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CENTRALIZED SUPERVISORY CONTROL EQUIPMENT

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I. FOREWORD

The increase in the scale of automation and centralization of electric stations has been accompanied by the introduction of computer-based centralized supervisory control equipment, but remote supervisory control equipment (telecon) are used at the responsible for maintenance at each area to back-up this control system. Recently, Fuji Electric and Chubu Electric Power Co. Inc. cooperatively developed a system that applies a microcomputer to this back-up telecon. The following outlines this equipment.

II. SYSTEM CONFIGURATION AND FUNCTIONS

This equipment is control 1:N method, supervision (1:1) x N method control station equipment. Its configuration is shown in *Fig. 1*.

Its main functions are:

1) Supervision

Besides the status of CB, LS, etc., the indicator unit installed at each station indicates 30F and 30S.

2) Control

Station and equipment selection is performed by push-

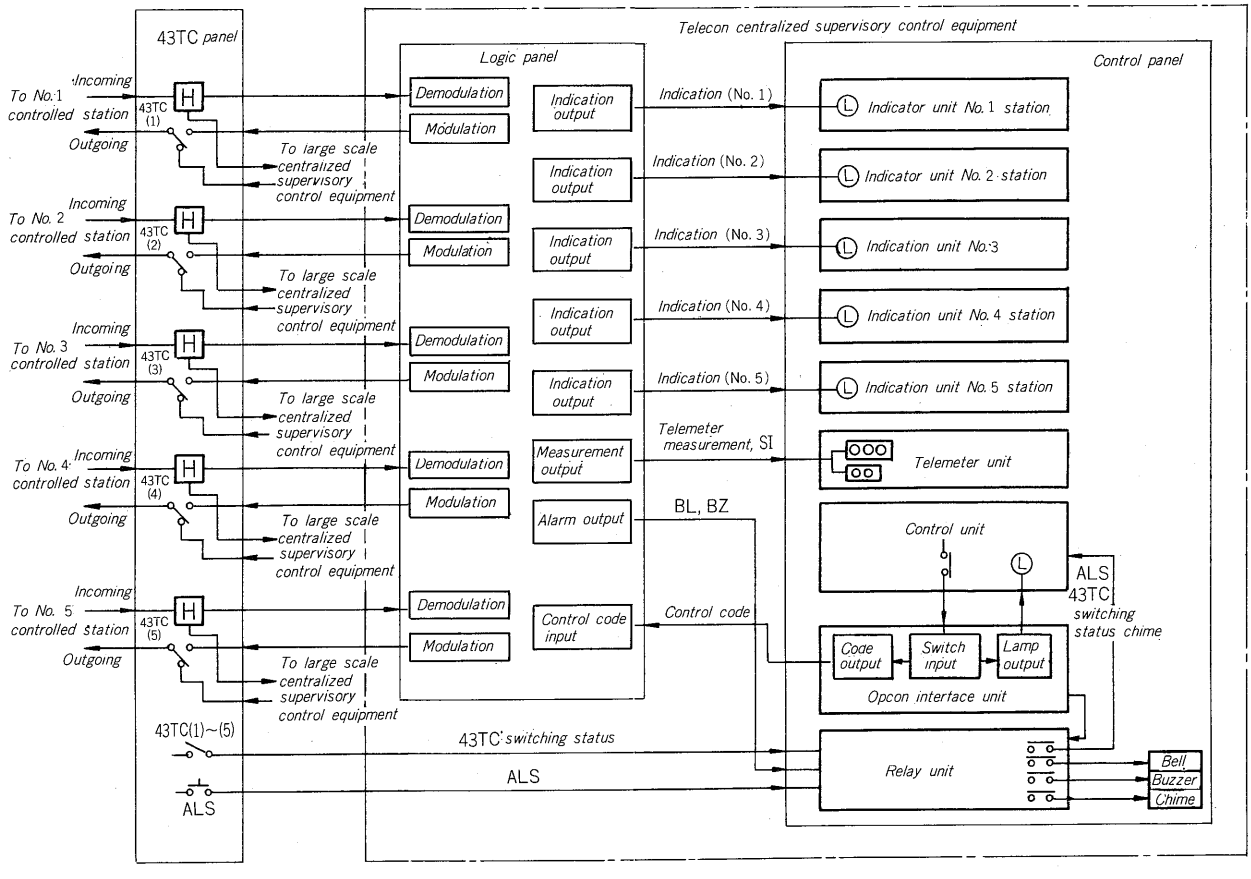

Fig. 1 System configuration

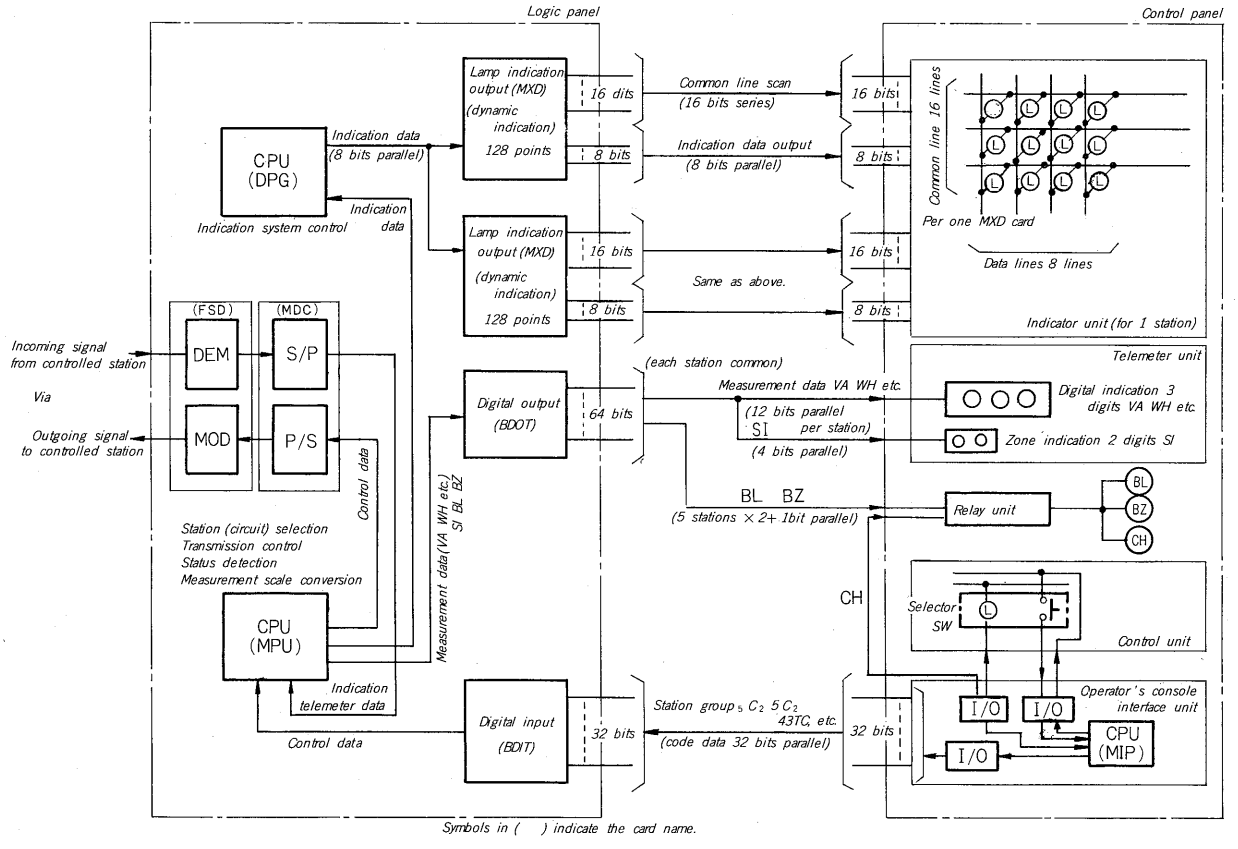

Fig. 2 Flow diagram

button switch and ON, OFF, and other operations are performed by control switch on the control unit commonly provided for each station.

3) Measurement

An LED type numerical indicator is provided at the telemeter unit installed at each station and the position corresponding to the voltage, current, active power, etc. is indicated by performing selection operation on the control unit.

Fig. 2 shows the signal flow.

In other words, the incoming signal demodulated by DEM is serial-parallel converted by S/P and memorized in the memory of the CPU (MPU) and status changes are detected. When a status change is detected, the information is transferred to the memory of the other CPU (DPG) and the indication pattern is selected in accordance with the indication specifications, shifted to the lamp indication output (MXD), and the indicator lamps (LED) are lighted, extinguished, or flickered.

On the other hand, concerning the flow of the outgoing signals, when the station and equipment are selected by the control unit, the selection contents are checked by the CPU (MIP) of the operator's console interface unit, converted to the specified code format, and sent to the CPU (MPU) via the digital input (BDIT). Here, station (circuit) selection is performed, the signals are parallel-serial converted by P/S, FS modulated by MOD, and sent to the slave station. Furthermore, the measurement data are scale converted and indicated to the telemeter via the digital output (BDOT) by selection of the pertinent position.

III. MAIN FEATURES OF EQUIPMENT

1) Reduction of installation space

Installation space for 5 stations is 1/5 that of the conventional type.

2) Correspondence to equipment of different code formats is possible

A microcomputer is employed and format conversion is performed.

3) Adoption of dynamic display

The indicator has been made substantially smaller and unitized by electric station by the adoption of light emitting diodes. Moreover, since control of the display output has be made normal cyclic dynamic display by using a microcomputer, reduction of the output section hardware was made possible.

4) Improved operability

Operation can be easily performed by pulling out the control unit.

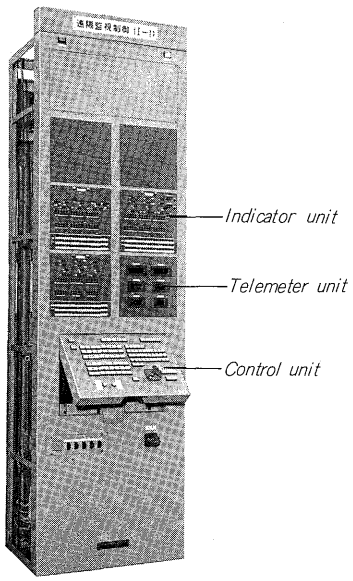

Fig. 3 Control panel

5) Simplified maintenance

Addition and modification of control and indication objective equipment permits simple correspondence by rewriting the tables.

IV. PANEL CONFIGURATION

The panels comprising this equipment, when the equal length code cyclic system remote supervisory and control equipment (600BPS) is made the standard, are two panels (control panel, logic panel 1 each) up to 5 stations and 3 panels (control panel 2, logic panel 1) from 6 to 10 stations.

1. Control panel

The control panel is shown in *Fig. 3*.

1) Control unit

(1) One unit can control 5 stations.

(2) The unit consists of station selection buttons, position selection buttons (lighted), reset buttons, control switches, and error lamps. (The device layout is shown in *Fig. 4*.)

2) Indicator unit

There is one unit for 1 station. ON, OFF indication (2 lamp system), status indication (1 lamp system), and fault indication are performed here. Station selecting and station status change indication are also performed. (The device layout is shown in *Fig. 5*.)

3) Telemeter unit

Selective measurement of 5 stations is indicated at this unit. (The device layout is shown in *Fig. 6*.)

V, A, WH, etc. are digitally indicated in 3 digits (SI is 2 digits).

2. Logic panel

This panel performs the controls for data transmission, alarm, indication, and others at this system.

(1) Logic shelves are provided for 2 units (5 stations each,

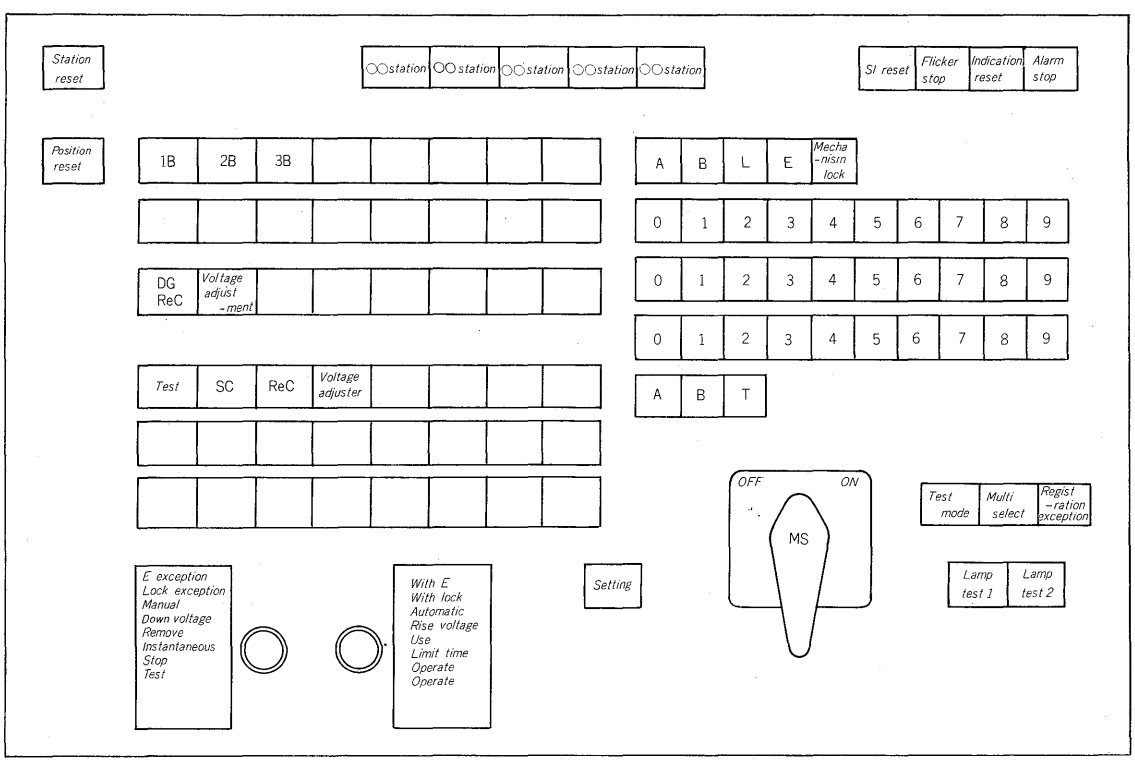

Fig. 4 Control unit

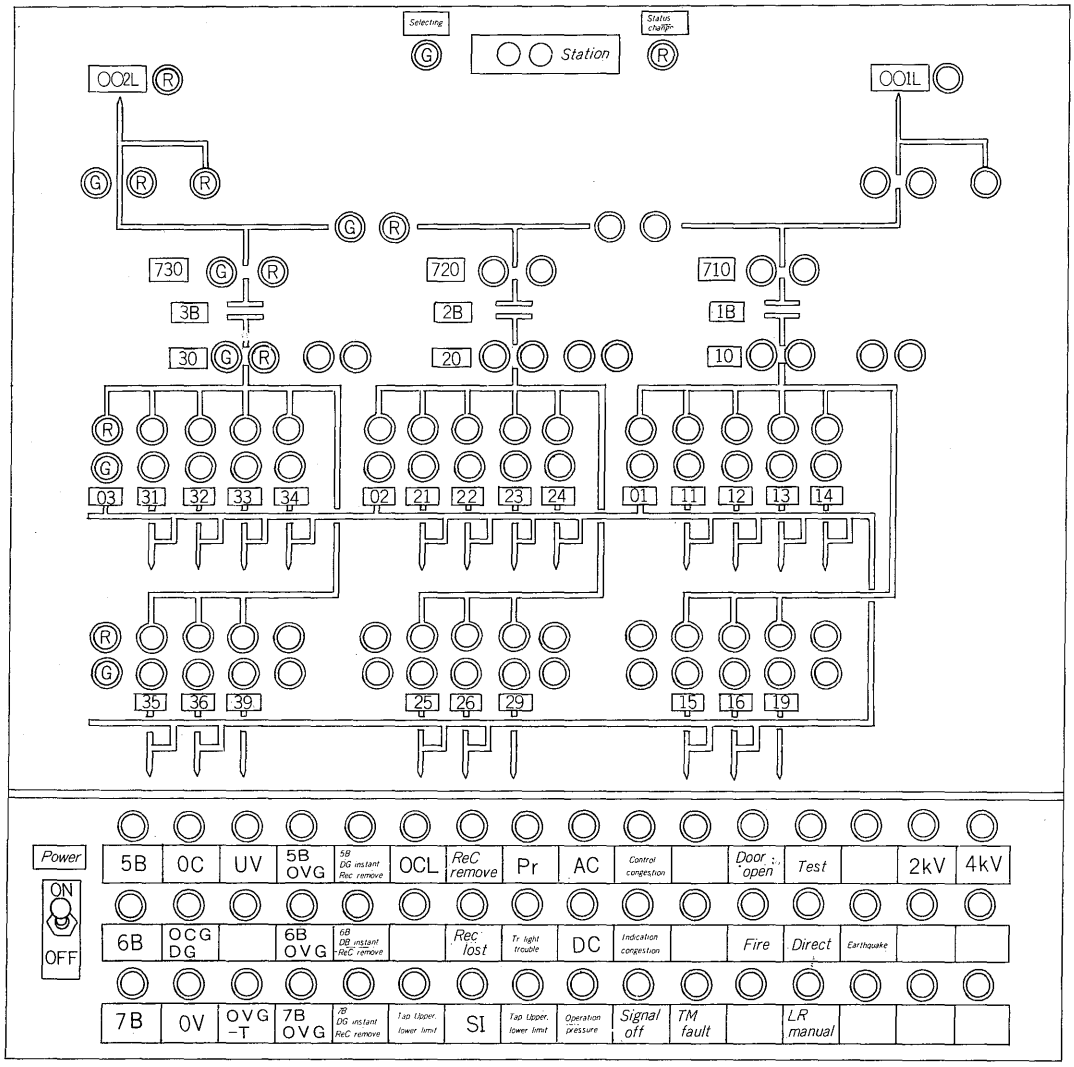

Fig. 5 Indicator unit

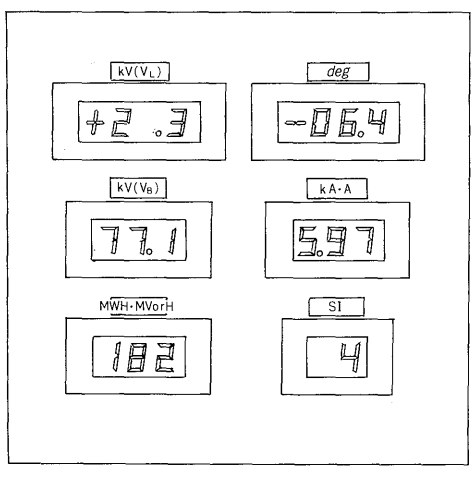

Fig. 6 Telemeter unit

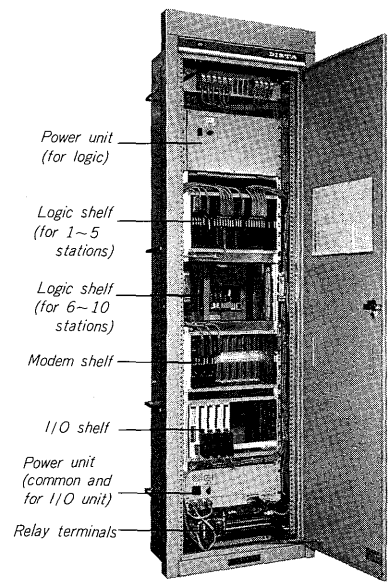

Fig. 7 Logic panel

total 10 stations mountable).
(2) Modem shelf (up to 10 stations are mountable by adding cards-however, when transmission speed is 600 bauds or 1200 bauds).
(3) I/O shelf (up to 10 stations mountable by adding block units).
(4) Logic power unit (for 10 stations).
(5) Common and I/O unit power unit (for 10 stations).
(6) Connecting terminals

V. OPERATING PROCEDURE

The operating procedure is outlined below.

1) Selection control operating procedure

After the station is selected by means of the station selection buttons provided at each station, the equipment is selected by combining the position selection buttons.

The selection contents are reconfirmed by means of the lighting state of the lamp inside the pushed button, and after registration check OK by pushing the setting button, the selection signal is sent and position selection is ended.

Operation command is performed by means of the master switch provided in common.

2) Measurement operation procedure

Of the above selection control operation procedure, the measured value is indicated at the step at which the setting button was pushed.

3) Operation procedure at fault generation

When a fault is generated, an alarm is generated and the pertinent station name lamp and fault indication lamp light and the status indication lamp of the automatically tripped breaker flickers. The alarm and flicker indication are stopped or reset by means of the reset button provided for each.

VI. MAINTENANCE

1) Maintenance and inspection

Regarding troubleshooting when equipment trouble occurs, indication and alarm are performed by grouping into power unit, logic unit, I/O unit, transfer unit, etc. so that quick action can be taken.

2) Addition and modification of control and indication equipment and supply No. modification

The control position, indication pattern, and measurement use parameters are table format so they can be easily corresponded.

VII. CONCLUSION

For field testing, this equipment from installed at the control station from December 1977 and tested for the Hukuzumi SS, Nagamori SS, Ashichika SS, and Saigou SS and is operating normally.

We feel that the range of application of the microcomputer to power automation equipment will increase steadily in the future and its effect is expected.

In conclusion we wish to thank all those who cooperated in the planning, manufacture, etc. of this equipment.