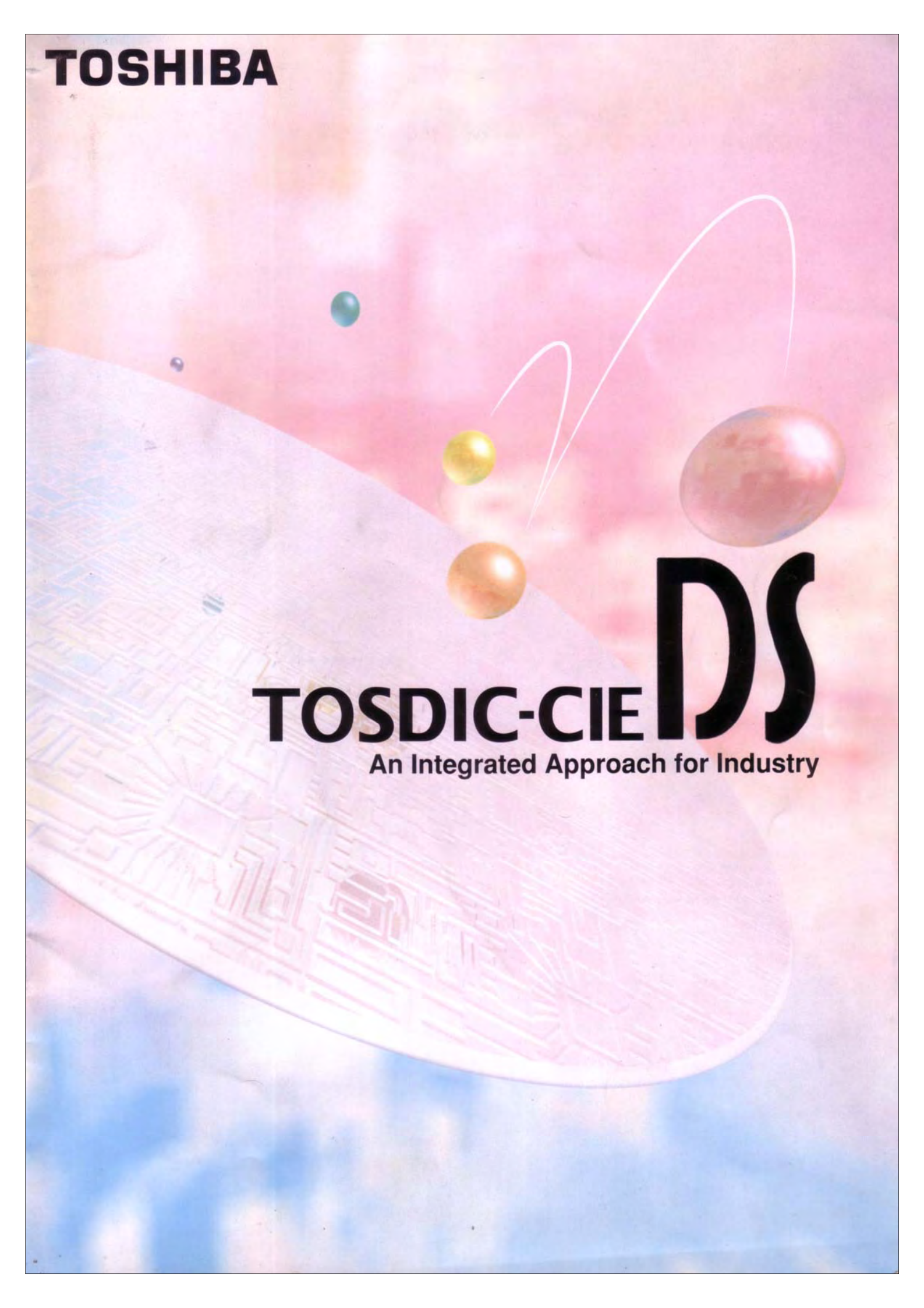


TOSHIBA



TOSDIC-CIE DS

An Integrated Approach for Industry

Proposal for a New Plant System for the 21st Century

Advanced Integrated control for the 21st Century

Toshiba, has for many years been a leader in the supply of integrated control systems which bring together Computers for management information,

Instrumentation for advanced process control, and Electric's for power control. This concept has been the essence of a range which has featured open-systems architecture, and scalability to enable right-sizing.

With the drive for greater plant information, necessary to maintain plant efficiency, Toshiba has launched its latest medium to large system offering "TOSDIC-CIE DS", which provides even closer communication and integration between higher order systems, and the control environment. The objective of this new system is to enhance plant efficiency in all of its guises. TOSDIC-CIE DS provides the basis for the information revolution which is occurring in industry today.

Features

- **Fast and efficient data transfer with client/server architecture**

Client/server architecture is applied to every aspect of data access within the system, achieving fast process data transmission and efficient data logging.

- **Easy configuration and maintenance, with simple tag management**

User-friendly and productive engineering tools on the control LAN for easy and efficient system configuration and maintenance, either on-line or off-line. Newly-added tags in a control station are immediately ready to appear on the HMI screen, based on the client/server style data handling.

- **Open application environment with ONS technology**

The ONS(Open Network Service) technology, process data access module for each station on control network, is available running as a package on the standard workstation. This offers a totally appear environment to make use of process data help within the system.

- **Low-cost upgrade path from existing TOSDIC systems**

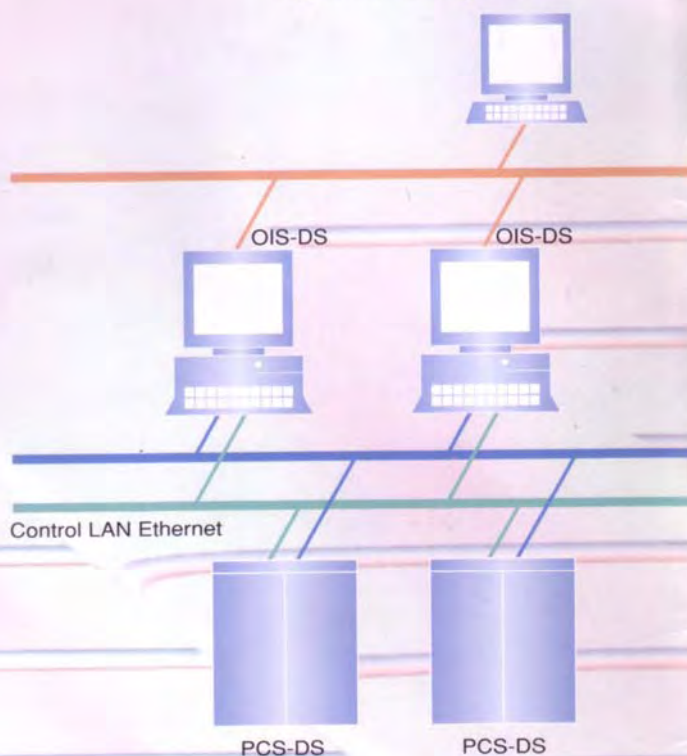
Previous generation DPCS stations can be connected to TOSDIC-CIE DS by replacing LAN interface card, enabling smooth systems upgrade at low cost.

(PCS6000/4000 controller connectivity: planned)

- **Provision for emerging industrial standards (planned)**

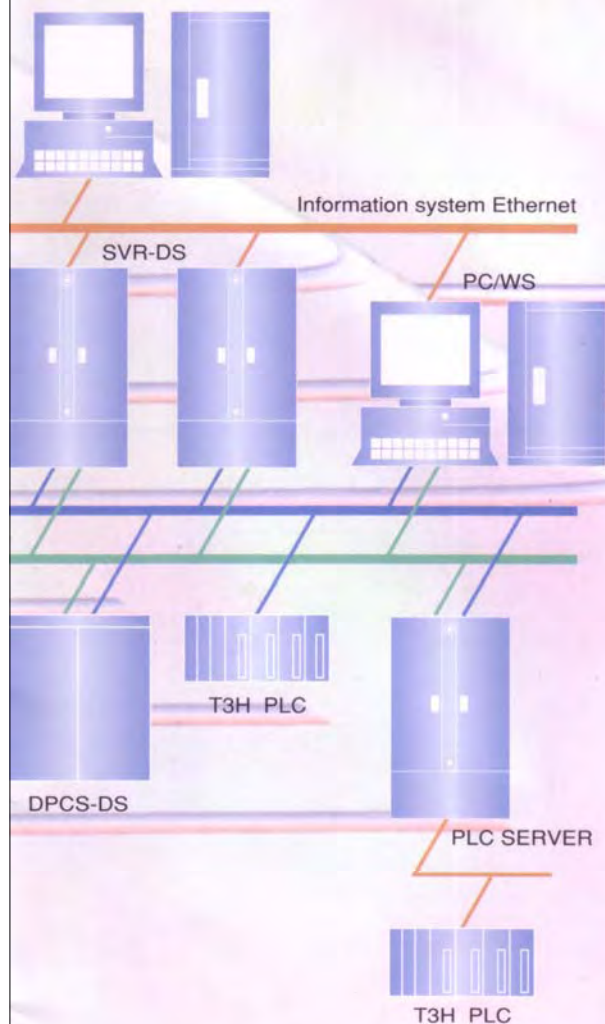
This open system is designed to implement future technologies such as OPC (OLE for Process Control), Active X and Foundation Fieldbus.

System Configuration



CIE Integrated Control Architecture Based on Open Systems, Right-Sizing

TOSDIC-CIE DS consists of a man-machine interface (OIS-DS), server stations (SVR-DS), and control stations (PCS-DS). Each of these is connected via IEEE 802.3-compliant Ethernet (r) in a distributed configuration. Standard workstations can be connected using the ONS package as option. Earlier generation control stations (DPCS-DS) and PLC (T3H) can be also be connected as option.



OIS-DS

An OIS-DS station harmonize operators with the control system. The OIS-DS stations present process data including system status, control modes and trend data in a format that is visually compelling yet reliable, and transfer control parameters and commands to the controller.

SVR-DS

A SVR-DS station is a historian, storing valuable operation log data and process data collected from PCS-DS stations. To enhance integrity, one system can have two SVR-DS stations in redundant configuration.

PCS-DS

A PCS-DS station is a process controller, collecting process data from the field sensors, and manipulating outputs based on the control strategy programmed within the controller. To enhance integrity, PCS-DS offers redundancy on each part of the station: main CPU, data bus and I/O modules.

DPCS-DS

A DPCS is a previous generation TOSDIC series control station. DPCS stations can be connected to CIE DS system by replacing its control LAN interface card.

T3H PLC

A T3H PLC is Toshiba's PROSEC series PLC, which can be connected directly to the control LAN or Ethernet line from PLC server. (Other PLC model support:planned)

PLC server

A PLC server collects PLC data, and converts them to process tag data to be handled by other stations within a CIE DS system. A PLC server may be a station on the control LAN with a PLC on a network or PLC connected via Ethernet.

Extensive Monitoring and Operation Functions Ensure an Advanced Operation Environment

Prompt and Accurate Quick Screen Operations

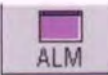
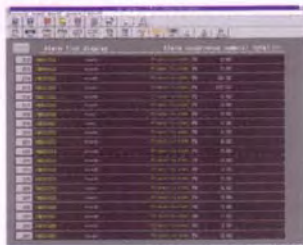
Top-Down Design for an Easy-to-Navigate Screen Operation Environment

Monitoring screens have a hierarchical (or top-down) design where the user starts from higher level screens and moves to screens lower in the hierarchy in order to find the information to be monitored. Related data can be quickly displayed. Multiple monitoring screens are linked for display purposes, so that information can be monitored and analysed from several perspectives.

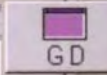
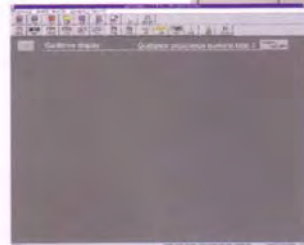
System State screen



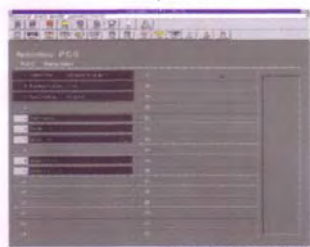
Alarm List screen



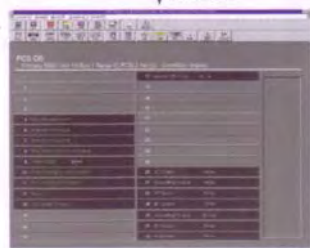
Guidance screen



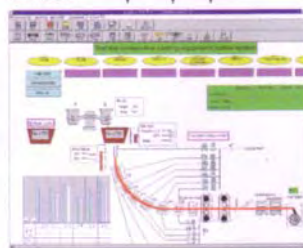
Station State screen



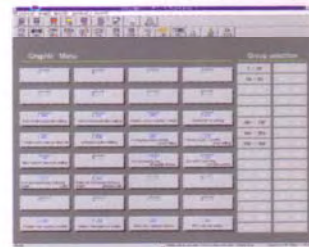
Detailed State screen



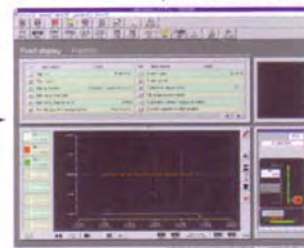
Graphic screen



Graphic Menu screen

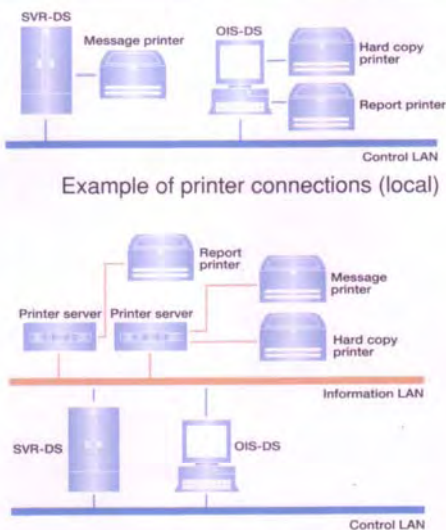


Point screen



Variety of Peripheral Equipment to Support Operator Tasks

In addition to keyboard and mouse, operations based on touch screens and specialised keyboards (multiple-loop operator consoles) can also be employed in parallel. A variety of voice output, printers, and other peripheral equipment are also available to support broad-ranging operator tasks. To properly handle a power failure, an uninterruptible power supply (UPS) is recommended.



Precise Screen Displays and Easy-to-View Multiple-Window Interface

In times of emergency, the ability to collect large amounts of data and make prompt and accurate decisions is paramount. Toolbars and menu bars allow a single operation to call up frequently-used screens. A multiple-window display mode allows up to four screens to be displayed simultaneously without overlap to display large amounts of information.

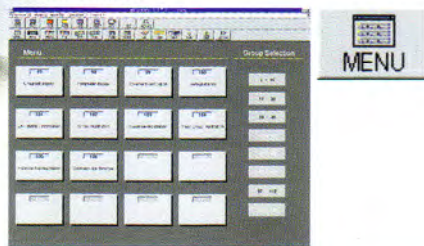


4 Window Screen display

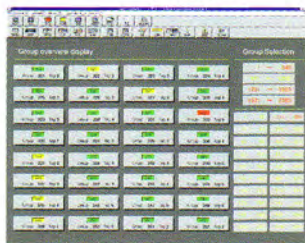
OIS-DS



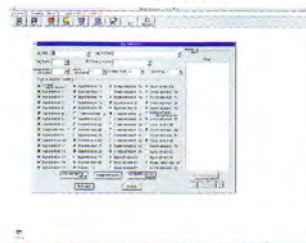
Menu screen



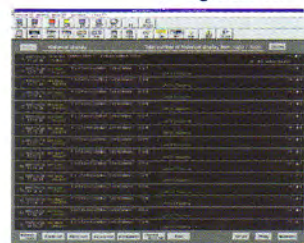
Group List screen



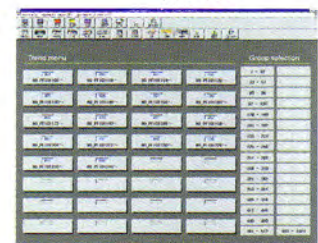
Tag Search screen



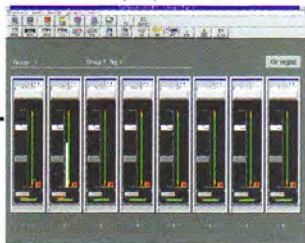
Log screen



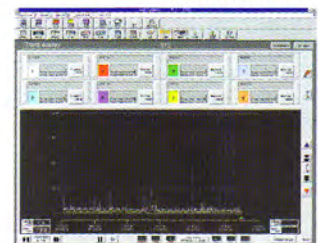
Trend Menu screen



Group screen

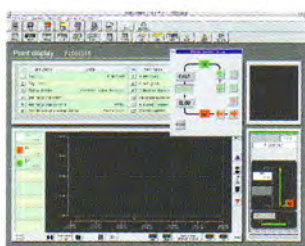


Trend screen



Numerous Functions Support Monitoring Operations

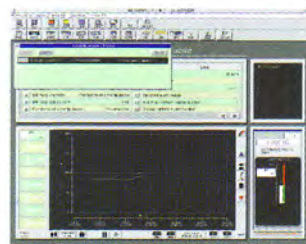
OIS-DS stations offer, as standard, a wide range of convenient functions for system monitoring. It includes report creation, screen scrolling, graphic screen zooming, and remote operation. Monitoring and operation restrictions can be specified by alarm monitoring groups and operation. In this way, stations can be established for specific operations, and reliability can be improved through parallel redundancy.



Remote operation

Versatile Alarm Processing

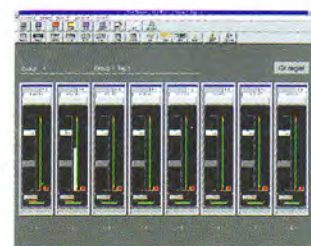
Multiple processing patterns are available for alarm notification and confirmation, which can be specified for each measurement point (tag) according to importance and process factors. In order to suppress alarm overloads, a "Representative Alarm Display" feature is also provided which activates only the most serious out of all alarms generated for a given tag.



Automatic window display

Group Screens and Multiple-Loop Operation

Multiple tags can be grouped and displayed on a single screen. Related tags can be easily assembled together for greater efficiency in monitoring and operations. In addition to this feature, a multiple-loop operator keyboard can be used for simultaneous operations on multiple tags.



Group screen

SVR-DS

Large-Capacity Database Servers Offer multiple access to Accumulated Data and an Environment for Creation of user defined application.

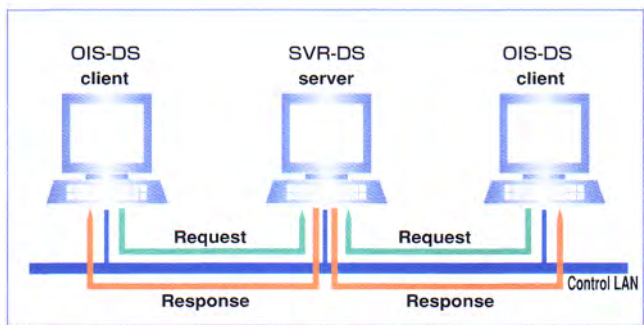


SVR-DS Stations Enhance System Performance

The SVR-DS stations play an essential role in the TOSDIC-CIE DS system by linking the human interface to the system. They manage a variety of information and data, and in particular are the source of data for the OIS-DS stations. The SVR-DS concentrates on data processing, hence the station is equipped with powerful CPUs to prevent processing delays and to ensure performance is able to meet the demands of mid- to large-scale systems.

Client-Server Architecture

A client-server configuration of SVR-DS and OIS-DS stations makes possible a man-machine interface with fast screen responses even in mid- to large-scale systems. The server SVR-DS stations respond promptly and accurately to requests for data from multiple OIS-DS stations, and therefore supports fast OIS-DS screen updates.



Schematic diagram of client-server architecture

Centralisation of Process and Historical Data

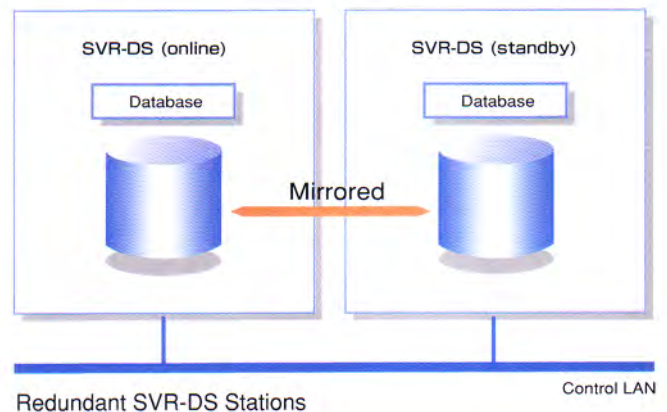
The data associated with user-created programmes is managed in a centralised format, as are the process data and parameters for each PCS-DS station, and the OIS-DS internal tag data. Data access functions are provided to allow use of this data in reports, in analysis, and in display of historical trends, so that accumulated data can be easily accessed by user-created applications.



Report Maintenance Screen

Reliability Ensured Through Redundant Configuration

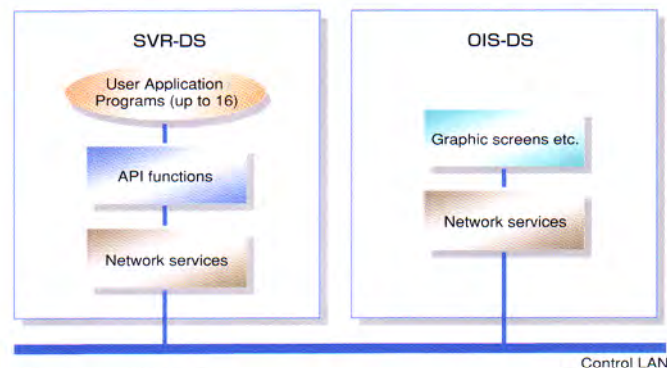
Continuous data collection and database mirroring are achieved through a parallel-redundant station architecture and through backups of historical data.



Redundant SVR-DS Stations

Application Development Environment

Up to 16 user definable application programmes can be written in the C language within the system. These programmes allow special application requirements to be easily implemented.



Schematic Diagram

Ethernet

Ethernet-Based Control LAN, High Integrated Performance through Open Network Services

Open System Architecture

Ethernet, a time proven and highly versatile network technology, has been adopted as the trunk LAN for control data transfer. This allows commercially available application packages to be freely integrated within the system.

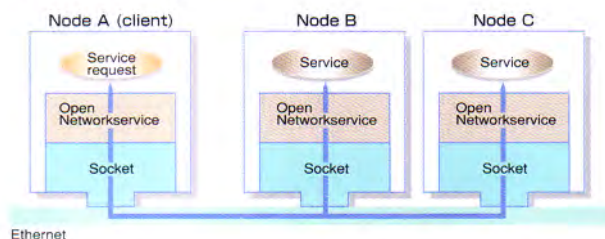
Innovations to Increase Speed and Reliability

Control applications require both high-speed data access and superior reliability. The TOSDIC-CIE DS system employs several techniques to satisfy both these demands.

① Open Network Services (ONS)

These services employ client-server functions to provide high-speed data access to a number of databases distributed over the network thereby removing the need to know where a specific database is located. By incorporating ONS, data within the system can be used "seamlessly," with the following services provided.

- Tag access
- Message transfer
- Historical data
- File mirroring



Data Access Method

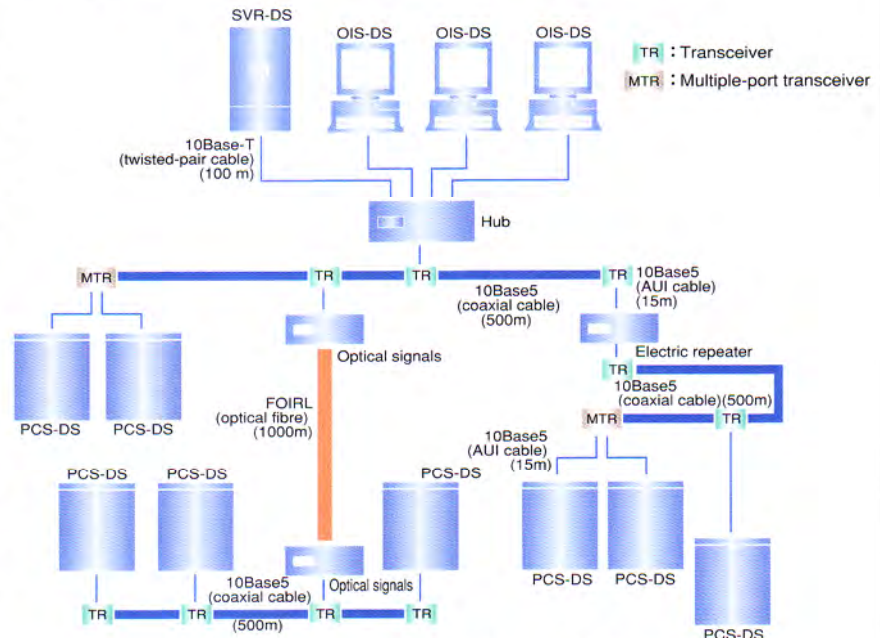
Service requested from a specific node may be provided elsewhere in the system, thereby providing a "transparent" processing network, independent of any specific processor.

② Network Redundancy

Network redundancy ensures continuous operation as data can continue to be transmitted to other stations whilst a problem may exist on one of the networks.

③ SNMP (Simple Network Management Protocol)

The status of network loading and of connection is obtainable. Network performance can be adjusted at system start-up and extension, thus aiding an optimal system operation. ONS package for Solaris Workstation is available. (Windows NT version: with release 2)



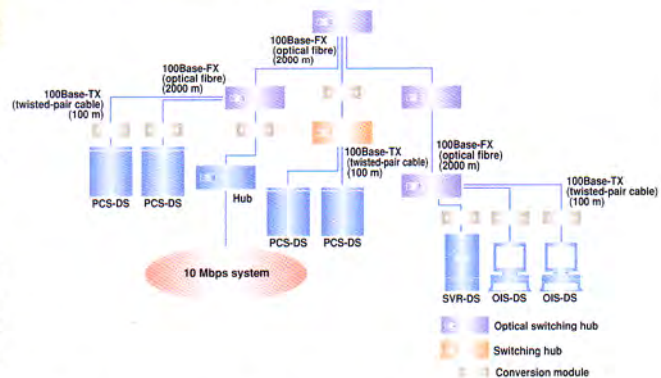
Example of Network Configuration (10Mbps)

Construction of a Long - Distance Network

Networks can be extended using repeaters and optical fibres (FOIRL) making possible various designs of system architecture. When extending a network, the IEEE 802.3 standard is followed. The entire system can have a maximum of five segments, four repeaters, and three cable segments, with up to 32 connection nodes.

Support for Large-Scale Systems

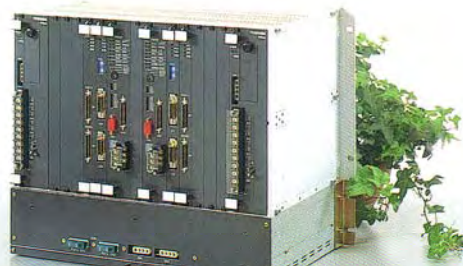
As the number of stations connected to the network increases, the data transfer increases accordingly. Fast Ethernet -the standard for high-speed data transfer at 100 Mbps-enables construction of large-scale systems with up to 64 nodes. With the use of bridges, the inclusion of 10 Mbps lines is also possible.



Example of Network Configuration (100 Mbps/10 Mbps mixed)

PCS-DS

A Control Station Combining the Three Imperatives for Optimum Control: Performance, Functionality, Reliability



● Main Unit

The main unit provides the platform for execution of the control operations based on user defined control programmes. It includes a serial interface to a peripheral I/O unit for sending and receiving field process datas, as well as an Ethernet interface for communication to OIS-DS man-machine interfaces and other hardware on the control system.

● Intelligent PI/O Units

These are PI/O units with special functions which include linearisation, engineering unit conversion etc. Because these units exchange data with the main unit via a serial data path, they can transmit and receive data locally or when used with repeaters, over extended distances.

● Parallel PI/O Units

Modular-type P5 series units are employed. Parallel PI/O units are capable of high-speed data transmission with sample rates of milliseconds and so are used mainly for control data I/O when fast processing is needed.



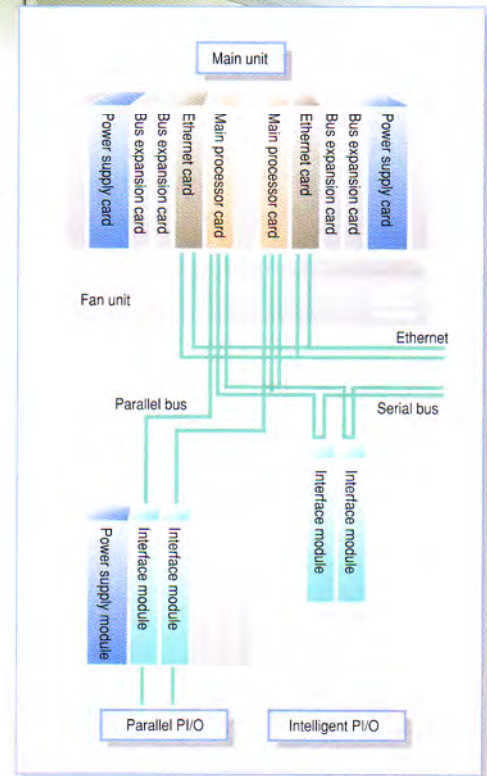
Main processor module



Intelligent PI/O model



Parallel PI/O model



Schematic Diagram of Core Unit and I/O Connections

High Performance

In addition to a general-use 32-bit processor, a custom processor which interprets ladder logic directly is provided for high-speed sequential processing in control operations. This provides for advanced functionality, and the ability to respond to fast plant changes.

High Functionality

A single controller provides both loop control and high-speed sequential control. PI/O units, which handle I/O data exchange with field equipment, logic and ladder, serial and/or parallel are selected according to application, and may also include, single and dual configuration. These and other features support flexible system configuration and expansion.

High Reliability

Hardware malfunctions are prevented by a redundant system configuration and RAS(Reliability Availability Serviceability) functions.

● Redundancy

- Main unit
- Power supply system
- Ethernet data transmission
- Internal bus for intelligent PI/O transmission (standard)
- Analogue I/O modules for intelligent PI/O units
- Internal bus for parallel PI/O transmission
- Parallel PI/O buffer modules

● RAS functions

- Auto-diagnostics
- DC power supply checks
- Low battery voltage detection
- Memory parity checks
- PI/O bus parity checks
- Bus time-outs
- Watchdog timers
- Read-back checks
- Fallback functions(Reduced operation)
- Trace functions (errors, events, operations, transmissions)
- Program execution time measurement/congestion detection

Task Processing

Six task types are provided. These are assigned priorities so that programmes can be executed according to relative importance. Control programmes are primarily executed by high-speed scan tasks and main scan tasks.

Simulation Functions

A data area is provided within the controller for performing dynamic simulations. This is useful for determining the operation of a control programme in advance.

Fallback Functions

Two types of fallback function enable a malfunctioning unit to be isolated so that control of normal units can continue unhindered. When fallback occurs, an error message is sent to the operator.

• Task Fallback

When improper memory access etc. occurs within a task, that task alone is terminated, leaving others to run.

• Parallel PI/O Fallback

When an error occurs in Input and output, subsequent input and output is prevented only to the failed channel.

PID Control

PID algorithms, called "Hyper-PID" are provided as standard. These provide secure control functions including a degrees of freedom technique for optimal compensation on setpoint changes and process disturbance.

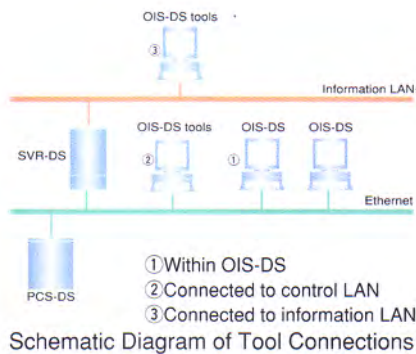
TOOL

Windows-NT-Based Engineering Tools Support System Configuration and Application Creation

OIS-DS Tool

An OIS-DS tool is used to configure plant monitoring, logging and trending functions on OIS-DS and SVR-DS station. This tool has the following features:

- Simple, easy-to-understand operation
- Data security
 - Erroneous operations are prevented;
 - version control implemented
- Object-oriented
 - OOP enables unified data management
- Online maintenance
 - Configuration can be modified and downloaded during system operation.



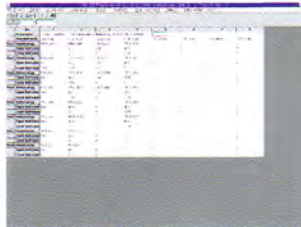
Schematic Diagram of Tool Connections

Graphics Editor (SL-GMS)

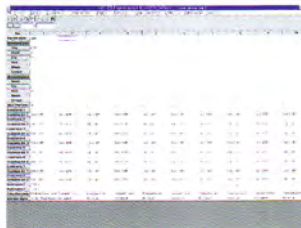
This object-based drawing software runs in the Windows environment. Screens may be quickly and easily created via an extensive graphic tool. Numerous supporting functions enable colour assignment, positioning, resizing, rotating, and other operations with real-time response. An extensive object shape library is provided, in addition, cut and paste of parts allows reuse of displays thus ensuring efficient creation of graphical screens.



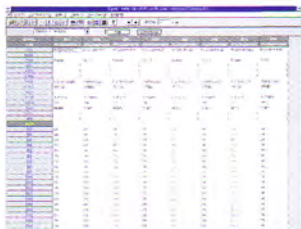
Graphics Editor Screen



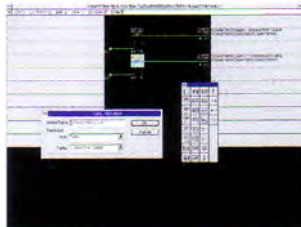
TREND GROUPING



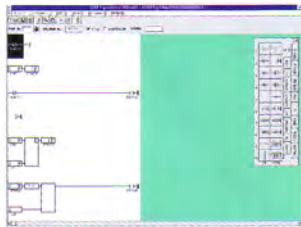
USER APPLICATION



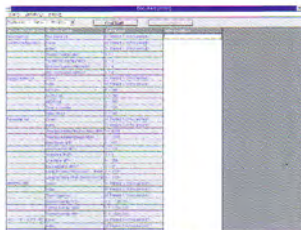
SIGNAL LIST



CONTROL FLOW



LADDER/DATAFLOW



DOCUMENT PRINT

Report Creation(using Microsoft Excel)

Data previously prepared by a SVR-DS station is used in report creation. DDE links can be employed to transfer data which can be easily formatted using one of the large number of templates provided. A multifunctional report maintenance screen is also provided.



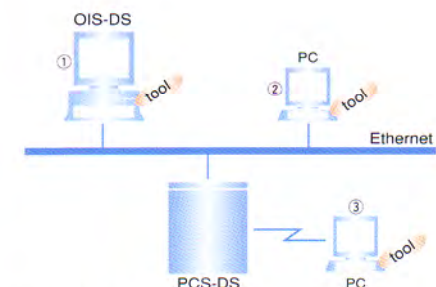
Report Screen

PCS-DS Tool

A PCS-DS tool is used to configure I/O modules, tag lists, parameters and control strategies in PCS-DS station. The tool handles DCS-oriented control language for loop controls and sequence controls as well as PLC's ladder/dataflow, making the PCS-DS suitable for a wide range of applications.

This tool has the following features:

- Simple, easy-to-understand operation
- Data version management
- Visual programming
 - Control programs can be created through simple operations
- Object-oriented
 - OOP enables unified data management
- Online maintenance
 - Program modification and downloading are possible during system operation.



- ① Provided in OIS-DS
- ② Installed in PC connected to Ethernet
- ③ Installed in PC, data exchange achieved via RS-232C cable

Schematic Diagram of Tool Connections

TOSDIC

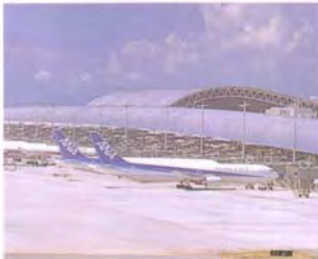
The Beginning of a
TOSDIC-CIE DS
Diverse Aspects of



Oil and Petrochemical



Foodstuffs, Pharmaceuticals



Airports



Power Generation



Buildings

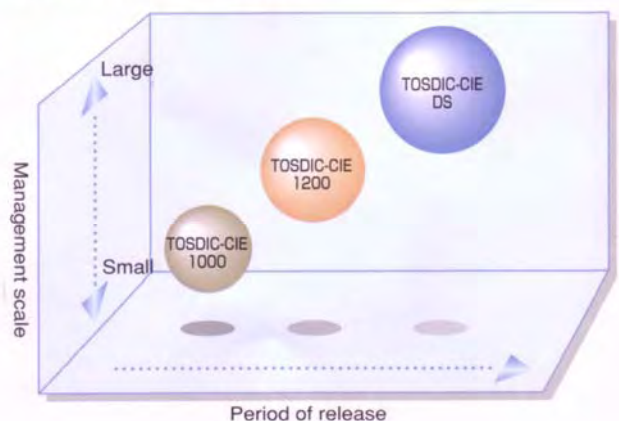


Roads



Toshiba Continues to Promote Open Systems and Right-Sizing

Since the release of its DCS product in 1975, Toshiba has striven constantly to understand accurately its customers' needs and the social circumstances which surround manufacturing systems. In recent years it has developed integrated control systems based on the concepts of open systems and right-sizing. With the introduction of new entries to the product line-up, Toshiba will continue to promote an open-system, right-sizing approach. Toshiba will offer ever more advanced systems-providing powerful support to customers' corporate activities.



CIE DS

New Plant System Revolutionises Production Management



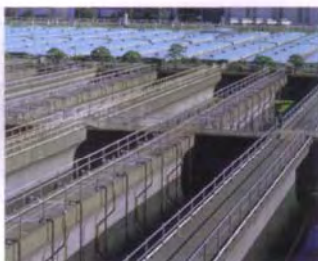
Steel and Non-ferrous Metals



Transportation



Gas Service



Waterworks and Sewage



Paper and Pulp



Waste

System Line-up

For Small-Scale Plants

TOSDIC-CIE 1000

The TOSDIC-CIE 1000 is the integrated control system that pioneered the open-system, right-sizing approach.

For Intermediate-Scale Plants

TOSDIC-CIE 1200

This integrated control system expands the functions of the TOSDIC-CIE 1000 Model, applicable to mid-size plants with excellent cost-performance.

SPECIFICATION

●HMI/Server

Item	Specification
Number of tag	20,000
OS	HMI : Windows NT(R) Server : Solaris(R)
Screen appearance	Operator Window area : 4 tiles maximum
Alarm Window	Auto Window display
Signal classification	64/system
Signboard	255 patterns/system
Number of menu	128/system
Trend display	8 pens/group, 1024/system
Graphic display	1024 screens/system
Historical database	Assign points : 5000/system Sampling cycle 5sec to 1 day Number of samples : 10,000/point
History storage points	8,000/system
Guidance	1,024/system
Report	Daily/monthly/yearly 64 sheets each

●Control Station

Item	Specification
Program	Ladder/dataflow Diagram 400step/page, 320pages
	Control flow diagram 1,280bytes/page, 1,000pages
Tag	Indicator : 512, Controller : 256, Counter : 128
	Pushbutton : 768, Data block : 256, Wind monitor : 4

●Network

Item	Specification
Data transmission speed	10Mbps 100Mbps
Media Access	CSMA/CD(IEEE802.3)
Transmission route	max 2.5km max 8.2km
No. of station	32 64
Media redundancy	Parallel redundancy (standard)



ISO9001certificate

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TOSHIBA

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- This product was designed and manufactured for use in general manufacturing equipment systems (for process control, production line control, etc.). It was not designed or manufactured for use with equipment employed under circumstances which pose a direct threat to human life, or with systems consisting of such equipment. Before using this product for such purposes, please consult a sales representative.
- This product was manufactured under rigorous quality control. However, when employing this product with facilities which may pose a threat to human life, or with facilities for which serious consequences may be foreseen, please take special care to ensure the construction of a system which is safe with respect to system operation, maintenance and management.
- This product requires electrical and mechanical installation. Please consult your vendor, a specialised service provider, or a Toshiba sales representative regarding installation. Improper installation may result in electric shocks or fires.
- Please read all related documentation prior to use of this product, and use the product only as described in the documentation.

Specifications are updated June., 1998 and subject to change without notice.
For further information, please contact your nearest Toshiba Representative.

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