

## FEATURES

Toshiba pioneered the development of numerical substation automation technology during the 1980s and has since built a wealth of experience in supplying systems for all voltage ranges including UHV substations.

GSC1000 is today's state-of-the-art system compliant with the IEC 61850 standard for substation communications and provides the following features.

### ◆ Open system architecture

- IEC 61850 compliant open system
  - Standardized information models and communication services
  - Standardized engineering tools using SCL\*
- Client/Server system architecture
- Bay oriented distributed system

### ◆ Flexible system configuration

- Flexible configuration for all voltage levels
- Integration of protection relays and other IEC 61850 compliant IED\*\*s
- Integration of non-IEC 61850 IEDs

### ◆ Minimized life cycle cost

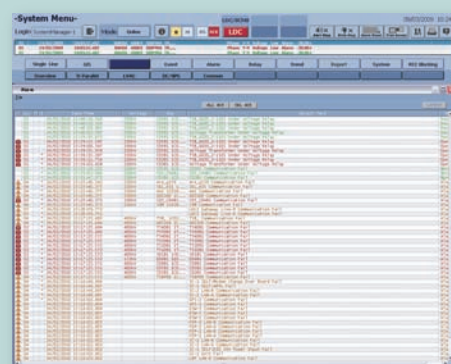
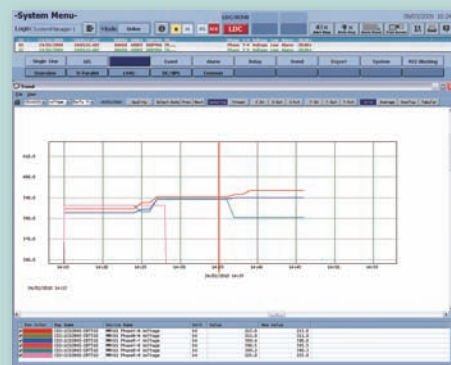
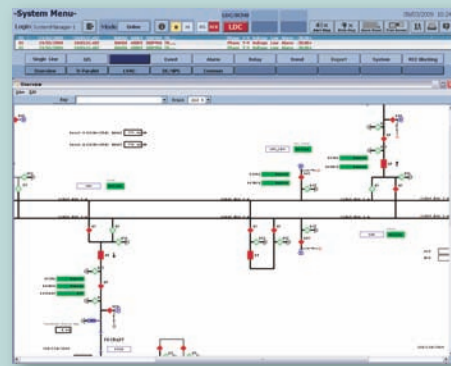
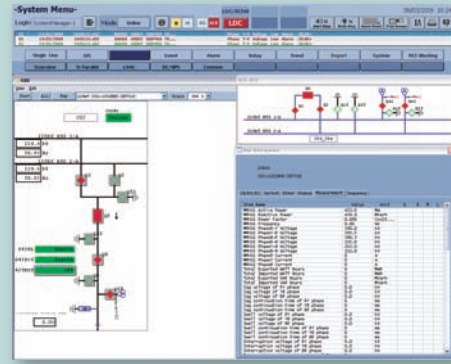
- Optimized maintenance cycle
- Efficient supporting guidance

### ◆ Applications

- All substation voltage ranges
- GIS (Gas Insulated Switchgear) substation
- AIS (Air Insulated Switchgear) substation
- Refurbishment of existing systems

SCL\* : Substation Configuration Language  
IED\*\* : Intelligent Electronic Device

## Typical VDU screens



# TOSHIBA

Leading Innovation >>>

SUBSTATION  
AUTOMATION  
SYSTEM

# GSC1000

## TOSHIBA

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# Toshiba GSC1000

## Leading innovation in the creation of total solutions for Substation Automation

- Safe, secure and reliable solutions for Substation Automation based on IEC61850
- Minimised life-cycle cost through ease of maintenance and low resource usage
- Flexible configuration for all system voltage levels

# GSC1000

## Substation Automation System



### SYSTEM CONFIGURATION

Typical system configuration of the GSC1000 is shown in Figure 1.

#### ◆ Station level

The station level equipment consists of duplicated station computer, an operator work-station, a printer, a GPS receiver, and the station bus.

#### ◆ Bay level

- For a GIS substation
  - The bay level equipment consists of bay control units (BCUs) and GIS local control panels (LCPs). The BCU is installed in the relevant LCP.
- For an AIS substation
  - The bay control units are installed in the dedicated LCP.
- Protection relays, AVRs and other IEDs are connected to the station bus.

#### ◆ Communication bus

- Ethernet LAN, 100BASE-TX/FX
- IEC 61850 protocol

#### ◆ Control points

- Three level hierarchy
  - Remote control point (Network level)
  - Substation control point (Station level)
  - Local control point (Bay level)

#### ◆ Remote monitoring

- Remote monitoring through router/modem
- Remote maintenance

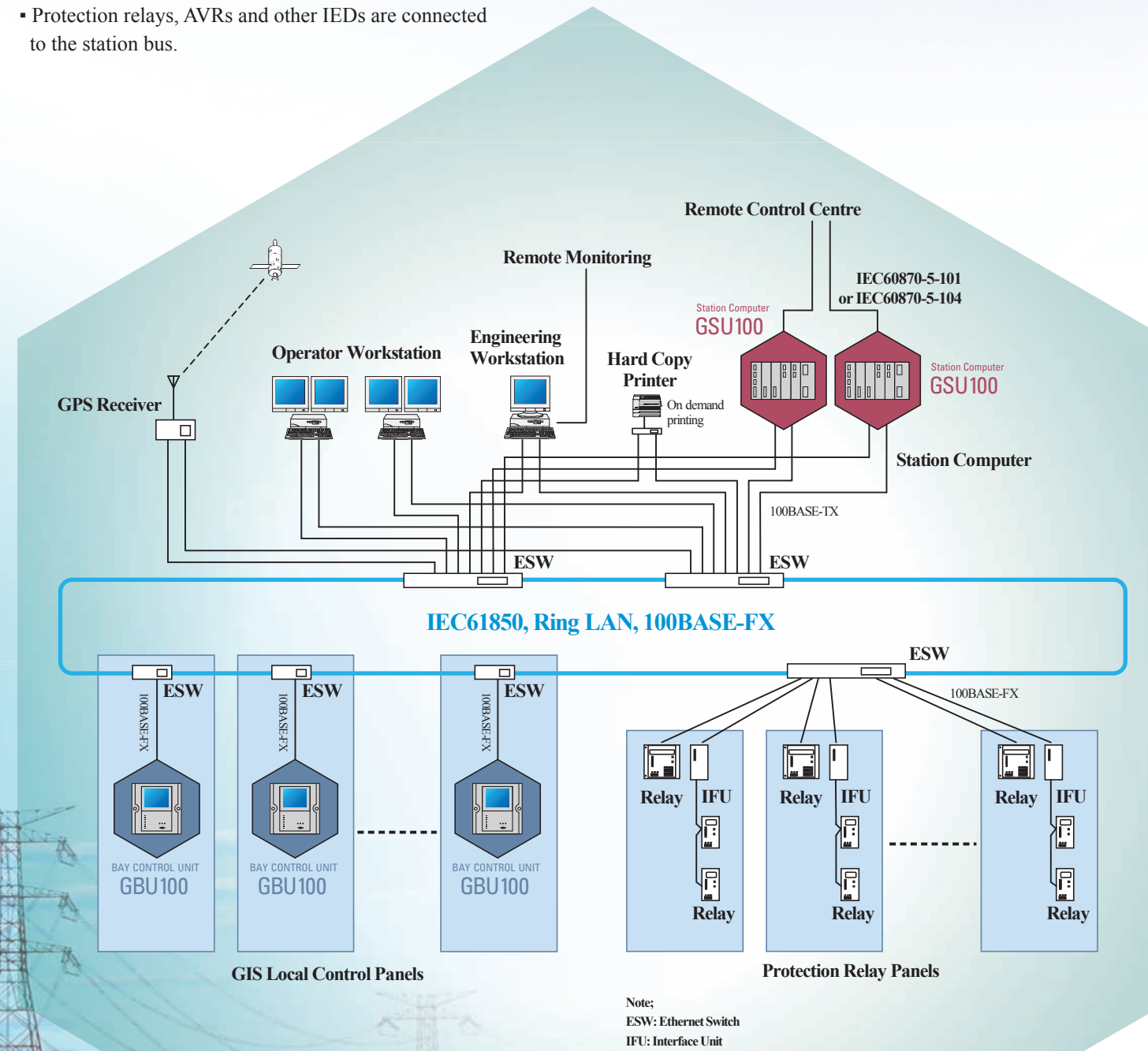


Figure 1 - Typical System Configuration

### FUNCTIONS

GSC1000 presents sophisticated functions for realizing secure operation of the whole substation.

#### ◆ Advanced functions

- Automation
  - Automatic synchronization for split system
  - Interlocking per bay and station wide
  - Automatic sequence control
  - Load shedding
  - Reactive power switching
- Power apparatus monitoring
  - Circuit breaker contact wear
  - Switchgear operating time
  - SF6 gas pressure of GIS
  - Operation counter
- Power quality monitoring (optional)
  - IEC 61000 -4-7, IEC 61000-4-30
  - Harmonics (THD\*, TDD\*\*, up to 15th)
  - Voltage swell, sag and interruption
- Protection
  - For medium and low voltage power system
  - Directional over current protection
  - Back-up over current protection
- Local control at bay control unit with touch type screen

#### ◆ Basic functions

- Control
- Monitoring
- Measurement
- Recording
- Operation support and maintenance

#### ◆ High reliability

- Robust systems
  - Fool proof philosophy
  - Redundancy
  - Protection from electrical interference
- Minimized AC operated devices
- Surge and noise withstand capability
- Duplicated DC power supply (option)

#### ◆ Safety operation

- Password security system
- SBO\*\*\* for control sequence
- Supporting guidance
  - Interlock guidance
  - Safety tag
  - Busbar coloring
  - Memorandum on HMI screen
  - Plant item information
- Windows screen and operation
- System monitoring

#### ◆ Easy maintenance

- Bay based maintenance
- Engineering tools and easy configuration
- On-line database maintenance
- Safety and easy bay extension on test mode
- Signal blocking and forced status setting

#### ◆ Saving resources

- Reduced installation space
- Minimized control cables and auxiliary equipment
- On demand printing
- Low power consumption

THD\* : Total Harmonic Distortion  
TDD\*\* : Total Demand Distortion  
SBO\*\*\* : Select Before Operation

### KEY DEVICES

GSC1000 is configured in a bay oriented and distributed system structure. Its components are modular based and facilitate easy upgrading to the latest model of each device.

#### ◆ Station computer (GSU100)

The station computer acts as substation server equipment and performs control and monitoring for the whole substation. The personal computer is applied as an operator workstation and performs as client equipment.

#### ◆ GPS (Global Positioning System)

The GPS is used as a master clock in the substation. The GPS receiver distributes time synchronizing signals to each IED using SNTP\*.

#### ◆ BCU (Bay Control Unit: GBU100)

The BCU performs control in accordance with control commands from network and station level control equipment and monitors the bay level power apparatus.

The BCU provides the following functions.

- Control
  - Close/Open commands to switchgear
  - Transformer tap raise/lower commands
  - Selection of in or out of service of protection relay equipment
  - Synchronism check for circuit breaker closing
  - Interlocking check
- Monitoring
  - Status and failure monitoring of all relevant equipment
  - Measurement
- Recording
  - Event recording with time tag of 1ms time resolution
  - Fault recording
- Other functions
  - Touch type LCD screen for local control at BCU
  - Time synchronization
  - Operation mode selection
  - Database maintenance
  - Automatic supervision
  - Protection

#### ◆ Protection relays and other IEDs

Protection relays and other IEDs can be connected to the station bus directly by IEC 61850 based communication. Non-IEC 61850 compliant IEDs can be connected via an interface unit.

#### ◆ Communication facilities

- Station bus
  - An Ethernet LAN, 100BASE-TX/FX, is used for the station bus to connect station level equipment and IEDs. Ethernet switches are used for the station bus. IEC61850 is applied for communication between the station computer and the IEDs. Optical cables are used to suppress surge and noise interference from power apparatus.
- Remote control center interface
  - The following IEC communication standards are available.
    - IEC 60870-5-101
    - IEC 60870-5-104

SNTP\* : Simple Network Time Protocol