GE Power Management

DDS Integrated P&C System

INTEGRATED PROTECTION AND CONTROL SYSTEM

DDS

INTEGRATED PROTECTION

INTEGRATED CONTROL
APPLICATION FIELDS

- SUB-TRANSMISSION SUBSTATIONS
  - DOUBLE/SINGLE BUSBAR LAYOUTS, BREAKER AND A HALF ETC.

- DISTRIBUTION SUBSTATIONS
  - SINGLE AND DOUBLE BUSBAR LAYOUTS

- TRANSMISSION SUBSTATIONS
  - NO KV LIMITATION
Traditional SCADA RTU

Remote Terminal Unit

Power Supply
Modem
Radio
Host

Inputs
Outputs
Alarms and Trips
Protection Relay

CT’s
CT’s

Neutral Current Transducer
Voltage Transducer
Phase Current Transducer
kW/kVAR Transducer
Power Factor Transducer
Other Transducers
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GE PM SOLUTION

CT’s
VT’s
Analog Inputs

Comm. Port

DMS INTEGRATED MODULE

Digital Inputs
Digital Outputs
• Power Supply Module (possible redundancy)
• Magnetic Module: 8 CT/VT
• Digital Inputs: 21
• Digital Outputs: 12
• Digital I/O: 7 inputs, 8 outputs
• Analog inputs module, 4 inputs
• CPU: 16 bit MP based
• Communications CPU: 16 bit MP based, RS-232, RS-485, Fiber Optics communications available.
• Front bus + MMI module (+ Graphic LCD + 6 control keys)
DMS UNITS CONTROL

FUNCTIONS

■ SWITCHGEAR CONTROL
  ▶ Up to 7 switchgear (or dynamic elements) control and real time monitoring.

■ MIMIC DISPLAY
  ▶ Allows real time monitoring (1 or 2 contacts selectable) and local operation of switchgear.
**METERING**

Default metering for every unit: Ia, Ib, Ic, In, I2, Vab, Vbc, Vca, Vbus, P, Q, f, Cos phi.
ALARMS PANEL

- 96 Configurable alarms (32 protection, 48 control, 16 comm.)
- Alarm format: Date, time, Description text.
- Alarm status (active/non active, acknowledged/not acknowledged)

- Alarm acknowledgement through graphical display (local HMI)
DMS UNITS CONTROL FUNCTIONS

- OPERATIONS & BAY INTERLOCKINGS
  - Up to 16 operations:  2 fixed (block / unblock control)
  - 14 programmable operations
  - Configurable parameters for each operation.
    - Operation description (text)
    - Operation conditions (4 per operation)
    - Failure conditions (3 per operation)
    - Success conditions (1 per operation)
    - Timers
      - Operation
      - Output
      - Success
      - Operation confirm
    - 1 per operation
  - Up to 4 programmable “static” interlockings.
Analog inputs:
- Up to 4 channels
- Selectable (each one independently) as: 0-1 mA, 0-5 mA, 4-20 mA, -2.5/+2.5 mA, -10/10 V.

Pulse Inputs: (Any digital input can be a pulse counting input)
- 9 digit counter (up to 999999999 Kwh or Mwh)
- 1-65000 Kwh per pulse
- 4 choices KWh, KVARh, MWh, MVArh

Inputs for tap load changer position monitoring:
- Up to 8 digital inputs in Gray/BCD/Binary code or through analog input.
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SUBSTATION ARCHITECTURE

LEVEL 3
REMOTE CONTROL

LEVEL 2
IEC 870-5

LEVEL 1
PROTECTION  CONTROL

LEVEL 0
CAPTURE  CAPTURE

GENERAL APPLICATION

TRANSMISSION SUBSTATIONS

SCHEMES:
• Breaker and a half
• Double busbar
• Single busbar

Protection and Control for:
• Line
• Transformer
• Busbars

Protection and Control for:
• Line
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• Busbars
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Protection System Integration Architecture

Phone Access

OTHER IED'S

IEC870-5-101

 CONTROL

LEVEL 2

GPS Sync.

LEVEL 1

Transmission Lines

ALPS RELAY

HV Bays

PC laptop for local access

MV Bays

Transformer Bays
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Control System Architecture

LEVEL 3

GENESIS SOFTWARE

(LEVEL 3)

PROTECTIONS

Available LEVEL 1 units:
DMS, DTP, DFF,
DBF, DRS, MOV,
DTR, SMOR, ALPS

MLINK 115 kbps Communication channel

Scada Modem

PC Dual

FAC

HV Bays

PC laptop for local access

LEVEL 2

LEVEL 1

Transformer Bays

MV Bays

IEC870-101

Printer

GPS Sync.

Control System Architecture

Control System Architecture

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SUBSTATION BAYS

- SUB-TRANSMISSION OR DISTRIBUTION HV LINE
- HV BUS COUPLER & METERING
- POWER TRANSFORMER
- MV FEEDER
- CAPACITOR BANK
- MV BUS COUPLER & METERING
- AUXILIARY/GENERAL SERVICES
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**Detail of Level 2 with Redundancy**

- **CPU - 1**
  - RAID 2 Power Supplies
  - SCSI Bus
- **CPU - 2**
  - RAID 2 Power Supplies
  - SCSI Bus
- **TCP/IP**
- **RS-232 Switch**
- **Modem**
- **IEC 870/5-101**
- **Serv-Switch**
- **SCREEN**
- **KEYBOARD**
- **MOUSE**
- **FAC2000**

**PROTECTIONS**

*Available LEVEL 1 units:*
- DMS, DTP, DFF, DBF, DRS, DTR, MOV, SMOR, ALPS

**Available LEVEL 2 units:**
- DMS (x number of units)
- DTP (x number of units)
LEVEL 2 CONTROL FUNCTIONS

- Programmable configuration of the substation
- Control of the HV equipment
- Switchgear status indication
- Instantaneous metering of the substation
- Programmable Interlockings between bays
- Automatic Functions
  - Load shedding for under voltage/frequency
  - Sequential Operations between bays
  - Reactive power control combined with transformer tap changer
CONTROL FUNCTIONS (Cont.)

- Metering Tariffication
- Alarm Treatment
- Maintenance Engineering
  - Breaker monitoring ($I^2t$)
- Substation event register
- RTU for connection to remote central dispatching centers
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GE-NEESIS

WINDOWS BASED SOFTWARE WITH APPLICATIONS

GE_LOCAL
GE_INTRO
GE_OSC
GE_POWER
GE_CONF
GE_FILE
GE-LOCAL: LOCAL COMMUNICATION FOR SETTINGS, INFORMATION REQUEST AND ON-LINE VIEW OF PARAMETERS

- Single line diagram position view, including status and metering values.
- Access to information: Status, Metering, Events, Oscillography and Alarms for every position.
- Viewing and change of settings.
- Access to Bay operations
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APPLICATIONS DESCRIPTION

GE_LOCAL

![Diagram of DMS3L1D1ABK001AI with remote status, status 79, and alarms activated.]

- Remote
- Status 79
- Alarms

System Information:
- Device Status
- Measures & Counters
- Settings
- Operations
- Counters
- Oscillography
- Date and Time
- Logs
- Demand
- Alarms Panel

Alarms: 10:21:48
APPLICATIONS DESCRIPTION

GE-INTRO:
CONFIGURATION AND ASSIGNMENT OF THE DDS INPUTS/OUTPUTS, ALARMS AND CONTROL LOGIC

Function:
- Protection inputs, outputs & events configuration.
- Control inputs, outputs & events configuration.
- Control programming.
- Alarm configuration
- Graphical display configuration
APPLICATIONS DESCRIPTION

GE_INTRO
GE-POWER:
LEVEL 2 PROGRAM THAT ALLOWS REAL-TIME CONNECTION TO LEVEL 1 DEVICES

- Single line Substation diagram including metering values and status.
- Zoomed single line diagrams per position.
- Access to information: Status, Metering, Events, Oscillography and Alarms for every position.
- Remote viewing and change of settings.
- Access to switchgear operation.
APPLICATIONS DESCRIPTION

GE-CONF: SUBSTATION CONFIGURATION

Functions:

- User configuration, privileges and passwords.
- Position configuration.
- Per position: Status, metering and values configuration for transfer to level 2.
- Per substation Data base generation.
APPLICATIONS DESCRIPTION

GE POWER

GE CONF

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Applications Description

**GE-FILE:**
REPORTS AND DEMAND PROFILE GENERATION

Functions:
- Events, logs, alarms, etc. report generator
- Operation reports and Demand Profile generation per bay.
APPLICATIONS DESCRIPTION
GE-OSC:
OSCILLOGRAPHY RECORDS DISPLAY AND ANALYSIS

Functions:
- Displays COMTRADE files (ASCII or binary), including:
  - Waveform
  - Fasors
  - Fault reports
  - Digital signals operations
- R-X Diagram module for distance relays analysis.
APPLICATIONS DESCRIPTION

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GE_OSC

[Images of oscilloscope displays showing waveforms and data readings]