

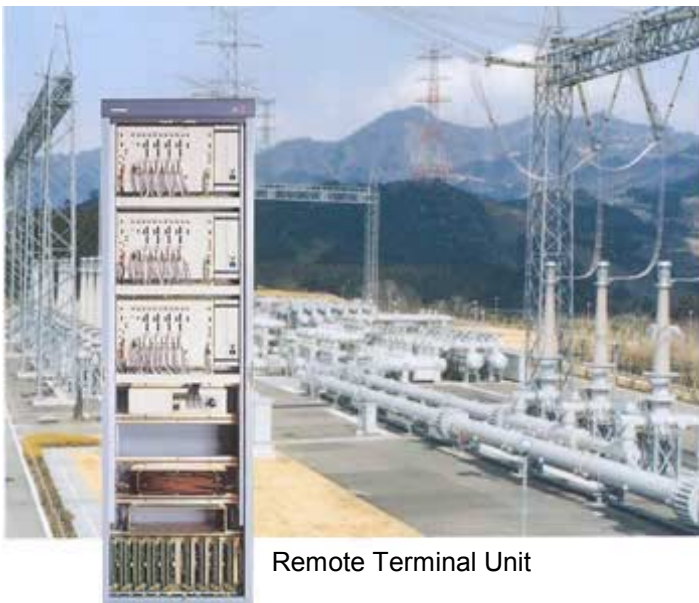
TOSHIBA

**TOSHIBA
EMS/SCADA/DAS
NETWORK SYSTEMS**

TOSCAN-3500



EMS System



Remote Terminal Unit



SCADA System

Introduction

TOSHIBA is one of the largest manufacturers of electric equipment in Japan. Its annual sales output is about 50 billion US\$, and the number of the total employees are, world wide, 186,000. TOSHIBA supplied an Automatic Generation Control System as the Japan's first computer-based system for power systems to a Japanese Power Utility in 1965. Since then TOSHIBA has supplied over 350 EMS/SCADA/ DAS systems to domestic and overseas users. TOSHIBA has supplied sixteen systems overseas to Australia, Bulgaria, Egypt, Indonesia, South Africa, South Korea and Taiwan.

As the leading supplier in the Japanese EMS/SCADA/DAS market, TOSHIBA has supplied EMSs to six major power utilities. Another, one utility has a TOSHIBA's EMS for on-line control and an IBM's system for analysis and scheduling.

In 1981, the first Dispatcher Training Simulator (DTS) in Japan was supplied. Since then tens of dispatcher training simulators have been supplied. Some of the latest ones can simulate not only power flows, voltages, and frequencies, but also transient stability phenomena.

In 1992, TOSHIBA developed the first on-line voltage stability monitoring system in the world, which predicts and alarms occurrence of voltage collapse in a bulk power system.

With regard to the open distributed EMS/SCADA systems, the first one was delivered to a domestic utility in 1994. Since then a number of the open distributed system have been supplied by TOSHIBA.



TOSCAN-3500

In the mid-1980's TOSHIBA standardized its EMS/SCADA/DAS systems based on the same design concept using TOSHIBA's 32-bit minicomputer, and named the system TOSCAN (TOSHIBA EMS/SCADA/DAS Network). At the beginning of the 1990's a new generation of the TOSCAN system, TOSCAN-2000, was developed based on an open distributed architecture. Since then this open distributed TOSCAN system has been upgraded. The latest one, TOSCAN-3500, uses SUN workstations and windows PCs for all processing requirements.

TOSCAN-3500 hardware and basic software products are compatible with international standards or industry-standard products. Application software is created using ANSI-C and FORTRAN languages. TOSCAN-3500 provides middleware which realizes high reliability, performance, and inter-operability of software. Designed for efficiency, reliability and long-term maintainability, each TOSCAN-3500 system is carefully configured with an optimum number of interconnected workstations and servers.

The TOSCAN-3500 system has many mode features. One of the features to be highlighted here is its networking capability. With the TOSCAN-3500 system each control center system can be connected through a high-speed wide area network so that the operator can monitor or control shared remote stations of control centers. Moreover, thanks to this networking capability, each control center system can operate as a back-up for another control center.

TOSCAN-3500 is an open-distributed system based around a local area network (LAN) of workstations to create a compact, energy-saving system. It requires 40% less installation space than conventional systems using process computers. The system is also energy-efficient, consuming 30% less power (in the case of a dual-configuration SCADA system).

Design Concept

TOSCAN-3500 is based on the open distributed design architecture. Client and server processes are distributed on readily available UNIX workstation hardware using open LAN and WAN protocols and networks. A redundant system configuration and RAS functions ensure high reliability, availability, and serviceability. Powerful CPU's and software ensure high performance.

Sophisticated, friendly human machine interface:

Two or three monitors, a keyboard and a mouse are provided for each operators console. Any desired information can be displayed on multiple windows on the display. Touch panels are available for Human Machine Interface (HMI) on request. The graphical user interface (GUI) is based on X-window and Motif. Microsoft Windows based GUI is also available.

Maintainability for the whole system:

TOSCAN-3500 provides, for database maintenance, a maintenance server, which enables maintenance of the database. Maintenance engineers maintain the databases on the maintenance server independently, and then download them to the data acquisition and control (DAC) servers and workstations. The database switching function enables the database to be switched quickly and safely after database maintenance.

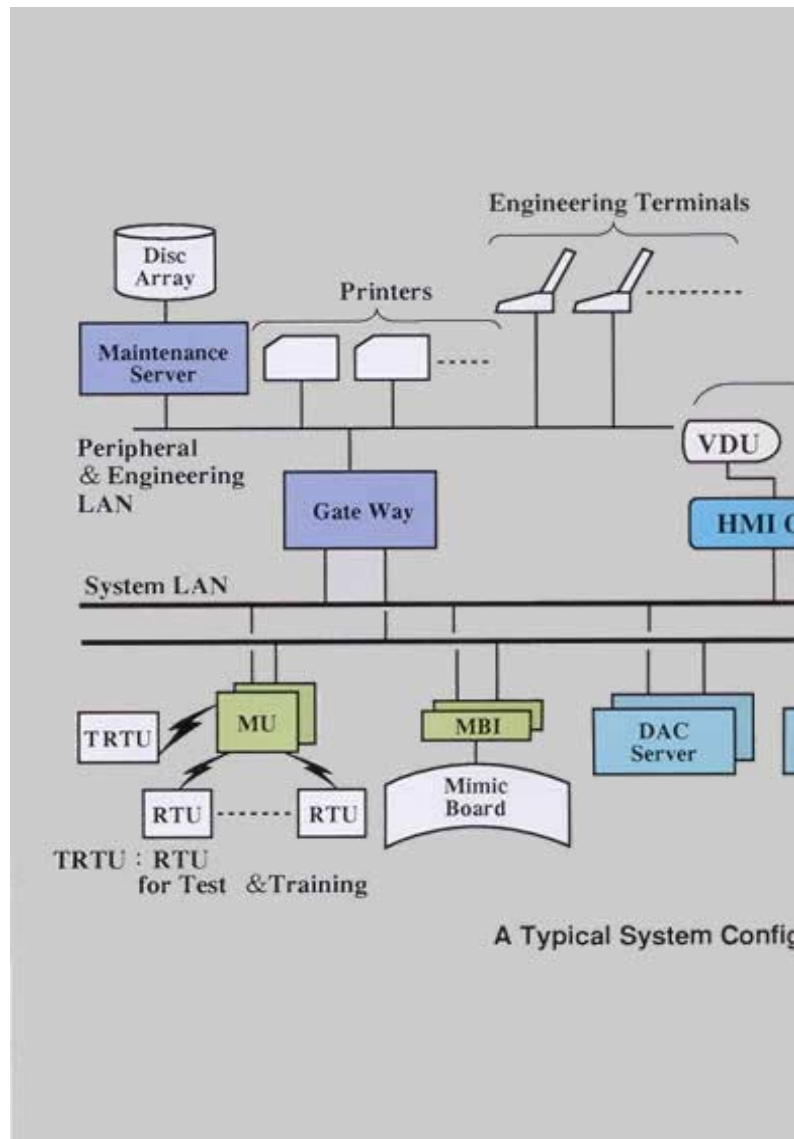
Telecontrol System:

The telecontrol Master Unit (MU), connected with the DAC servers in the TOSCAN-3500, provides the RTU communication functions. It can handle various types of transmission protocols at the same time and performs all of the corresponding conversion and front-end processing for the data. Downline loading via the DAC server from the maintenance server is used to set parameters to select protocols and parameters for processing.

System Configuration

TOSCAN-3500 is an advanced system, which uses the latest workstation computer technology in an open distributed architecture. It consists of the following architectural components:

- Data acquisition and control (DAC) server
- HMI clients for operator's consoles
- Data server (Historical Recording, etc)
- Maintenance server
- Gateway for a maintenance server, printers, and engineering terminals
- Telecontrol Master Units (MUs)
- Mimic Board Interface (MBI)
- Energy Management System (EMS) server (Optional)
- Dispatcher Training Simulator (DTS) server (Optional)



Software Configuration

The software architecture of the TOSCAN-3500 is a hierarchical one that can be generally categorized into four layers.

a. Platform

This layer is made up of the hardware and the operating system.

b. Platform Interface Layer

At this interface layer, differences in the platforms are hidden from the applications so that above the TOSCAN API Layer these appear as the same type of logical computers.

In terms of data traffic on the system LAN and other redundant LANs, the virtual circuit provided by the LAN manager ensures that the LAN hardware configuration is transparent above the TOSCAN API Layer.

c. TOSCAN API Layer

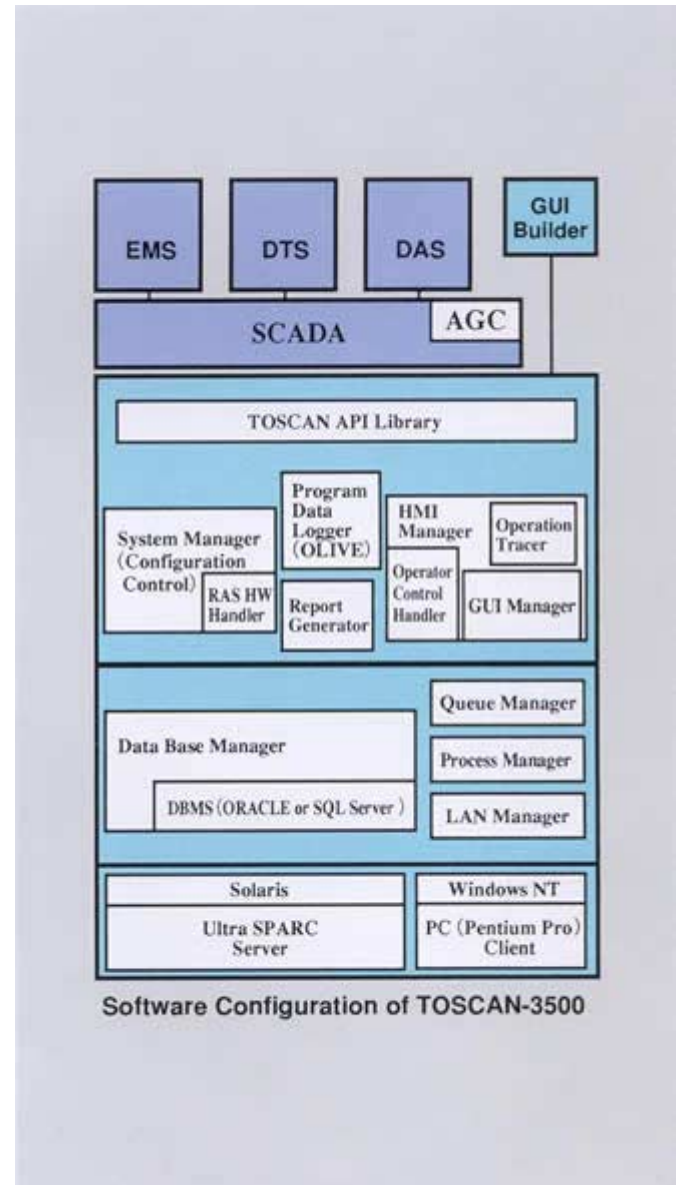
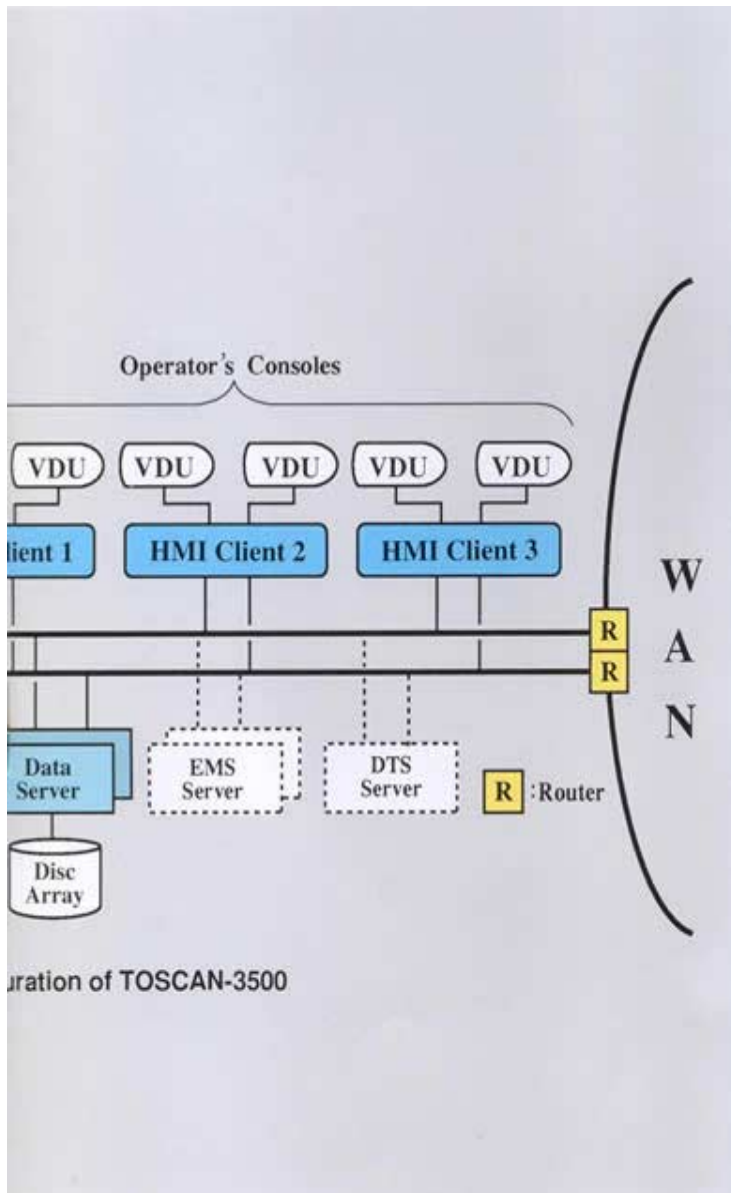
This layer provides the APIs for the basic functions and the various TOSCAN applications. The basic functions are as follows:

- System Manager (Configuration Control)
- Human Machine Interface (HMI) Manager
- Report Generator
- Program Data Logger (OLIVE)
- TOSCAN API Library

The TOSCAN API Library provides APIs for various applications on the Application Layer. The API specifications are not changed when the platform layers and the functions on the Platform Interface Layer and the TOSCAN API Layer are upgraded.

d. TOSCAN Application Layer

This layer controls the TOSCAN application functions. It is made up of the SCADA, EMS, DTS and DAS function modules and a GUI builder used to construct a man machine interface.

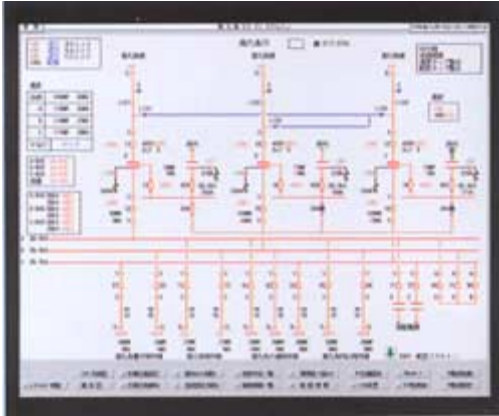


HMI

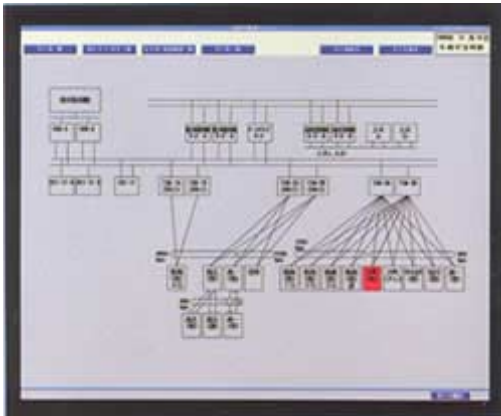
TOSCAN's human-machine interface adds consistency, speed and ease of use, to the operation of any TOSCAN2000/3000/3500 series.

Graphical user interface is also provided. Logs/ reports can be created in the Motif or Microsoft Windows, enabling log creation without coding.

- Graphically displayed maps and one-line diagrams for browser



One-Line Diagram

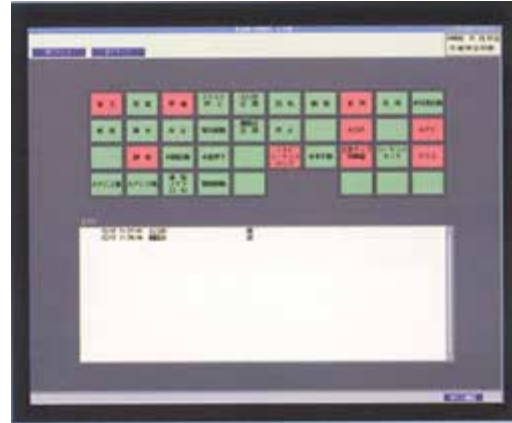


Communication Configuration



Generation Summary

- Alarm lists

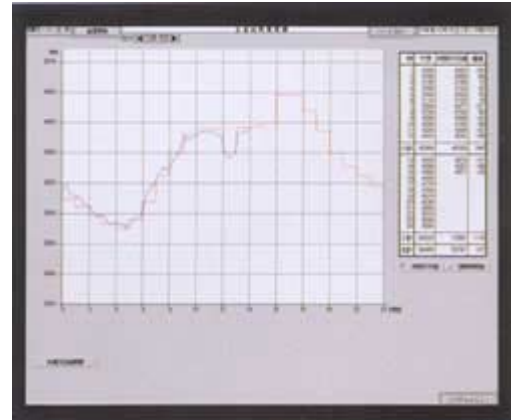


Alarm Summary



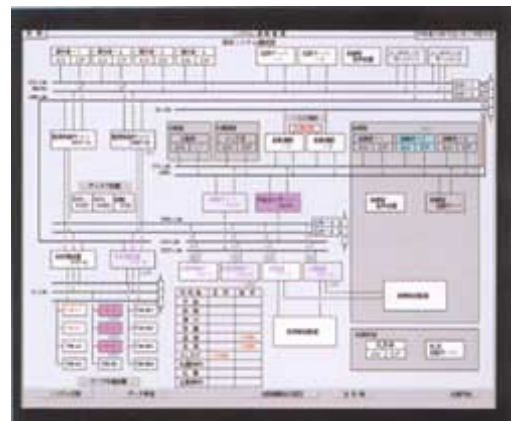
Alarm & Event List

- Trend recording



System Load Curve

- Post Disturbance data handling
- Printer control panel
- Computer System monitor
- Network Configuration Control



System Configuration Control

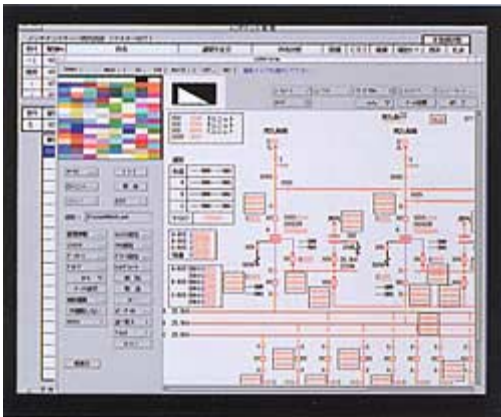
Services

TOSHIBA provides the following project services:

- Project management
- Quality Assurance in accordance with ISO9000
- Installation Work
- Training
- Maintenance Services
- Documentation e Database editor
- Graphic page editor



Database Editor



Graphic Page Editor

Functions

EMS functions:

- System Load Forecast
- Bus Load Forecast
- Generation Scheduling
- Unit Commitment
- Network Analysis Functions
 - Real-time Network Analysis Control
 - Network Model Builder
 - State Estimator
 - Security Analysis
 - Study Network Analysis
 - Optimal Power Flow
 - Voltage Stability Analysis
 - Transient Stability Analysis



TOSCAN-EMS System

SCADA functions:

- Power system monitoring
- Supervisory control
- Historical data processing
- Computer system monitoring
- Intelligent alarm processing
- Power flow calculation
- Post disturbance review
- Maintenance
- Automatic Fax/Telcommunication



TOSCAN-SCADA System

Optional Functions:

The following optional functions are available with the TOSCAN-3500 system. Any, of all of them can be supplied with the stem, according to the user's requirements.

- Sequential Switching Operation
- Voltage and Reactive Power Control
- Dispatcher Training Simulator



Dispatcher Training Simulator

TOSHIBA

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