------------|------------------|------|--------------|---------|--------------|-------------|
| PS031   | Operational | FS31             | A    | OK           | Active  | Running      | Hot Standby |
| PS032   | Operational | FS32             | A    | Common Error | Active  | Running      | Hot Standby |
| PS033   | Operational | FS33             | A    | OK           | Active  | Running      | Hot Standby |
| PS034   | Operational | FS34             | A    | OK           | Active  | Running      | Hot Standby |
| PS035   | Operational | FS35             | A    | OK           | Active  | Running      | Hot Standby |
| PS036   | Operational | FS36             | A    | OK           | Active  | Running      | Hot Standby |
| PS037   | Operational | FS37             | A    | OK           | Active  | Running      | Hot Standby |
| PS038   | Operational | FS38             | A    | OK           | Active  | Running      | Hot Standby |
| PS039   | Operational | FS39             | A    | OK           | Active  | Running      | Hot Standby |
| PS040   | Operational | FS40             | A    | OK           | Active  | Running      | Hot Standby |
| PS071   | Operational | FS71             | A    | OK           | Active  | Running      | 1oo2        |
| PS072   | Operational | FS72             | A    | OK           | Active  | Running      | 1oo2        |
| PS073   | Operational | FS73             | A    | OK           | Active  | Running      | 1oo2        |
| PS074   | Operational | FS74             | A    | OK           | Active  | Running      | 1oo2        |
| PS075   | Operational | FS75             | A    | OK           | Active  | Running      | 1oo2        |
| PS081   | Operational | FS81             | A    | OK           | Active  | Running      | 1oo2        |
| PS111   | Operational | FS31             | B    | Degraded     | StandBy | Running      | Hot Standby |
| PS112   | Operational | FS32             | B    | Common Error | StandBy | Running      | Hot Standby |
| PS113   | Booting     | FS33             | B    | OK           | StandBy | Starting     | Hot Standby |

PS Status / PS Backup / PS Loading / PS Redundancy / OS/HS Status / Net Status

- Use System Status to get information regarding redundancy

## PS Operation

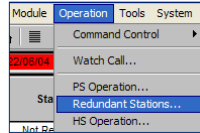


From the menu: Operation > PS Operation

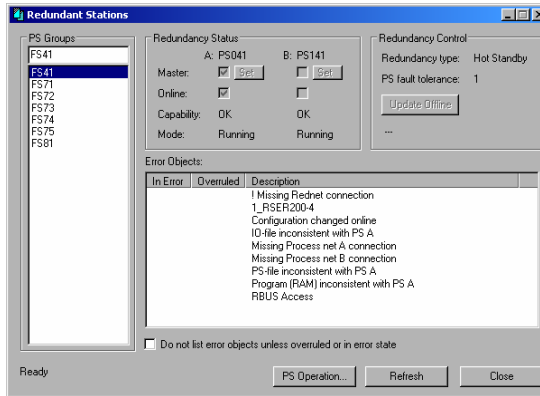
Shows:  
 Redundancy type: Hot Standby  
 PSs in group: 41 and 141  
 Master and Online: 41

Configuration mode for redundancy can be set

## Redundant Stations



From the menu: Operation > Redundant Stations



Shows:  
Redundancy Status  
Error Objects

## Exercise: Redundancy



## Summary



- Redundancy switch criteria
- Field station cabinets with redundancy, C-R1
- Terminology
  - Redundancy Group
  - Master PS
  - Online
- Redundant RCU, single or shared RIO
- Wiring Diagram, Handshake signal
- Capability
- Redundancy type
  - Hot Standby
  - 1oo2
- PS Operation, status and set configuration mode
- Redundant stations, status and error handling