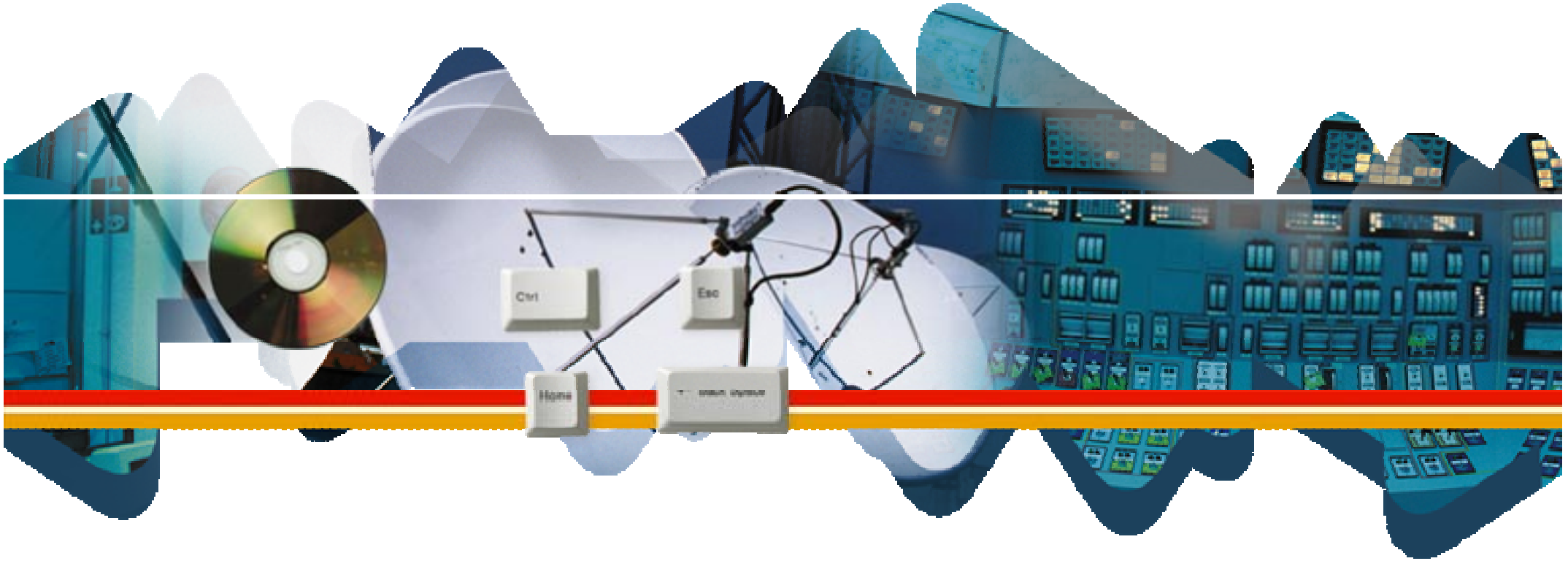
DTE Power via MDI
DC Feeding Voltage

Ed:2 of 07 Sept. 00



ALCATEL

Summary

- Objectives of the analysis
- Terminations to be powered
- Reduced voltage range scheme
- Impact of reduced voltage range feeding
- Extended voltage range scheme
- Impact of extended voltage range feeding
- Feeding and discovery without insulation
- Feeding and discovery with insulation
- Solution (extended voltage range)
- Solution (reduced voltage range)
- Conclusion
- Proposal

Objectives of the Analysis

- Impact of the voltage range choice on the systems

The choice of the voltage range (Extended or reduced) will have a large impact on the following aspects which will be discussed hereafter

  - Impact on the feeding architecture
  - Impact on feeding and discovery schemes
  - Impact on Cost , Volume , thermal management

Terminations to be powered

Proprietary sets

DECT

LAN

LAN

LAN

S0 Plugware

ISDN (S0)

Voice Mail
e-Mail server
Internet access

FAX

SWITCH

LAN

IP phone

Tie Lines
- Analog
- Digital (QSIG)

PABX

RS232
or LAN

LAN

Networks

Analog (DDI/NDDI)
ISDN (T0/T1/T2)

VoIP (hop on/hop off)
Web access

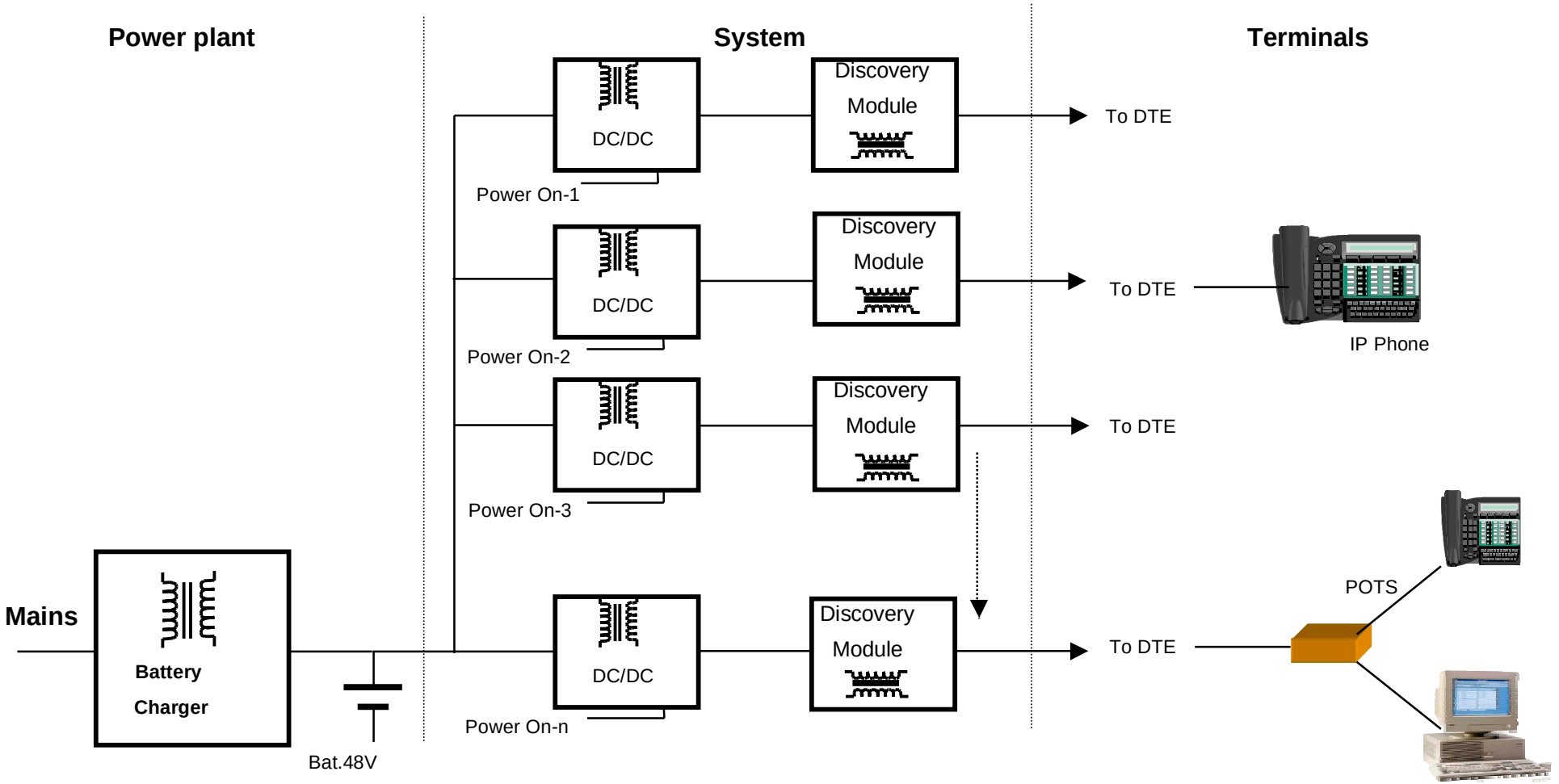
INTERNET

10base

Management

Reduced voltage range feeding scheme

Reduced voltage range feeding Environment A & B

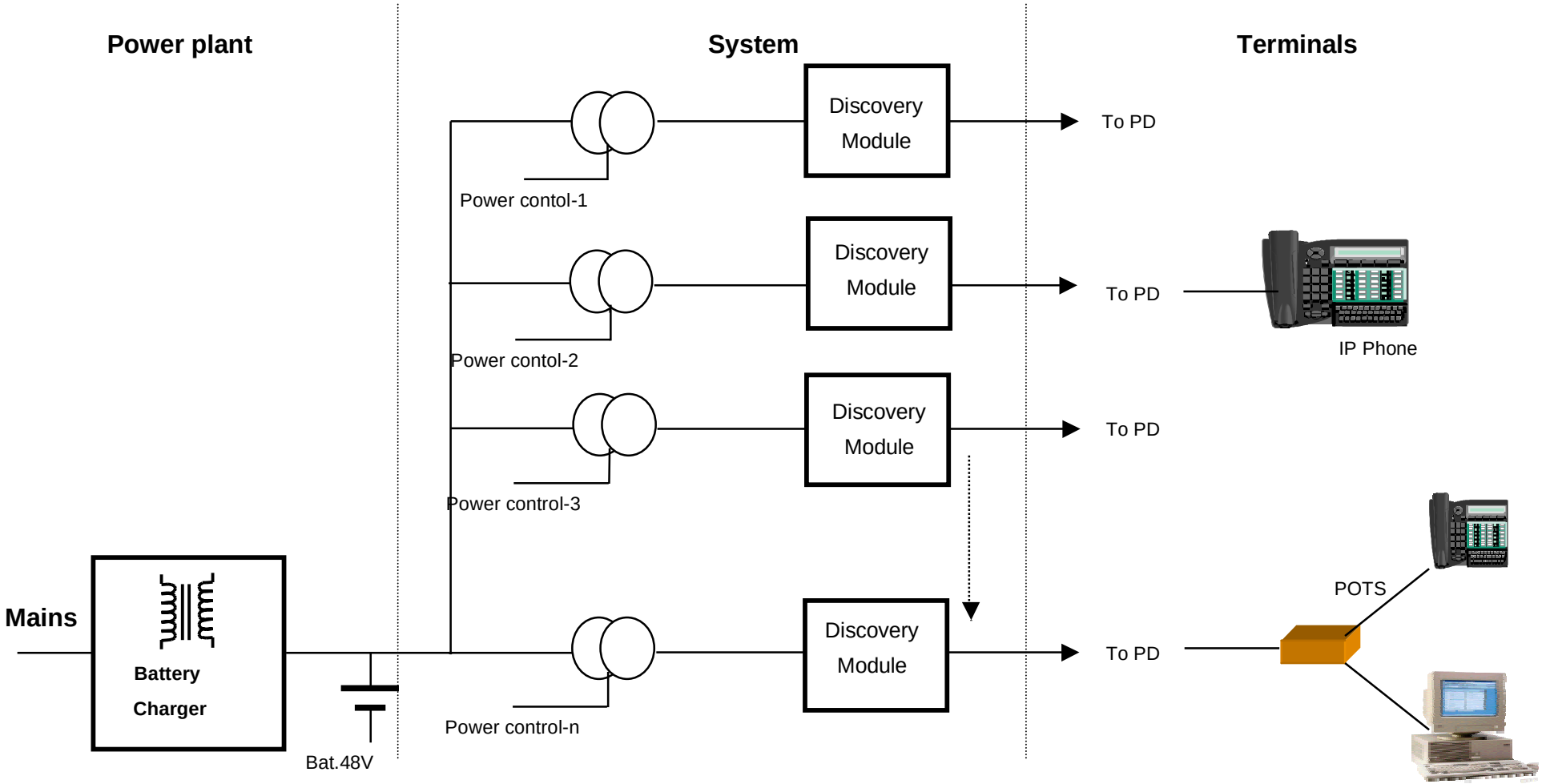


Impact of reduced voltage range feeding

- Impact on power plant and system
  - Need of extra DC/DC converters for the limitation of the battery voltage range.(Centralized or distributed)
  - Increase of size , volume , cost , power consumption of the complete system.
    See also presentation Ed Walker “Ottawa June 2000”
  - Thermal management issues.
  - System power Consumption: Not in line with the objectives of the US “Energy Star Program”

Extended voltage range feeding scheme

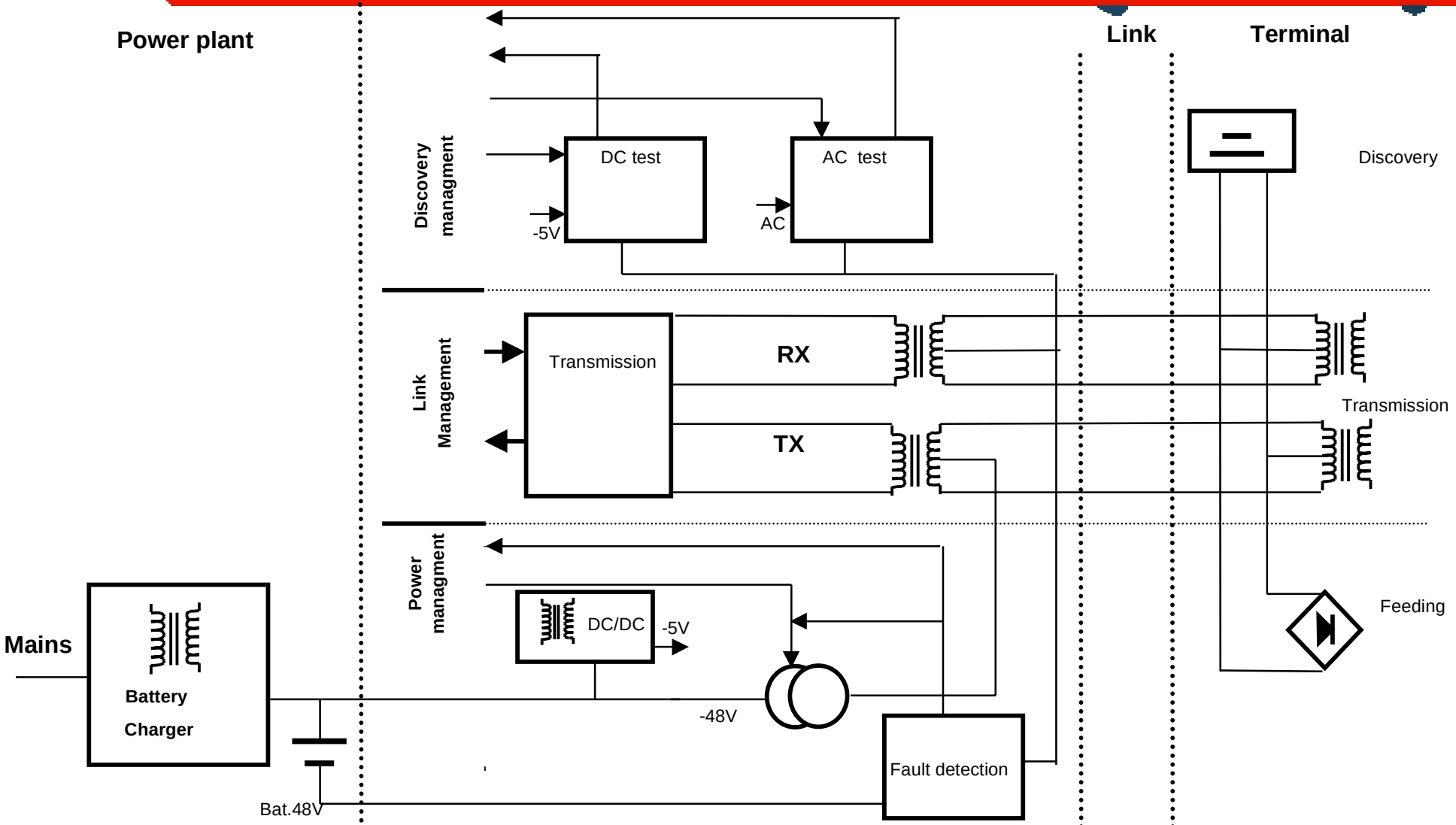
Direct feeding in environment A without insulation and extented voltage range



Impact of extended voltage range feeding

- Impact on power plant and system
  - No extra DC/DC converters, possibility of direct feeding from the batteries of the back-up power system.
  - Feeding method for most of the terminals (Environment A)
    See presentation : Steward from Lucent "Ottawa June 2000)
  - No increase of size , volume , cost , power consumption of the system.
  - Reduced thermal management issues at the system level
  - No power conversion efficiency decrease due to an intermediate stage.
  - Power plant upgrade only related to the consumption of the terminals
  - In Line with the objectives of the US
    "Energy Star Program"

Feeding and discovery without insulation



Feeding and discovery with insulation(Env. B)

Power plant

Link

Terminal

Galvanic Insulation

Discovery managment

Link Management

Power managment

DC test

AC test

-5V

AC

Transmission

RX

TX

Discovery

Transmission

Feeding

Mains

Battery Charger

Bat.48V

DC/DC Converter

-5V

-48V

Fault detection

Solution (extended voltage range)

Features (Rq1)	Power Plant	Power Contr.	Power Convers.	Discovery	Terminal	Total
Efficiency (%)	80	90	N/A	N/A	85	61
Power dissipation(Rq2)	2.8W(Losses)	1.1 W(Losses)	N/A	N/A	10 W	13.9 W
Input Power(Rq2)	13.9 W	11.1 W	N/A	N/A	10 W	
Surface			N/A			
Insulation	Yes IEC950	Env. B	N/A	Env. B	Yes IEC 950	IEC + IEEE
Heat sink	Yes	No	N/A	N/A	Power depend.	
Price			N/A			

- (Rq1) Installed power per interface = 15Watts
- (Rq2) Average Power per port = 10Watts (48Volts)
- All the values are related to 1 interface
- Extended voltage range = 48 Volts Battery Voltage

Solution (reduced voltage range)

Features (Rq1)	Power Plant	Power Contr.	Power Convers.	Discovery	Terminal	Total
Efficiency (%)	80	90	85	N/A	85	52
Power dissipation(Rq2)	3.2 W(Losses)	1.3 W(Losses)	1.8 W(Losses)	N/A	10 W	16.3 W
Input Power(Rq2)	16.3W	13.1 W	11.8W	10W	10 W	
Surface/Extended	+N x 2,4 Watts		+Nx15Watts	N/A		
Insulation	Yes IEC 950	Env. B	Env. B	Env.B	Yes IEC 950	IEC + IEEE
Heat sink	Yes	No	Yes	No	Power depend.	
Price/Extended	+N x 2,4 Watts		+40$			

- (Rq1) Installed power per interface = 15Watts
- (Rq2) Average Power per port = 10Watts (48Volts)
- All the values are related to 1 interface
- Reduced voltage range = 48 Volts +-3%

Conclusion

- Drawbacks of choice of reduced voltage.
  - Need of a DC/DC Converter per link in Env. B
  - Need of DC/DC Converters Central. or per link in Env. A
  - Increase of: Cost (+30$ per link) , Thermal dissipation (+2.4 Watt per link) , Volume of systems
  - Decrease of global power efficiency (Lost of10%)
    - Not in line with US Energy Star Program
- Drawbacks of insulation in Env. A and B
  - Need of isolated driving and scanning signals for discovery

Proposal

- Use of the extended voltage range (42V to 56Volts) for remote feeding of terminals

- Use of the last edition 3 of safety standard IEC 950 taking in account the actual status of networks and terminals

- Evolution of the standard by adopting IEC 950 instead of Env.A and Env.B concepts.