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# Specification and Implementation of a Foundation Fieldbus Project

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Lead Instrument Engineer  
23 March 2007



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Foundation Fieldbus End Users Council Australia Incorporated  
“Jump Aboard 2007” Conference March 21 - 23, Australia



# Overview



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- Project Description
- Network Design
  - Segment Loading and Execution
  - FF Segment Risk Management
- Host Control System
- Field Devices
- FISCO
- Documentation
- Inspection and Testing



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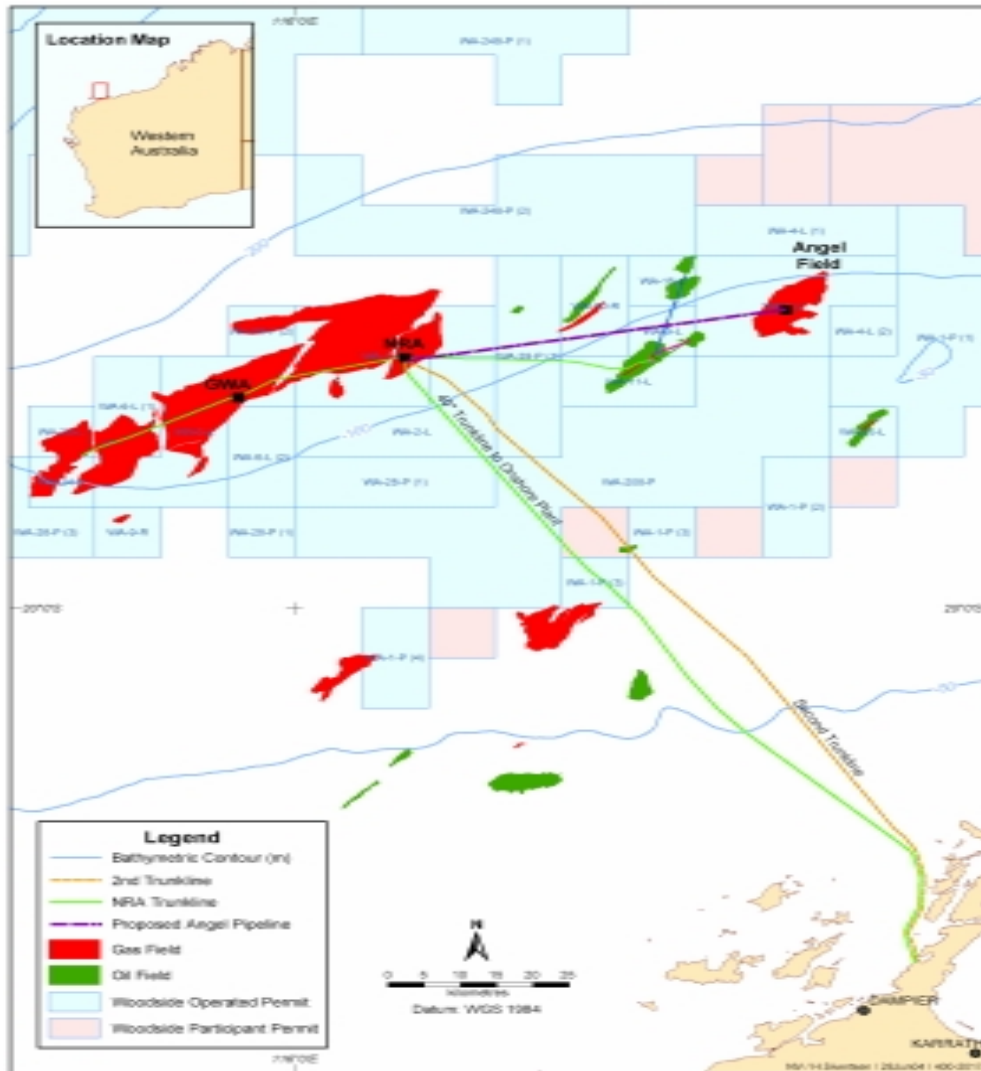


# Angel Platform



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- Approximately 123km offshore from Dampier and approximately 49km East of North Rankin Alpha (NRA) Platform



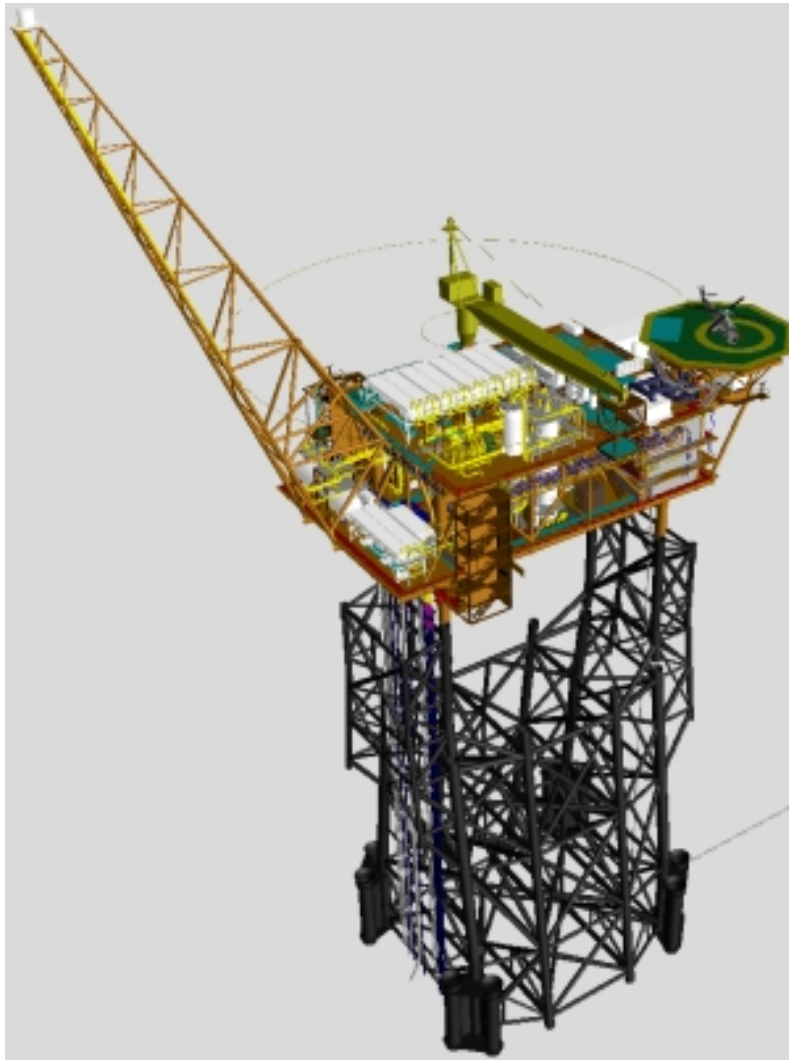


# Angel Platform



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- Design by EOS – joint venture between KBR and WorleyParsons
- Jacket Type Platform with “Floatover” Topsides
- Subsea wells tied back to topsides process
- 800 MMscfd gas + condensate tied into main trunkline from NRA to Burrup Peninsula
- Powered and Controlled from NRA Platform
- Process facilities and ancillaries designed to enable Not Normally Manned operation



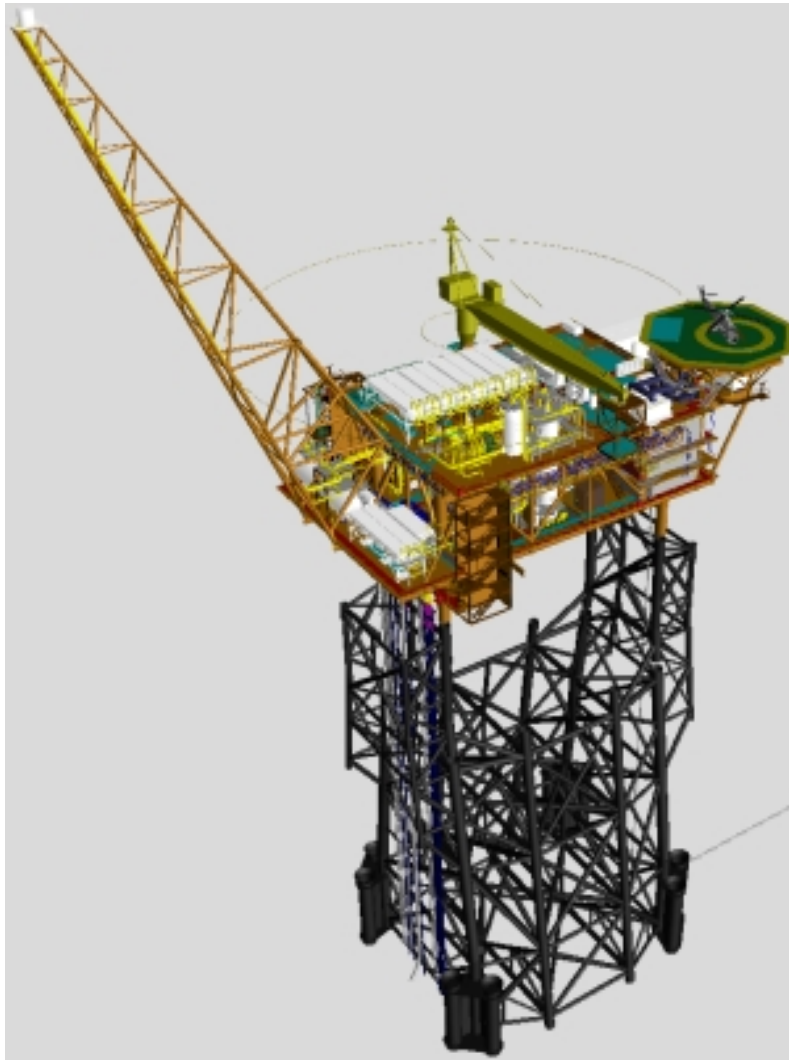


# Angel Platform



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- Foundation Fieldbus selected for Process Control Instrumentation
- Profibus used for VSD
- Fieldbus Digital Valve Controllers used on all shutdown and blowdown valves
- Multivariable Transmitters used where practical
- Host is Honeywell Experion PKS



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# Network Design



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- Network Topology
  - Tree structure, no daisy chains
- Redundancy
  - PCS FIMs, LAS
- Segment Loading/Cycle Times



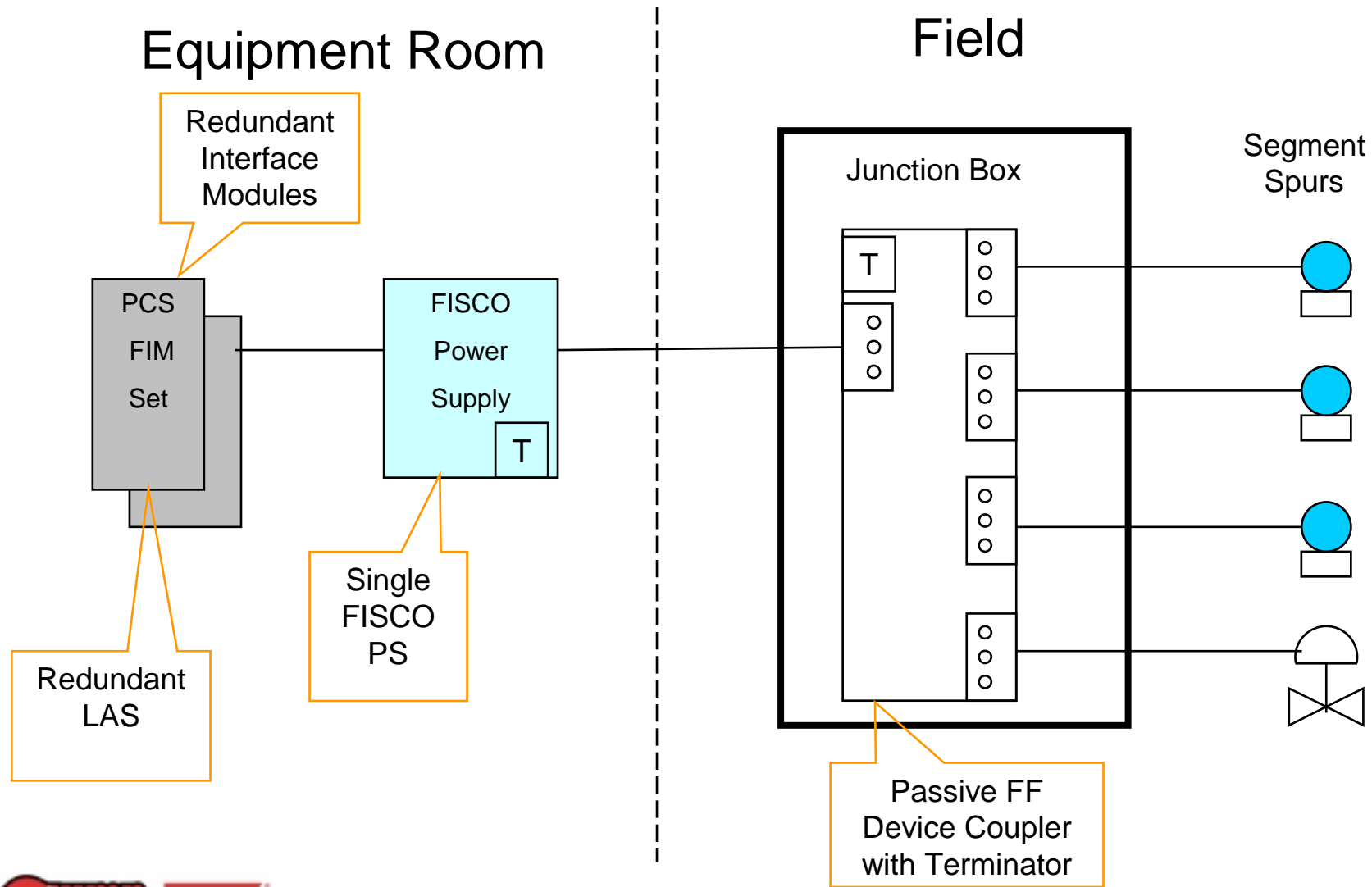
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# Network Topology



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# Segment Design



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Segment Loading Calculations carried out by PCS Vendor

## Segment Execution Times

- For segments with monitor only measurements
  - limit segment to 12 devices.
- For loops requiring 1-second execution time
  - limit segment to 8 devices.
- For loops requiring 0.5-second execution time
  - limit segment to 4 - 8 devices.
- For loops requiring 0.25-second execution time,
  - limit segment to 3 devices with a maximum of one (1) final control element.





# Risk Management



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- Level 1
  - Failure of segment or valve results in an immediate plant shutdown
  - Limit to one Level 1 valve and associated transmitter
- Level 2
  - Failure of the segment or valve will not result in a short term risk of a plant shutdown
  - Two Level 2 valves can reside on the same segment along with Level 3 devices
- Level 3
  - Monitoring only devices, up to 12 on one segment





# Risk Management



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- Single Loop PID Control
  - All function blocks reside on the same segment
- Cascade Loop PID Control
  - Primary and secondary loops may reside on the same segment for Level 2 segments
  - Primary and secondary loops must reside on the separate segments for Level 1 segments





# PCS Requirements



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- Interoperability
  - PCS shall have completed the Host Interoperability Support Test (HIST)
- Link Active Scheduler
  - Link Master and back-up LAS in redundant FIMs
  - No requirement for LAS in field devices
- Functionality
  - Automatic node addressing
  - Direct configuration of devices using DDL
  - Add new devices to a segment on line





# PCS Requirements



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- Maintenance and diagnostics
  - Segment diagnostics
  - Schedule management + reports
  - Device alarms
  
- Interface redundancy
  - Redundant FIMs for each segment
  - Master and backup LAS





# PCS Requirements



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- Advanced diagnostics and Asset Management
  - Asset Management package for advanced device diagnostic information
  - Potential for valve signatures to assist maintenance planning





# Device Selection



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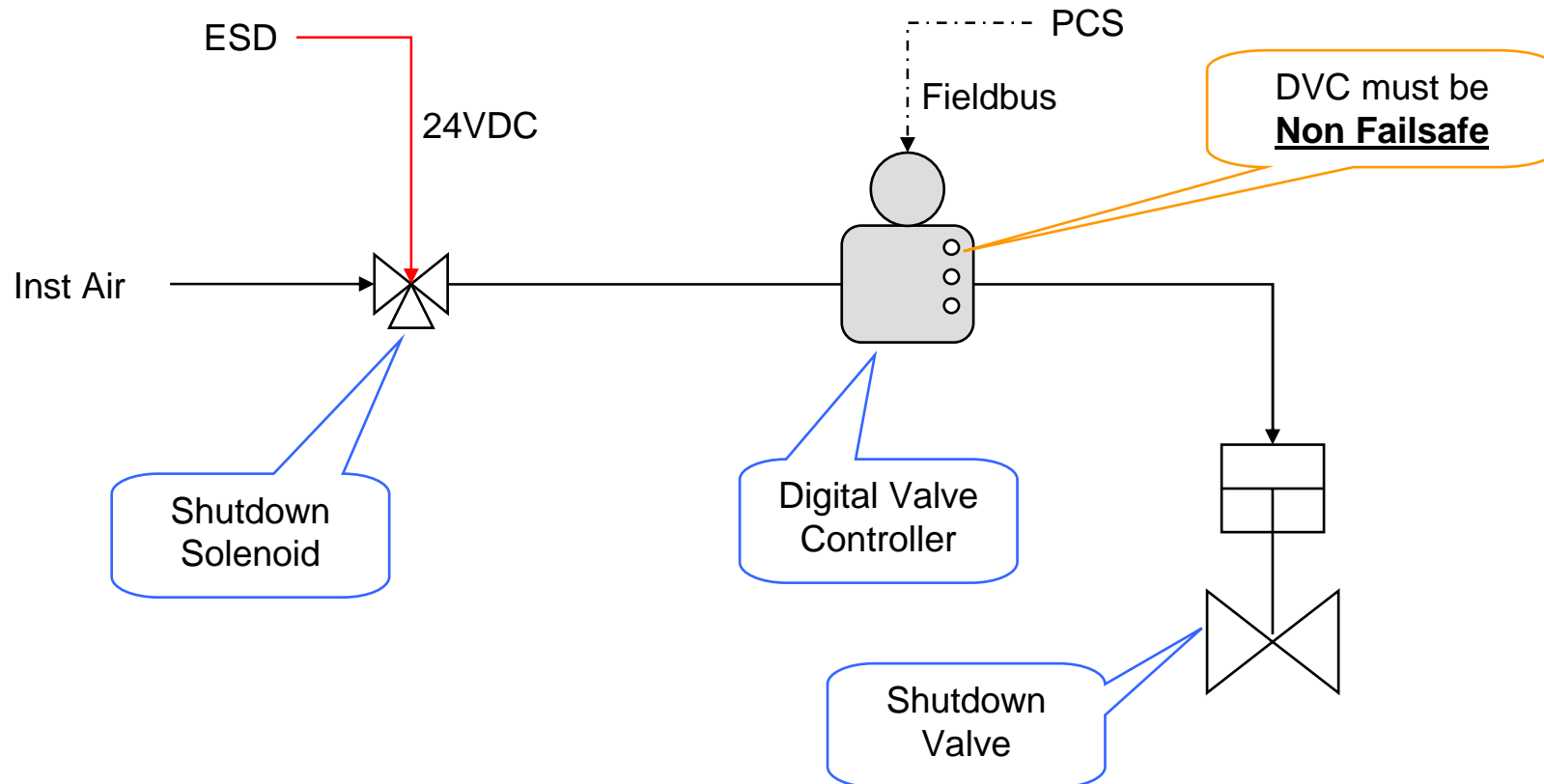
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- **Fieldbus Registration**
  - All devices including 3<sup>rd</sup> Party packaged equipment must satisfy the requirements of the Fieldbus registration lab.
- **Functionality**
  - Tested to ITK4.6 as a minimum. ITK5.0 preferred
  - Tested and compatible with the Host PCS
  - Minimum lift off voltage not more than 9V
- **Device Power**
  - Bus powered
  - Operate at voltages of 9-32 VC





## Digital Valve Controller on Shutdown Valves





# FISCO



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- For hazardous area installations we can choose a number of options.
  - Entity, FNICO, FISCO, Ex d
- FISCO offers the following benefits;
  - Simple Safety Assessment
  - Elimination of cable parameter calculations
  - Higher levels of available current for the field wiring (compared to Entity)
  - Addition of new devices without reviewing the safety case





# FISCO



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- Electrical Power for Field Devices
  - The FISCO concept dictates that only there is only one source of possible energy into the flammable atmosphere. Power supply redundancy is not supported.
  - Power supply selected - MTL FISCO 9121-IS with galvanic isolation.





# FISCO



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- Device Couplers
  - RELCOM Megablocks F245/251, 4 and 8 way
    - Terminator RELCOM FCS-FBT1-IS line terminator
    - Supplied and mounted by JB supplier
  
- Cables
  - Type A Specified
    - Twisted pair, 0.8 mm<sup>2</sup>
    - 44 Ohm/km





# FISCO



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- Junction Boxes
  - IP66
  - Certification is not a requirement but can be provided as Ex e ia
  - Supplied with Megablocks installed





# Documentation



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- FF Execution Philosophy
- System Network Drawing
- FF Segment Diagrams
- Instrument Datasheets
  - Include FF specific items
- FF Instrument Parameter Definition
- FISCO Safety Documentation





# Documentation



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- Execution Philosophy
  - Developed in FEED
  - Defines the way FF will be implemented
  - Use as a reference during detail design.





- **Fieldbus Specific Datasheet Fields**
  - Firmware revision
  - DD revision
  - CFF revision
  - Device ID
  - LAS capable (Y/N)
  - Lift-off (minimum) voltage
  - Polarity sensitive (Y/N)
  - Current draw, in-rush current
  - Certification type (IS / FISCO / FNICO)
  - ITK revision





- Fieldbus Parameters
  - Resource Block
  - Transducer Block
  - AI Block(s)
  - Any other Blocks

[FF Parameters.xls](#)





## Safety Documentation for a FISCO System

Item	Description	Manufacturer	Type No.	Classification	Cert. Number	Temperature Range
1	FISCO Supply	MTL	9121-IS	IIC [ib]	BAS02ATEX276	-40°C to +70°C
2	Connector block	Relcom	FCS-MB4-IS	Simple apparatus		-45°C to +70°C
3	Terminator	MTL	FBT1-IS	IIC ia T4	BASEEFA 02ATEX0042	-40°C to +70°C
4	Enclosure	Klippon	333OS	Simple apparatus		-40°C to +70°C
5	Temp. Transmitter	Emerson	6244	IIC ia T4	ABC02ATEX0034	-40°C to +70°C
6	Press Transmitter	Bars	888P	IIC ia T4	XYZ01ATEX3455	-40°C to +70°C





# Inspection and Testing



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- Specialised Fieldbus Test Equipment
  - Segment Tester
    - Relcom Inc. FBT-6
  - Oscilloscope





- Installation Tests
  - Cables/Junction Boxes
    - Insulation
    - Continuity
    - Resistance
    - Capacitance
    - Grounding/Shielding
  - Segment Tests (FBT-6)
    - DC Carrier Voltage
    - LAS Function Test
    - Average Noise Test





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# *Thank You*

# Questions?



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