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OPERATOR'S STATION FOR DISTRIBUTED CONTROL SYSTEM MICREX

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1 FOREWORD

The growth of the distributed control system was accompanied by the fixing of the CRT operator's station in the industrial world. During this time, many requests based on usage experience were received. These requests are roughly classified into "coping with voluminous data" and "easy engineering".

For the former, a method of easily realizing processing and display which can exhibit arbitrary independence instead of the conventional fixed processing display and direct viewing operation backed by a touch screen, etc. instead of fixed key operation are desired. Moreover, the advance of application of the distributed control system to large plants is accompanied by a strong demand for collective processing and single windowing of data and electrical machinery (E), instrumentation (I), and computer (C) system unification.

For the latter, there is a strong desire for a change from controller function representation by program description using conventional POL (Problem Oriented Language), BASIC, etc. to graphic representation by time chart, transfer diagram, loop diagram, etc. and for a system with abundant affinity and independent expandability for engineering.

The operator's station developed with these demands as the background adapts the record of achievements of the functions of the conventional OCS series and uses an architecture which distributes the man-machine interface functions to the OCS-1500, the process data management functions to the DBS-1500, and the engineering functions to the EWS-500 and has independent expandability by function while improving the functions.

This article emphasizes the system achitecture and special functions of this station.

2 SYSTEM ARCHITECTURE AND SPECIFICATIONS

2.1 Architecture

The MICREX operator's station is connected to a process station PCS-500, programmable controller HDC-500, and telemeter telecontrol system SAS via a dataway DPCS-F. The OCS-1500 and DBS-1500 are connected by DPCS-F and general-use LAN and the DBS-1500 and EWS-500 are connected through a general-use interface. The overall system architecture is shown in *Fig. 1*. An exterior view of the operator's station is shown in *Fig. 2*.

Fig. 1 Overall system architecture

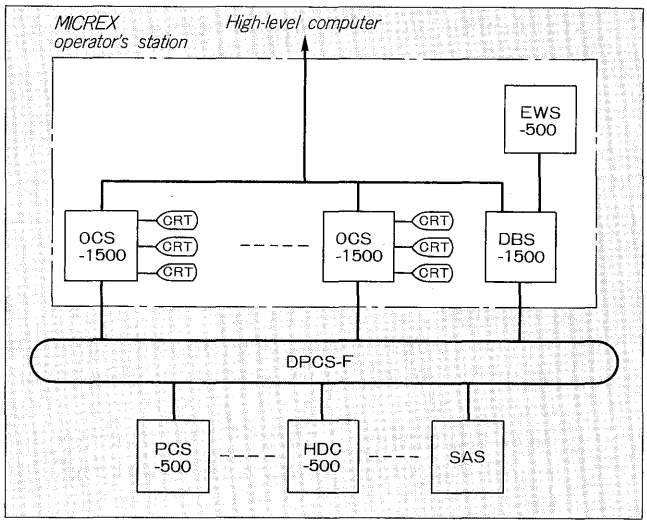
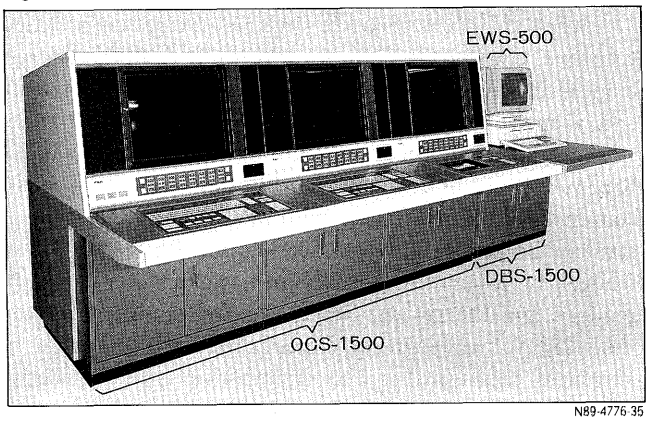


Fig. 2 Exterior view of operator's station



2.2 Specifications

The specifications of the operator's station in function

Table 1 Operator's station specifications

Model	Specification	System specifications
OCS-1500	CRT Max 3, 20 inch, 16 colors 640 x 400 dots, four-fold image KB touch screen, EIC integration KB Number of resident tags : 2,048 + 64 tags Number of arbitrary process data : 17,280 data Number of condition signals : 30,720 points	OCS-1500 Max 8 PCS-500 Max 60
DBS-1500	Number of monitor TAG : 17,280 tags Number of arbitrary process data : 17,280 data Number of condition signals : 30,720 points Number of trend points : 2,048 points Number of plant screens : 512 pages Pinter : Max 8	Duplicate architecture possible
EWS-500	Loop diagram, time chart, transfer conditions diagram, standard image	Max 4

Fig. 3 OCS-1500 hardware architecture

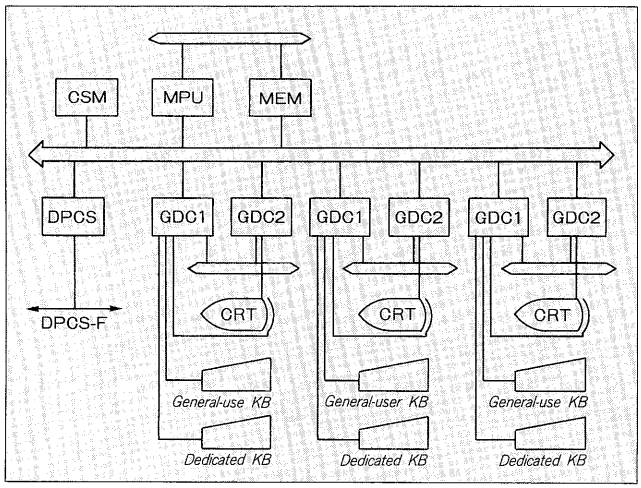
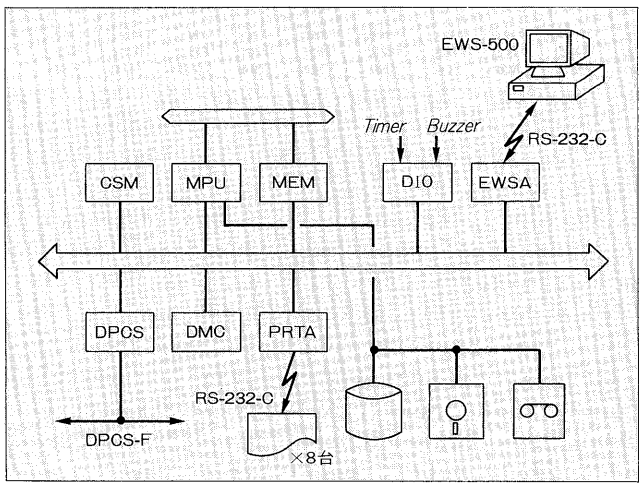
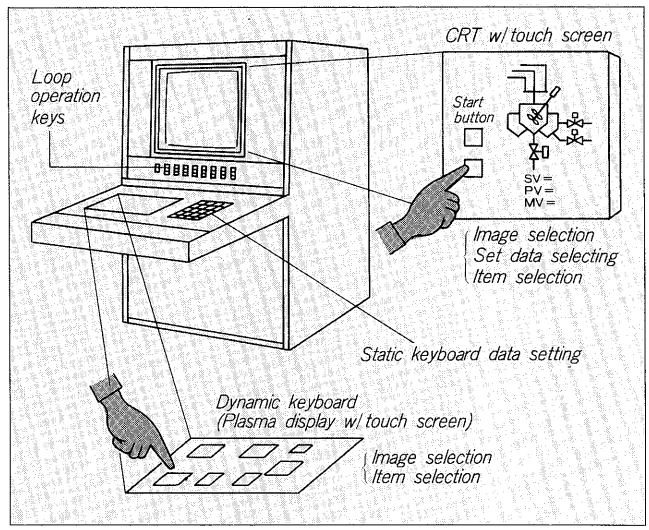


Fig. 4 DBS-1500 hardware architecture



units are listed in *Table 1*. The hardware architecture is shown in *Figs. 3* and *4*. The touch operation is outlined in *Fig. 5*.

Fig. 5 OCS touch screen



3 OPERATION FUNCTIONS

Besides process monitoring operation and other operation functions, the OCS-1500 has plant graphic panel interactive image creation, standard image definition, and other engineering functions. The OCS functions system is shown in *Fig. 6*. The main functions of the OCS are described below.

3.1 Screen interruption functions (Fig. 7)

(1) Operation guide message interruption

When the operator touches a symbol on the screen, a detailed alarm message and operation guide message are interruption displayed.

(2) Trend interruption

Since the trend recording condition near the symbol touched on the screen is interruption displayed, the trend condition can be easily grasped while continuing to monitor the plant.

(3) Instrument diagram interruption

During analog operation, the same instrument diagram as that of the group panel is interruption displayed and up-down operation can be performed with loop operation keys.

(4) Alarm message interrupt

An alarm is emergency interruption displayed by a process condition change and operator cautionary operation can be prompted.

3.2 Trend function

Besides arbitrary time data digital value display on a trend graph, trend functions include vertical and horizontal axes expanded and contracted display, transfer display and clearing in pen units, pen start-stop display by sequence starting, set value pattern superimposed display, printer output, etc.. Real time trend display for all pens is possible and analog operation by instrument diagram interruption display is also easy.

Fig. 6 OCS functions organization

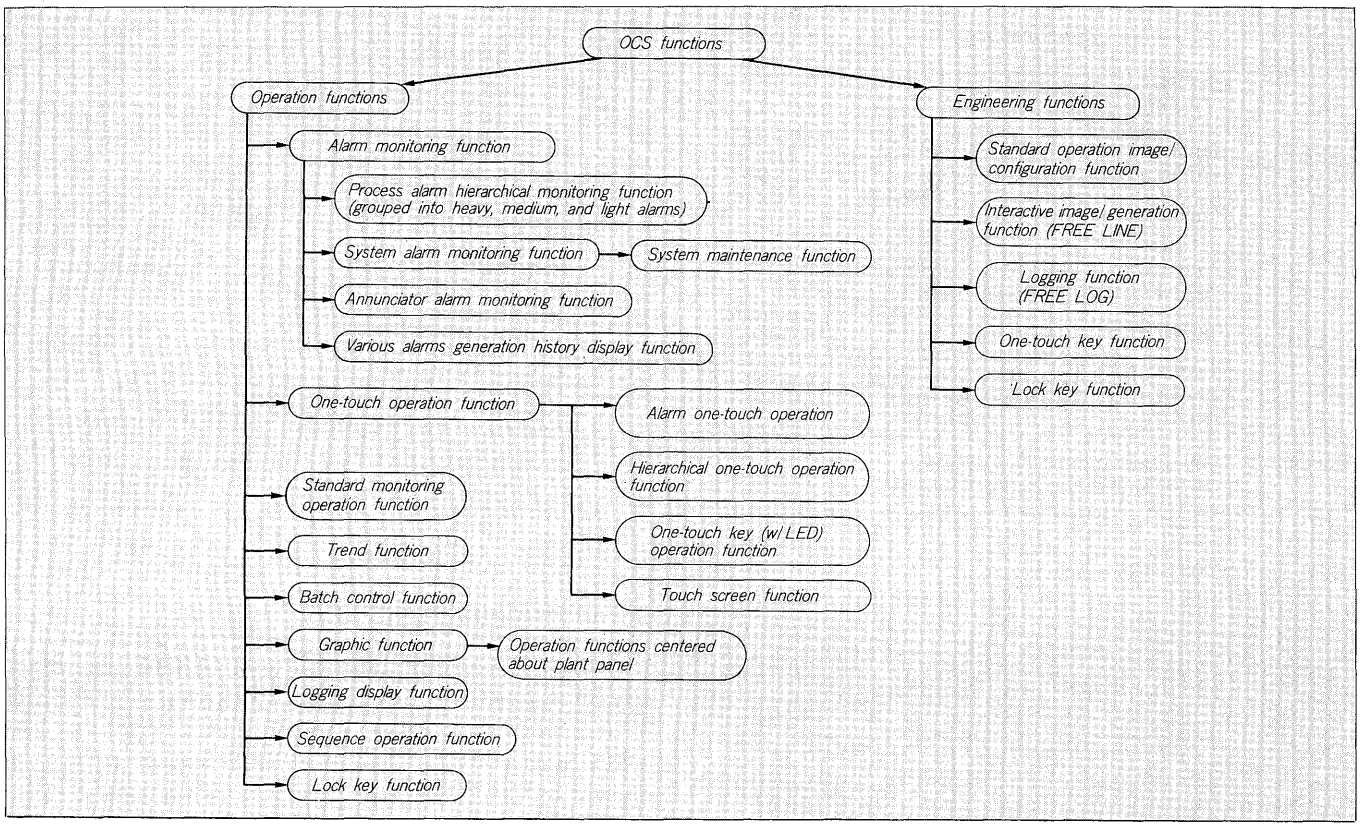
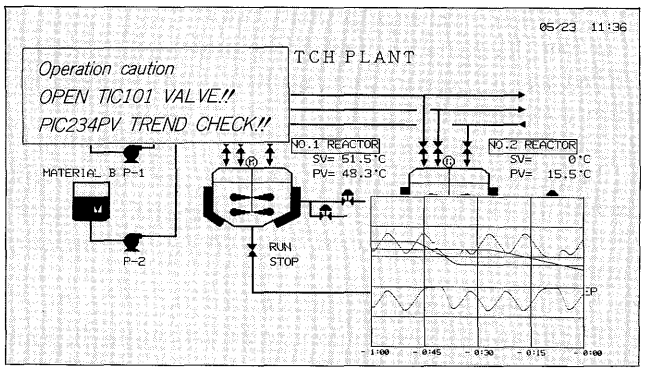


Fig. 7 Example of screen interruption display to plant panel



3.3 Single window, single keyboard

OCS screen display and key input are handled as common input/output data between multiple OCS and of a high-rank control computer.

(1) Image exchange between OCS
(2) Flicker stop (FL-STOP) key, etc. exchange between OCS
(3) Computer data OCS image display
(4) Transmission of OCS key input data to computer
(5) Dynamic keys E, I, and C dedicated keys arrangement display and input corresponding processing

4 DATA MANAGEMENT FUNCTIONS

The DBS-1500 is the system function that manages the MICREX system common data. The machinery, instruments, and computer common unified data base is collectively managed by DBS and a function with OCS as a unified single window is achieved. (*Fig. 8*)

4.1 Process data base, factory data base

(1) Trend data storage

As the data amount, the analog data of 2048 points is a variable period of 2 seconds or more and can be recorded for 24 hours at a 1 minute period and for 8 days in the long-term mode.

(2) Logging data storage

Daily report, weekly report, monthly report, annual report, etc. are handled. Daily reports for 64 days and monthly reports for 32 months can be stored. Parallel incorporation of preceding days data, data of the same day a preceding month and preceding year, comments, etc. into the daily report page is easy.

(3) Alarm condition change detection function

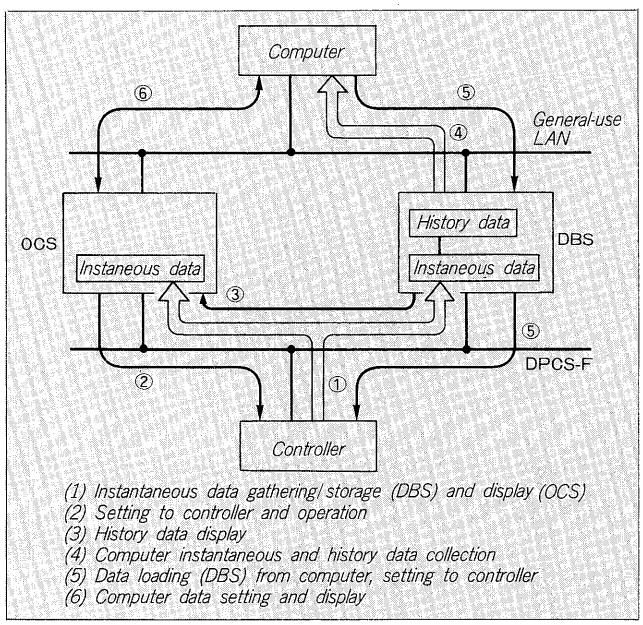
Collectively managed system abnormalities, process abnormalities, and other condition changes are detected in the entire system and each OCS is informed and the condition changes are stored historically. Data retrieval by trouble generation order, specification by TAG No., time specification, etc. is easy.

(4) Common timer function

Timer data flows on the DPCS-F line and time management which unifies the entire system is performed.

(5) Architecture data management

Fig. 8 Data base functions interrelation



PCS-500 architecture data, OCS image architecture data, system programs, etc. are collectively managed.

4.2 Computer linking function

Since various process data is file and data managed on the DBS, a high-rank system can access it in unified data format over a general-use LAN and unification of low-rank process control and high-level data management is easy.

5 ENGINEERING FUNCTIONS

The EWS-500, which realizes engineering functions, uses a general-purpose personal computer so that equipment is used effectively.

5.1 Controller functions configuration

(1) Loop control function

The PCS-500 contains an internal timer and processor for loop control. The architecture allows flexible implementation of various control by combining these internal instruments. An example of this configuration method is shown in *Fig. 9*.

(2) Sequence control function

The process control system of the PCS-500 is based on a step sequence. The step sequence is based on the condition transfer concept. For example, a control function for describing output devices operating conditions and switching conditions in process units is implemented. The set value, parameters, mode, etc. for digital I/O, analog I/O, switch I/O, and internal instruments can be designated as I/O function. Output interlock, emergency interlock, and other processing indispensable in sequence control can be easily added also. A time chart configuration example is shown in *Fig. 10*.

Fig. 9 Loop control configuration example

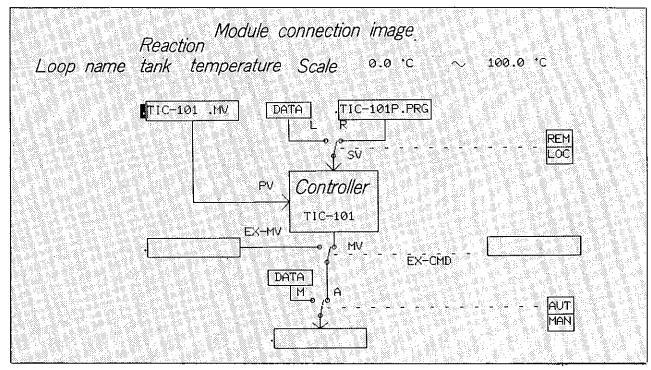
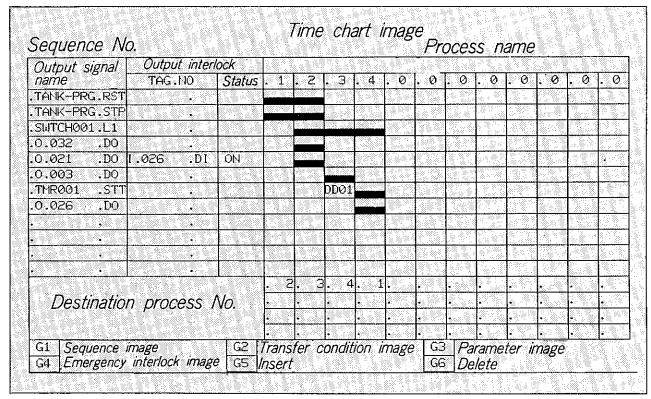


Fig. 10 Time chart configuration example



5.2 Man-machine interface function configuration

(1) FREE-LINE, FREE-LOG

The interactive image creation and tabulation functions are improved by continuing the ease of creation of the OCS-100 series and reflecting the opinions of users. For example, user release of touch panel to plant image, definition of various interrupt display images, packaging related to telemeter and tele-control system setting, etc.. There are many kinds of log tabulation, such as 66 lines X 180 columns image creation area expansion, inter-item calculation arbitrary definition, etc..

6 CONCLUSION

The operator's station introduced here copes with international standards and is a crystal of the newest microprocessor technology and graphic display technology and has flexible and abundant software configurations with upward compatibility considered to the maximum. In the future, we will continue the pursuit of the operator's station as a center which plays a more important role among distributed digital instrumentation systems with the introduction of trouble diagnsis, facility diagnosis, and other AI technology, function with the fiber-optic field instrumentation system FFI, in which Fuji Electric took the initiative, tackling of advanced control system, including autotuning and fuzzy control, and offering of compact machines for medium and small systems, etc..