

Design of Digital Instrumentation and Control Systems for KALIMER

150

(KALIMER)

KALIMER

Human

Interface , Supervisor and Manager ,
Actuator 4 가 ,

Abstract

The top design concept of Instrumentation and Control (I&C) systems for Korea Advanced Liquid Metal Reactor(KALIMER) is to apply the modern digital technology and to achieve high reliability and safety in I&C systems. This paper describes the basic structure of I&C systems developed during the conceptual design stage of KALIMER. The fully digitalized I&C systems have the structure of four levels such as a human system interface level, supervisor and manager level, distributed control and protection level, and sensor and actuator level. This paper describes the functional goals for the KALIMER I&C systems and the design bases for each I&C system.

1.

1992

150MW

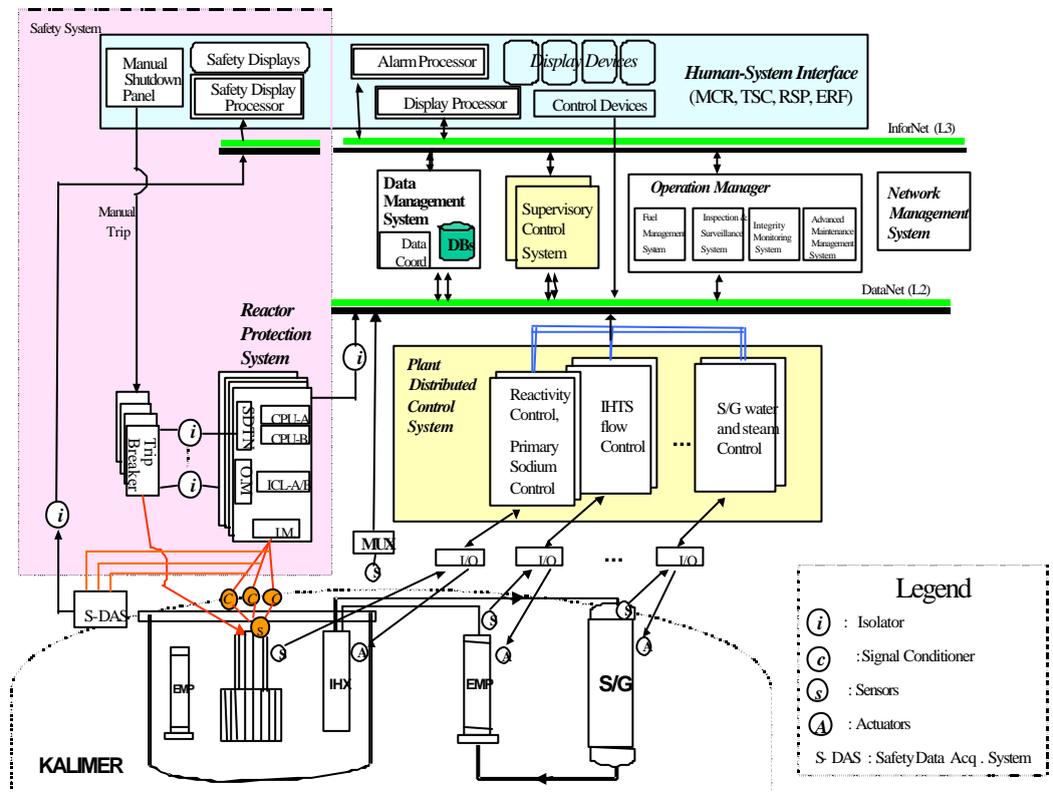
Pool Primary Heat Exchanger System(PHTS) Intermediate Heat Exchanger
System (IHTS) [1,2].

KALIMER

, Human System Interface
[3].

1. L3: Human System Interface (HSI) Level,
2. L2: Supervisor and Manager(S&M) Level,
3. L1: Distributed Control and Protection Module Level,
4. L0: Sensor and Actuator(S&A) Level,

HSI
 L0 L1
 HSI
 Workspace
 Workspace
 L2 , Supervisor Manager
 L1
 2/4
 L0 Actuator
 1
 [4].



1. KALIMER

2. (Design Bases)

KALIMER

,

[3]

-

- HSI

-

-

Issue

-

-

Distributed Control System) (Supervisory Control System) 가 (Plant

KALIMER

가

(Calibration)

(OMS : Operational Management System)

HSI

HSI

Work-load

Vigilance 가

가

3.

KALIMER

1

1

가

3.1. (Plant Control System) [3,4]

(Supervisory

Control)

Supervisory Control System

Command

가

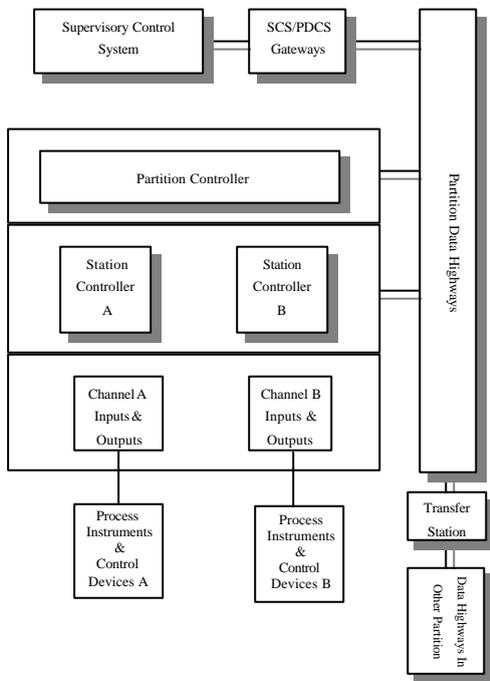
. NSSS

Reactivity Control, Primary Sodium Flow Control,

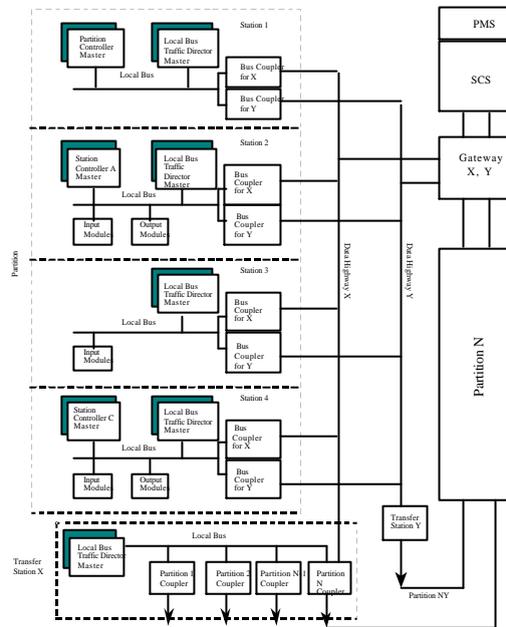
Intermediate Sodium Flow Control, Steam Generator Control,

2 Partition Controller 가

3



2



3

3.2.

[5]

(RPS : Reactor Protection System)

4

RPS

, Bistable

, Coincidence

, Trip Breakers,

IEEE

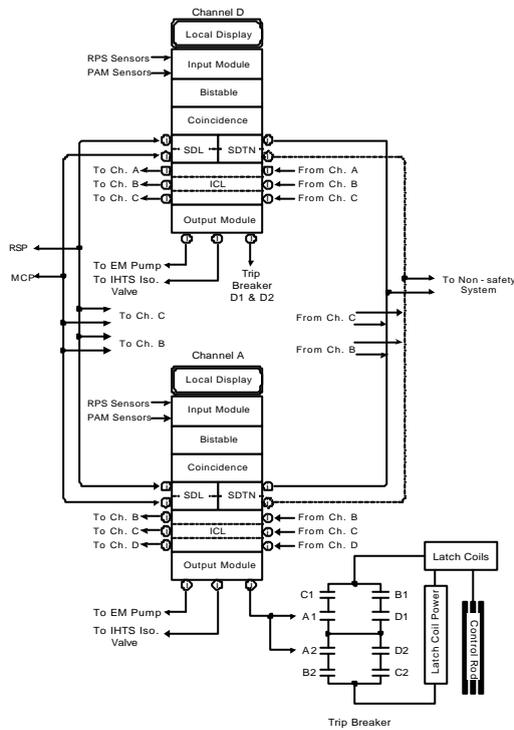
Class 1E

A/D(Analog to Digital)

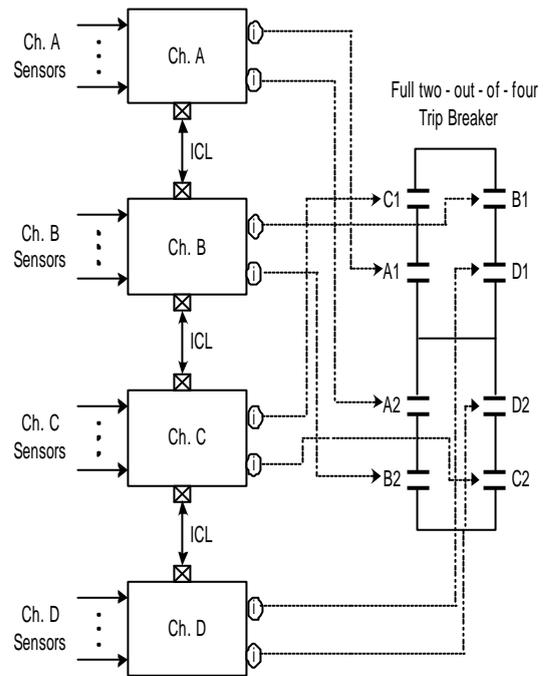
Bistable Logic Processor

. Bistable

Coincidence Module Internal Data Link
 . Coincidence Logic Module 2/4 Voting
 Breaker . Breaker 2/4 Voting
 2 Coincidence Processor가
 . . Operational Bypass Start-
 up Shut-down Trip
 Bypass . Channel Bypass
 Voting Logic 2/3
 Trip Breaker
 4 , 5 Trip Breaker 2/4 Logic



4 RPS



5 Trip Breaker Logic

3.2.1. Trip Breaker Logic

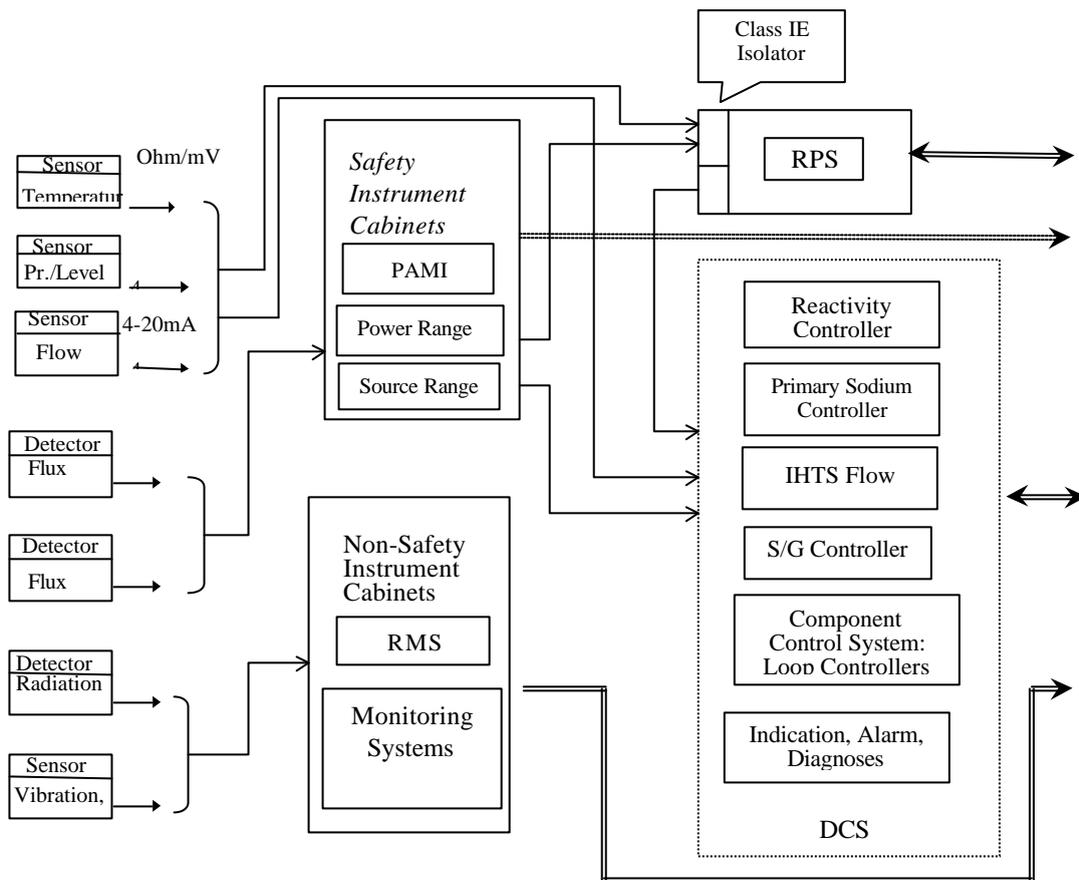
5 Breaker 8
 2/4 가
 Breaker가 가 가
 Breaker , 가
 . 가

3.3.

[6]

(Monitoring Instrumentation),
 (Nuclear Instrumentation),
 (Process Instrumentation)

6



6

RTD(Resistance Temperature Detector) Thermocouple
 PLC(Programmable Logic Controller) 가

가 , , 4-20mA

가

HSI

4.

KALIMER ,
and Manager(S&M) , Distributed Control and Protection Module , HSI , Supervisor , Sensor and Actuator(S&A)
4 가 , 1 ,
, I&C 2
2/4 가 4
KALIMER ,

Acknowledgement

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- [2] KAERI, KALIMER Design Concept Report, KAERI/TR-888/97, Jul.1997.
- [3] J. Kim, KALIMER MMIS Design Bases, KAERI/IC000-DB-01/1997 Rev.0, KAERI, March, 1998
- [4] C. Jung, Plant Distributed Control System Design Description, KALIMER/IC221-DD-01/2000, KAERI, Jan. 2000.
- [5] C. Kim, Reactor Protection System Design Description, .LMR/IC132-DD-01 Rev1/2000, KAERI March, 2000.
- [6] I. Hwang, Instrumentation Requirements, LMR/IC110-DR-01/2000, KAERI August, 2000.