HAI NAM
TOTAL POWER & AUTOMATION SOLUTIONS

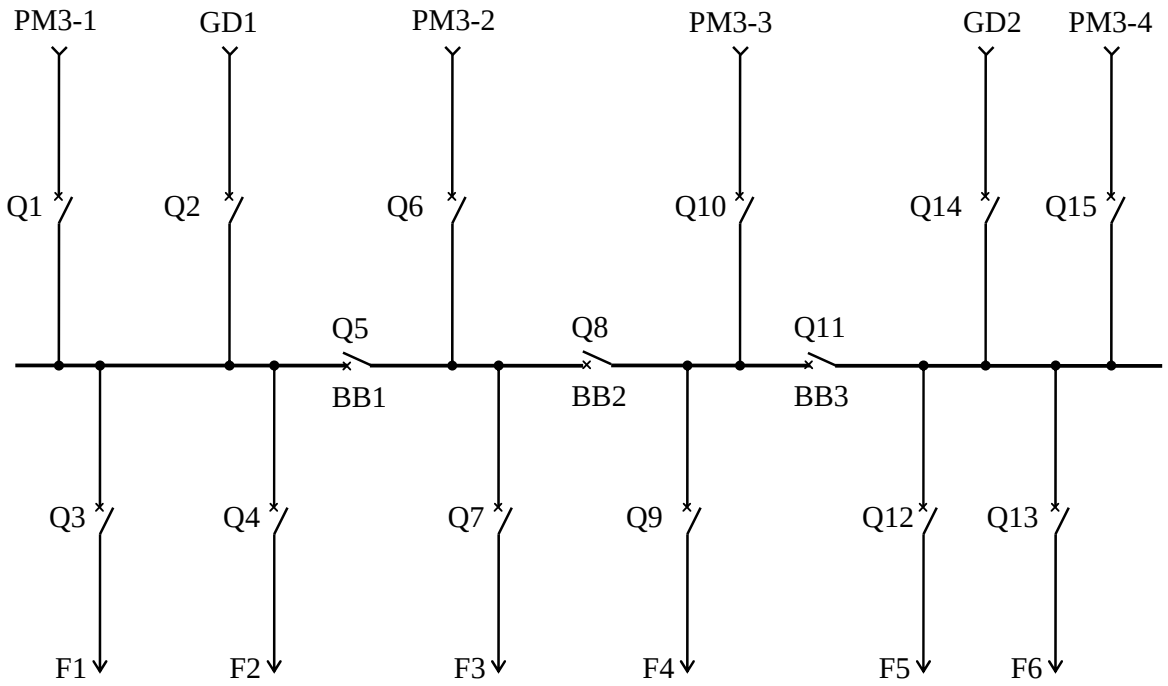
SCADA SYSTEM DESCRIPTION FOR POWER DISTRIBUTION SYSTEM
Project: Phu My Industrial Park
Client: Sanyo Engineering and Construction
Rev: 01

Date	Revision	Description	Designed by	Checked by
15/09/2016	01	Original version for programming	T. N. Nhan	H. T. Hoang

1. HARDWARE DESCRIPTION

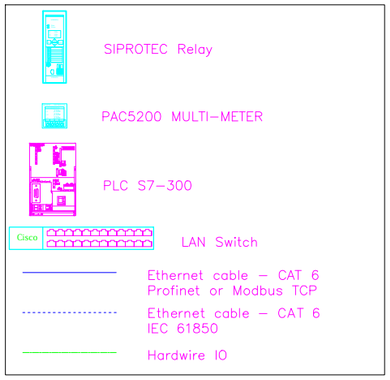
CB name	Description	Section
Q1	Main circuit breaker (PM3-1 from PM3 S/S TRANS No.1)	MP3-1
Q2	Main circuit breaker (GD-1 from Go Dau S/S Network 22kV)	MGD1
Q3	Outgoing circuit breaker (FEEDER 1)	F1
Q4	Outgoing circuit breaker (FEEDER 2)	F2
Q5	Bus-tie circuit breaker	BB1
Q6	Main circuit breaker (PM3-2 from PM3 S/S TRANS No.1)	MP3-2
Q7	Outgoing circuit breaker (FEEDER 3)	F3
Q8	Bus-tie circuit breaker	BB2
Q9	Outgoing circuit breaker (FEEDER 4)	F4
Q10	Main circuit breaker (PM3-3 from PM3 S/S TRANS No.1)	MP3-3
Q11	Bus-tie circuit breaker	BB2
Q12	Outgoing circuit breaker (FEEDER 5)	F5
Q13	Outgoing circuit breaker (FEEDER 6)	F6
Q14	Main circuit breaker (GD-2 from Go Dau S/S Network 22kV)	GD-2
Q15	Main circuit breaker (PM3-4 from PM3 S/S TRANS No.1)	MP3-4

Principle Diagram



PHU MY POWER MONITORING AND SCADA ARCHITECTURE

LEGENDS:

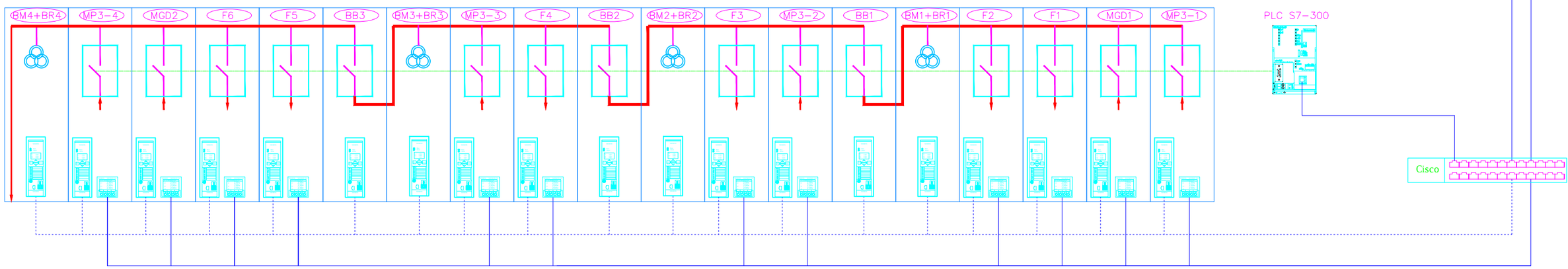


ELECTRIC HOUSE

PC with Sentron
PowerManager Software To
Monitoring PAC5200 Multi–meter

PC with WinCC Software To
Monitoring and Control VCBs
and Siprotec Relay

Printer



PHASE 1A

2. SCADA OPERATION DESCRIPTION

The SCADA system is designed to have the following functions:

2.1 Supervision:

This function allows operators to continuosly monitor the operation of the Phu My 3 IP's power system:

- Operating mode of the Interlock PLC (MAN, AUTO)
- Status of equipments:
  - Status of VCBs (OPEN, CLOSE, TRIP, REMOTE/LOCAL, RACK IN/ RACK OUT)
- Measured value indication:
  - Busbar voltage
  - Current, active power, reactive power, power factor of incoming main circuit
  - Current, active power, reactive power, power factor of outgoing feeder circuit
  - Temperature and oil level of genset; voltage, current and power of gensets
  - Voltage of baterries
- Alarm indication: Alarm function warns operators about the abnormal status of the power distribution system. The following abnormal status or behavior are detected and displayed:
  - Status of VCBs (in Remote mode) that do not follow control signal
  - Recommended actions that the operator should take on the VCBs in local mode such that the Interlock Matrix is satisfied.
  - Trip status of VCBs
  - Overvoltage or undervoltage of busbar
  - Overcurrent in incoming main circuit / outgoing feeder circuit
  - Overvoltage or under voltage of baterries
  - Communication errors

2.2 Historical data processing:

- Realtime measurement data (current, voltage, power) are periodically collected and stored in database.
- Historical data sampling interval can be set by administrator.
- Waveform of current, voltage, power measurement (historical or realtime) over a specific period can be displayed on the HMI monitor.

2.3 Event log:

The following events will be logged and store in the database:

- Start and stop SCADA system
- Alarms
- Working mode changes
- Error command in manual control mode
- User log in and log out of workstation

2.4 Report and printing:

- Report alarm events.
- Print the waveform of current, voltage, power measurement over a specific period.
- Print the alarm log over a specific period.
- Print the current screen.

3. POWER QUALITY MONITORING DESCRIPTION

The power quality monitoring system is based on SENTRON POWERMANAGER system which has following characteristics:

Item	Specification	Power Management System SENTRON POWERMANAGER	
		Software (SENTRON POWERMANAGER V 3.2)	Devices - Multifunctional **PAC5200**
I	**OPERATING FUNCTIONS**		
A	**GENERAL**		
1	The structure of the power management system is a modern scalable server-client application with the possibility of simultaneous by up to 5 clients	Yes	
2	Access to measuring devices is gained via Ethernet either directly or via gateway. Up to 200 measuring devices can be linked up	Yes	
3	Support distribution network topology	Yes	
4	The software licenses are portable & the user can transfer licenses between different PCs	Yes	
5	OPC interface are availble for exchanging data with other system like BMS	Yes	
B	**FEATURES**		
1	Standard's compliance	EN 16001 or ISO 50001	
2	Visualization & recording of energy, graphical load profile	Yes	
3	Auto generation of report with historical data in Microsoft Excel format for energy, demand or any parameters as required	Yes	
4	Make SLD type HMI showing breaker status and remote Open/Close button on the sreen	Yes	
5	Possible to access the screens of server through internet	Yes	
6	Sending the report automatically via e-mail	Yes	

7	Status monitoring: possible to do remote monitoring of circuit breaker status (On/Off/Trip) and controlling (Open/Close)	Yes	
8	Access level should be provided with software to use specific user name & password with different rights	Yes	
C	**MEASURED VALUE ACQUISITION AND ARCHIVING**		
1	Energy data is accquired through direct connection of the devices to the PC via Modbus TCP	Yes	
2	Measured variables from devices with Modbus capability (e.g. protection relay, multifunction meter, modbus, modbus I/O) are acquired	Yes	
3	Archiving is carried out in an integrated database without a separate license & without separate engineering tool.	Yes	
4	To minimize the amount of data, measured values are only archive in the case of change that can be stipulated in per cent	Yes	
D	**VISUALIZATION OF MEASURED VARIABLES**		
1	The measured variables must be displayed in predefined technological groups. The following grouping are available: Voltage, current, power factor, THD, Power/mean powers, energy values, device data.	Yes	
2	The values with [value] & [unit] are displayed	Yes	
3	Load curves can be displayed on the basis of archived variables measured within a freely selectable time. All available measured values can be displayed	Yes	
4	Displayed load curves can be printed out & values from them can be exported	Yes	
E	**MONITORING OF MEASURED VARIABLES/ENERGY STAGES**		
1	Measured variables can be monitored as well as being recorded, displayed & archived.	Yes	
2	Messages can either require or not require acknowledgement.	Yes	
3	For each message, the user can enter additional information in the form of a comment that is specifically stored for this message.	Yes	
F	**EVALUATIONS ON THE BASIS OF THE MEASURED VARIABLES/COST CENTER ASSIGNMENT**		
1	Export of data to Excel	Yes	
2	Free creation and storage of report template with the help of standard Excel function (incl. formula, diagram etc.)	Yes	

G	**EVALUATIONS ON THE BASIS OF THE MEASURED VARIABLES/COST CENTER ASSIGNMENT**		
1	In order to prevent unauthorized access to the system, there is a user administration system with 5 authorization levels.	Yes	
2	Users with particular authorization level can be spceified. During this time, each user logs in with his user code & password.	Yes	
3	A change of user is possible online, without the application having to be restarted	Yes	
II	**Electrical pararmecters as multifunction meter**		
1	Basis measurement		
	Voltage (L-L,L-N,3 phase average)		Yes
	Current (per phase, 3 phase average)		Yes
	Neutral conductor current		Yes
	Apparent power (per phase and total)		Yes
	Active power (per phase and total)		Yes
	Total reactive power (per phase and total)		Yes
	Power factor (per phase and total)		Yes
	Frequency (of the reference phase)		Yes
	Min/max value / date & time		Yes / Yes
2	Extended measurement variables		
	Phase displacement angle (between voltage & current per phase)		Yes
	Phase angle (between the phase voltages)		Yes
	THD voltage (per phase)		Yes
	THD current (per phase)		Yes
	Harmonics in voltage (per phase)		2nd to 40th
	Harmonics in current (per phase)		2nd to 40th
	Distorion current strength (per phase)		Yes
	Min/max value / date & time		Yes/Yes
	Unbalance of voltage / current		U_{nba}/I_{nba}
3	Power measurement/counter		
	Apparent energy		Yes
	Active energy		Yes
	Reactive energy		Yes
	Tariff counter (high tariff / low tariff) : apparent, active and reactive energy		2
	Daily energy values for 365 days : apparent, active and reactive energy		Yes
	Demand for energy in last measurement period: Apparent, active and reactive energy		Yes
	Measurement period: Can be set in minutes		Yes
	Min/max value of the power types: With the measurement period		Yes
	Operating hours counter: Operating hours of loads		Yes

	Univesal counter: Multifunctional		Yes
4	Monitoring function		
	Limit value monitoring		6
	Boolean logic: AND, OR, NAND, NOR, XOR, XNOR		Yes
	Limit values/inputs: Suitable for logic operations		Yes/no
5	Recording function		
	Load profile record		Yes
	* Apparent, active and reactive power averages		Yes
	* Min/max values: Per measurement period		Yes
	* Duration of recording: With 15 minute measurement period		Yes
	* Synchronization: Digital input, bus, internal clock		Yes
	* Adjuistable mean- value generation		Yes
	* Recording methods: Fixed block or rolling block		Yes
	Event recorder according to EN 50160		Yes
	* Max. number of events		>4000
	* Priority control		Yes
	* Selectable alert levels		Yes
	* Selectable mandatory acknowledgement		Yes
	* Selectable recording: Per event type		Yes
	* Memory		2GB
6	Interfaces		
	Ethernet (integrated): For twisted pair cable		10/100Mbit/s
	* Protocol Modbus TCP		Yes
	* Protocol Modbus RTU		Yes
	* Protocol Profibus DP		Yes
	* Web servers		Yes
7	Inputs/outputs		
	Digital inputs: Multifunctional		7
	Digital outputs: Multifunctional		2
	Operatinal voltage DI/DO: Rated value		24VDC
8	Clock/Calendar		
	Real-time clock		Yes
	Calendar function : Selectable day and time format		Yes
	Summer/winter time changeover according to region or user defined		Yes
9	Fault limits		
	Voltage/ current related to the measured value		±0.3%/±0.2%
	Apparent, active, reactive power related to the measured value		±0.5%/±0.5%/±2 %
	Active ennergy: According to IEC 62053-22		Class 0.5S
	Reactive ennergy: According to IEC 62053-23		Class 2
10	Indication/operation		
	Display LCD with background lighting		Yes
	Type of indication		LCD color graphic
	Operation: Menu prompted using function keys		Yes
	Languages: DE, EN, PT, TR, ES, IT, FR, ZH, RU		Yes
11	Measurement/ supply voltage		

	Measuring inputs for voltage: 3 phase AC, U_{L-L}, U_{L-N}, CAT III		Max. 690V/400V
	* Power supply unit with wide voltage range AC/DC		95…240VAC, 50/60Hz±10% and 110…340VDC ±10%
	Measuring inputs for voltage: 3 phase AC, U_{L-L}, U_{L-N}, CAT III		Max. 500V/289V
	* Power supply unit with extra low voltage		DC 22..65VDC ±10%
	Measurement on voltage transformers: For voltage > 500V or 690V		Yes
	Measuring inputs for current: 3 phase AC, CAT III		x/1A or x/5A
	Current direction programmable		Yes - per phase
III	**POWER QUALITY MONITORING FUNCTIONS**		
1	Automatic data read out from measure devices, save historical data on external hardisk and automatic delete historical database	Yes	
2	Database	Integrated own database which could be exported to external SQL database	
3	The system capture waveform faults (sag/Swell, transient) as graph, automatic download to computer's server and save them on external hardisk for report purpose	Yes	Yes
4	The number of cycles can be capture (before or after fault) when event was be recorded		Configurable
6	The system can be viewed by a remote web brower	Yes	
7	Make report of power quality as standard EN50160, EN61000-2-4 and generate scheduled PQ report	Yes	Yes