

# CENTRALIZED

ELECTRONIC INTERLOCKING SYSTEM  
EQUIPMENT MONITORING SYSTEM

FOR IBARA LINE SIGNALLING SYSTEM

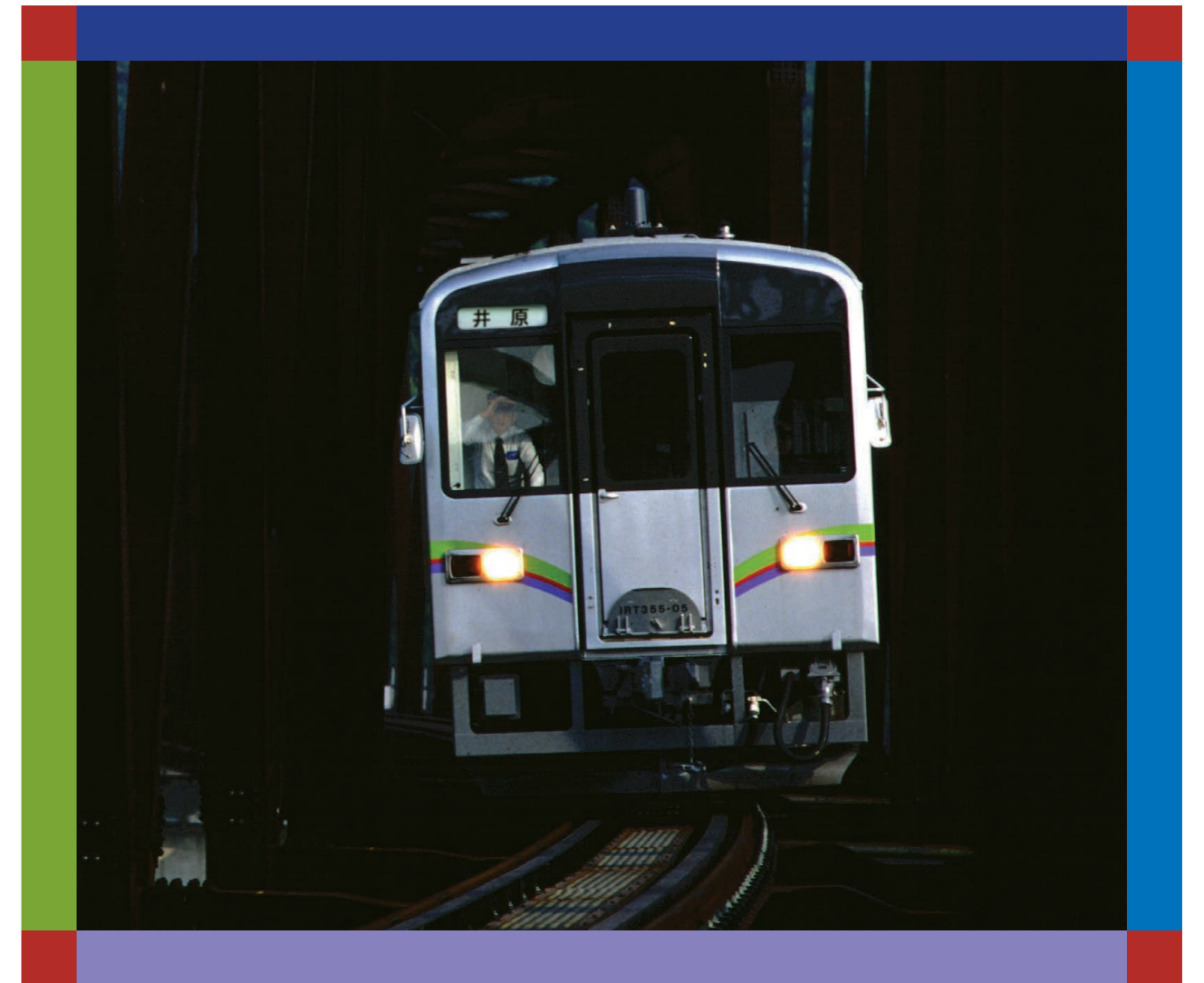
## SITE EQUIPMENT SUPPORTS CONVENIENT, SAFE OPERATION



Equipment monitoring system normally monitors operations at control center

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# ONE-COMMANDER, TWO-PERSON MAINTENANCE SYSTEM

# DRAMATICALLY REDUCES LABOR!!

## IBARA LINE SIGNALLING EQUIPMENT IS BASED ON A CENTRALIZED SYSTEM

**Outline of Ibara Line**

The Ibara Line is a railway linking Soja City, Okayama Prefecture, with Kannabe, Hiroshima Prefecture, via Kiyone-mura, Makibi-machi, Yakage-machi, and Ibara City.

In December 1986, twelve local governments including cities, towns, and villages in Okayama and Hiroshima Prefectures, in cooperation with other private and related sectors, established Ibara Railway Co., Ltd., and Japan Railway Construction Corporation began construction. The service was opened on January 11, 1999.

The Ibara Line transports passengers between cities in the south and the Bingo area of Okayama Prefecture, and is expected to contribute greatly to a revolutionary improvement of transportation conditions between both areas, and promote and develop industry, economy and tourism in areas along the line.

Trains are scheduled to efficiently transport passengers on the Kibi and Hakubi lines (Soja and Kiyone Stations), and Fukun line (Kannabe station). Three trains scheduled for morning, noon, and evening can directly enter Fukuyama station from the Ibara line and change lines.

Section	Soja-Kannabe (41.7km) Single line
Business activity	Transportation of passengers
Number of stations	15 stations and one depot (9 interlocking stations)
Vehicles	12 railcars (IRT 355 type) High-performance cars with a maximum speed of 110 km/h
Operating plan	23 shuttling operations a day One train every 30 minutes during morning and evening rush hours One train an hour during the day
Composition of train	One car or two cars
Travel time	About one hour between Soja and Kannabe
Longest bridge	River Takahashi 716.3m
Longest tunnel	Seyama tunnel 940m



**FIRST IN JAPAN!  
CENTRALIZED ELECTRONIC INTERLOCKING SYSTEM**

- improved maintainability -

High-level signalling systems are achieved by integrating single track automatic blocking function, interlocking function, and CTC function.

The system configuration is simple and easy to maintain using the central control system in which entire sections are controlled by the same interlocking logic as that for a station (a set of electronic interlocking system is provided for all sections).

**NEW!  
EQUIPMENT MONITORING SYSTEM**

- remote maintenance -

The system can monitor in real-time the operating status of all equipment and apparatus for operation and maintenance, including track circuits, switches, signals, road crossings, and power supplies.

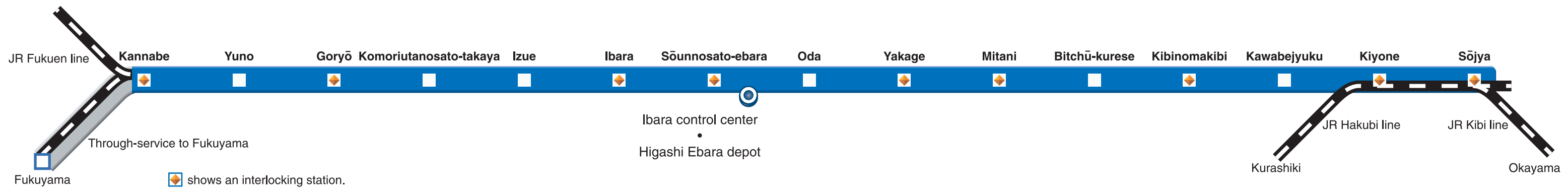
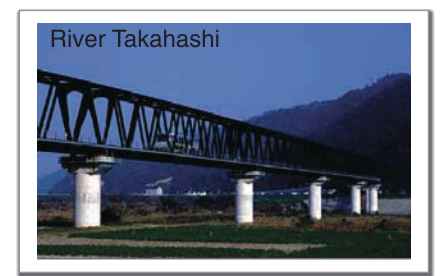
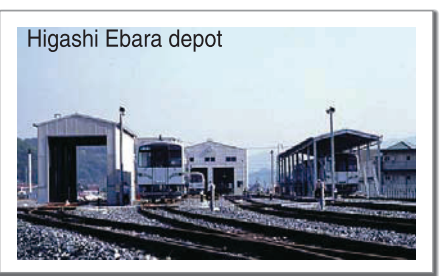
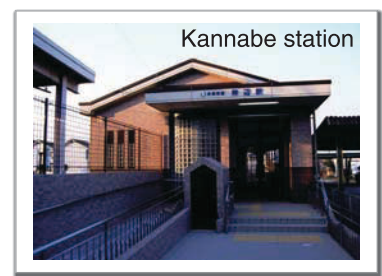
In addition, the system has a database of collected measurement data, enables high-level preventive maintenance that was not available with conventional systems, and contributes greatly to saving labor for maintenance.

**FULLY AUTOMATIC!  
PTC SYSTEM**

- saves labor in routine operations -

The automatic route control function controls diagrams and automates routine train dispatching operations.

The system provides a variety of functions such as support functions; e.g., indication of diagram in strips and operation regulation, approach announcement, and control of passenger information indication devices.





## TECHNICAL FEATURES OF THE SYSTEM

### 1 Improved safety

Safe transportation is further increased by a new multi-track central operation directional logic.

### 2 Improved signal monitoring property

Using high-speed, large-capacity optical fiber communications, the operating status of all present signalling equipment is monitored in real-time.

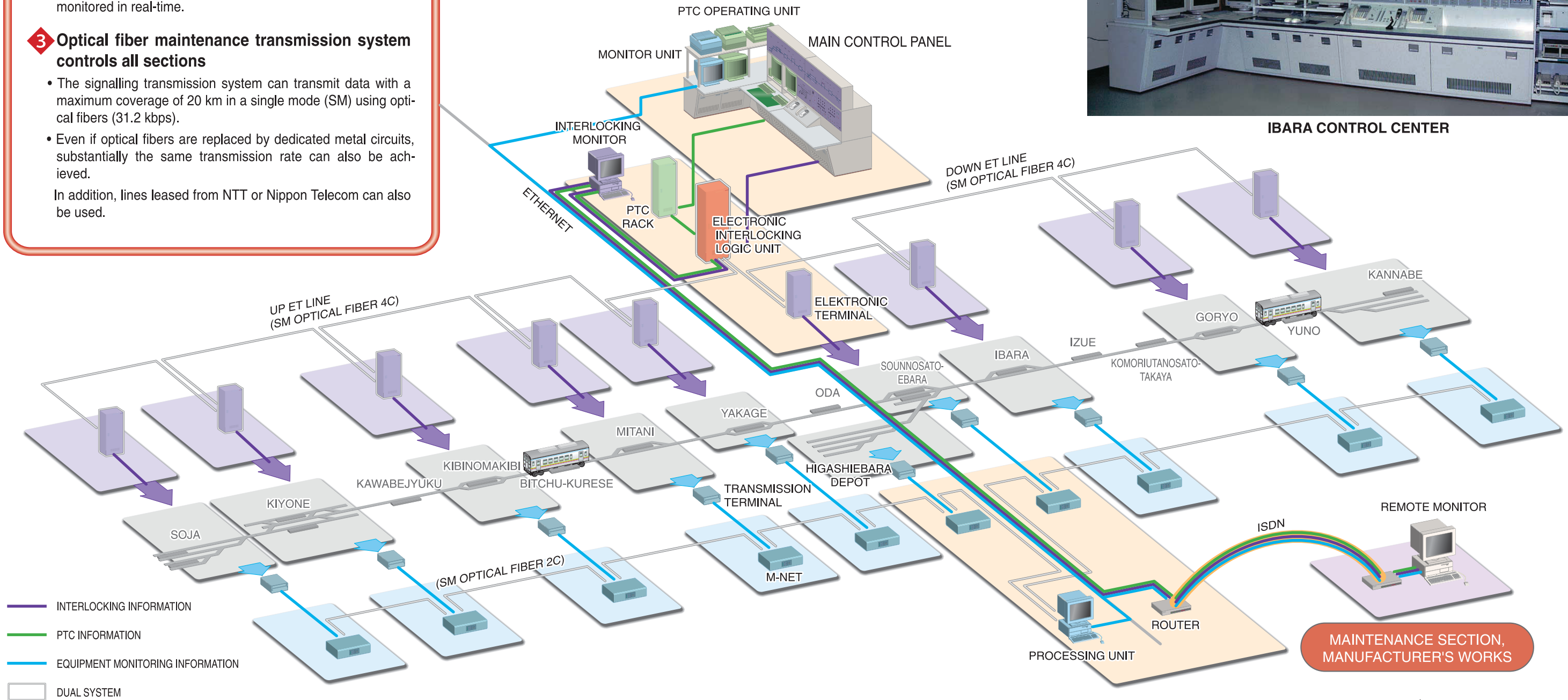
### 3 Optical fiber maintenance transmission system controls all sections

- The signalling transmission system can transmit data with a maximum coverage of 20 km in a single mode (SM) using optical fibers (31.2 kbps).
- Even if optical fibers are replaced by dedicated metal circuits, substantially the same transmission rate can also be achieved.

In addition, lines leased from NTT or Nippon Telecom can also be used.

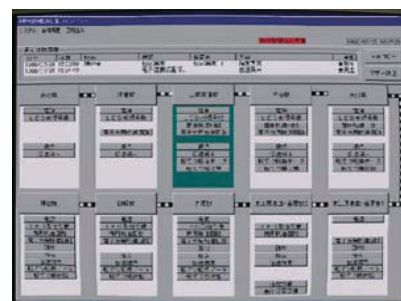
## NEW SYSTEM SAVES LABOR IN THE OPERATION AND THE MAINTENANCE IBARA LINE SIGNALLING EQUIPMENT BASED ON A CENTRALIZED SYSTEM

### IBARA CONTROL CENTER

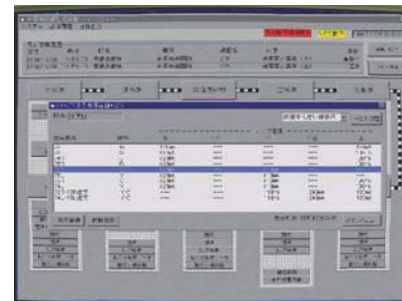


IBARA CONTROL CENTER

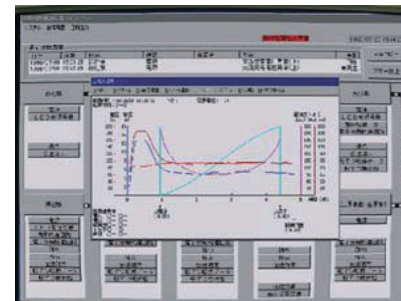
## VARIOUS OPERATIONS OF SIGNALLING EQUIPMENT ARE DISPLAYED CLEARLY GRAPHICALLY.



▲ MENU  
- FOR ALL SECTIONS



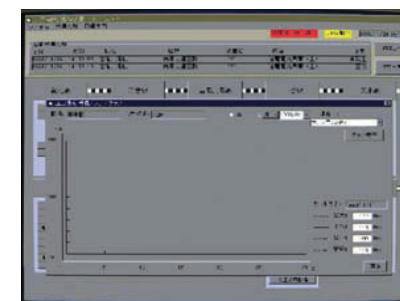
▲ CURRENT VALUES OF LED SIGNALS  
- REAL-TIME INDICATION



▲ SET OF CONVERSION DATA  
- ANALOG REPRODUCTION GRAPH



▲ SEQUENCE OF CROSSING OPERATION  
- DIGITAL REPRODUCTION GRAPH



▲ LED SIGNAL TREND GRAPH  
- TREND VALUES ON GRAPH

### ◆ REMOTE MONITOR

Connected with ISDN line, local conditions can be monitored in the same way as at the site.



# FIRST IN JAPAN! CENTRALIZED ELECTRONIC INTERLOCKING SYSTEM

**ONE LOGIC UNIT CONTROLS  
ALL LINES**

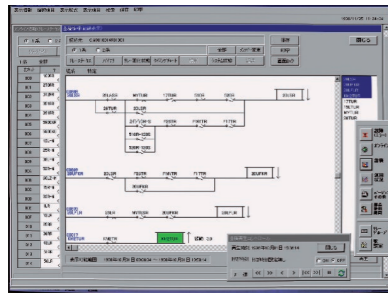
## NEW OPERATION SIGNALLING SYSTEM INTEGRATING SINGLE TRACK AUTOMATIC BLOCKING, INTERLOCKING, AND CTC

### SIMPLE AND ECONOMIC CONFIGURATION OF EQUIPMENT

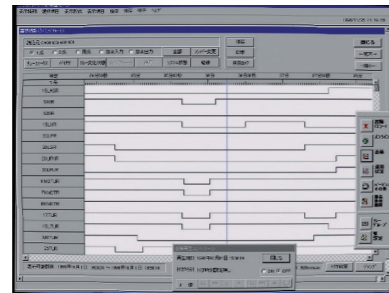
- ◆ Conventional interlocking unit and control panel installed at each station are no longer needed, achieving high cost efficiency.
- ◆ Because the control center and each station are connected directly with optical fibers for signalling transmission, no dedicated transmission apparatus (CTC etc.) is required.
- ◆ The operating status of all tracks can be monitored at any station.
- ◆ Within the range controlled by the centralized interlocking system, no blocking line is necessary and traffic levers need not be controlled between stations.

### HIGH LEVEL OF SAFETY ASSURED

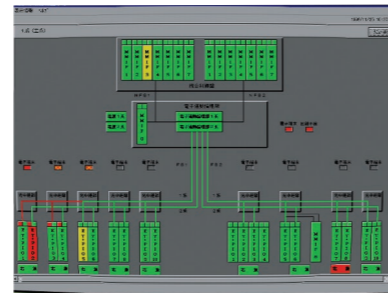
- ◆ Track tracing logic to control sections  
Erroneous operations of track relays between stations can be monitored more securely than with previous systems.
- ◆ Improved safety in single track blocking logic  
The safety of the blocking system is further improved by adding a new multiple track controlling operation-direction logic.
- ◆ Employs new interlocking monitor



▲ Interlocking monitor connection diagram display



▲ Interlocking monitor time-chart display



▲ Equipment status display for all tracks under interlocking monitor

# FULLY AUTOMATIC! TRAIN OPERATION CONTROL SYSTEM (PTC SYSTEM)

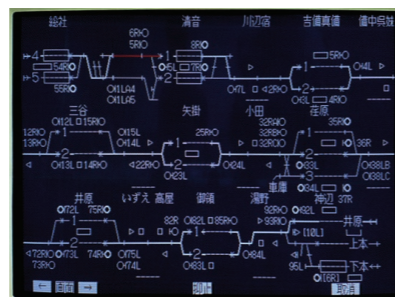
**ACHIEVES  
ONE-PERSON CONTROL**

## CONTROLS ALL OPERATION DIAGRAMS ON IBARA LINE, AUTOMATICALLY CONTROLS ROUTES, AND PROVIDES VARIOUS OTHER FUNCTIONS.

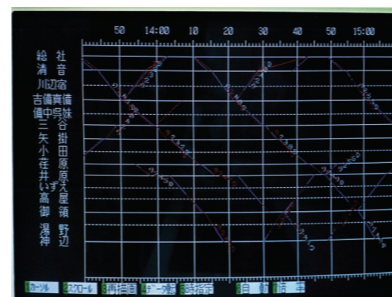
- ◆ Starting inspection  
The system is automatically controlled at a preset time.
- ◆ Automatic route control (operating diagram)  
The system allows manual control of routes and automatically controls routes for entering and exiting the depot.
- ◆ Tracks numbers of trains and announces train numbers on JR line.
- ◆ Operation control  
Controls departure and arrival times and travel distances of trains.
- ◆ Outputs information for approach announcements  
The system outputs train passing / stopping information, track information, etc., to each station.
- ◆ Outputs information for passenger information board  
The system outputs information on types of train and departing track to stations with information boards.
- ◆ Monitors status and outputs alarms  
The system monitors fault status, deadlock, check lever rejection, etc. and outputs alarms in case of failure.



▲ PTC OPTREATING UNIT



▲ INDICATION CONTROL PANEL - OPERATING STATUS INDICATION



▲ SCREEN FOR DIAGRAM MONITORING EQUIPMENT - OPERATION IN STRIPS

# NEW! EQUIPMENT MONITORING SYSTEM

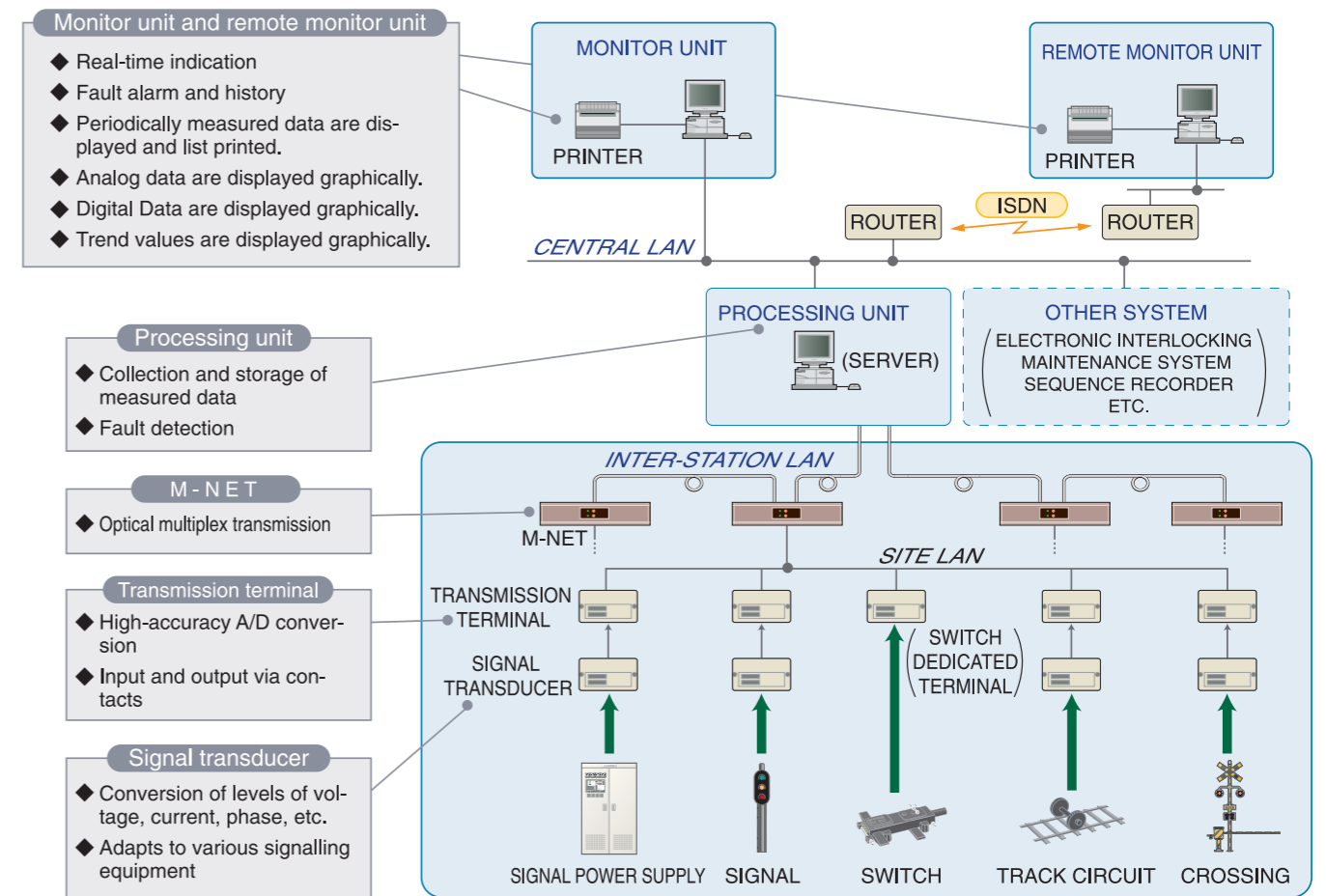
**ACHIEVES  
TWO-PERSON MAINTENANCE**

## ACHIEVES EFFICIENT MAINTENANCE OPERATIONS

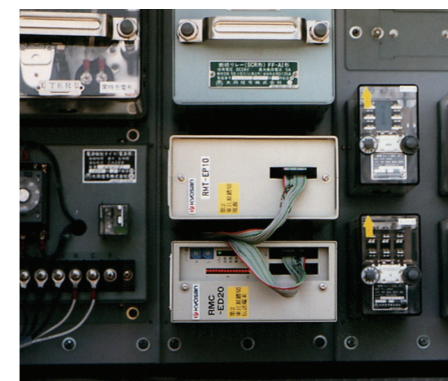
- ◆ Four major functions strongly support maintenance operations
  - Automatically records measurement data periodically at preset times.
  - Preventive maintenance uses trend monitoring values.
  - Detects faults early by checking limit values.
  - Identifies cause of fault by displaying data graphically.

## OPTIMUM THREE LANs FOR EACH STRATUM

- ◆ In the central LAN, monitor unit and processing unit are connected in a client / server system.  
(10 Mbps Ethernet or 128 kbps ISDN)
- ◆ At the inter-station LAN, data are transmitted optically in multiplex mode between center and stations, because of the long distance and high volume of information traffic.  
(M-NET and optical SM2C of 100 Mbps)
- ◆ At the site LAN, information from transmitting terminals in the signal equipment room and instrument box are collected at each station.  
(ARCNET and metal 1P of 156.25 kbps)



- ◆ Types of terminal for easy mounting  
Relay terminals are incorporated for easy mounting on equipment at the site.



▲ SIGNAL TRANSDUCER (UP) AND TRANSMISSION TERMINAL (DOWN)

## VARIOUS SIGNALLING EQUIPMENT CAN BE MEASURED ACCORDING TO THEIR CHARACTERISTICS

- ◆ Signal power supply  
Measures voltage.
- ◆ Signal  
Measures current of LED-type signal, and detects open-circuit.
- ◆ Electric switch  
Measures motor voltage and current, and calculates torque and turning force.
- ◆ Track circuit  
Measures voltages and currents of operating track circuits and long, large track circuits.
- ◆ Road crossing  
Measures voltages of power supply and crossing track circuit. Also records sequence of crossing operation.