Trailblazing the future through the fusion of information technology with MHPS’s plant manufacturing experience
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Mitsubishi Hitachi Power Systems is one of the largest plant manufacturers in the world. We manufacture the devices in a power plant such as boilers, turbines and gas turbines, and also engineer conventional plants consisting of boilers and turbines and combined cycle plants consisting of gas turbines, HRSGs (waste heat recovery boilers) and steam turbines.

Additionally, we design and manufacture various types of power generation facilities using gas engines, diesel engines, wind power, fuel cells and waste materials, and different types of facilities in a power plant (such as desulfurization facilities).

As a company that manufactures the devices in a power plant and engineers power plants, Mitsubishi Hitachi Power Systems started to create its own control system, DIASYS®, from 1970s to provide optimum control for these power generation facilities.

So far, we have released the DIASYS-UP series and the DIASYS-UP/V series employing the latest hardware of each era. For the software that controls each plant, we always use our original logic description language called DIASYS-IDOL that is best suited for plant control.

DIASYS Netmation® was released in 2000 and it is the latest control system of the DIASYS® series. DIASYS Netmation® actively incorporates the ever-developing IT technology and uses DIASYS-IDOL++ as the plant control software. DIASYS-IDOL++ is an enhanced version of DIASYS-IDOL which has many successful results and is optimized for plant control. The DIASYS Netmation® system is designed to achieve high reliability which we think, as a designer and manufacturer of plants, is the most important feature. DIASYS Netmation® differs from the old DIASYS® series in three points:

1. Using the latest IT technology and maintaining the high reliability as before

   - We developed our original card communication technology based on the Internet technology with enhanced reliability and use it to monitor and control plants. The card communication technology is highly reliable and creates only a low traffic load, enabling control and monitoring of a remote place by radio with no need to prepare new infrastructures such as optical fiber.

   - By using Microsoft Windows as the user-machine interface, high operability is achieved. The important features such as data logging and alarm detection are equipped in the controller to maintain reliability.

   - The logic and graphics creation tools are based on VISIO, a CAD tool which is renowned for its user-friendliness, so you can design systems by dragging and dropping. The logic diagrams you create by using VISIO are directly saved as formal drawings, allowing you to keep the consistency between the actual logic and drawings (self documentation).

   - There are many options based on the IT technology such as emailing alarms, monitoring and operations via the Web, mobile operator stations, and displaying the video recorded by cameras via the Web.

   - The latest technology is always used for external security.

   - Many interfaces are available to enable the connection with the systems of other companies.

2. Easy maintenance using the fully integrated database

   Before DIASYS Netmation®, the user needed to register items in a system and set up the system in each of different tools that were used to create and change logic, create graphics windows for monitoring, and perform other operations. The different sets of data in the tools needed to be related by using communication point numbers.

   Now DIASYS Netmation® centrally manages all the system data in the integrated database and you do not need to relate the data by using communication point numbers any more. Since you can reference and edit the same data in an easy-to-understand format from multiple tools, human errors such as incorrect relations of data can be prevented and efficient maintenance is possible.

3. Broad line-up to accommodate systems of any size

   The large controller (MPS) and the small controller (CPS) are available. The MPS is suitable for controlling a gas turbine or a gas engine which requires processing of large quantities of data at a fast cycle, or a plant which requires processing of many input and output points. The CPS is suitable for a small system consisting of such as a packaged boiler, enabling an optimum system with adequate cost and performance. The MPS and the CPS can be used together to operate, monitor, and maintain a plant.
System Overview and Feature

Below are outlined the main devices making up the DIASYS Netmation® system.

**System Devices**

- **Multiple Process Station (MPS)**
  The Multiple Process Station (MPS) is used to perform automatic plant control and I/O processing. It features advanced arithmetic processing capabilities that enable it to support a wide range of applications that require high-speed processing, such as turbine governor control, as well as automatic boiler control and automatic plant start/stop control. In addition, since the MPS was successfully connected with the products of other companies in many occasions in the past and has interface software as standard, you can configure a seamless control and monitoring system. The MPS also contain an interface to connect to fieldbuses via ControlNet. Moreover, since the Multiple Process Station supports a duplicated configuration and optical communications, remote-process I/O devices can be installed right next to plant equipment. The MPS is equipped with CPUs, power supplies, I/O networks to ensure the reliability as a controller.

- **Operator Station (OPS)**
  The Operator Station (OPS) is a human-machine interface for monitoring and operating a plant. Since an OPS is a Windows-based system, it is easy to use and allows the plant operators to learn the operations easily.

- **Browser Operator Station (Browser WSM)**
  DIASYS Netmation® also offers browser-based OPS software. Simply by installing and setting up this software on a browser-resident PC, operators can obtain the same functionality as provided by an OPS in the central control room.

**System Suited for Remote Monitoring and Control**

When you use DIASYS Netmation®, you can easily create a remote monitoring and operation system that allows operations and monitoring at a place far from the plant or a field mobile terminal system that enables operations on the field outside the control room in the same manner you expand an ordinary system (accordance to your needs). You can create such systems since a protocol for low-load traffic, termed the card communication technology, was developed and adopted in DIASYS Netmation® to enable the communications between the system components.

**Low-load traffic is achieved by sending and receiving only required data**

The traditional control systems periodically sent all the process data collected by the controller to user-machine interface devices such as OPSs. Therefore, the larger the plant, the larger the traffic became. And an applicable infrastructure was required. The card communication technology is an outstanding communications method since it queries the controller for the data to be displayed on the OPS, and compresses and sends or receives only the required data.

**Many applications are available for the control and monitoring system**

Many applications are available such as a remote monitoring and operation system using existing microwave lines for security purposes or telephone lines, a tablet PC used as a field mobile terminal, and the email feature of a mobile phone used as an alarm reception feature.

![Image 1: System Configuration](image1)

![Image 2: Card Communication](image2)
Not all applications involve large-scale systems like thermal power plants. The Compact Process Station (CPS) has the flexibility to adopt to smaller, dispersed power sources and other small-scale facilities. As a DCS, the CPS has the same operability, expandability, and reliability that characterize DIASYS Netmation®, with the size and cost performance comparable to a sequencer (PLC).

- Whereas in the MPS, the CPU chassis and I/O modules are completely independent in the cabinet, the CPS employs a simpler arrangement, with the CPU module located alongside the DIN rail with I/O modules.
- High-speed access is made possible by directly connecting the CPU module and the I/O module via a world-standard Allen Bradley FLEX I/O.
- In addition to the conventional DIASYS Netmation® I/O module, the Allen Bradley module can also be used on its own.
- A dual CPU configuration can also be used for even higher reliability.
- The system can be configured and maintained using the same Engineering & Maintenance Station software as with DIASYS Netmation®.
- Systems combining DIASYS Netmation® and the “Smart CPU” can be seamlessly configured, operated, and maintained.
- DIASYS Netmation®’s characteristic low-load communications allows the configuration of remote monitoring and control systems for unmanned facilities and so on.

For details, see the chapter on the Compact Process Station (CPS).

**Coexistence of User-friendliness (OPS) and High Reliability (MPS and CPS)**

DIASYS Netmation® uses Microsoft’s Windows as the operating system of the OPS. Since you can use the OPS to operate and monitor a plant by clicking the mouse or dragging and dropping items like you use Windows applications such as Word and Excel, the users who are accustomed to Windows can easily learn how to use the OPS. DIASYS Netmation® was successful in gaining the operability of Windows and high reliability by designing the system based on a concept that totally differs from conventional control systems. Now the controller (MPS or CPS) has the data collection feature and the alarm detection feature which belonged to the OPS previously. Even if the OPS goes down, the required functionality is never lost. The MPS and the CPS are designed with reliability as the top priority. To achieve this level of reliability, DIASYS Netmation® knows the causes that might freeze Windows in advance and performs required measures on Windows applications for continued operation. That is why DIASYS Netmation® can run 24 hours a day, 365 days a year. If a memory leak that might cause a system freeze occurs, an appropriate circuit in DIASYS Netmation® detects it and reports it as an alarm to reset the PC before the freeze occurs and release the memory.

**Windows is convenient. But how about reliability?**

To ensure high performance, DIASYS Netmation® is equipped with an automatic online DUPE (dual redundancy processor) system that ensures system reliability. The data collection, alarm detection, and graphic display software (Work Space Manager) is running and the OPS does not collect or store process data at all. When the OPS needs data, it asks the MPS, the CPS, or the ACS using the card communication technology each time. To ensure high performance, DIASYS Netmation® knows the causes that might freeze Windows in advance and performs required measures on Windows applications for continued operation. That is why DIASYS Netmation® can run 24 hours a day, 365 days a year. If a memory leak that might cause a system freeze occurs, an appropriate circuit in DIASYS Netmation® detects it and reports it as an alarm to reset the PC before the freeze occurs and release the memory.

**Compact Process Station (CPS)**

In this example, multiple power plants on separate islands were monitored and controlled from a single plant, for improved operating efficiency. Communication between the islands was carried out using the client’s secure microwave link and an NTT (Nippon Telegraph and Telephone Corporation) dedicated phone line.
Human-Machine Interface

Overview

Control, monitoring, and data management are carried out from OPSs, which are Windows PC-based systems. The human-machine interface was created with emphasis placed on similarity to Microsoft Office, to make the system easy to learn for operators familiar with the use of Word and Excel.

It is also possible to set up a central control room designed for people familiar with office-type environments that utilizes full-monitor operation combined with a user-friendly human-machine interface. Adding a large screen (optional) allows several people to share the latest plant information.

A Web-based OPS (browser OPS) has also been developed for DIASYS Netmation®. Simply by setting up the OPS on a Browser-active PC, operators can supervise plant operations via their intranet. Operators can also perform browser OPS operations at home or on the road via public telephone lines.

Furthermore, by setting up a wireless LAN on their premises, operators can perform plant operations, monitoring and control in the field using a notebook or tablet PC, just as if they were in the central control room.

The OPS is a Windows personal computer installed with Work Space Manager which is the DIASYS Netmation® graphics display software. The OPS does not store process data. Each time a window needs to be displayed on the OPS, the OPS asks the MPS, the CPS, or the ACS to send the data required for the window (card communication technology). Therefore, operations and monitoring can be performed with low traffic load.

OPS/MPS/ACS Role Allocation

The human-machine interface functions are implemented using the three main elements making up DIASYS Netmation®: Operator Stations (OPS), Process Stations (MPS/CPS), and Accessory Stations (ACS). Their respective roles are apportioned as shown in Fig. 10. The OPS does not store process data of the plant. It fetches necessary data from the MPS/CPS or the ACS when necessary using the card communication technology.

Function of OPS

The OPS provides plant operation and monitoring functions. 

▌ Graphics (P&ID display)

The OPS graphically displays the operating status of a plant. The OPS displays an overall or partial system diagram of the plant, and displays process status and process values in real time, using methods such as digital display, bar graphs, and color variations. Clicking on the screen-displayed graphical symbol of a plant device causes a control loop plate (operation frame) to appear, where it can then be manipulated. Further, more efficient status monitoring can be achieved by displaying trend components and other graphic components concurrently. Since the logic calculation status can also be displayed, a screen densely populated with integrated plant and control information can be configured.

Fig. 10 : Sample Graphic Screen

Fig. 11 : Sample Graphic Screen
### Control Loop Plates

A control loop plate component (equivalent to a conventional monitoring and operation-type instrument) is provided with the system. Control loop types include analog operation loops and digital operation loops. Analog operation loops are used for performing continuous operations (e.g. set value manipulation and valve lift operations) and digital control loops are used for starting and stopping auxiliary equipment and for opening and closing motorized valves. The system is designed to prevent mishaps through the combined use of control loop operation and execute keys for initiating an operation. The control loop’s associated controllers and control logic are processed at a Multiple Process Station. It is possible to display a maximum of 12 control loops per OPS window.

### Trends

A trend is a component that graphically displays the variance of process data over time. There are three types of trend components:

#### 1) Trend Graph

The trend graph component graphically displays up to 16 points of process data as the data varies over time.

**Functions**
- Seamless display of both real-time & historical trends
- Pen recorder-style current value monitoring
- Easy scaling and scaling information summary
- Independent timing mark information
- Display of reference data such as ideal curves
- Collection time
  - Recent mode: Display data within the last 24 hours
  - Historical mode: Display data after the last 24 hours up to 31 days ago (standard)
- Collection cycle
  - Recent mode: 1 sec
  - Historical mode: 10 sec (standard), 1 sec, 5 sec, or 15 sec
- Display span: 3 min, 10 min, 30 min, 1 hr, 2 hr, 4 hr, 8 hr or 24 hr

#### 2) Quick Trend

The quick trend allows ready display of trends in parameters the user wishes to monitor for a short time only. Simply right-click any analog data on the graphic window to display trend data.

**Functions**
- Vertical axis auto-scaling
- Drag-and-drop display of up to 4 parameters
- High/low (max/min) monitoring

#### 3) X-Y Trend

The X-Y trend graphically displays the correlation between multiple process data items that cannot be represented by the time-sequence components. The X-Y trend component supports operation and monitoring by the operator through display of saturation curves, NPSH characteristics, water-fuel ratio, cross limits, and a host of other data types.

**Functions**
- Setting of actual data as a target curve
- Drag & drop target curve setting
- On-line or off-line target curve setting

### Alarms

DIASYS Netmation®’s alarm function boasts a number of ways to quickly inform operators of plant and system abnormalities, and to help investigate their sources. The system comes with an alarm summary, two-line message, alarm group display, and event trace. It also includes an alarm setting function and alarm event printing function.

#### 1) Alarm Summary

The alarm summary displays a list of alarms that have occurred. Alarms can be grouped according to categories set using the Engineering & Maintenance Station, and the classified alarms easily displayed with the look and feel of Explorer. Operations such as alarm suppression are also possible.

**Functions**
- Fifteen-class Color-Coded Display
- Alarm sorting by device and importance using the alarm list view
- Sorting by priority (Fifteen-class)
- Display items: Occurrence time (mm/dd hh:mm:ss), tag name, details, level, alarm setting value. The user can access detailed information on selected alarms using the View function.

#### 2) Two-line Message

The two-line message displays the latest alarm messages on two lines. The latest alarm occurrences and their status can be checked while referring to graphic and trend windows.

#### 3) Event Trace

The event trace displays in list form up to 160,000 events of various types (alarm occurrence and recovery, automatic manual switching, etc.). An event-type sorted display is also available.
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Operator Action Logs

The operator action log function stores operator actions such as control loop plate operation (on/off, increase/decrease) and alarm/data setting, and automatically prints them on demand. Display options are also available.

Functions
- Number of actions stored: up to 160,000 (including event, trace)
- Display options: operation-, tag-, and time-based display

Flight Recorder

If a main plant device is tripped, the flight recorder function collects the data about the pre-registered process values before and after the trip and displays the data as trend data on the OPS. The flight recorder helps you investigate and analyze the cause of trips by chronologically displaying the process data before and after a trip in high resolution.

Functions
- Collection interval: Minimum calculation interval of logic
- Collection period: 1 minute at maximum before and after a trigger
- Number of points collected: 32 points at maximum/group, up to 8 triggers can be set per group
- Number of groups: 4 groups at maximum/MPS
- Display method: Trend feature of the OPS
- Amount of data stored: Data of past 10 collections is stored per group.

Digital Group Trends

The digital group trend function periodically stores the pre-registered data and chronologically displays it in a list format.

Functions
- Number of data items registered: 20 points at maximum/group
- Number of groups: 40 groups at maximum
- Display update interval: Selectable from 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, and 30 seconds, 1, 2, 3, 5, 10, 20, 30 minutes, and 1 hour

Maintenance Logs

Using bar graphics or numeric values, the maintenance log function displays the elapsed operation time or the total number of starts and stops of specified auxiliary plant equipment.

Functions
- 3200 items
- Group Point List

Group Point List

The group point list function displays the current values of pre-registered data in a table format in real time.

Functions
- Number of data items registered: 64 points at maximum/group
- Number of groups: 64 groups at maximum
- Display update interval: 1 second

Sequence Event Logs

If a major device in the plant is tripped, the log collects data of the signals that are registered in the event DI module every milliseconds.

Functions
- Resolution: 1 msec
- Collection period: 30 minutes at maximum before and after a trigger
- Number of trigger points: 128 points at maximum/group
- Number of groups: 10 groups at maximum
- Amount of data stored: Data of past 10 collections is stored per group.

Reports

The report function is used for printing process data managed by the Accessory Station database in the form of daily or monthly reports. To print, data is first obtained from the database and then a report is created by pasting the data into an Excel form. Because report screens are created using Excel, report formats can easily be created by customers.

Functions
- Report types: daily, monthly, and the following optional types: hourly, shift, weekly, quarterly, and annual
- Print request function for reprinting previously printed reports on demand
- Ability to revise reports using Excel

System Status Indication

This window displays the status of each element making up the system. If an abnormality occurs, a message including its details (self-diagnosis results) and location (e.g., card/module address) is displayed.
Plant Operation Support Functions

As a leading plant manufacturer, MHPS offers a variety of plant operation support software packages.

Operation Support Functions (optional)

The following operation support functions are available to customers upon request.

- Functions (selected)
  - Plant start and stop curve display
  - Automatic plant start and stop control
  - Trip factor monitoring
  - Control schematic diagram display
  - Enthalpy diagrammatic drawing
  - Control balance
  - Trend monitoring

- Plant Calculation (optional)

MHPS offers a variety of calculation packages.

- Functions (selected)
  - User defined calculations
  - Stress calculations
  - Life duration calculations
  - Functions (selected)

MHPS offers a variety of calculation packages.

Voice Guidance (optional)

Voice guidance uses speech to convey the content of the plant auxiliaries operation guide and to alert operators to alarm occurrences.

Large Screen (optional)

Connection and use of a large screen display allows several operators to monitor the plant and share plant operations at the same time.

Displaying Video Recorded by a Web Camera (optional)

The video of Motion-JPEG (M-JPEG) can be displayed. The video recorded by an inexpensive Web camera can be displayed in the same manner graphics are displayed on the OPS. Any type of camera can be used.

Displaying Video Recorded by an NTSC Camera (optional)

The video recorded by an existing NTSC camera can be displayed by installing an MPEG4 encoder. You can use an existing camera and display the recorded video on the OPS.

Remote Monitoring and Operation Functions

Browser OPS (optional)

By installing and setting up this software on a browser-resident PC, operators can obtain the same functionality as provided in the central control room OPS.

- By connecting to the operator’s intranet, plant operation and monitoring are possible from the home or office. What’s more, by implementing this function over the Internet or a leased line, remote monitoring from MHPS and remote plant diagnosis are also possible.

Mobile OPS (optional)

By setting up a wireless LAN, OPS functionality using a tablet PC can be realized from the field. Security from external tampering is achieved by setting up a firewall.

System Security

DIAYS Netmation®’s security system is built on MHPS’s proven track record in security technology.

- Special operating controls ensure solid security, including password-protected operation, over and above what is already provided by carefully-implemented hardware and software procedures.

- Firewalls are set up where necessary, to block unauthorized access from outside the system.

- The Operator Station can be set up with security levels to limit access either by operation or by area.

Hardware Specifications

The hardware specifications for the Operator Station (OPS), the Browser OPS, and the Accessory Station (ACS) are listed below.

Table 2 : OPS Hardware Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Pentium 4 1.5GHz or higher (latest model is employed)</td>
</tr>
<tr>
<td>Memory</td>
<td>1 GB or more</td>
</tr>
<tr>
<td>Hard disk</td>
<td>80 GB or more</td>
</tr>
<tr>
<td>Resolution</td>
<td>1280 x 1024</td>
</tr>
<tr>
<td>Network connection</td>
<td>10baseT x 2ch (2ch when networking printer not required)</td>
</tr>
<tr>
<td>OS</td>
<td>Windows NT 4.0 workstation/ 2000/XP Professional</td>
</tr>
</tbody>
</table>

Table 3 : Browser OPS Hardware Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Pentium 4 2.4GHz or higher (latest model is employed)</td>
</tr>
<tr>
<td>Memory</td>
<td>1 GB or more</td>
</tr>
<tr>
<td>Hard disk</td>
<td>80 GB or more</td>
</tr>
<tr>
<td>Resolution</td>
<td>1280 x 1024</td>
</tr>
<tr>
<td>Network connection</td>
<td>10baseT x 1ch</td>
</tr>
<tr>
<td>OS</td>
<td>Windows NT 4.0 workstation/ 2000/XP Professional</td>
</tr>
<tr>
<td>Browser</td>
<td>Internet Explorer 5.0 or higher</td>
</tr>
</tbody>
</table>

- Windows-based PC is employed.
- An industrial personal computer for long-term maintenance (PCLTM01) is recommended.

Table 4 : Accessory Station (ACS) Hardware

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Pentium 4 1.5GHz or higher (latest model is employed)</td>
</tr>
<tr>
<td>Memory</td>
<td>1 GB or more</td>
</tr>
<tr>
<td>Hard disk</td>
<td>80 GB or more</td>
</tr>
<tr>
<td>Network connection</td>
<td>10baseT x 3ch (2ch when networking printer not required)</td>
</tr>
<tr>
<td>OS</td>
<td>Windows NT 4.0 workstation/ 2000/XP Professional</td>
</tr>
<tr>
<td>Other</td>
<td>CD-ROM drive</td>
</tr>
</tbody>
</table>

- Windows-based PC is employed.
- An industrial personal computer for long-term maintenance (PCLTM01) is recommended.

Other Functions

Archiving to External Storage Units (optional)

This function archives data to large external storage units such as magneto-optical disks.

Voice Guidance (optional)

Voice guidance uses speech to convey the content of the plant auxiliaries operation guide and to alert operators to alarm occurrences.

Large Screen (optional)

Connection and use of a large screen display allows several operators to monitor the plant and share plant operations at the same time.

Displaying Video Recorded by a Web Camera (optional)

The video of Motion-JPEG (M-JPEG) can be displayed. The video recorded by an inexpensive Web camera can be displayed in the same manner graphics are displayed on the OPS. Any type of camera can be used.

Displaying Video Recorded by an NTSC Camera (optional)

The video recorded by an existing NTSC camera can be displayed by installing an MPEG4 encoder. You can use an existing camera and display the recorded video on the OPS.

Remote Monitoring and Operation Functions

Browser OPS (optional)

By installing and setting up this software on a browser-resident PC, operators can obtain the same functionality as provided in the central control room OPS.

- By connecting to the operator’s intranet, plant operation and monitoring are possible from the home or office. What’s more, by implementing this function over the Internet or a leased line, remote monitoring from MHPS and remote plant diagnosis are also possible.

Mobile OPS (optional)

By setting up a wireless LAN, OPS functionality using a tablet PC can be realized from the field. Security from external tampering is achieved by setting up a firewall.

Alarm Mail (optional)

It is possible to register a critical alarm and deliver it in real time via e-mail. This function allows you to know immediately if a problem occurs in the plant and to take a quick, proper action.
**Multiple Process Station (MPS)**

**Overview**

The Multiple Process Station (MPS) of DIASYS Netmation® is a controller that performs arithmetic operations for control and processes input and output with the field. The DIASYS Netmation® Multiple Process Station (MPS) gives full play to the plant manufacturer's basic philosophy of ensuring reliability and controllability. The key features of the MPS are as follows.

### High Reliability

Duplicated redundant functional processors, network and power supply units help ensure system reliability. Moreover, each CPU is provided with a complete set of self-diagnostic functions. This means that, in the event of failure, switchover can be made to the standby CPU of the duplex system without adversely affecting control.

### High-Performance Control Functions

DIASYS Netmation®’s MPS achieves excellent controllability, thanks to its powerful Intel Celeron/Pentium processor and high-speed process I/O scheme. Since it employs the latest high-speed CPU, the MPS is able to perform most any type of arithmetic computation, including efficiency calculations, soot calculations, and more. The MPS also detects alarms and logs data.

### Flexible System Configuration

A broadly-based hardware line-up makes it possible for the MPS to conform to a wide range of system configurations, from compact architecture systems to highly-complex systems. Since sequencers (PLCs), MCCs and fieldbuses can be connected directly to the system, the plant system designer can set up a total plant control and monitoring system, including control of proprietary systems within the plant.

### Easy Maintenance

The DIASYS-IDOL® engineering software tools integrate total plant control logic designing, maintenance, monitoring and diagnostics. DIASYS-IDOL® is a user-friendly system for the customer, which makes it a snap to perform system maintenance of anything from control logic modification to system configuration.

### High Maintainability of Hardware

Even in the unlikely event of system failure, the MPS’s self-diagnostic functions and indication features make it easy to locate the failure and restore the system.

### Table 5: Specifications of the CPU in the MPS

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Intel Celeron 300 MHz</td>
</tr>
<tr>
<td></td>
<td>Intel Pentium 700MHz</td>
</tr>
<tr>
<td></td>
<td>Intel Pentium 4-M 2.2GHz</td>
</tr>
<tr>
<td></td>
<td>Intel / ULV Celeron M 1.0GHz</td>
</tr>
<tr>
<td>Redundancy</td>
<td>Duplex</td>
</tr>
<tr>
<td>CPU bus</td>
<td>CompactPCI bus</td>
</tr>
<tr>
<td>Backup battery</td>
<td>Unnecessary (flash memory is used)</td>
</tr>
<tr>
<td>DS</td>
<td>512 MB</td>
</tr>
<tr>
<td>Memory</td>
<td>128 MB ECC memory as standard</td>
</tr>
<tr>
<td></td>
<td>256 MB ECC memory as standard</td>
</tr>
<tr>
<td>CompactFlash</td>
<td>64 MB as standard</td>
</tr>
<tr>
<td></td>
<td>128 MB as standard</td>
</tr>
<tr>
<td></td>
<td>256 MB as standard</td>
</tr>
<tr>
<td>Battery</td>
<td>Lithium battery (for calendar)</td>
</tr>
<tr>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Remarks</td>
<td>-</td>
</tr>
</tbody>
</table>

### Table 6: Specifications of the MPS I/O

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O network</td>
<td>ControlNet</td>
</tr>
<tr>
<td>Redundancy</td>
<td>Duplex</td>
</tr>
<tr>
<td>Standard</td>
<td>ECE1158</td>
</tr>
<tr>
<td>Communication method</td>
<td>ETDMA (Concurrent Time-Domain Multiple Access)</td>
</tr>
<tr>
<td>Communication speed</td>
<td>5 Mbps</td>
</tr>
<tr>
<td>Maximum number of distributors</td>
<td>5 ControlNet/ MPS</td>
</tr>
<tr>
<td>Maximum number of ControlNet nodes</td>
<td>For arithmetic operations at 50 msec; 7 adapters/ControlNet, for arithmetic operations at 100 msec; 14 adapters/ControlNet</td>
</tr>
<tr>
<td>Number of I/O modules</td>
<td>6 modules/adapter</td>
</tr>
<tr>
<td>Data update interval</td>
<td>5 msec</td>
</tr>
</tbody>
</table>

**Multi-screen (optional)**

The multi-screen is an OPS consisting of one PC controller and multiple monitors. The multi-screen supports a one-person operation by allowing you to concurrently display and operate multiple windows more easily compared to usual monitors.

**Liquid Crystal Panel (optional)**

OPSs with liquid crystal panels are available (with limited functions). You can incorporate this type of OPS in the control board if you do not require an independent personal computer as the OPS.
Hardware Architecture

The system configuration of the MPS is shown in Fig. 22.

There are two, duplexed CPU cards, each of which monitors the other in a redundant configuration. If one of the CPUs fails, the control functions are seamlessly handed over to the standby CPU. Process I/O modules that provide plant interfaces also provide the interface to the CPUs via ControlNet, which is an open, state-of-the-art control network advanced by Allen Bradley specifically for real-time, high-throughput industrial applications.

Ready I/O module extensibility is provided by adding I/O modules to ControlNet. Similarly, specialized function modules such as turbine interlock modules and valve interface modules are also connected to ControlNet, just like a regular I/O module.

Allen Bradley’s PLC can also be connected directly to ControlNet. This allows one to configure a total plant control and monitoring system that includes proprietary PLCs for auxiliary systems such as water treatment facilities, desulfurization facilities and ash treatment facilities. For the sequencers (PLCs) that are manufactured by companies other than Allen Bradley, the interface is enabled by MODBUS or Ethernet. Moreover, by connecting linking devices to ControlNet, the system can also be set up to interface fieldbuses, DeviceNet networks, or MCCs.

Fig. 23 shows a typical arrangement of modules in a cabinet; Fig. 24 is a sketch of a CPU chassis; and Figure 25 is power distribution diagrams of the CPU and I/O systems.
Table 7: DIASYS Netmation® Original Card and Module Lineup (1/2)

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Number</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU chassis</td>
<td>A-CPU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU chassis</td>
<td>B-CPU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware Lineup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F module</td>
<td>F XDIM01 FLEX I/O card</td>
<td>80</td>
<td>(ControlNet FLEX 24V DC Digital Input, 8 Points)</td>
</tr>
<tr>
<td>F module</td>
<td>F XDIM02 FLEX I/O card</td>
<td>16</td>
<td>(ControlNet FLEX 48V DC Digital Input, 16 Points)</td>
</tr>
<tr>
<td>F module</td>
<td>F XDIM03 FLEX I/O card</td>
<td>32</td>
<td>(ControlNet FLEX 120V DC Digital Input, 32 Points)</td>
</tr>
<tr>
<td>F module</td>
<td>F XDIM04 FLEX I/O card</td>
<td>64</td>
<td>(ControlNet FLEX 230V DC Digital Input, 64 Points)</td>
</tr>
<tr>
<td>F module</td>
<td>F XDIM05 FLEX I/O card</td>
<td>128</td>
<td>(ControlNet FLEX 460V DC Digital Input, 128 Points)</td>
</tr>
</tbody>
</table>

Fig. 25: Power Distribution Diagram
Table 8 : Allen Bradley FLEX I/O Module Lineup

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1794-O 4</td>
<td>DIASYS Netmation® Original Card and Module Lineup (2/2)</td>
</tr>
<tr>
<td>1794-O 8</td>
<td>ControlNet™ communication error</td>
</tr>
<tr>
<td>1786-R PA</td>
<td>Ethernet transmission error</td>
</tr>
<tr>
<td>1794-O 16</td>
<td>Tracking receive error</td>
</tr>
<tr>
<td>1794-IV 16</td>
<td>System configuration data error</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>System I/O card data transfer error</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Target abort</td>
</tr>
<tr>
<td>1794-O B 16</td>
<td>Invalid opcode</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Double fault</td>
</tr>
<tr>
<td>1794-IV 16</td>
<td>Invalid TTS</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Segment not present</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Black fault</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>General protection error</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Floating point error</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Sheet data expansion error</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Sheet data mismatch</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>System I/O connector error</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Tracking receive error</td>
</tr>
<tr>
<td>1794-1B 16</td>
<td>Ethernet transmission error</td>
</tr>
</tbody>
</table>

System Reliability

To help ensure the highest system reliability, a stringent quality control system is rigorously applied to both the hardware and the software of the MPS. Even so, as a basic rule, MHPs embraces a redundant configuration to maintain automatic control and operation monitoring functions, even in the rare event a system failure occurs.

In a redundant configuration, reliable self-diagnostic functions and a thorough backup transfer function constitute the two most critical elements. These self-diagnostic functions are shown in Table 11.

1) Self-diagnostic Functions

Since the CPU card of an MPS assigns its highest priority to maintaining continued control as the plant control system, it is equipped with the ability to perform reliable self-diagnostics.

2) System Switching Procedure

Two CPUs are used for redundancy. One CPU is the control CPU and the other is the standby CPU. The control CPU issues output permissions to the output modules and the calculations of this CPU control the plant. The standby CPU periodically fetches necessary data from the control CPU to maintain the same calculations as the control CPU in case of emergency switchover.

The CPUs monitor each other. If an abnormality occurs in the control CPU, the standby CPU detects it immediately and takes over the control CPU bumplessly. The system I/O card in each system monitors whether the status of the other CPU is normal or abnormal.

Table 9 : Self-Diagnostic Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>WDT error</td>
</tr>
<tr>
<td></td>
<td>PCI bus error</td>
</tr>
<tr>
<td></td>
<td>Master abort</td>
</tr>
<tr>
<td></td>
<td>Target abort</td>
</tr>
<tr>
<td></td>
<td>Address parity error</td>
</tr>
<tr>
<td></td>
<td>Data parity error</td>
</tr>
<tr>
<td></td>
<td>CPU power supply error</td>
</tr>
<tr>
<td>Software</td>
<td>Monitor by zero</td>
</tr>
<tr>
<td></td>
<td>Incorrect address</td>
</tr>
<tr>
<td></td>
<td>Overflow</td>
</tr>
<tr>
<td></td>
<td>Alignment over access</td>
</tr>
<tr>
<td></td>
<td>Invalid opcode</td>
</tr>
<tr>
<td></td>
<td>Double fault</td>
</tr>
<tr>
<td></td>
<td>Invalid TTS</td>
</tr>
<tr>
<td></td>
<td>Segment not present</td>
</tr>
<tr>
<td></td>
<td>Black fault</td>
</tr>
<tr>
<td></td>
<td>General protection error</td>
</tr>
<tr>
<td></td>
<td>Floating point error</td>
</tr>
<tr>
<td></td>
<td>Sheet data error</td>
</tr>
<tr>
<td></td>
<td>Sheet data expansion error</td>
</tr>
<tr>
<td></td>
<td>Sheet data mismatch</td>
</tr>
<tr>
<td></td>
<td>System configuration data error</td>
</tr>
<tr>
<td></td>
<td>System I/O connector error</td>
</tr>
<tr>
<td></td>
<td>Tracking receive error</td>
</tr>
<tr>
<td></td>
<td>Ethernet transmission error</td>
</tr>
<tr>
<td></td>
<td>ControlNet® communication error</td>
</tr>
<tr>
<td></td>
<td>Ethernet transmission fault (minor error)</td>
</tr>
<tr>
<td></td>
<td>ControlNet® communication fault (minor error)</td>
</tr>
</tbody>
</table>
Compact Process Station (CPS)

Overview

The Compact Process Station (CPS) of DIASYS Netmation® is a controller that handles input and output with the instruments and devices installed in the field of the plant. The CPS automatically controls the plant and performs varied calculations. The CPS contains a CPU that can be mounted on a FLEX I/O module bus. Since the CPS requires no CPU chassis unlike the MPS and may be used in a single configuration, it can be used more casually, for example, in a small-scale system such as a packaged boiler, an additional facility for diagnosing combustion vibration of a gas turbine, or any other place that requires input and output. The CPS can be duplicated if necessary.

Specifications

Table 10 : DIASYS Netmation® CPS Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU module</td>
<td>FXCPU01</td>
</tr>
<tr>
<td>CPU</td>
<td>32-bit high speed RISC CPU 266 MHz</td>
</tr>
<tr>
<td>Memory</td>
<td>128 MB</td>
</tr>
<tr>
<td>OS</td>
<td>Linux (realtime compatible)</td>
</tr>
<tr>
<td>Ethernet</td>
<td>3 ch</td>
</tr>
<tr>
<td>Control port</td>
<td>2</td>
</tr>
<tr>
<td>Max. number of I/O module connections</td>
<td>16 modules / 40 modules</td>
</tr>
<tr>
<td>Operating cycle</td>
<td>More than 10 msec</td>
</tr>
<tr>
<td>Data logging function</td>
<td>CPS internal logging capacity: 600 points per hour (1 sec cycle), up to 1,600 alarms total (Separate ACIS required for long-time storage)</td>
</tr>
<tr>
<td>Power</td>
<td>24V DC</td>
</tr>
</tbody>
</table>

Hardware Architecture

Fig. 26 shows a typical system configuration for a CPS. SmartCPU can be directly connected to an OPS or an EMS as shown in Fig. 26 since SmartCPU has an Ethernet interface. Up to eight I/O modules can be connected to an I/O module bus in the CPS. To duplex the CPS, connect two SmartCPUs by using a tracking cable.

Hardware Lineup

Table 11 shows the module line-up of the DIASYS Netmation® CPS. In addition to DIASYS Netmation®’s original modules, you can use the FLEX I/O modules manufactured by Allen Bradley.

Table 11 : Hardware Lineup

<table>
<thead>
<tr>
<th>TYPE</th>
<th>NUMBER</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU module</td>
<td>FXCPU01B</td>
<td>FLEX I/O TYPE CPU MODULE (Ethernet 3 ch / 16 modules)</td>
</tr>
<tr>
<td></td>
<td>FXCPU03</td>
<td>FLEX I/O TYPE CPU MODULE (Ethernet 3 ch / 40 modules)</td>
</tr>
<tr>
<td></td>
<td>FXADP01B</td>
<td>FLEX I/O REDUNDANT ADAPTER MODULE (FXCPU01B)</td>
</tr>
<tr>
<td></td>
<td>FXADP02</td>
<td>FLEX I/O REDUNDANT ADAPTER MODULE (FXCPU03)</td>
</tr>
<tr>
<td>I/O module</td>
<td>FX type modules listed Table 7 can be used.</td>
<td></td>
</tr>
</tbody>
</table>

Features

- Easy maintenance using the fully integrated database
- Engineering by dragging and dropping
- No conversion of logic to POL (logic diagrams are directly used as arithmetic operation data)
- DIASYS-IDOL++ logic description language added with data processing and OPS elements in addition to the logic language.

Functions

- Logic Data Management and Creation (LOGIC WINDOW/LogicCreator)

For a traditional control system, the instrumentation control engineer creates logic diagrams and the maintenance tool of the control system converts the logic diagrams to POL diagrams to create the logic to be calculated on the controller. For DIASYS Netmation®, the conversion to POL diagrams is totally abolished.

The instrumentation control engineer uses LogicCreator, which is based on a Microsoft CAD tool, VISIO, to create function block diagrams (control logic diagrams) by drag and drop operations only. When the data is built and downloaded to the MPS or the CPS, only the logic elements that need to be calculated are extracted and calculated. The created diagrams can be directly submitted to your customers or maintained properly. For the traditional system, if logic is changed in the system, the diagrams need to be re-written afterward. For DIASYS Netmation®, since the calculated logic and the diagrams are the same, the diagrams are automatically updated when logic is changed.

Features

- System Configuration Function (SYSTEM WINDOW)
- Human Machine Interface Setting Function (HMI WINDOW)
- Plant System Diagram Management and Creation Function (GRAPHIC WINDOW)
- ObjectDatabase (ORCA) Modification Function (DOCUMENT WINDOW)
- Drawing Management Function (DRAWING WINDOW)
Integrated Database (Object Database (ORCA))

One of the main features of DIASYS Netmation® is an integrated database called ObjectDatabase (ORCA).

The control system performs varied functions including the graphic display on an OPS, creating logic for defining arithmetic processing for control, and assignment of input and output signals to I/O modules. ObjectDatabase (ORCA) managed each piece of data that is shared by different functions as a single component (object). Objects appear differently depending on the function that uses them. However, objects do not change. Figure 28 shows the concept.

In previous systems, when different functions required the same data, each function created the data and gave the same number to the data to show that they were actually using the same data. Let's take a pump for example.

Suppose there is logic that defines a pump that changes its color depending on its status. Also suppose there is a graphic window that displays the pump which changes its color. In previous systems, the logic creation tool was used to create the color change logic and the pump was given a number for each piece of that logic. Then the graphic creation tool was used to create a graphic that displayed the pump. To the colors of the pump, the numbers defined in the color change logic were assigned.

Figure 29 shows the concept of the previous number assignment method. Figure 30 shows the ObjectDatabase (ORCA) method used in DIASYS Netmation®.

Fig. 28 : Conceptual Rendering of ObjectDatabase (ORCA)

Fig. 29 : Previous Control System’s Method (Example of Pump Color Change)

Fig. 30 : ObjectDatabase (ORCA)’s Method (Example of Pump Color Change)
Control and Processing Logic Description Language DIASYS-IDOL**

Control and processing logic is described using DIASYS-IDOL**, the logic description language exclusive to DIASYS®. Conventional digital controllers require programming technology to build up the control logic, making them difficult for control engineers to handle. With DIASYS-IDOL**, however, the program code is formed simply by drawing a conventional control system diagram on the VDU screen.

This control and processing logic description software, originally developed by MHPS for power plants, has earned a solid reputation among customers for its easy description of control algorithms. Since it was first developed in 1980, DIASYS-IDOL** has become faster and more compact in terms of arithmetic processing, while maintaining the same interchangeability of expression.

The DIASYS-IDOL** contains more than 100 standard logic elements, with the typical 6 elements shown in Fig. 31. The elements are displayed for selection on the LogicCreator of the EMS. The standard elements can also be combined to form a new element using the "user definition macro function."

![Fig. 31: Typical DIASYS-IDOL** Elements](image)

The DIASYS-IDOL** software installed in the EMS includes not just elements for logic description language, but for operating screens, OPS control monitoring elements including alarms and lamps, and plant status as well, allowing various linked conditions to be entered on a single logic sheet. Previously, links between control logic, OPS, and other functions were created by assigning an ID number, but DIASYS-IDOL** eliminates the need to assign and manage ID numbers.

![ORCA: Object Relation Control Architecture](image)

Hardware Specifications

The hardware specifications for the EMS are listed below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Pentium 4 2.4 GHz or higher (latest model is employed)</td>
</tr>
<tr>
<td>Memory</td>
<td>1 GB or more</td>
</tr>
<tr>
<td>Hard disk</td>
<td>80 GB or more</td>
</tr>
<tr>
<td>Resolution</td>
<td>1280 x 1024</td>
</tr>
<tr>
<td>Network connection</td>
<td>100baseT x 3ch (2ch when network printer not required)</td>
</tr>
<tr>
<td>OS</td>
<td>Windows NT 4.0 workstation/ 2000/XP Professional</td>
</tr>
</tbody>
</table>

* Windows-based PC is employed.
* An industrial personal computer for long-term maintenance (PCLTM01) is recommended.
As a plant manufacturer, Mitsubishi Hitachi Power Systems (MHPS) provides total solutions for operating plant including design, manufacture, and operation of boilers and turbines. We also integrate the component parts of the plant such as boilers, turbines, and auxiliary units using our thermal plant control system, DIASYS®. This provides the measurement, control, and required information to operate the plant. In addition, MHPS offers other products to cover every aspect of plant operation: high sensitivity monitoring devices, high efficiency operation control support applications, and operation training assistance systems.

**Joint Operation System (JOS)**

JOS enables the optimal operation of power plants with multiple boilers and turbines in factories. It uses the system characteristics and fuel costs of the plant as parameters and finds the optimal solution that minimizes the fuel and electricity to be purchased while satisfying the demands for electricity and steam in the factory. When combined with online control, JOS also enables real-time optimal operation.

**Advantages of introducing SimTRAC**

1. Operators can easily learn how to start and stop a plant or change load by themselves.
2. Simulated operations provide a varied types of abnormalities including device failures and system changes, allowing operators to improve their skills effectively.
3. Simulations for changing the control logic and adjusting parameters allow operators to understand plants better.
4. Simulations include special types of operations such as coal-fired boilers.

**Training Simulator**

**Precise and compact**

Highly sophisticated design technologies of Mitsubishi Hitachi Power Systems as a plant manufacturer are incorporated in SimTRAC. This training simulator, SimTRAC, is the essence of our accumulated design know-how and operation technologies, realized in the form of user-friendly simulation technology.

**System Overview**

1. Operators can easily learn how to start and stop a plant or change load by themselves.
2. Simulated operations provide a varied types of abnormalities including device failures and system changes, allowing operators to improve their skills effectively.
3. Simulations for changing the control logic and adjusting parameters allow operators to understand plants better.
4. Simulations include special types of operations such as coal-fired boilers.

**Example of Calculating the Advantages of Introducing JOS**

The typical cost improvement of a mill of a paper manufacturer is described here. You can calculate the advantages of introducing JOS based on the following data:

1. (Systems in the target plant: steam, fuel, electricity)
2. (Whether electricity is purchased, unit price of electricity (for each season and time zone))
3. (Rating and structures of boilers and turbines)
4. (Boilers: Rated capacity, type of fuel, operation range)
5. (Turbines: Type (such as 2-stage extraction back-pressure), rated capacity, operation range of steam in each stage)

As parameters, you can specify (or enter signals for) 1): plant system information, such as characteristics of boilers and turbines or pressure loss in pipes, 2): electricity supply charge, fuel cost, 3): energy demand patterns of steam and electricity and 4): operation conditions. By doing so, JOS calculates the economical operation in real time using n-order polynomial expressions considering the task as a non-linear constrained optimization problem and displays the result as a reference for the actual operation.

**Related Products**

- **Flame Detector**
  - IR-S Infrared Flame Detector
  - Net IR-S Infrared Flame Detector
  - Infrared Flame Detector Rail Mounting Net IR-S

- **Analyzer/Simulator**
  - Tube Leak Detector
  - Training Simulator

- **Self-learning Training Simulator**
  - SimTRAC

http://www.diasysnetmation.com/solutions
Remote Operation and Monitoring System

Newly, remote systems are introduced to allow operations of a power plant from a different remote power plant or operations and monitoring from a customer’s headquarters. MHPS has provided remote systems in more than 30 power plants worldwide. Some remote systems are connected to MHPS’s remote center to allow our plant engineers to support efficient operations.

To introduce a remote system, the following points must be noted:
1) Security precautions against network intruders and information leakage must be provided.
2) The processing of the control system must not be affected.
3) There should be no response bottlenecks that may cause communication overload on the data transmission route such as VPN lines and Internet lines.
4) Expandability must be taken into account to allow adding features in the future such as video transmission.

MHPS has delivered remote systems that require high reliability such as remote systems in far islands and remote geothermal turbines.

Net IR-S Infrared Flame Detector

The recent monitoring and control systems for thermal power plants require the communications technology such as the Internet and intranet, powerful databases, high-performance yet low-cost hardware including personal computers, and easy-to-use user-machine interface software. To fulfill these needs, DIASYS Netmation IR-S (Net IR-S) is created. The Net IR-S is a flame detector that is created as a feature of the burner control system by combining DIASYS Netmation, which is latest control system of Mitsubishi Hitachi Power Systems, and the renowned IR-S Infrared Flame Detector.

The sensor unit of the Net IR-S inherits the detection reliability, maintainability, and economy of the conventional IR-S. The detection circuit board is now a module of DIASYS Netmation. The board is connected to the higher levels of Netmation, enabling easy-to-use user-machine interface. The Net IR-S can be detached from the burner control unit and used as an independent flame detector as well.

Features

High Reliability
- High-sensitivity design
- The newly designed sensor enables the detection of burner flames, reliability. Flames are detected through the non-ignition zone.
- Greater detection range
- The detector allows better and more reliable detection from high-luminance flames to slow combustion. Besides providing a much better detection sensitivity-100 times that of the existing product, the new detector eliminates the need for sensitivity adjustments.

Excellent Maintainability
- Maintenance-free design
- The spherical lens eliminates the need for cleaning the sensor window.
- Long-life sensor
- Long-life semiconductors used in the infrared sensor element makes it unnecessary to carry out replacement at normally frequent intervals.

Excellent Economy
- Fewer number of panels
- Due to the space-saving design of the detector module, each panel is capable of housing 40 corners.
- Uses existing boiler equipment
- For replacement work, it is unnecessary to modify the boiler.
- Uses existing equipment
- It is unnecessary to replace the sensor-to-panel cable.

Example of the burner control system with the built-in Net IR-S

Net IR-S Infrared Flame Detector