# K5BMC

# ELECTRONIC INTERLOCKING MANUAL

# HIGHER MANAGEMENT LEVEL

# KYOSAN INDIA PVT LTD.

# Maintenance Manual

# for K5BMC Electronic Interlocking Syatem

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**Version 3**

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**Kyosan Electric Mfg. Co., Ltd.**

**Document Revision History**

| Ver. No. | Date | Nature of Revision | Author(s) |
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| 1 | 16. Jun. 2009 | First Edition | T. Suzuki |
| 2 | 12. Nov. 2010 | Revised by Journal Module addition<br>Revised the word (SSI to EI and unit to card) | T. Suzuki |
| 3 | 12. Feb. 2011 | Addition of functional explanation of Indication, Switch on the Front Panel of Journal Module and INIO2 card<br>Addition of Card information Flow Chart of Journal Module<br>Correction of a miswritten words and drawings<br>Changing from ball type to optical type of mouse | Y.Kanno |
|  |  |  |  |
|  |  |  |  |

# SAFETY PRECAUTIONS

♦ To ensure the safety for users and personnel engaging in maintenance activities etc, of this product, all contents of this guide(including attached sheets) have to be carefully read and fully understood prior to the use of this product. Then, this product have to be correctly used in accordance with this guide.

♦ This guide(including attached sheets) must be kept in its proper place to be available when necessary.

♦ The PL mark used in this instruction manual means as follows.   Be sure to observe and follow the messages because they are very important to ensure your safety when using the equipment.

| ⚠ DANGER | Danger includes information and instructions which, if not followed, could result in injury or death of personnel such as workers and passengers as well as destruction or fire of equipment. |
|---|---|
| ⚠ WARNING | Warning includes information and instructions which, if not followed, might result in injury or death of personnel such as workers and passengers as well as damage or fire of equipment. |
| ⚠ CAUTION | Caution includes information and instructions which, if not followed, could result in partly fault or damage of equipment as well as loss of the data. |

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If you handle erroneously, you may receive an electric shock

If you handle erroneously, you may be scalded.

If you handle erroneously, you may be caught at part of your body.

Do not touch the equipment for your safety.

Do not disassemble the equipment for your safety.

If you handle erroneously, the equipment may catch fire.

If you touch the equipment or part of body, clothes, etc. is inserted, you may be injured.

If you handle erroneously, the equipment may fail or you may be injured.

Unless the equipment is handled according to the procedure, the equipment may fail or you may be injured.

# CAUTION

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♦ Contents of the manual may subject to change without notice.

♦ Although the contents of the manual have been prepared very carefully, if you find any ambiguous matter, errors or omissions, please inform Kyosan. Nevertheless, Kyosan may not take any responsibility for the results of operation performed according to the manual.

☆   ☆   ☆   ☆   ☆   ☆   ☆

♦ Maintenance personal computers and displays used in operator control etc. are procured from external manufacturers, therefore, please read specifications and instruction manual of each manufacturer.

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♦ Input / Output library VCT-0101 built in personal computer is a registered trade mark of Japan Interface.

♦ BURNDY connectors trade marks of SOURIAU Connection Technology.

## Table of Content

# 1. Scope

The Electronic Interlocking Equipment incorporates microcomputers to realize interlocking functions using the hardware and software developed originally.

One of the features of this Electronic Interlocking Equipment is that it consists of Interlocking Logic Module, Electronic Terminal Modules and Journal Module. Processing cards realize high-speed processing and transmission using fail-safe microcomputers.   The Electronic Interlocking Equipment is highly immune to various emissions (certified for EMC by the international standards) and other climatic conditions, provides high-quality interlocking operation, and is highly expansible. Interlocking data of each station are created using offline equipment.   Therefore, the data can be validated off line, and collected into the Interlocking Logic Module and Electronic Terminal Modules.

This manual describes for the maintenance personnel, basic handling methods, operation procedures, precautions, etc.   Maintenance personnel are requested to read through the manual to ensure safety of people and equipment.

In the K5BMC system manufactured by Kyosan, external units of the points, the signals, the level crossings, blocking work and the crank handles etc. are controlled through the relay interfaces. The EI system, the ATP and the CTC system can be interfaced by adding more hardware.

In case of end cabin and multi cabin operations, 2 or more CCIPs or VDU control consoles, or both of them can be interfaced to the EI system.

The K5BMC system has been isolated from external devices electrically by the relays and it is corresponding to in the AC electrified sections.

The K5BMC system is capable of interfacing with block instrument. Also, it is capable of interfacing with the intermediate block signals and the automatic block signals including the outlaying yards. This can be achieved by the relays and the logic circuits.

For large stations which cannot be processed by one EI, 2 or more EI logic modules can be connected via signal LAN.

The signal LAN has a fail-safe feature.

For all the vital connections, the OFCs or the twisted pair cables have been applied.

## 2. Terminology

### 2.1 Abbreviation

ABBREVIATION

| | |
|---|---|
| EI | Electronic Interlocking |
| ET-NET | Electronic Terminal-NET |
| MM-NET | Man Machine -NET |
| ET-PIO2 | Electronic Terminal-Parallel Input Output 2 Card |
| MMIF2 | Man Machine Interface 2 Card |
| LINE2B | Fiber Line 2B Card |
| IPU6C | Interlocking Power 6C Card |
| F486-4I | Fail-safe 486-4I Card |
| FSIO | Fail-safe Input Output Card |
| B24 | Terminal block No., DC24V (+side) Logic Power |
| C24 | Terminal block No., DC24V (-side) Logic Power |
| B26 | Terminal block No., DC26V (+side) Interface Power |
| C26 | Terminal block No., DC26V (-side) Interface Power |
| OPC | Operator Console |
| MS | Master Station Room |
| CPU | Control Processing Unit |
| NET | Network |
| NFB | No Fuse Breaker |
| NFL | Noise Filter |
| MTC | Maintenance Console |

**2.2 Electronic Interlocking System**

Control panel / Operator console --- Man-machine interface of EI Equipment

Interlocking Logic Module

Abbreviations of Cards

(1) F486-4I    Fail-safe CPU Card

(Executes interlocking functions)

(2) FSIO    Interface for Electronic Terminal Transmission and Fail-safe Driver Card

(Abnormality relay, system control, maintenance personal computer I/F)

(3) FSIO-EX    Interface Card for Electronic Terminal Transmission

(4) IPU6C    Logic power Supply Card

(Input DC 24V, output DC 5V and DC 24V)

(5) FIO7-[P]    E/O Converter for Electronic Terminal Transmission and Maintenance

Terminal Transmission E/O Connector Card

(ET-NET:31.2 Kbps, MTC: for serial transmission)

(6) EXTFIO7P    Electronic Terminal Transmission E/O Converter Card

(ET-NET 31.2Kbps)

(7) DID    Station ID Input and Intersystem I/F Card

Electronic Terminal Module

Abbreviations of Cards

(1) PIO2-LOG    Electronic terminal that controls parallel input output interface Card.

(2) MMIF2    Electronic terminal that controls man machine I/F Card

(3) LINE2B    Terminal block power supply and electronic terminal transmission line E/O

converter Card

(4) LINEM2    Man-machine I/F Card power supply and electronic terminal E/O converter

Card

(5) INIO2    Personal computer and Electronic Interlocking Logic Card transmission Card

(Two types for operator console and maintenance console)

(6) SPHC-TT    Optical Branch Card

(7) SPHC-PW    Power supply for Optical branch Card

Journal Module

Abbreviations of Cards

(1) ZPEN3    Program processing card for Journal Module

(2) ZNIO2    I/F card between Logic Module and Journal Module

(3) ZSIO2    I/F card between Protocol Converter and Journal Module

(4) KDD172-KY48-2    Journal Module Power Supply Card

(Input DC 24V, output DC 5V and DC 12V)

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## 3. General description

### 3.1 System

The system consists of Operator console, Control Panel, Interlocking Logic Rack (Signaling System Logic Module/Electronic Terminal Module/Journal Module).

Interlocking logic functions include setting and resetting control of routes, various locking and unlocking operations such as approach locking.

**(1) Interlocking equipment**   Electronic Interlocking Equipment

**(2) Configuration**       See attached figures.

**(2) Equipment configuration**  See 3.2.

### 3.2 System configuration

**(1) Sample configuration**

a. MS (Master Station Room)

| Equipment | Devices used | QTY | Weight | Remarks |
|---|---|---|---|---|
| Operator Console | Personal computer + LCD monitor + mouse + key board | 1 set | | |
| Panel Control | Domino panel | 1 set | | |

b. ER (Equipment Room)

| Equipment | Dimensions | | | No. of Racks | Type | Weight | Remarks |
|---|---|---|---|---|---|---|---|
| | W(mm) | D(mm) | H(mm) | | | | |
| Interlocking Logic Rack | 850 | 600 | 2150 | 1 | Standalone | 450kg | |
| Relay Rack | | | | 1 | | | |
| Output Terminal Rack | | | | 1 | | | |

Note 1: W (mm) does not include side panel.

Note 2: Cable inlet : Bottom of each rack.

Power supply, external line and inter-rack cable of each rack.

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## 4. Specifications and Conditions
### 4.1 Operator Console
#### 4.1.1 Flat Panel Color Monitors (for reference)

| Screen | Technology | Active Matrix Thin Film Transistor(TFT) Liquid Crystal Display(LCD) |
|---|---|---|
| | Size/viewable image size | 18.1"/18.1" |
| | Pixel pitch | 28 mm |
| | Display colors (maximum) | Up to 16.7 milion color combinations |
| | Brightness | 200 (cd/m$^2$) |
| | Contrast ratio | 150:1 |
| Functional features | Display modes | VGA, SVGA, XGA, SXGA |
| | Maximum addressability | 1280×1024 |
| | Active display area (Horizontalx Vertical) | 14.1" × 11.3" 359 × 287mm |
| | Minimum viewing angle | 80deg. up, 80deg. down, 80deg. right, 80deg. left |
| | Power management | ENERGY STAR, NUTEK |
| | User controls | Power, brightness, contrast, image position, size, color, horizontal/vertical position, setup language selection, menu position |
| | On-screen display(OSD) | Yes(Analog models only) |
| | Lockable controls | Yes |
| Physical features | Power supply  Signal cable(provided) | Universal, External 12Vdc 15-D to 15-D(T85A) P&D to P&D(T85D) |
| | Dimensions(H×W×D) | 18.2" × 18.1" × 8.8" (462.6 × 459 × 224.3 mm) |
| | Weight | 19.8lbs (9.0kg) |
| | Tilt | -4deg. forward, 41deg. backward |
| | Swivel | 170deg. left,   170deg. right |
| | Environment | -10°C ~ +70°C   /   5~95% at +40°C |
| | Touch display available | Yes |

### 4.1.2   FA Personal Computer(for reference)
#### (1) Hardware Specifications
a. Processor (operating frequency) Celeron processor 566MHz

b. CPU built-in cache memory: 128KB

c. Main memory: 64MB with ECC (DIMM×1 pc.)

d. Video

-VRAM 16MB

-Screen resolution, display colors: 1,024× 768, True Color (32bit)

1,280×1024, True Color (32bit)

1,600×1200, True Color (32bit)

e. Standard built-in storage units

-FDD 3.5 inches (720KB/1.44MB) ×1 unit

-HDD 10.2GB(IDE)×1 unit

f. Expansion slots

| | |
|---|---|
| -PCI | : 2 pcs. (short) |
| -PCI/ISA sharing | : 3 pcs. (long) |
| -ISA | : 1 pc. (long) |

g. Standard input/output interfaces

| | |
|---|---|
| -RGB×1 | (Mini-D-Sub15pin, 3-row type) |
| -Parallel×1 | (D-Sub25pin) |
| -Serial×1 | (D-Sub9pin) |
| -Keyboard interface×1 | (PS/2) |
| -Mouse interface×1 | (PS/2) |
| -USB ports×2 | (Front×1, rear×1) |

Note) USB ports can be used on OS of NT2000 or later versions.

h. Power supply specifications

| | |
|---|---|
| -Voltage | : AC100V - 240V ± 10%(Wide range) |
| -Frequency | : 50/60Hz ± 3Hz |
| -No. of phases | : Single phase |
| -Power consumption | : 175W at a maximum (Energy consumption efficiency based on the Energy Saving law: 0.043, Category: R) |
| -Rush current | : 35A or less |

#### (2) Environmental conditions

| | |
|---|---|
| a. Temperature | : -10 ~ 70°C in operation |
| b. Humidity | : 5 ~ 95%RH (No condensation at 40°C) |
| c. Concussion resistance | : 5.9 m/s$^2$ (10 Hz, 5 seconds except for CD-ROM) |
| d. Impact resistance | : 19.6 m/s$^2$ (in operation), 98m/s$^2$ without energi-zation |
| e. Dust | : 0.3 mg/m$^3$ or less (JEIDA-29, Class B) |
| f. Corrosive gas | : JEIDA-29 Class A (Temperature 25°C, relative humidity 50%) |

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### 4.1.3   Operator console / Control Panel
#### (1) Hardware Specifications

-Electronic Terminals- Man-Machine Interfaces (MMIF2)

| Items | | | Specifications |
|---|---|---|---|
| Main unit | Redundant configuration | | Dual system |
| | Control method | | Programming method for single CPU |
| | Transmission | System | Serial transmission, asynchronous |
| | | Line | 2 channels, RS-485 |
| | | Rate | 31.2 Kbps |
| | Type | | 8 bits (80386 SX) |
| | Operating frequency | | 12 MHz |
| | Memory capacity | ROM | 256 Kbytes (1M Rom x 2) |
| | | RAM | 32 Kbytes (256K Ram x 1) |
| | Error detection | | CRC check |
| Interface unit | INPUT | No. of inputs | 32 ports |
| | | Type | Parallel photo coupler isolation |
| | | Current | 10 mA |
| | OUTPUT | No. of inputs | 64 ports |
| | | Type | Parallel photo mos isolation |
| | | Current | 1920mA/Card, 640mA/common, 30mA/every port, 50mA/ 1/2 port |

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-INIO2 (Computer I/F)

| Items | Specifications | Remarks |
|---|---|---|
| Transmission level | -20dBm ~ -17dBm | |
| Reception level | -27dBm ~ -17dBm | |
| Optical connector | FC receptacle type | |
| Fiber optics | Multi-mode fiber | |
| Light wavelength | 0.85μm | |
| Transmission rate | 31.2Kbps (ET line), 307.2Kbps (Maintenance system line) | |
| Transmission cycle | Depends on safety system | |
| No. of nodes | 8 in maximum | |

-SPHC-TT (Optical branch Card)

| Items | Specifications | Remarks |
|---|---|---|
| Transmission level | -20dBm ~ -17dBm | |
| Reception level | -27dBm ~ -17dBm | |
| No. of input | 1 channel (GI optical cable) | |
| No. of outputs | 2 channels (GI optical cable) | |
| Supply voltage | DC5V +5% -0% | |

-SPHC-PW (Power supply for Optical branch Card)

| Items | Specifications | Remarks |
|---|---|---|
| Input voltage | DC24V±10% | |
| Output voltage | DC5V +5% -0% | |

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### 4.2   Logic Module
#### 4.2.1   Specifications for Logic Module

| Items | | | Specifications |
|---|---|---|---|
| Logic module | Common | Redundant configuration | Dual system(2 sets running in parallel) |
| | | Control method | Bus synchronous fail-safe CPU |
| | | Electronic terminal circuit — Transmission system | Serial transmission, asynchronous |
| | | Electronic terminal circuit — No. of inputs and outputs | Transmission/reception,    3+2 channels |
| | | Electronic terminal circuit — Electric conditions | As transmission medium, optical cables are used. |
| | | Electronic terminal circuit — Transmission rate | 31.2Kbps |
| | | Electronic terminal circuit — Transmission channel | Optical cables |
| | F486- 4I | Type | 32 bits (i486) |
| | | Operating frequency | 40MHz |
| | | Memory capacity — ROM | 1 Mbytes |
| | | Memory capacity — RAM | 2 Mbytes |
| | | Error detection | Bus comparator<br>Watchdog timer<br>CRC checking |
| | | FSIO(1) interface | Dual port RAM, 16Kbytes |
| | | FSIO(2) interface | Dual port RAM, 16Kbytes |
| | | IC card | Not less than 16Mbytes |

(Part 2)

| Items | | | Specifications |
|---|---|---|---|
| Logic module | FSIO | Type | 32 bits (SH2) |
| | | Operating frequency | 24.576MHz |
| | | Memory capacity — ROM | 512Kbytes |
| | | Memory capacity — RAM | 1 Mbytes |
| | | Parallel input circuit — No. of ports | 8 pcs. |
| | | Parallel input circuit — System | 24V power supply, photo coupler isolation |
| | | Parallel output circuit — No. of ports | 12 pcs |
| | | Parallel output circuit — System | 24V power supply, photo coupler isolation |
| | | Checking input circuit — No. of ports | 12 pcs |
| | | Checking input circuit — System | 24V power supply, photo coupler isolation |
| | | Logic module normal output circuit — No. of ports | 1 pc. |
| | | Logic module normal output circuit — System | 24V power supply, photo coupler isolation |
| | | Monitoring circuit — Transmission system | Serial transmission, optical cables |
| | | Monitoring circuit — No. of channels | 1 pc. |
| | | Monitoring circuit — Transmission rate | 307.2Kbps |
| | | Electronic terminal line — Transmission system | Serial transmission, optical cables |
| | | Electronic terminal line — No. of channels | 3 pcs. |
| | | Electronic terminal line — Transmission rate | 31.2 Kbps |
| | FSIO-EX | Electronic terminal line — Transmission system | Serial transmission, optical cables |
| | | Electronic terminal line — No. of channels | 2 pcs. |
| | | Electronic terminal line — Transmission rate | 31.2 Kbps |

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- FIO7-[P] (Electronic terminal and MTC interfaces)

| | Items | Specifications | Remarks |
|---|---|---|---|
| Electronic terminal line | Transmission system | Serial transmission, asynchronous | |
| | No. of inputs | Transmission and reception, 3 channels | |
| | Electric conditions | As transmission medium, optical cables are used. | |
| | Transmission rate | 31.2 Kbps | |
| | Transmission channel | Optical cables | |
| Monitoring line | Transmission system | Serial transmission, asynchronous | |
| | No. of inputs | 1 channel | |
| | Electric conditions | As transmission medium, optical cables are used. | |
| | Transmission rate | 307.2 Kbps | |
| | Transmission channel | Optical cables | |

- EXTFIO7P (Electronic terminal interface)

| Items | Specifications | Remarks |
|---|---|---|
| Transmission system | Serial transmission, asynchronous | |
| No. of channel | 2 channels | |
| Electric conditions | As transmission medium, optical cables are used. | |
| Transmission rate | 31.2 Kbps | |
| Transmission channel | Optical cables | |

- DID (Intersystem interface)

| Items | Specifications | Remarks |
|---|---|---|
| Station ID input | Configurable among 00h-FFh | |
| Intersystem transmission | Transmission between Systems 1 and 2 of F486-4I | |

- IPU6C (Power supplies for each Card in Logic Module)

| Items | Specifications | Remarks |
|---|---|---|
| Input voltage | DC24V ±10% | |
| Output voltage | DC24V ±10% , DC5V +5% -0% | |

**4.3   Electronic Terminal Module**

### 4.3.1   Electronic Terminal – Parallel Output (ET-PIO2)

| Items | | Specifications | | |
|---|---|---|---|---|
| Main unit | Redundant configuration | Dual system | | |
| | Control method | Phase difference comparing fail-safe | | |
| | Transmission | System | Serial transmission, asynchronous | |
| | | Lines | 2 lines (RS-485) | |
| | | Rate | 31.2 Kbps | |
| | Type | 32 bits (SH2) | | |
| | Operating frequency | 20 MHz | | |
| | Memory capacity | ROM | 1 Mbytes | |
| | | RAM | 1 Mbytes | |
| | Error detection | Phase difference comparing system CRC checking | | |
| Interface unit | No. of inputs/outputs | 32 ports for inputs 32 ports for outputs | | |
| | Relay output | 120 mA for each port, DC24V | | |
| | Contact capacity | For DC24V, 16mA/simplex | | |
| | Power consumption | Electric power | No. control | Total control |
| | | Logic DC24V | 0.39A | 1.67A |
| | | Logic DC5V | 0.515A | 1.635A |
| | | Interface DC24V | 4mA | 3.972A outputs 0.512A inputs |

-   LINE2B (Power supply for ET-PIO2 and Logic Module interfaces)

| Items | Specifications | Remarks |
|---|---|---|
| Input voltage | DC24V±10% | |
| Output voltage | DC5V+5% -0% | |
| Transmission system | Serial transmission, asynchronous | |
| No.of input/output | 1 channel for input and output | |
| Electric conditions | As transmission medium, optical cables are used. | |
| Transmission rate | 31.2 Kbps | |
| Transmission channel | Optical cables | |

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### 4.3.2   Man-machine Interface Control Terminal (MMIF2)

| Items | | | Specifications |
|---|---|---|---|
| Main unit | Redundant configuration | | Dual system |
| | Control method | | Programming method for single CPU |
| | Transmission | System | Serial transmission, asynchronous |
| | | Line | 2 channels, RS-485 |
| | | Rate | 31.2 Kbps |
| | Type | | 8 bits (80386 SX) |
| | Operating frequency | | 12 MHz |
| | Memory capacity | ROM | 256 Kbytes (1M Rom x 2) |
| | | RAM | 32 Kbytes (256K Ram x 1) |
| | Error detection | | CRC check |
| Interface unit | INPUT | No. of inputs | 32 ports |
| | | Type | Parallel photo coupler isolation |
| | | Current | 10 mA |
| | OUTPUT | No. of inputs | 64 ports |
| | | Type | Parallel photo mos isolation |
| | | Current | 1920mA/Card, 640mA/common, 30mA/every port, 50mA/ 1/2 port |

-LINEM2 (power supply for MMIF2 and Logic module interfaces)

| Items | Specifications | Remarks |
|---|---|---|
| Input voltage | DC24V±10% | |
| Output voltage | DC5V+5%, -0% | |
| Transmission system | Serial transmission, asynchronous | |
| No. of input/output | 1 channel for input and output | |
| Electric conditions | As transmission medium, optical cables are used. | |
| Transmission rate | 31.2Kbps | |
| Transmission channel | Optical cables | |

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### 4.4   Journal Module
#### 4.4.1   ZPEN3 (Main processing part of Journal Module)

| Item | | Performance |
|---|---|---|
| CPU | | Celeron 650MHz<br>CULV Consumer Ultra Low Voltage |
| Main Memory | | 256MB (PC-133SDRAM) |
| Cache Memory | | L1-32KB,   L2-256KB |
| Chipset | | Intel815E |
| Interface unit | Serial | RS-232C × 2ch |
| | IDE | PIO4, BusMaster, UltraDMA/33<br>Maximum of two connection is possible by using external connector and internal PC card connector. |
| | VGA | Controller :    build in chipset<br>         (VRAM; using Main memory)<br>Resolution :    280×1,024dot : 16.77million colour<br>                    1,600×1,200dot : 256colour |
| | Keyboard and Mouse | PS/2 × 1    (splitter cable use in using mouse) |
| | USB | USB1.1 × 2ch |
| | Clock | Lunar Inequality: 3 minutes (Condenser backup : 8H) |
| | Buzzer | Included |
| | LAN | 100BASE-TX × 2ch |

#### 4.4.2   ZNIO2 (I/F for interlocking Logic Module)

| Item | Performance | Note |
|---|---|---|
| CPU | SH2-DSP    (Clock    24.5760MHz) | |
| Memory | Internal ROM     512K Byte<br>Internal RAM     8K Byte<br>External RAM    1M Byte<br>shared RAM      16K Byte | |
| Transfer method | serial transmission,<br>start-stop synchronous communication | |
| Input / Output | Transmission and receiving :    1 channel | |
| Electric Condition | Transmission Media : Optical fiber cable | |
| transfer rate | 9.6K to 614.4Kbps | |
| transmission line | Optical fiber cables | |

### 4.4.3   ZSIO2 (I/F for Data Logger)

| Item | Performance | Note |
|---|---|---|
| CPU | SH2-DSP    (clock frequency 24.5760MHz) | |
| Memory | Internal ROM    512K Byte<br>Internal RAM     8K Byte<br>External RAM    1M Byte<br>shared RAM      16K Byte | |
| Transfer method | serial transmission, EIA/RS-232E,CCITT/V.28 | |
| Input / Output | Transmission and receiving :    1 channel | |
| transfer rate | 1.2K to 76.8Kbps | |
| transmission line | Metal cable | |

### 4.4.4   KDD 172-KY48-2(Power supply for Journal Module)

| Item | Performance | Note |
|---|---|---|
| Input voltage | DC24V+20%, -10% | |
| Output voltage | DC5V±5%, DC12V±10% | * |

　* This Output voltage can not be measured since the Journal module has not measuring
　　terminal.

## 5. Safety precautions for operation

### 5.1 Operator Console

Please be careful to the following precautions for your health and normal operation of

Operator Console.
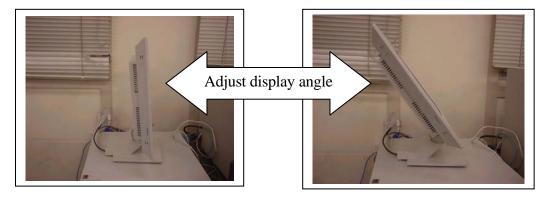
**Operating posture**

When you use the operator console continuously for a long time, you may be tired.
To avoid fatigue, keep a good pose during operation.    The good posture is that you
sit on a chair with the back stretched, both hands almost parallel to the floor, and
look slightly downward to the screen.



Adjusting angle of LCD display

The angle of LCD display can be adjusted up and down.    Adjust the angle to see the
screen more easily.



Adjust display angle

Adjusting brightness/contrast of LCD display

Adjust brightness and contrast of the screen.
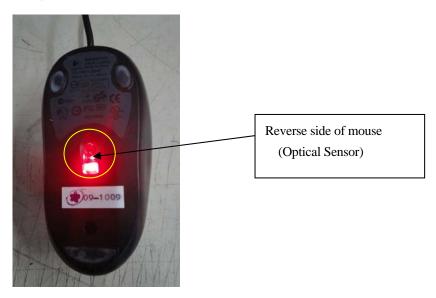
Optimum brightness and contrast of the screen depend on age, personal difference,
environmental lighting, etc.    Adjust the brightness and contrast of the screen depending
on you circumstances, for your best visible conditions

Mouse

If the optical sensor is covered with dust or contact points of bottom phase are soiled, the mouse pointer may move sluggishly. For such cases, cleaning is required.

Cleaning of optical sensor



Reverse side of mouse
(Optical Sensor)
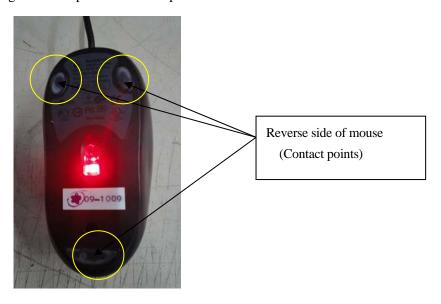
Turn the mouse up.
Blow the dust on optical sensor off with air duster or wipe the same off with soft cotton applicator.
Note : Wipe the optical sensor **softly** to avoid destruction.

Cleaning of contact points of bottom phase



Reverse side of mouse
(Contact points)

Turn the mouse up.
Wipe the contact points of bottom phase with soft cloth.

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| ⚠ WARNING | |
|---|---|
| ⚠ ❗ | If power to Operator Console is cut off by careless operation, contents of the hard disk might be destroyed.    Be sure to turn off the power switch after shutdown operation.

If power to Operator Console/Control Panel is cut off carelessly, the EI Equipment might fail and Operator Console/Panel Control might be disabled to control a route. Do not cut off the power switch of the operator console/ control panel. |

| ⚠ CAUTION | |
|---|---|
| | To move a personal computer or Interface Box, preferably employ two persons for safety. If incorrectly handled, the device might fail or break down.

Do not loosen or disassemble mounting screws, connection cables, etc. of personal computer or LCD for purposes other than mounting or removing.    Otherwise, the equipment may fail or break down.

Precautions for optical fiber cord or cable:
  - When an optical connector is not used, be sure to apply a cap.
    (Dust-proofing purpose)
  - Keep a bending radius of 500 mm or more.
  - Do not step on or put anything on the cord.
  - Do not pull an optical connector with a tension of 5 kg or more.
  - Do not strongly vibrate or impact the cord. |
| | The surface of the card is hot, so to replace the card, do not touch it with bare hands.    Otherwise, your hands might be scalded.

Be sure to house spare parts or replaced card in a static charge protective bag.    Otherwise, the card might break down due to static electricity. |

| | Do not touch the equipment or card with wet hands; otherwise, you might receive an electric shock.<br>When a fan etc. is rotating, do not touch it with hands or insert your cloths or hair in it.<br>Do not touch internal wiring of the rack of card or power cable.   Otherwise, you might receive an electric shock. |
|---|---|
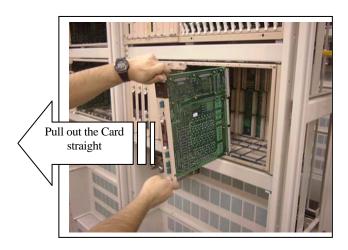
## 5.2 Card and IC Card replacing method

If the card fails sporadically, or F486-4I card is replaced, or LDC circuit diagram is modified, replace the card and IC Card and maintain the equipment.

### 5.2.1 Card replacing method
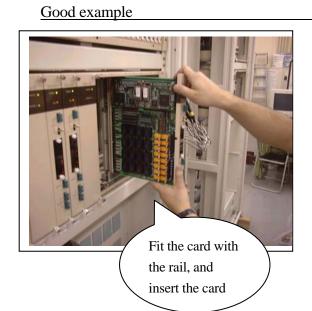
#### (1) Removing the card
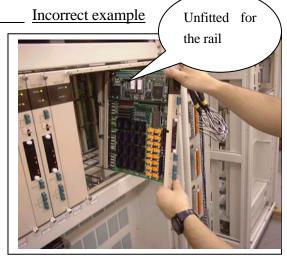
Turn OFF the power switch of each card.   Remove card fixing screws.   Next, pull out the card straight.



Pull out the Card straight

#### (2) Inserting the card

Confirm that the power switch of the card is OFF, and carefully insert the card along the guide rail.   If incorrectly inserted, interlocking functions might be disabled. Completely fix the card with fixing screws, turn ON the power switch.   Check the sub-rack mounting drawing and confirm where to mount the card, and replace it with a new card.

Good example                                                    Incorrect example

Unfitted  for the rail





Fit the card with the rail, and insert the card
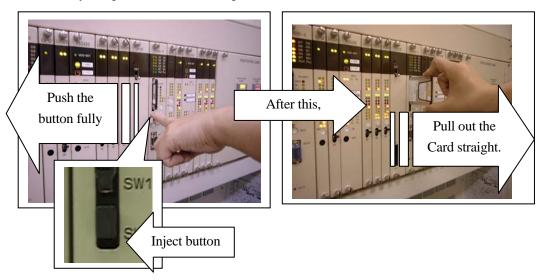
### 5.2.2 IC Card replacing method

#### (1) Removing IC Card
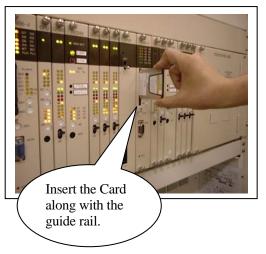
Turn OFF the power switch of IPU6C card . After removing inject button guard, push the inject button fully up to the innermost and then the IC Card comes out slightly. Next, hold the top and bottom of the IC Card firmly and pull out the Card straight.

Push the button fully

After this,

Pull out the Card straight.

SW1

Inject button

#### (2) Inserting the IC Card

After carefully confirming that device type and data version of the IC Card are correct, replace the Card. Confirm that the power switch of the IPU6C card is OFF, turn the surface of IC Card to right side and carefully insert the IC Card along the guide rail. Confirm that the IC Card is inserted fully up to the innermost and so that the inject button comes out. After returning the inject button guard to the original position, turn ON the power switch.

Good example

Incorrect example

Insert the Card along with the guide rail.

Unfitted for the rail

## 5.3  Logic Module handling precautions

| ⚠ WARNING | |
|---|---|
| ⚠ ❗ | If the power switch is inadvertently turned OFF, the EI equipment might fail or stop functioning.  Do not switch OFF the Logic Module in operation.<br><br>Before replacing a card, be sure to turn OFF the power switch. Otherwise, the card might fail, and in addition, all functions of the card might stop. |

| ⚠ CAUTION | |
|---|---|
| ⬥ ⊘ ⬥ | The EI Logic Module consists of a number of cards.    If a card is inserted into an incorrect slot, the card might fail and interlocking functions might stop.<br><br>Do not replace an IC etc. on a card board of the Logic Module or disassemble a stack of cards, using screwdriver.<br><br>Handling precautions of optical fiber cords or cables<br> - When an optical fiber connector is not used, be sure to apply caps.    (Dust-proof)<br> - Keep a bending radius of no less than 500 mm.<br> - Do not step or put anything on them.<br> - When pulling an optical fiber connector, keep a tension of less than 5 kg.<br> - Do not strongly vibrate or impact a cord or cable.<br><br>Carefully protect an IC card from static electricity, and never touch contacts of the card during handling.    Otherwise, the IC card might fail.<br><br>The F486-4I card normally mounts an IC card.    This IC card stores interlocking data.  Be careful that if this IC card is removed, interlocking functions might stop.<br><br>If the setting of card switch (Dip-Switch) in the Logic Module is changed, interlocking functions stop.  Do not touch the Dip Switch. |

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| | |
|---|---|
| ⚠ 🔥<br><br>🚫✋ | The surface of the card is hot, so when replacing the card, do not touch it with bare hands. Otherwise, your hands might be scalded.<br><br>Be sure to house spare parts or replaced card in static electricity protective bags.<br><br>Otherwise, they might break down due to static electricity.<br>Do not operate with wet hands, otherwise you might receive an electric shock. |
| ⚠ 🔥<br><br>🚫✋<br><br>⬦ ⚡ | Because the power card is hot, when replacing the card, grip the front panel with both hands. Otherwise, your hands might be scalded.<br><br>Be sure to house replaced cards in static electricity protective bags.<br>Otherwise, they might break down due to static electricity.<br><br>After replacing the power supply card, install wires to the terminal board exactly according to the prescribed procedure.<br>Do not operate the equipment with wet hands.  Otherwise, you might receive an electric shock. |

### 5.4 Electronic Terminal Module

Electronic Terminal handling precautions

| ⚠ WARNING | |
|---|---|
| ⚠ ❗ | Do not turn OFF the power switch without performing prescribed preparations, otherwise Electronic Interlocking functions might stop.<br><br>Before replacing a card, turn OFF the power switch.<br>If a card is inserted or removed with power supplied, the card might fail and all card functions might stop. |

| ⚠ CAUTION | |
|---|---|
| | When replacing a card, pull out the card board while taking care not to insert finger etc. between the housing and the card. If you drop the card board, the card might fail or you might be injured.<br><br>Do not loosen fixing screws of housing, rack and cables or overhaul any of them for purposes other than mounting or removing a device.   Otherwise, equipment failure or damage might occur.<br><br>Before replacing a card, turn OFF the power switch. If a card is inserted or removed with power supplied, the card might fail and all card functions might stop.<br>Do not remove ROM in the MMIF2 card without performing prescribed preparations.   Otherwise, the card might fail.   In addition, interlocking functions might be lost. |
| | The surface of the card is hot, so when replacing the card, do not touch it with bare hands.   Otherwise, your hands might be scalded.<br><br>Be sure to house spare parts or replaced card in static electricity protective bags.<br><br>Otherwise, a card might break down due to static electricity.<br><br>Do not work with wet hands, otherwise you might receive an electric shock. |

| | |
|---|---|
|  | When replacing a card board, be careful not to touch wires, boards, etc. inside the rack.   Otherwise, you might receive an electric shock. |
|  | Because the power card is hot, when replacing the card, grip the front panel with both hands.  Otherwise, your hands might be scalded.<br><br>Be sure to collect replaced cards in static electricity protective bags.<br>Otherwise, they might break down due to static electricity.<br><br>After replacing the power supply card, install wires to the terminal board exactly according to the prescribed procedure.<br>Do not operate the equipment with wet hands.   Otherwise, you might receive an electric shock. |

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### 5.5 Power Supply Units inside of control rack

Precautions for Power Supply Units inside of control rack are described below.

Be careful that power supply methods are different at each OPC, control panel and EI at station.

### 5.5.1 Voltage of power supply VS. type of control rack

| Equipment | | Voltage of power supply | Remarks |
|---|---|---|---|
| OPC | LCD Display | AC230V | * See the specifications in 4.1. |
| | Personal Computer | AC230V | |
| Control panel | | DC24V ± 10% | |
| Interlocking Logic Rack | | DC24V ± 10% | |

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### 5.5.2 Main power switch and connected location

#### (1) Operator Console

PC and LCD
For details, please refer to instruction manuals of PC and LCD.

Front                                   Rear
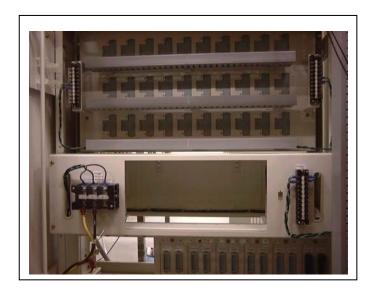
**(2) Interlocking Logic Rack**

Functions and precautions for rack Power Supply Unit are described below.

Front



Rear



The power NFB at rack bottom supplies power to the logic circuits of Logic

Sub-Rack and Electronic Terminal Sub-Rack.

**Precaution for power supply unit of EI equipment**

| ⚠ WARNING | |
|---|---|
| ⚠<br><br>❗ | Do not inadvertently turn OFF(NFB), otherwise functions of the EI Equipment might stop.<br><br>Before replacing a power supply unit, turn OFF the main switch. (NFB)<br><br>If a power supply unit is replaced while the main power switch (NFB) is turned ON. the power supply unit might fail or you might receive an electric shock. |

| ⚠ CAUTION | |
|---|---|
| ⚠<br><br>🚫<br><br>⚠ | When working with a rack to replace the power supply unit, carefully pull out the rack without inserting fingertip etc. between the rack and the housing.  Otherwise, you might drop the rack or be injured.<br><br>Do not loosen or disassemble fixing screws for the housing, rack and cables for purposes other than removing or mounting a device.   Otherwise, the equipment might fail or malfunction.<br><br>Also, do not remove accessories such as protective cover. |
| ⚠<br><br>🚫 | The surface of the unit is hot, so when replacing the unit, do not touch it with bare hands.   Otherwise, your hands might be scalded.<br><br>Be sure to collect replaced unit in static electricity protective bags.<br><br>A unit might break down due to static electricity.<br><br>Do not work with wet hands, otherwise you might receive an electric shock. |

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| | | |
|---|---|---|
| | | When replacing a sub-unit, be careful not to touch wires, boards, etc. inside the rack.    Otherwise, you might receive an electric shock. |
| | | Because the power supply unit is hot, do not open front panel.    Otherwise, your hands might be scalded.

Be sure to collect replaced unit in static electricity protective bags.
A unit might break down due to static electricity.

After replacing the power supply unit, follow the prescribed procedure to connect wires to the terminal board. Do not work with wet hands.    Otherwise, you might receive an electric shock. |

**5.6 Relay Unit**

Relay Unit handling precautions are described below.

Please be careful for relay insertion or pulling out, because the relay is very small.

Front of Relay Unit



Rear of Relay Unit

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**Removing and inserting a relay from and to jack**

When removing a relay from the jack and inserting it, carefully align the relay unit to the jack as shown below.

Otherwise, the relay might not correctly contact the jack, resulting in a faulty contact etc.

Correct inserted condition                    Incorrect inserted condition
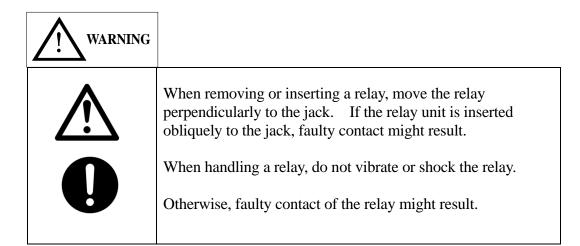


**Handling a relay**
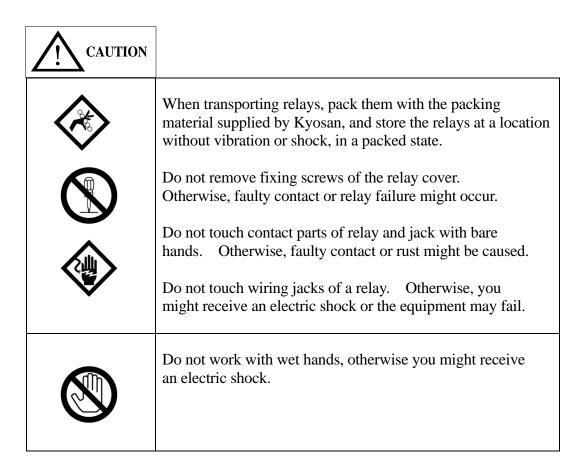
Relay contacts are very fragile to vibration or shock.   If strongly vibrated or impacted, faulty contact might result.    When handling a relay, do not vibrate or shock the relay.

**Relay Unit handling precautions**

| ⚠ WARNING | |
|---|---|
| ⚠ ❗ | When removing or inserting a relay, move the relay perpendicularly to the jack.   If the relay unit is inserted obliquely to the jack, faulty contact might result.<br><br>When handling a relay, do not vibrate or shock the relay.<br><br>Otherwise, faulty contact of the relay might result. |

| ⚠ CAUTION | |
|---|---|
| ⚠ 🚫 ⚠ | When transporting relays, pack them with the packing material supplied by Kyosan, and store the relays at a location without vibration or shock, in a packed state.<br><br>Do not remove fixing screws of the relay cover. Otherwise, faulty contact or relay failure might occur.<br><br>Do not touch contact parts of relay and jack with bare hands.   Otherwise, faulty contact or rust might be caused.<br><br>Do not touch wiring jacks of a relay.   Otherwise, you might receive an electric shock or the equipment may fail. |
| 🚫 | Do not work with wet hands, otherwise you might receive an electric shock. |

### 5.7 Connector Unit (Square multi-pin connector made by SOURIAU)

The Connector Unit is used for inter-rack cable in the equipment room.

Connector Unit handling precautions are shown below.

Connector Unit



Receptacle

The receptacle is mounted on connector panel.

Model MS50RM

Plug

The plug connector is used for the cable.

Model MS50PM-JD10

Specifications

- Materials

    Housings           : Phenol resin with glass fiber

    Contacts           : Brass (Gold or silver plated nickel base)

- Rating

    Rated voltage      : AC750V    DC1000V

    Rated current      : 13A （See Note）

    Range of operating temperatures: -55°C ~ + 125°C

- Electrical performance

    Contact resistance  : 10.5mΩ or less (Initial)

    Insulation resistance : 5000MΩ or more

    Withstand voltage   : AC 2000V (1 minute）

- Mechanical performance

    Durability        : Contact resistance shall be 12mΩ or less after 500 times
                         of coupling and removing test
                         (6.3, JIS C 5402)

    Seismic resistance  : Chattering during the test shall be 1μsec or less
                         (JIS C 0040)

    Contact holding force   : 11.3kg or more
                             (after 10 times of insertion and removal)
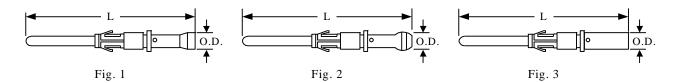
    Single contact pulling out force : 56.7 ~ 340g
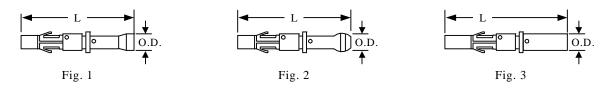
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## Contents

・ Pin contacts


Fig. 1


Fig. 2


Fig. 3

| Model | Pin OD (mm) | Applied conductor | | | | | Fig No. | Dimensions (mm) | | Crimping tool | | | | Removing tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size | | Covering OD | | Penciling length (mm) (±0.5) | | L | O.D. | M8ND | M10S-1 | | BANDOMATIC | |
| | | Stranded(mm²) | Single(Φ mm) | Min | Max | | | | | Dies | Dies | Stop bushing | Indenter kit model | |
| RM24M-9D28 | | 0.13 ~0.24 | 0.4 ~ 0.5 | 0.9 | 1.6 | | 1 | | 2.6 | N24RT-10 | S-9 | | AMK-9 | |
| | | | | 1.4 | 1.63 | | | | | | S-10 | | | |
| RM20M-13D28 | 1.59 | 0.30 ~0.61 | 0.65 ~ 0.8 | 1.2 | 1.8 | 5.0 | 2 | 25.9 | 2.9 | N20RT-30 | S-10 | SL-40 | AMK-6 | RX20-25V2J |
| RM20M-12D28 | | | | 1.5 | 2.2 | | | | | | | | | |
| RM16M-23D28 | | 0.52 ~1.38 | 1.0 ~ 1.3 | - | 3.0 | 7.0 | 3 | | 2.6 | N16RT-21 | S-3D1 | SL-39 | AMK-10 | |
| RM14M-50D28 | | 2.0 | - | | 3.6 | 11.8 | | | 3.1 | - | S-3-14 | | - | |

・ Socket contacts


Fig. 1


Fig. 2


Fig. 3

| Model | Pin OD (mm) | Applied conductor | | | | | Fig No. | Dimensions (mm) | | Crimping tool | | | | Removing tool |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Size | | Covering OD(mm) | | Penciling length (±0.5) | | L | O.D. | M8ND | M10S-1 | | BANDOMATIC | |
| | | Stranded(mm²) | Single(Φ mm) | Min | MAX | | | | | Dies | Dies | Stop bushing | Indenter kit model | |
| RC24M-9D28 | | 0.13 ~0.24 | 0.4 ~0.5 | 0.9 | 1.6 | | 1 | | 2.6 | N24RT-10 | S-9 | | AMK-9 | |
| | | | | 1.4 | 1.63 | | | | | | S-10 | | | |
| RC20M-13D28 | 1.59 | 0.30 ~0.61 | 0.65 ~0.8 | 1.2 | 1.8 | 5.0 | 2 | 18.0 | 2.9 | N20RT-30 | S-10 | SL-40 | AMK-6 | RX20-25V2J |
| RC20M-12D28 | | | | 1.5 | 2.2 | | | | | | | | | |
| RC16M-23D28 | | 0.52 ~1.38 | 1.0 ~1.3 | - | 3.0 | 7.0 | 3 | | 2.6 | N16RT-21 | S-3D1 | SL-39 | AMK-10 | |
| RC14M-50D28 | | 2.0 | - | | 3.6 | 11.8 | | | 3.1 | - | S-3-14 | | - | |

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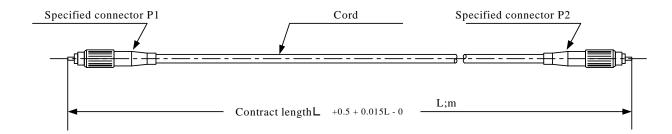
### 5.8 Optical fiber

The optical fiber is used in MM-NET, ET-NET (fail-safe circuit/non-fail-safe circuit).
Optical fiber handling precautions are described below.

Specifications of cord used in rack

GI optical fiber cord with connectors at both end

Specified connector P1          Cord          Specified connector P2

Contract length L   +0.5 + 0.015L - 0      L;m

P1, P2: Type of connector, either FC, SC, SC2, D4 or ST

P3: Color of cord sheath, either black, yellow, orange, blue or brown

The drawing shows connector FC.

| P1,P2 | Polished surface | P3 |
|---|---|---|
| FC | Spherical | Black, yellow, orange, blue, brown |
| SC | Spherical | |
| SC2 | Spherical | |
| D4 | Flat | |
| ST | Spherical | |

Specifications of optical fiber cord
・ Core of optical fiber

Table 1

| Mold filled OD | | $10 \pm 1$ |
|---|---|---|
| Clad OD | | $125 \pm 2.0 \mu m$ |
| Eccentricity | | $1 \mu m$ or less |
| Buffer layer | | Silicon resin (OD 0.4mm) |
| Sheath | Material | Nylon |
| | Outside Size | $0.9 \pm 0.1mm$ |
| Structure | | Fig-1 |

core

clad

Buffer layer

Sheath

Fig-1
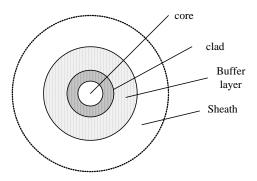
**Optical fiber cord Structure**

Table-2

| Core of optical fiber | | Table-1 |
|---|---|---|
| Reinforcement | Material | Polyamide fiber |
| | Composition | Longitudinal covering |
| Sheath | Material | PVC |
| | Color | Yellow, black, orange, blue, brown |
| Structure | | Fig-2 |



Φ2.8±0.2mm

Optical fiber

Reinforcement

PVC
Sheath
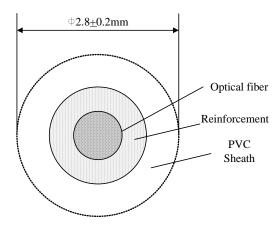
Fig-2

**Characteristics**

Characteristics of optical fiber

Table-3

| Wave length (μm) | Transmission loss α (dB/Km) | Range of operable temperatures (°C) |
|---|---|---|
| 1.3 | 0.5 or less | - 20 ~ + 60 |

Optical characteristics of cord with connector

Table 4 Optical characteristics of cord with connector

| Item | Connector models FC,SC,SC2,ST | Connector model D4 | Measuring conditions |
|---|---|---|---|
| Transmission loss (cord loss + connector coupling loss) | αL + 1.0dB or less *1 | αL + 1.6dB or less *2 | Per JIS C 5961 |
| Connector reflection attenuation | 22dBor more | | ″ |

α(dB/km) : See Table 3

L（km）: Cord length

∗1 : Note that individual coupling loss shall be 0.5 dB or less.

∗2 : Note that individual coupling loss shall be 0.8 dB or less.
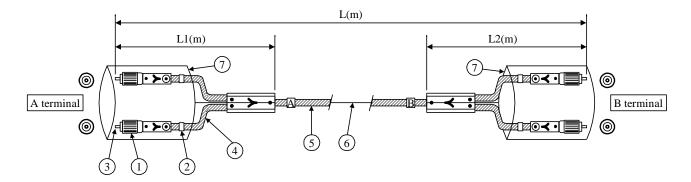
**Cabling precautions**

| Minimum bending radius | 30(mm) |
|---|---|
| Short permissible tension | 98(N) |

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## Inter-rack optical fiber between EI – MTC – Operator Console – Panel Control.



| No. | Part | | Note (Option) |
|---|---|---|---|
| 1 | Connector | | SC, FC, ST |
| 2 | Mark band | | 1, 2, 3, 4, 5, 6, 7, 8 |
| 3 | Polishing | | Physical contact Spherical polishing = p |
| 4 | Subdivision cable | Color | B(black), G(green), Y(yellow), S(blue), D(orange) R(red), H(white), N(gray) |
| | | Length | 0.5m or more |
| 5 | Main cable | Color | B(black), G(green), Y(yellow), S(blue), D(orange) R(red), H(white), N(gray) |
| | | Length | 0.5m or more |
| | | Size | One core = 18<br>Two core s = 26<br>Four cores = 30<br>Six core s = 40<br>Eight core s = 60 |
| 6 | Optical fiber | | G1(G1 50/125)    G(GI 62.5/125) S1(SM 10/125) |
| 7 | Protective tube | | - |

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### Optical fiber handling precautions

| ⚠ WARNING | |
|---|---|
| ⚠ ❗ | Do not bend an optical fiber with a radius of less than rated value.   Otherwise, the optical fiber might break down.

To remove or insert an optical fiber, grip connector (FC) and insert it straight. After insertion, confirm that the connector is inserted firmly.   If the fiber cord or fiber is pulled strongly, the fiber might be destroyed.

Do not apply a load to an optical fiber cord or cable.
Otherwise, the fiber may break down. |

| ⚠ CAUTION | |
|---|---|
| 🚫 🖐🚫 🚫 | Do not disassemble the optical fiber cable.
Otherwise, the optical fiber connector or cable may be destroyed.

Do not touch the tip of an optical connector.

Do not stick a PVC tape etc. on the tip.
Otherwise, a loss of the optical fiber might become large during operation, and the connector at the optical fiber unit might be defective.

Do not place anything on an optical fiber during storage. |
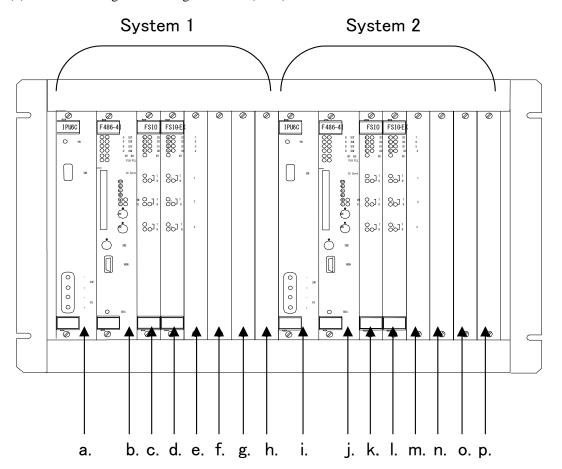
# 6. Equipment description

## 6.1 Logic Module

Precautions of Logic Module operating and storing cards are described below.
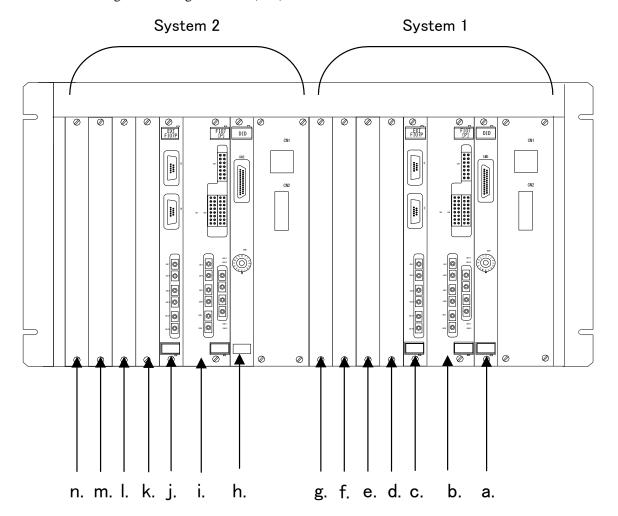
(1) Cards mounting view in Logic Module (front)



| No. | Card (System 1) | No. | Card (System 2) |
|-----|-----------------|-----|-----------------|
| a. | IPU6C | i. | IPU6C |
| b. | F486-4I | j. | F486-4I |
| c. | FSIO | k. | FSIO |
| d. | FSIO-EX | l. | FSIO-EX |
| e. | Vacancy | m. | Vacancy |
| f. | Vacancy | n. | Vacancy |
| g. | Vacancy | o. | Vacancy |
| h. | Vacancy | p. | Vacancy |
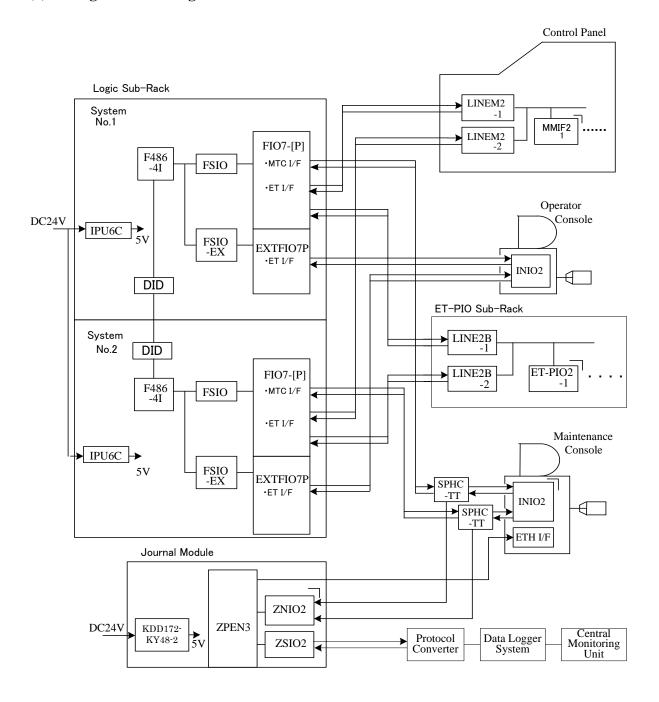
Cards mounting view in Logic Module (rear)



| No. | Card (System 1) | No. | Card (System 2) |
|-----|-----------------|-----|-----------------|
| a. | DID | h. | DID |
| b. | FIO7-[P] | i. | FIO7-[P] |
| c. | EXTFIO7P | j. | EXTFIO7P |
| d. | Vacancy | k. | Vacancy |
| e. | Vacancy | l. | Vacancy |
| f. | Vacancy | m. | Vacancy |
| g. | Vacancy | n. | Vacancy |

**(2) Configuration of Logic Module and ET-NET**
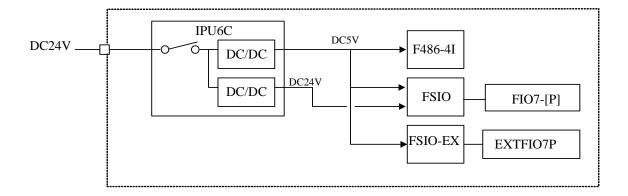
**(3) Power supply system of Logic Module**

Although IPU6C supplies power to Logic Module.

Power supply system diagram is shown below.

Power supply system (Logic Module)

**(4) IC cards**

An IC card of F486-4I card is a memory to store the data that achieves interlocking functions.

・How to grip a card



・Compact flash



⚠ **WARNING**

| ⚠ ❗ | Do not insert or remove IC card when the system is in operation. In addition, it shall be confirmed without fail that IC card is mounted in the Logic Module when power is turned ON. Do not remove "Smart medium " or "Compact flash " from the adapter. Otherwise, functions of EI will be stopped. |
|---|---|

### 6.1.1 IPU6C Card

IPU6C is a power supply card for each card of the Logic Module.   With DC 24V received, it supplies each card of the Logic Module with DC 24V and DC 5V through the built-in DC/DC converter.

### 6.1.2 F486-4I Card

F486-4I processes main tasks of the EI System (setting system cycle time, Processing of interlocking connections and input/output with various apparatus, etc.). In addition, it also processes interlocking connections by reading station-based data and driver data for inputs and outputs of each card from IC cards.

### 6.1.3 FSIO Card

FSIO is used when the logic module and the electronic terminal are connected in a star shape. It has 3 lines which can be connected to terminals and when a cycle of the EI system's processing time is 200ms, each line can be connected to up to 8 cards.

The FSIO is an optic connector/PIO2 card which is used in combination with the FIO7-[P]. It also performs fault monitoring of each card and fail-safe driver output. In addition, it also outputs all the Logic Module data to the maintenance system.

### 6.1.4 FSIO-EX Card

FSIO-EX is used for star-connecting the Logic Module and Electronic Terminal. The card has 2 circuits for connecting to the terminals and each circuit can be connected to up to 8 electronic terminals when processing time per cycle of the EI is 200ms.

### 6.1.5 FIO7-[P] Card

FIO7-P is an optical fiber connector card to be used in combination with the FSIO(1) card.
 It incorporates optic connectors for connecting the electronic terminals for 3 lines.
 It is connected to the maintenance system using a FC connector.

### 6.1.6 EXTFIO7P Card

EXTFIO7P is an optical fiber connector card to be used in combination with the FSIO-EX card.
 It incorporates optic connectors for connecting the electronic terminals for 2 lines.
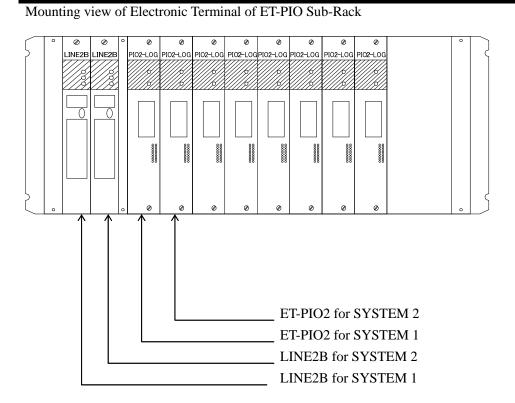
### 6.1.7 DID Card

 DID is an intersystem transmission card. Also a card ID can be set.

Kyosan Electric Mfg. Co., Ltd.
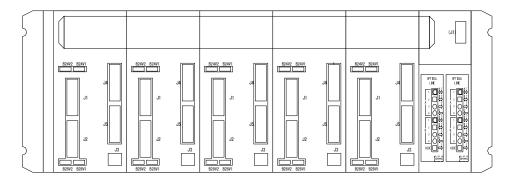
## 6.2  Electronic Terminal Module

Electronic terminal operating precautions are described below.

Mounting view of Electronic Terminal of ET-PIO Sub-Rack



ET-PIO2 for SYSTEM 2

ET-PIO2 for SYSTEM 1

LINE2B for SYSTEM 2

LINE2B for SYSTEM 1
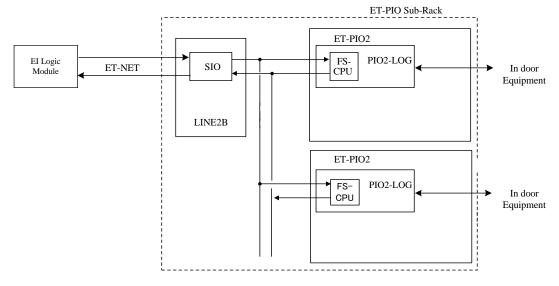
Rear View of ET-PIO Sub-Rack
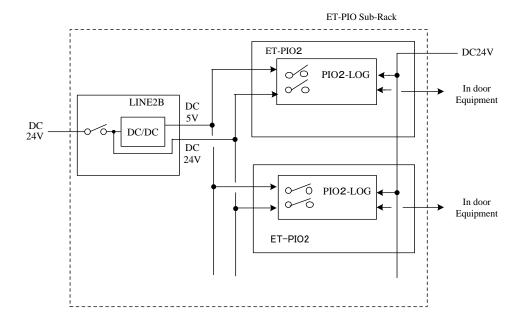
Configuration of Electronic Terminal



Power distribution system of Electronic Terminal

### 6.2.1  LINE2B Card

LINE2B connects electronic terminals and the main EI System. Star-connection is adopted using ET-NET. And LINE2B card has FC optical connectors.

Receiving DC 24V input, LINE2B supplies Electronic terminals with DC 5V through built-in DC/DC converter.

The LINE2B is used for ET-PIO2.

### 6.2.2 LINEM2 Card

LINEM2 connects electronic terminals and the main EI System. Star-connection is adopted using ET-NET. And LINEM2 card has FC optical connectors.

Receiving DC 24V input, LINEM2 supplies Electronic terminals with DC 5V through built-in DC/DC converter.

The LINEM2 is used for MMIF2.

### 6.2.3 ET-PIO2 Card

ET-PIO2 gates conditional input and output of DC24V. Each ET-PIO2 is provided with 32 input/output ports, and it can be connected only to indoor equipment. An input current of 32mA flows per port. An output port can transmit a load current of 120mA per port.

### 6.2.4 MMIF2 Card

MMIF2 gates non fail-safe conditional input and output of DC 24V.  Each MMIF2 is provided with 32 input ports and 64 output ports, and it can be connected only to indoor equipment.

**6.3  Operator Console/Maintenance Console and MMIF2 Terminal for Control Panel**

Operations and storing precautions of cards for Operator Console/Maintenance Console and MMIF2 Terminal for Control Panel are described below.

**Module Mounting on Operator Console/Maintenance Console**

Mounting view of Module (front/rear)

Front

Rear

**Kyosan Electric Mfg. Co., Ltd.**
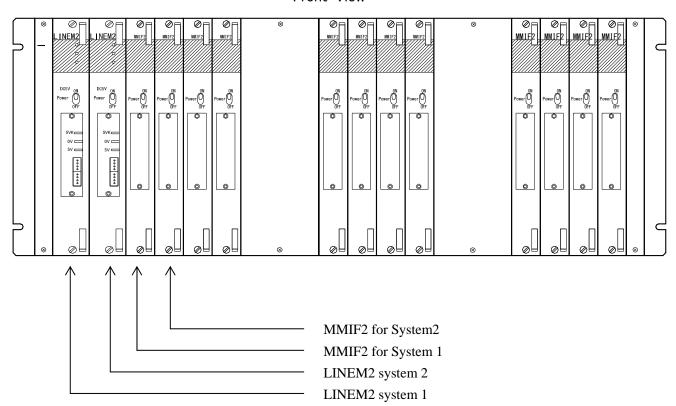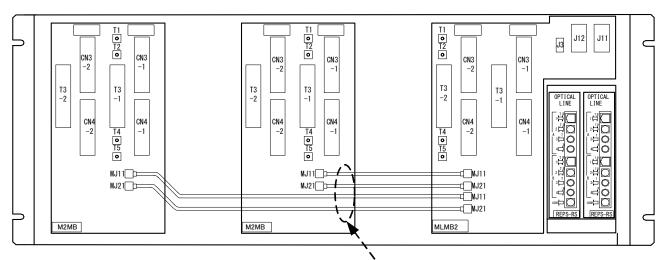
**Card Mounting on MMIF2 Terminal**

Mounting view of Cards (front/rear, In case of MMIF2 full mounting)

Front View



MMIF2 for System2

MMIF2 for System 1

LINEM2 system 2

LINEM2 system 1
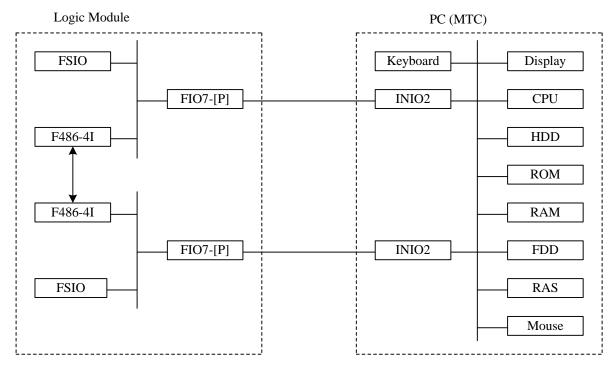
Rear View



LAN Cable Wired by Kyosan corresponding to the sub-rack set

**Kyosan Electric Mfg. Co., Ltd.**

**(1) Connection configuration between MTC and Interlocking Logic Module**

Logic Module

PC (MTC)

| FSIO |

| FIO7-[P] |

| F486-4I |

| F486-4I |

| FIO7-[P] |

| FSIO |

| Keyboard |

| INIO2 |

| INIO2 |

| Display |

| CPU |

| HDD |

| ROM |

| RAM |

| FDD |

| RAS |

| Mouse |
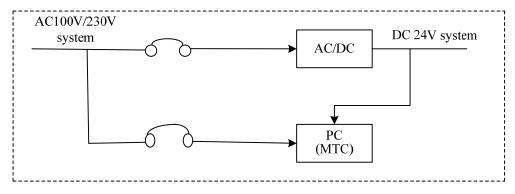
The Logic Module and MTC are connected by serial transmission using optical fiber cable.

**(2) Power source of MTC**

Personal Computer is operated with power supply system of AC100V/230V.

Detail ratings shall be referred to operation manual of personal computer.

Power source of MTC

AC100V/230V
system

DC 24V system

| AC/DC |

| PC (MTC) |

Mounting view of Operator Console (Rear)



| Name | Card name |
|------|-----------|
| a | INIO2 |

a

### 6.3.1  SPHC-PW Card

SPHC-PW is a card to convert 24V DC to 5V DC through a DC/DC converter.

### 6.3.2  SPHC-TT Card
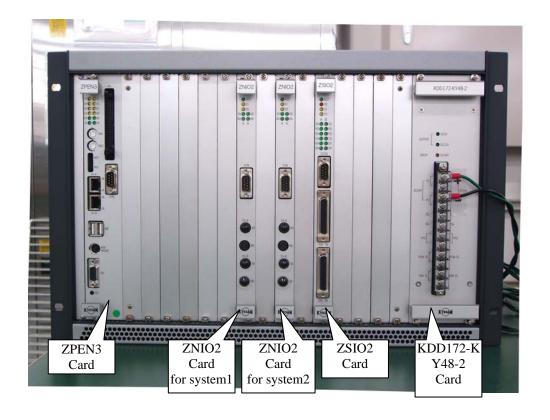
SPHC –TT is a card to divide the optical cable into 2 and connect the Operator Console/Control Panel to EI.

### 6.3.3  INIO2 Card

INIO2 is a card to connect Logic Module with Personal Computer, and FC type optical connector is mounted on the card. The Card is operated with 5V DC prepared in the Personal Computer.

## 6.4   Journal Module



ZPEN3
Card

ZNIO2
Card
for system1

ZNIO2
Card
for system2

ZSIO2
Card

KDD172-K
Y48-2
Card

**Kyosan Electric Mfg. Co., Ltd.**
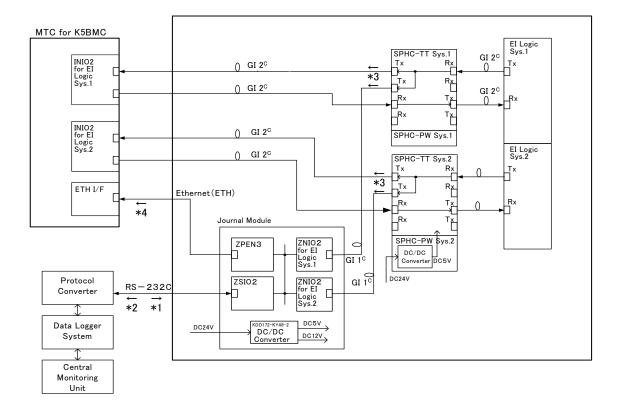
System configuration of Journal Module



### 6.4.1  ZPEN3 Card

**(1)**  ZPEN3 performs main processing of Journal Module. (clock time control, editing of interlocking status data, input and output processing with other cards in Journal Module)

(2)  ZPEN3 transmits the time data to MTC in constant cycle (10 sec)    (*4)

### 6.4.2  ZNIO2 Card

EI Logic Module transmits interlocking status data to MTC and ZNIO2 in constant cycle (300msec). However, ZNIO2 only receives interlocking status data, and transmit no data.    (*3)

### 6.4.3  ZSIO2 Card

(1)  ZSIO2 receives the interlocking status data demand in constant cycle (200msec) from the Data Logger. When time adjustment is required, ZSIO2 receives time correction demand from the Central Monitoring Unit via Data Logger.    (*1)

(2)  ZSIO2 of the Journal Module transmit necessary interlocking status data as the answer, when the module receives required interlocking status data demand from the Data Logger.    (*2)

### 6.4.4  KDD172-KY48-2 Card

KDD172-KY48-2 and SPHC-TT convert DC24V power to DC5V and DC12V by DC/DC converter.

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# 7. Maintenance and security

## 7.1 Start-up methods

### 7.1.1 EI System starting methods

Basically, power should be switched ON from a remote part in the system configuration diagram.

 Fundamental switch-ON procedure is shown below.

 Switch-ON procedure

(1) Electronic Terminal Parts (ET-PIO2 and MMIF2)

(2) Interlocking Logic Parts

However, even if this fundamental procedure is not exactly followed, system failure might not occur.

(The procedure is only referential at any rate.)

### 7.1.2 Operator Console/ Control Panel starting methods

(1)  Check that the cards and cables are inserted completely in correct position before starting up the Operator Console.

 Turn ON the power switch of personal computer. The personal computer starts up from the hard disk.  Therefore, it takes about 30 seconds.  Upon completion of starting up, the station track line figure is displayed.

(2) Electronic Terminal (MMIF2)

### 7.1.3 Interlocking Logic Rack

Check that card power SW, card, cable, etc. are inserted completely in correct position before starting up the Interlocking Logic Rack.

(To fix the card, fully tighten fixing screws.   Be careful that faulty contact of the card etc. might occur due to vibration during operation.)

 The Interlocking Logic Rack starts up by turning on the NFB.

It takes a starting time of about 30 seconds to read the IC card.    After started up, confirm that the rack operates normally according to the LED indication on the F486-4I card.

### 7.1.4 Electronic Terminal Rack

Check that card power SW, card, cable, etc. are inserted completely in correct position before starting up the Electronic Terminal Rack.

(To fix the card, completely tighten fixing screws.   Be careful that faulty contact of the card etc. might occur due to vibration during operation.)

The Electronic Terminal Rack starts up by turning on the NFB.   When started up completely, normal indication (G) of the Electronic Terminal lights and shows normal operation. (See the LED indication of the card.)

**7.2 LED indications, switches and other items of Logic Module**

LED indications, switches and other items on panel of cards used in the Logic Module are shown below.   Please read and understand the following paragraphs so as to be of some help for replacing or troubleshooting the card, and carefully handle the equipment.

When inserting or removing a card, turn off the power switch without fail. In addition, after replacing the card, settings shall be restored to the original positions before replacing.

**7.2.1 IPU6C Card**

| | Function |
|---|---|
| | Function |
| PW | Power supply normal ON |
| SW1 | Power switch (outputs 5V, 24V)      *1 |
| 5V+, - | Trimmer resistance to adjust output 5V      *2 |
| 24V+, - | Trimmer resistance to adjust output 24V      *2 |

*1 When replacing a logic card, turn off the power switch without fail.
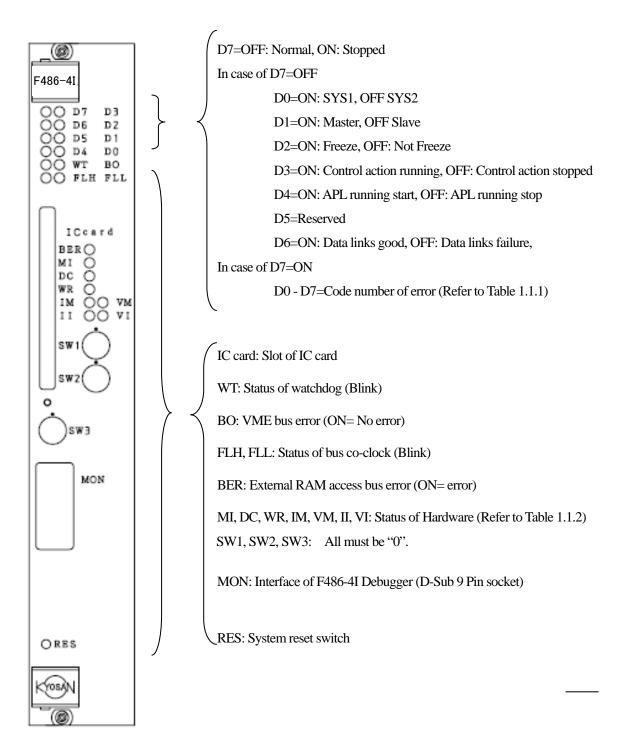
*2 Do not operate the trimmer resistance.

### 7.2.2  F486–4I Card

1) LED-Indications, Switches, Slot & Socket

D7=OFF: Normal, ON: Stopped

In case of D7=OFF

        D0=ON: SYS1, OFF SYS2

        D1=ON: Master, OFF Slave

        D2=ON: Freeze, OFF: Not Freeze

        D3=ON: Control action running, OFF: Control action stopped

        D4=ON: APL running start, OFF: APL running stop

        D5=Reserved

        D6=ON: Data links good, OFF: Data links failure,

In case of D7=ON

        D0 - D7=Code number of error (Refer to Table 1.1.1)

IC card: Slot of IC card

WT: Status of watchdog (Blink)

BO: VME bus error (ON= No error)

FLH, FLL: Status of bus co-clock (Blink)

BER: External RAM access bus error (ON= error)

MI, DC, WR, IM, VM, II, VI: Status of Hardware (Refer to Table 1.1.2)

SW1, SW2, SW3:   All must be "0".

MON: Interface of F486-4I Debugger (D-Sub 9 Pin socket)

RES: System reset switch

2) Stop code

If the F486-4I card is stopped the operation, LED indication are fixed at ON or OFF with indicating the stop code (Hexadecimal)which are listed in the Table 1.1.1 Stop code.

In the figure shown to the left, the status shows the stop code 'E8'.

More significant digit

$$8 + 4 + 2 = \text{EH}$$

Less significant digit

$$8 = 8\text{H}$$

$\rightarrow$    The stop code  =  E8H

Table 1.1.1    Stop code

| Stop code | Cause of function stop | Remarks |
|---|---|---|
| 81 | Illegal interrupt error | Illegal interrupt occurs |
| 82 | Main system start-up condition error | The system cannot shift to normal operation at preset time after being judged as main system during initializing period |
| 83 | Module trace error | Module trace diagnostic error |
| 84 | Key-code error | Key-code diagnostic error |
| 85 | Parameter error | Illegal CRC or SUM of K6. DAT |
| 86 | Initial diagnostic error | There is no preset idle time for application during initial period |
| 87 | WDT alternate output error | The relay drops away although WDT has alternately been output |
| 88 | S-SYS output error | Disagreement with details received from S-SYS |
| 89 | RAM diagnostic error | RAM diagnostic result error during normal operation |
| 8A | Logic computation range disagreement error | Disagreement between A range and A/range |
| 8B | Timer monitor error | Timer of subject system fails |
| 8C | Monitor input error | Monitor input to parallel port is abnormal |
| 8D | Sub-system version error | Version of sub-system differs from that of main system, when sub-system starts up |
| 8E | Bus disagreement detection error | Pendulum signal stops to output alternately |
| 8F | Inter-system transmission error | There are transmission data while inter-system transmission is not activated |
| 91 | Pendulum stop circuit diagnostic error 1 | Pendulum stop circuit fails (output of 1) |
| 92 | Pendulum stop circuit diagnostic error 0 | Pendulum stop circuit fails (output of 0) |
| 94 | Main system condition error | All main system conditions are not valid although subject system operates |
| 95 | Sub system condition error | Subject system is judged as working system although subject system is unuse |
| 96 | Initial program diagnostic error | Program check code is abnormal during initial period |
| 97 | Program diagnostic error | Program check code is abnormal during normal operation |
| E1 | Initial RAM diagnostic error | RAM diagnostic result is abnormal during initial period |
| E1 | Transmission card data length error | |
| E2 | Receiving card data length error | |
| E5 | FHSC L line node No. monitor input error | |
| E8 | FHSC L line card No. monitor input error | |
| EB | FHSC R line node No. monitor input error | |
| EE | FHSC R line card No. monitor input error | |
| EF | FHSC node No. disagreement | |
| F1 | (ET) control data length error | Length of control data to be output to ET circuit exceeds 192 |
| F3 | (ET) transmission error | Transmission data are detected in ET circuit during non-transmission period |
| F4 | (ET) SIO operation permission error | SIO operation permission semaphore of ET-SIO cannot be acquired during initial period |
| F5 | Fail Safe bus error | CPU-A / CPU-B Fail Safe Bus data disagreement |
| F8 | (MT) SIO operation permission error | SIO operation permission semaphore of MT-SIO cannot be acquired during initial period |

Table 1.1.2

| Access detail | MI | DC | WR | IM | VM | II | VI |
|---|---|---|---|---|---|---|---|
| ROM prefetch | OFF | ON | ON | ON | OFF | - | - |
| ROM, IC card read | OFF | OFF | ON | ON | OFF | - | - |
| IC card write | OFF | OFF | OFF | ON | OFF | - | - |
| Internal IO read | ON | OFF | ON | - | - | ON | OFF |
| Internal IO write | ON | OFF | OFF | - | - | ON | OFF |
| Interrupt ACK | ON | ON | ON | - | - | - | - |
| VME(A24)read | OFF | OFF | ON | OFF | ON | - | - |
| VME(A24)write | OFF | OFF | OFF | OFF | ON | - | - |
| VME(A16)read | ON | OFF | ON | - | - | OFF | ON |
| VME(A16)write | ON | OFF | OFF | - | - | OFF | ON |

### 7.2.3  FSIO Card

1) LED-Indications

D0 to D7:

Status of software (Refer to Table 1.2.1)

WT:

Blink= Normal running, OFF= Stopped.

Show status of ET SIO lines.

Blink   = Have transfer data, OFF= No transfer data

1 T: Line 1 Self SYS Sending

1 R(left): Line 1 Self SYS Receiving

1 R(right): Line 1 Other SYS Receiving

2 T: Line 2 Self SYS Sending

2 R(left): Line 2 Self SYS Receiving

2 R(right): Line 2 Other SYS Receiving

3 T: Line 3 Self SYS Sending

3 R(left): Line 3 Self SYS Receiving

3 R(right): Line 3 Other SYS Receiving

Table 1.2.1

| LED | Information | Normal | Failure | |
|---|---|---|---|---|
| D0 | LED output (50ms) | Blink | ON or OFF | |
| D1 | Initialize processing | Blink | ON (Initial processing start) OFF (Initial processing finish) | |
| D2 | DPRAM read processing | Blink | ON (DPRAM read processing start) OFF (DPRAM read processing finish) | |
| D3 | DPRAM write processing | Blink | ON (DPRAM write processing start) OFF (DPRAM write processing finish) | |
| D4 | MTC Tx/Rx processing | OFF | ON (DPRAM initialization is not finished) | |
| D5 | Transmission speed | ON or OFF | ON (1.2Mbps) OFF (307.2Kbps) | |
| D6 | Interrupt MTC Tx/Rx | Blink | ON (Interrupt processing start) OFF (Interrupt processing finish) | |
| D7 | System Error | OFF | ON | Initial RAM check error (When D0 is OFF) |
| | | | | Idle time RAM check error (When D0 is ON) |

### 7.2.4  FSIO-EX Card

1) LED-Indications

D0 to D7

Status of software (Refer to Table 1.3.1)

WT:

Blink = Normal running, OFF= Stopped.

Show status of ET SIO lines.

Blink =    Have transfer data, OFF= No transfer data

1 T: Line 4 Self SYS Sending

1 R(left): Line 4 Self SYS Receiving

1 R(right): Line 4 Other SYS Receiving

2 T: Line 5 Self SYS Sending

2 R(left): Line 5 Self SYS Receiving

2 R(right): Line 5 Other SYS Receiving

3 T: Reserved

3 R(left): Reserved

3 R(right): Reserved

Table 1.3.1

| LED | Information | Normal | Failure | |
| --- | --- | --- | --- | --- |
| D0 | LED output (50ms) | Blink | ON or OFF | |
| D1 | Initialize processing | Blink | ON (Initial processing start) OFF (Initial processing finish) | |
| D2 | DPRAM read processing | Blink | ON (DPRAM read processing start) OFF (DPRAM read processing finish) | |
| D3 | DPRAM write processing | Blink | ON (DPRAM write processing start) OFF (DPRAM write processing finish) | |
| D4 | MTC Tx/Rx processing | OFF | ON (DPRAM initialization is not finished) | |
| D5 | Transmission speed | ON or OFF | ON (1.2Mbps) OFF (307.2Kbps) | |
| D6 | Interrupt MTC Tx/Rx | Blink | ON (Interrupt processing start) OFF (Interrupt processing finish) | |
| D7 | System Error | OFF | ON | Initial RAM check error (When D0 is OFF) |
| | | | | Idle time RAM check error (When D0 is ON) |

### 7.2.5  FIO7-[P] Card

CN9: Reserved

CN7: Reserved
CN8: Reserved

CN1T: ET Line 1 (Output Only)
CN1R: ET Line 1 (Input Only)

CN2T: ET Line 2 (Output Only)
CN2R: ET Line 2(Input Only)

CN3T: ET Line 3 (Output Only)
CN3R: ET Line 3 (Input Only)

CN51T: Maintenance Line (Output Only)
CN51R: Maintenance Line (Input Only)

CN61T: Reserved
CN61R: Reserved

### 7.2.6  EXTFIO7P Card

CN5: Reserved

CN6: Reserved

CN11T: ET Line 4 (Output Only)
CN11R: ET Line 4 (Input Only)

CN12T: ET Line 5 (Output Only)
CN12R: ET Line 5(Input Only)

CN13T: Reserved
CN13R: Reserved

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### 7.2.7   DID Card
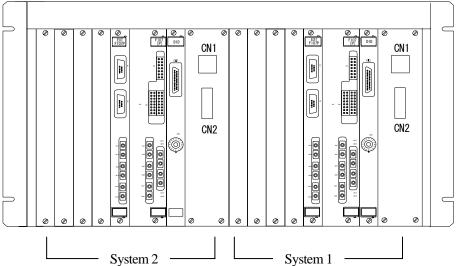
CN2:    Station ID Jumper Connector

DSW1: VME base-Address setting (Must be F)

### 7.2.8   Power supply connectors and fault output connectors in Logic Sub-Rack

**Rear of Logic Sub-Rack**



CN1 is Logic Module power input connector for System 1 or 2.

CN2 is Logic Module fault output connector for System 1 or 2.

### 7.3 Basic block, LED indications and switch functions of Electronic Terminal Module

LED indications and switch functions of the card panel used in Electronic Terminal Module are shown below.  Carefully read and understand the following descriptions and handle accordingly the card for replacement and fault repair.

### 7.3.1 Electronic Terminal

**(1) LINE2B Card**



| NORMAL | Meaning         ----Terminal transmission & 5V power supply normal |
| --- | --- |
|  | Indication status----ON for normal, OFF for fault |
| RXD | Meaning         ----Reception from safety system |
|  | Indication status----ON during reception |
| TXD | Meaning         ----Transmission to safety system |
|  | Indication status----ON during transmission |
| LED 4 | Meaning         ----Terminal transmission normal |
|  | Indication status----ON for normal |
| LED 5 | Meaning         ----5V power supply normal |
|  | Indication status----ON for normal |
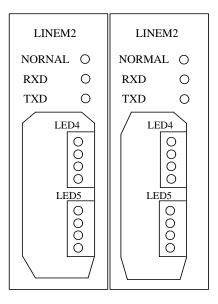
**(2) ET-PIO2 Card**

System 1      System 2

PIO2-LOG      PIO2-LOG

SYSTEM   NORMAL     SYSTEM   NORMAL

○    ○      ○    ○

TXD    ○      TXD    ○

| | | |
|---|---|---|
| SYSTEM | Meaning      ---- Comparator (FLR) is normal | |
| | Indication status---- ON for normal, OFF for fault | |
| NORMAL | Meaning      ---- All function is normal | |
| | Indication status---- ON for normal, OFF for fault | |
| TXD | Meaning      ---- Transmission | |
| | Indication status---- ON during transmission | |
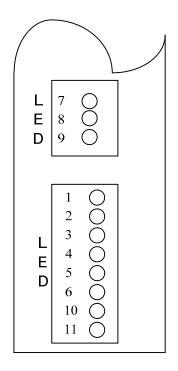
**(3) LINEM2 card**



| NORMAL | Meaning         ----5V power supply normal |
| --- | --- |
|  | Indication status----ON for normal, OFF for fault |
| RXD | Meaning         ----Reception from safety system |
|  | Indication status----ON during reception |
| TXD | Meaning         ----Transmission to safety system |
|  | Indication status----ON during transmission |
| LED 4 | Not Used |
| LED 5 | Not Used |

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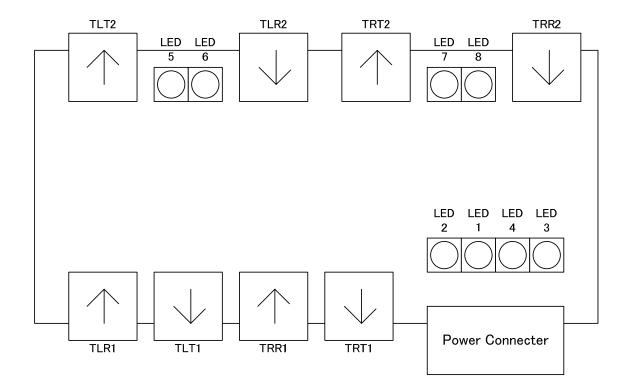
**(4) MMIF2 Card**



| LED7 | Meaning          ----WDT |
| --- | --- |
|  | Indication status----ON for normal power supply and normal by |
|  | hardware diagnosis |
| LED8 | Meaning          ---- Indication to slave |
|  | Indication status----ON when slave |
| LED9 | Meaning          ----System in use |
|  | Indication status----ON when own card has input/output right, |
|  | OFF when other card has input/output right |
| LED1,2,3,4 | Terminal No |
| LED5 | Meaning          ----TX |
|  | Indication status----ON during transmission |
| LED6 | Meaning          ----RX |
|  | Indication status----ON during reception |
| LED10 | Not Used |
| LED11 | Not Used |

**(5) SPHC-TT**



| LED1 | Blink when data receiving (TLR1 Optical Line) |
|------|-----------------------------------------------|
| LED2 | Blink when data sending (TLT1 Optical Line) |
| LED3 | Blink when data receiving (TRR1Optical Line) |
| LED4 | Blink when data sending (TRT1 Optical Line) |
| LED5 | Blink when data sending (TLT2 Optical Line) |
| LED6 | Blink when data receiving (TLR2 Optical Line) |
| LED7 | Blink when data sending (TRT2 Optical Line) |
| LED8 | Blink when data receiving (TRR2 Optical Line) |
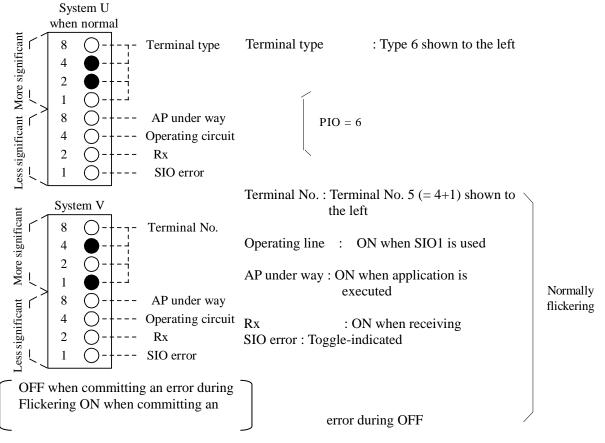
**(6) LED indication for various maintenance detail for ET-PIO2**
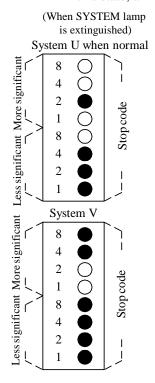
8-seg LED indicators (yellow) are provided and show normal status during normal operation, and when a fault occurs, the indicators show error code**.**

### a. Details of normal indication codes

System U
when normal

| More significant | 8 | ○ | Terminal type |
| | 4 | ● | |
| | 2 | ● | |
| | 1 | ○ | |
| Less significant | 8 | ○ | AP under way |
| | 4 | ○ | Operating circuit |
| | 2 | ○ | Rx |
| | 1 | ○ | SIO error |

Terminal type    : Type 6 shown to the left

PIO = 6

System V

| More significant | 8 | ○ | Terminal No. |
| | 4 | ● | |
| | 2 | ○ | |
| | 1 | ● | |
| Less significant | 8 | ○ | AP under way |
| | 4 | ○ | Operating circuit |
| | 2 | ○ | Rx |
| | 1 | ○ | SIO error |

Terminal No. : Terminal No. 5 (= 4+1) shown to the left

Operating line   :   ON when SIO1 is used

AP under way : ON when application is executed

Rx          : ON when receiving
SIO error : Toggle-indicated

Normally flickering

OFF when committing an error during
Flickering ON when committing an

error during OFF

### b. Details of FLR drop-away indication codes of terminal

In this state, all LEDs are fixed at ON or OFF.

(When SYSTEM lamp is extinguished)

System U when normal

| More significant | 8 | ○ | |
| | 4 | ○ | |
| | 2 | ● | Stop code |
| | 1 | ○ | |
| Less significant | 8 | ○ | |
| | 4 | ● | |
| | 2 | ● | |
| | 1 | ● | |

System V

| More significant | 8 | ● | |
| | 4 | ● | |
| | 2 | ○ | Stop code |
| | 1 | ○ | |
| Less significant | 8 | ● | |
| | 4 | ● | |
| | 2 | ● | |
| | 1 | ● | |

In the figure shown to the left,
System U 27H (comparator check data error)
System V CFH (application synchronism error)

System U more significant digits
= 2      = **2H**
$\Rightarrow$  **27H**
Less significant digits
= 1 + 2 + 4 = **7H**

System V more significant digits
= 8 + 4 = 12 = **CH**
$\Rightarrow$  **CFH**
Less significant digits
= 8+ 4 + 2 + 1 = **FH**

Causes of faults that extinguish SYSTEM lamp at Electronic Terminal Module are encoded, and output to maintenance LED.

A.  Stop codes of collation output data
Details in common with terminals

a)  Collation data before comparator

| Stop code | Meaning |
|---|---|
| 81H | Comparator check data |
| 62H | Buffer resistor data |
| E3H | Important data |
| C4H | ROM check data |
| 45H | RAM check data |
| A6H | Command check data |

b)  Command check data

| Stop code | Meaning |
|---|---|
| 27H | Comparator check data |
| E8H | Buffer resistor data |
| 69H | Important data |
| 8AH | ROM check data |
| 0BH | RAM check data |
| 2CH | Command check data |

"Buffer register data" include "Terminal No. data" and "Control output data".
"Important data" include "Control output data".

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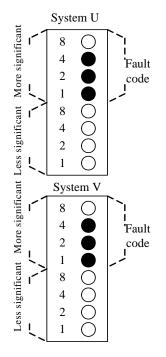
B.   Stop codes at each terminal when error is detected (other than collation output data)

| Stop code | Meaning |
|-----------|---------|
| ADH | INT_0 signal |
| 4EH | Window timer |
| CFH | I/O port input/output synchronization |
| CFH | Application synchronization |
| CFH | SIO transmission monitor signal |
| 11H | TXMON error |
| 22H | Transmission error |
| 44H | Other system normal status input error |
| 55H | Latch answer error |
| 66H | Control output (NR, RW) error |
| 77H | SSR check error |
| 88H | RI input error |

C.   Details of indication codes when normal lamp at terminal is extinguished

(When NORMAL lamp is extinguished)

When normal lamp is extinguished, both Systems U and V of maintenance LED show the detail status by less significant lights and more significant lights.
Refer to an example in the figure shown to the left:

System U

8 ○
4 ●
2 ●   Fault code
1 ●
8 ○
4 ○
2 ○
1 ○

System U    7H = ( = 4 + 2 + 1 )

System V

8 ○
4 ●
2 ●   Fault code
1 ●
8 ○
4 ○
2 ○
1 ○

System V    7H = ( = 4 + 2 + 1 )

→   Fault indication code

77H (SSR check error)

Causes of faults that extinguish NORMAL lamp at Electronic Terminal Module are encoded, and output to maintenance LED.

(Example) Notation of fault code

$$\underset{\uparrow}{\underline{1}} \qquad \underset{\uparrow}{\underline{1}} \qquad H$$

System U     System V

Details of PIO terminal

| Stop code | Meaning |
|-----------|---------|
| 11H | Control information receiving error |
| 22H | Transmission error |
| 33H | Unset terminal No. error |
| 44H | Other system normal status input error |
| 55H | Latch answer error |
| 66H | Control output (RO) error |
| 77H | SSR check error |
| 88H | RI input error |

D.  Details of Indication Code for MMIF2

8 ◯ LED4

4 ◯ LED3

2 ● LED2

1 ◯ LED1

These LEDs indicate terminal No. during transmission (Terminal No.2 for this case) and diagnosis result during non transmission as per below table.

| LED4 | No serial input for continuous 3 cycles |
| LED3 | No polling input to terminal for continuous 4 cycles |
| LED2 | Input data error |
| LED1 | Transmission supervising error |
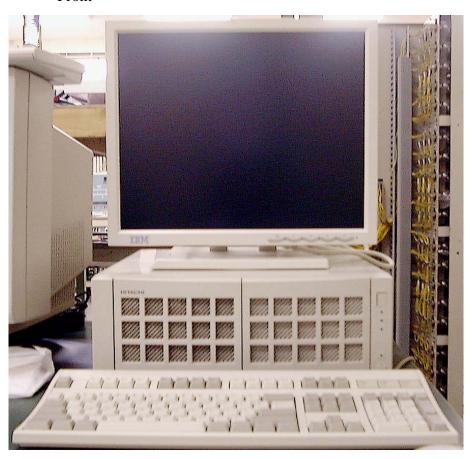
### 7.4   Operator console

LED indication and switch functions of a card used in Operator Console are described below.
It is useful for replacement of the card and faults of the cards, so it shall handle the card carefully
with understanding of this description.

### 7.4.1   Personal Computer

Front



Note: 1) Before the an card of Personal Computer is to be added/replaced, shut down the Personal Computer
and turn OFF power switch without fail.
2) Do not operate DIP switch  mounted on the card.

### 7.4.2   INIO2 Card

Front

| Item | Function |
|------|----------|
| WT | Lighted  when CPU in module is normal |
| SA | Lighted when transmission data exist in  A channel |
| RA | Lighted when reception data exist in  A channel |
| SB | Lighted when transmission data exist  in  B channel |
| RB | Lighted when reception data exist in  B  channel |
| Ach-SD | FC type optical  connector for transmission of A channel |
| Ach-RD | FC type optical connector for reception of  A channel |
| Bch-SD | FC type optical connector  for  transmission of B channel |
| Bch-RD | FC type optical connector for  reception of  B channel |

**7.5 LED indications, switches, ports and terminals of Journal Module**
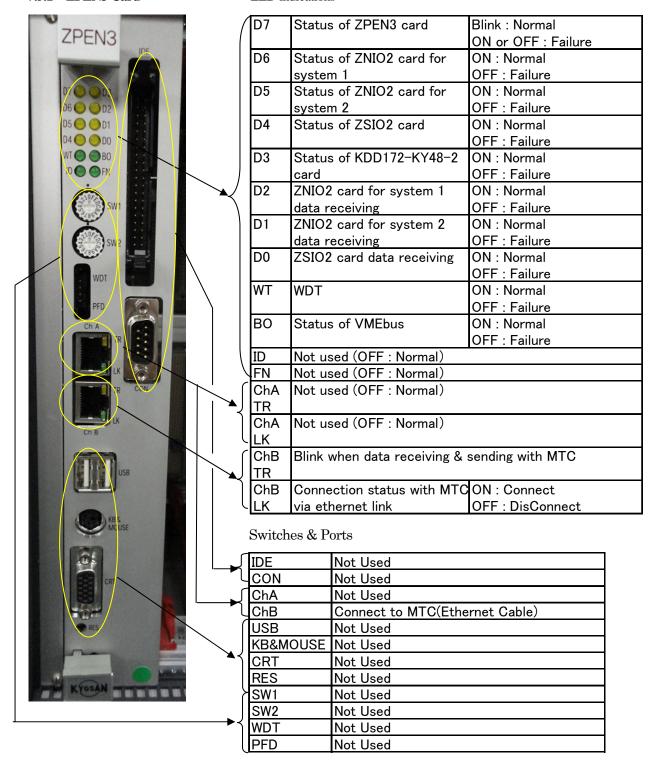
LED indications, switches, ports and terminals of Card Panel used in the Journal Module are shown below.

Please read and understand the following paragraphs because the manual may be of some help for replacing or troubleshooting the card, and carefully handle the equipment

When inserting or removing a card, turn off the power switch without fail. In addition, after replacing the card, setting shall be restored to the original positions before replacing.

**7.5.1 ZPEN3 Card**          LED indications



| D7 | Status of ZPEN3 card | Blink : Normal ON or OFF : Failure |
|---|---|---|
| D6 | Status of ZNIO2 card for system 1 | ON : Normal OFF : Failure |
| D5 | Status of ZNIO2 card for system 2 | ON : Normal OFF : Failure |
| D4 | Status of ZSIO2 card | ON : Normal OFF : Failure |
| D3 | Status of KDD172-KY48-2 card | ON : Normal OFF : Failure |
| D2 | ZNIO2 card for system 1 data receiving | ON : Normal OFF : Failure |
| D1 | ZNIO2 card for system 2 data receiving | ON : Normal OFF : Failure |
| D0 | ZSIO2 card data receiving | ON : Normal OFF : Failure |
| WT | WDT | ON : Normal OFF : Failure |
| BO | Status of VMEbus | ON : Normal OFF : Failure |
| ID | Not used (OFF : Normal) | |
| FN | Not used (OFF : Normal) | |
| ChA TR | Not used (OFF : Normal) | |
| ChA LK | Not used (OFF : Normal) | |
| ChB TR | Blink when data receiving & sending with MTC | |
| ChB LK | Connection status with MTC via ethernet link | ON : Connect OFF : DisConnect |

Switches & Ports

| IDE | Not Used |
|---|---|
| CON | Not Used |
| ChA | Not Used |
| ChB | Connect to MTC(Ethernet Cable) |
| USB | Not Used |
| KB&MOUSE | Not Used |
| CRT | Not Used |
| RES | Not Used |
| SW1 | Not Used |
| SW2 | Not Used |
| WDT | Not Used |
| PFD | Not Used |

### 7.5.2   ZNIO2 Card

*ZNIO2 card is used for Logic System 1 and 2 separately.

LED indications

| WDT | Status of ZNIO2 card | ON : Normal<br>OFF : Failure |
|---|---|---|
| D1 | Not used (ON : Normal) | |
| D0 | Not used (OFF : Normal) | |
| ChA SD | Not used (ON : Normal) | |
| ChA RD | Blink when data receiving | |
| ChB SD | Not used (OFF : Normal) | |
| ChB RD | Not used (OFF : Normal) | |

Ports

| CON | Not Used |
|---|---|
| ChA SD | Not Used |
| ChA RD | Connect to EI-Logic(Optical Cable) |
| ChB SD | Not Used |
| ChB RD | Not Used |

**7.5.3　ZSIO2 Card**

LED indications

| WDT | Status of ZSIO2 card | Blink : Normal<br>ON or OFF : Failure |
|---|---|---|
| PE | Parity Error | ON : Error<br>OFF : Normal |
| D1 | ResponseFrame Control | ON : Normal<br>OFF : Abnormal |
| D0 | Set Up | ON : Set up completed<br>OFF : Under set up |
| ChA<br>SD | Blink when data sending | |
| ChA<br>RD | Blink when data receiving | |
| ChA<br>RS | Not used (OFF : Normal) | |
| ChA<br>CS | Not used (OFF : Normal) | |
| ChA<br>ER | Not used (ON : Normal) | |
| ChA<br>DR | Not used (OFF : Normal) | |
| ChB<br>SD | Not used (OFF : Normal) | |
| ChB<br>RD | Not used (OFF : Normal) | |
| ChB<br>RS | Not used (OFF : Normal) | |
| ChB<br>CS | Not used (OFF : Normal) | |
| ChB<br>ER | Not used (ON : Normal) | |
| ChB<br>DR | Not used (OFF : Normal) | |

Ports

| CON | Not Used |
|---|---|
| ChA | Connect to Data Logger(RS-232C Cable) |
| ChB | Not Used |

### 7.5.4.   KDD172-KY48-2 Card

LED indications

| DC5V | DC5V power status | ON : Normal |
|------|-------------------|-------------|
|      |                   | OFF : Failure |
| DC12V | DC12V power status | ON : Normal |
|       |                    | OFF : Failure |
| DC24V | DC24V power status | ON : Normal |
|       |                    | OFF : Failure |

Terminals

| DC24V P1 | Power Supply |
|----------|--------------|
| DC24V P2 |              |
| FG | Not Used |
| SG | Not Used |
| PFD | Not Used |
| POW FL | Not Used |
| FAN FL | Not Used |

**7.6    Maintenance methods**

**7.6.1 General description**

The outline of maintenance is shown below.

```
                          ┌──────────────────┐
                          │   Maintenance    │
                          │  and inspection  │
                          └──────────────────┘
                    ┌──────────────┴──────────────┐
            ┌──────────────┐              ┌──────────────┐
            │  Preventive  │              │  Corrective  │
            │ maintenance  │              │ maintenance  │
            └──────────────┘              └──────────────┘
                    │                            │
            ┌──────────────┐              ┌──────────────┐
            │   Periodic   │              │    Fault     │
            │  inspection  │              │  occurrence  │
            └──────────────┘              └──────────────┘
             ┌──────┴──────┐                     │
      ┌──────────────┐ ┌──────────────┐   ┌──────────────┐
      │    Patrol    │ │ Interlocking │   │    Fault     │
      │  inspection  │ │  inspection  │   │    survey    │
      └──────────────┘ └──────────────┘   └──────────────┘
            *1              *2                    │
                                          ┌──────────────┐
                                          │   Recovery   │
                                          │  from fault  │
                                          └──────────────┘
                                                 *3
```

*1 ----   Refer to 7.6.2. (Checking various indications etc.)

*2 ----   Refer to 7.6.3. (Interlocking test, voltage measurement, etc.)

*3 ----   Refer to 7.7

General description of maintenance

**(1) Be sure to store spare parts always in electrical storage area.**

**(2) When a fault occurs, precisely locate faulty device, and replace only the related device.**

| ⚠ | |
|---|---|
| ⚠ ❗ | Before replacing a faulty device, be sure to turn off the power switch. |

### 7.6.2 Patrol inspection (periodic inspection: once or twice per month)

Conditions of equipment are checked when patrolling an equipment room and/or operating room once or twice per month.

**(1) Visual inspection**

a. Check conditions of inserted external connectors.

b. Check inserted conditions of sub-cards and relays.

c. Inspect abnormalities and corrosion of other parts.

**(2) Measuring environmental conditions**

a. Measure ambient temperature and humidity. (-10°C ~ +70°C  /  5 ~ 95% at +40°C)

b. Check the protection against dust effect. Confirm no sedimentation of the mine dust.

c. Check the satisfactory protections to drips, direct sunshine, etc.

d. Check the local overheating, abnormal noise and obnoxious odor.

**(3) Inspecting LED and indication lights**

Check various LED indication lights on Control Panel, Operator Console, Interlocking Logic Rack, for ON, blink and OFF, and investigate the reason of fault.

Check the status of on and off light of each LED indications described in the items in clause 7.2 Logic Modules, 7.3 Electric Terminal Modules, 7.4 Operator Console and 7.5 Journal Module are normal condition.

**(4) Confirming power supplies**

Check voltages and currents of various power supplies in Logic Rack.

**(5) Others**

a. Check conditions of air-conditioner.

b. Survey storage conditions of spare parts.

### 7.6.3 Interlocking inspection (periodic inspection: once or twice per year)

Check following functions of equipment once or twice per year.

**(1) Interlocking inspection**

Check interlocking functions based on applicable interlocking table (route control table and point control table).

**(2) Card inspection**

Check normal operation of spare cards.

**(3) Voltage measurement**

Measure voltages of various power supplies.

### 7.6.4 Example of measuring device

General purpose meters for measuring electric voltage or current and temperature or humidity for the inspections above clause 7.6.2 and 7.6.3 can be used.

The followings are examples for general and portable meters.

(1) Voltage and Current meter

Company:    Yokogawa Meters & Instruments Corporation

Name of Instrument:    Digital-Multi-meter   type 73202

(2) Temperature and Humidity meter

Company:    Chino Corporation

Name of Instrument:    HN-CHN palm-sized Temperature / Humidity Meter
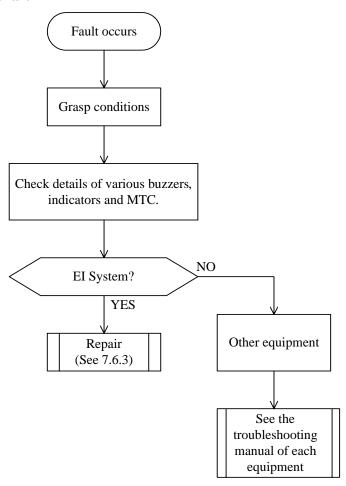
**Kyosan Electric Mfg. Co., Ltd.**

### 7.7    Troubleshooting

#### 7.7.1    Grasping conditions

d. Precisely grasp the cause of fault.

e. Survey symptoms or hidden causes that resulted in the fault.

Example: Restructuring work, power abnormality, lightening, error in connected device, etc.

#### 7.7.2 Troubleshooting flow chart

```
              ╭──────────────╮
              │ Fault occurs │
              ╰──────┬───────╯
                     │
          ┌──────────▼──────────┐
          │   Grasp conditions  │
          └──────────┬──────────┘
                     │
          ┌──────────▼──────────────┐
          │ Check details of various│
          │ buzzers, indicators and │
          │          MTC.           │
          └──────────┬──────────────┘
                     │
                ╱────▼────╲            NO
               ╱ EI System?╲──────────────┐
               ╲           ╱               │
                ╲────┬────╱                │
                     │ YES                 │
          ┌──────────▼────────┐   ┌────────▼────────┐
          │││    Repair     │││  │  Other equipment │
          │││  (See 7.6.3)  │││  └────────┬─────────┘
          └───────────────────┘           │
                                  ┌────────▼─────────┐
                                  │││  See the     │││
                                  │││troubleshooting│││
                                  │││ manual of each│││
                                  │││  equipment   │││
                                  └──────────────────┘
```

Troubleshooting flow chart

Note: 1) Refer to Manual for respective equipment.
2) After repairing, confirm without fail that there is no abnormal for whole equipment on system screen of MTC.

## 7.7.3 Fault locating and repairing

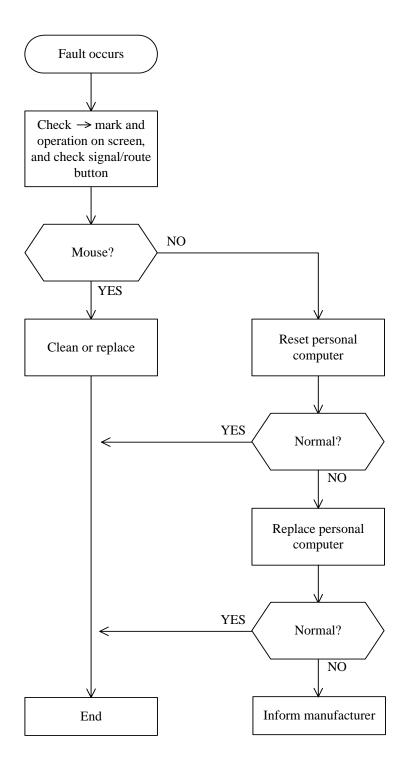### (1) Fault originating locations and fault details are shown below.

| Location | | Error detail | Check point | Repair |
|---|---|---|---|---|
| OPC | Mouse | Uncontrollable from mouse | Check mouse operation and screen. | See item (a) |
| | Display screen | Recovery from power failure | Check Interlocking Logic Module. | See item (c) |
| | | Stoppage of electronic terminal function | Check that front LED of each card lights. Check details in MTC. | See item (d) |
| | | Route setting unable | Check operation on screen/panel, or check details in MTC. | See item (e) |
| | | Disorder in display screen | Adjust LCD. | See item (f) |
| Control panel | Push Button | Uncontrollable from push button | Check button operation and panel. | See item (b) |
| | Display Panel | Recovery from power failure | Check Interlocking Logic Module. | See item (c) |
| | | Stoppage of electronic terminal function | Check that front LED of each card lights. Check details in MTC. | See item (d) |
| | | Route setting unable | Check operation on panel, or check details in MTC. | See item (e) |
| Interlocking Logic rack | Logic Parts | Disorder in display screen | Check that front LED of each card lights. Check details in MTC. | See item (g) |
| | Electronic Terminal Parts | Stoppage of electronic terminal function | Check that front LED of each card lights. Check details in MTC. | See item (d) |

**(2) Recovery processing**

a.   Mouse and Personal computer

```
                    ⎛  Fault occurs  ⎞
                    ⎝                ⎠
                            │
                            ▼
              ┌─────────────────────────┐
              │ Check → mark and        │
              │ operation on screen,    │
              │ and check signal/route  │
              │ button                  │
              └─────────────────────────┘
                            │
                            ▼
                   ╱─────────────╲            NO
                  ⟨    Mouse?      ⟩ ───────────────┐
                   ╲─────────────╱                  │
                        │ YES                        │
                        ▼                            ▼
              ┌──────────────────┐        ┌──────────────────┐
              │ Clean or replace │        │ Reset personal   │
              │                  │        │ computer         │
              └──────────────────┘        └──────────────────┘
                        │                            │
                        │                            ▼
                        │           YES     ╱─────────────╲
                        │ ◄─────────────────⟨   Normal?     ⟩
                        │                    ╲─────────────╱
                        │                          │ NO
                        │                          ▼
                        │                ┌──────────────────┐
                        │                │ Replace personal │
                        │                │ computer         │
                        │                └──────────────────┘
                        │                          │
                        │           YES            ▼
                        │ ◄─────────────────╱─────────────╲
                        │                   ⟨   Normal?     ⟩
                        │                    ╲─────────────╱
                        │                          │ NO
                        ▼                          ▼
              ┌──────────────────┐        ┌──────────────────┐
              │       End        │        │ Inform           │
              │                  │        │ manufacturer     │
              └──────────────────┘        └──────────────────┘
```
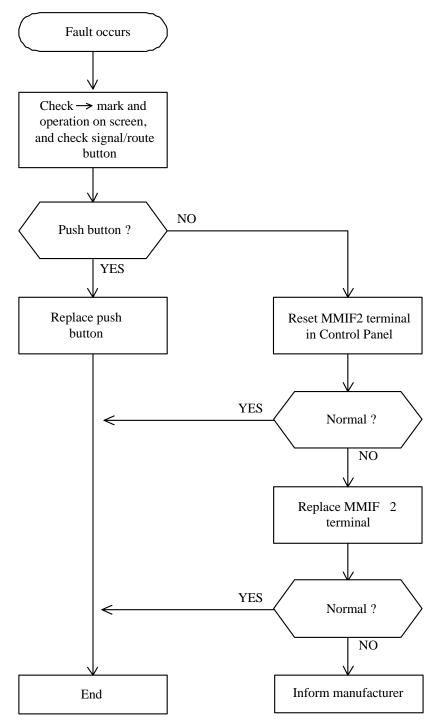
Note: 1) When replacement, read Chapters 5.1 carefully and replace.

2) When plural failures occur, check other factors first.

b. Push button

```
            ┌─────────────────┐
            │  Fault occurs   │
            └─────────────────┘
                     │
                     ▼
         ┌───────────────────────┐
         │  Check → mark and     │
         │  operation on screen, │
         │  and check signal/route│
         │  button               │
         └───────────────────────┘
                     │
                     ▼
            ╱─────────────╲            NO
           ⟨ Push button ? ⟩───────────────────┐
            ╲─────────────╱                     │
                     │ YES                       │
                     ▼                           ▼
         ┌──────────────────┐        ┌─────────────────────┐
         │  Replace push    │        │  Reset MMIF2 terminal│
         │  button          │        │  in Control Panel    │
         └──────────────────┘        └─────────────────────┘
                     │                           │
                     │                           ▼
                     │         YES      ╱─────────────╲
                     │   ◄──────────────⟨   Normal ?   ⟩
                     │                   ╲─────────────╱
                     │                           │ NO
                     │                           ▼
                     │                ┌─────────────────────┐
                     │                │  Replace MMIF  2     │
                     │                │  terminal            │
                     │                └─────────────────────┘
                     │                           │
                     │         YES      ╱─────────────╲
                     │   ◄──────────────⟨   Normal ?   ⟩
                     │                   ╲─────────────╱
                     │                           │ NO
                     ▼                           ▼
         ┌──────────────────┐        ┌─────────────────────┐
         │       End        │        │ Inform manufacturer │
         └──────────────────┘        └─────────────────────┘
```
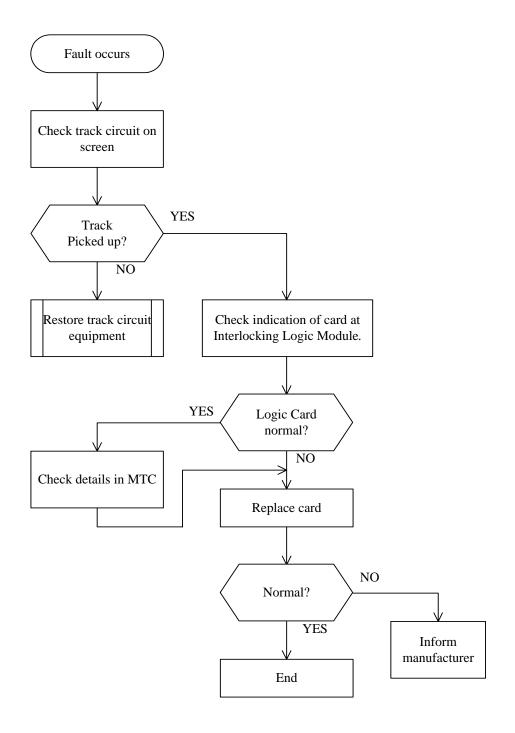
Note: 1) Reset the terminal of each system one by one. If both systems are reset simultaneously, important EI function may stop.

2) Reset or replace only related MMIF2 for push button input/output. When replacement, read Chapters 5.2 to 5.4 carefully and replace.

3) When plural failures occur, check other factors first.

c.   Recovery from power failure

```
                    ┌─────────────────┐
                    │   Fault occurs  │
                    └────────┬────────┘
                             │
                    ┌────────▼────────┐
                    │ Check track     │
                    │ circuit on      │
                    │ screen          │
                    └────────┬────────┘
                             │
                      ╱──────▼──────╲        YES
                     ╱    Track      ╲────────────────┐
                     ╲  Picked up?   ╱                │
                      ╲──────┬──────╱                 │
                         NO  │                        │
                    ┌────────▼────────┐      ┌─────────▼─────────┐
                    │ Restore track   │      │ Check indication  │
                    │ circuit         │      │ of card at        │
                    │ equipment       │      │ Interlocking      │
                    └─────────────────┘      │ Logic Module.     │
                                             └─────────┬─────────┘
                                                       │
               YES                             ╱───────▼───────╲
          ┌──────────────────────────────────╱   Logic Card    ╲
          │                                   ╲    normal?      ╱
          │                                    ╲───────┬───────╱
          │                                        NO  │
   ┌──────▼──────┐                           ┌─────────▼─────────┐
   │ Check       │──────────────────────────▶│   Replace card    │
   │ details in  │                           └─────────┬─────────┘
   │ MTC         │                                     │
   └─────────────┘                             ╱───────▼───────╲     NO
                                              ╱    Normal?      ╲──────────┐
                                              ╲───────┬───────╱           │
                                                 YES  │              ┌─────▼─────┐
                                             ┌────────▼────────┐     │  Inform   │
                                             │      End        │     │ manufac-  │
                                             └─────────────────┘     │  turer    │
                                                                     └───────────┘
```
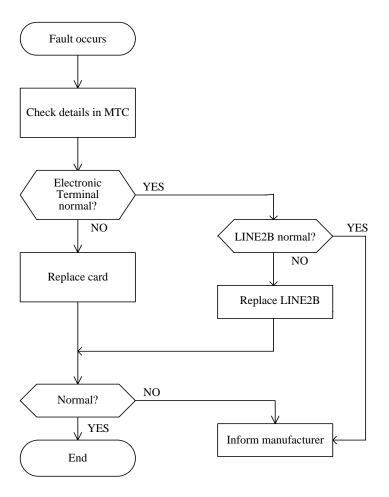
Note: 1) Confirm for power supply equipment, power wire etc. Refer to Manual for power supply equipment when checks the power supply equipment. Be careful when power cable check so as not to have shock hazard, short etc.

2) Read Chapters 5.2 to 5.4 carefully when replacement of card and then replace. Note down Stop Code of maintenance LED without fail to search its reason and then turn off card power source.

d.   Stoppage of electronic terminal function

```
                    ┌─────────────────┐
                    │   Fault occurs  │
                    └────────┬────────┘
                             │
                    ┌────────▼────────┐
                    │ Check details   │
                    │    in MTC       │
                    └────────┬────────┘
                             │
                    ╱────────▼────────╲        YES
                   ╱    Electronic     ╲──────────────┐
                   ╲    Terminal       ╱              │
                    ╲    normal?      ╱               │
                     ╲───────┬───────╱                │
                          NO │              ╱─────────▼─────────╲   YES
                             │             ╱   LINE2B normal?    ╲─────┐
                    ┌────────▼────────┐    ╲                     ╱     │
                    │  Replace card   │     ╲───────┬───────────╱      │
                    └────────┬────────┘          NO │                  │
                             │             ┌────────▼────────┐         │
                             │             │ Replace LINE2B  │         │
                             │             └────────┬────────┘         │
                             │◄─────────────────────┘                  │
                             │                                         │
                    ╱────────▼────────╲       NO                       │
                   ╱     Normal?       ╲────────────┐                  │
                    ╲─────────────────╱             │                  │
                          YES │              ┌──────▼──────────┐       │
                    ┌─────────▼───────┐      │     Inform      │◄──────┘
                    │       End       │      │   manufacturer  │
                    └─────────────────┘      └─────────────────┘
```
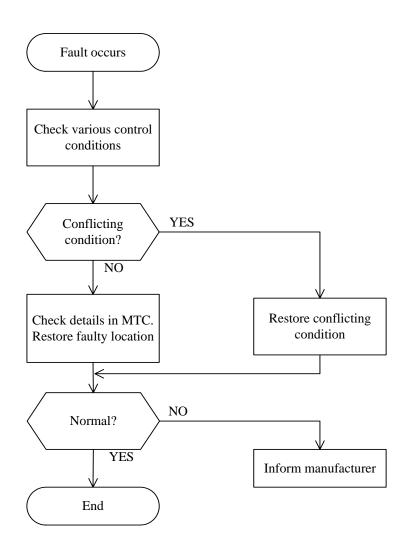
Note: 1)   Read Chapters 5.2 to 5.4 carefully when replacement of card and then replace. Note down Stop
           Code of maintenance LED without fail to search its reason and then turn off card power source.
               If the stop code is unknown, it might be a case that failure reason is not fixed. As for the stop code,
           refer to Chapters 7.2 and 7.3.
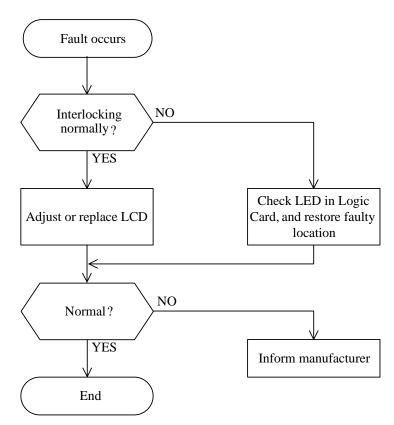
**Kyosan Electric Mfg. Co., Ltd.**

e.   Route setting unable

```
                    ┌──────────────────┐
                    │   Fault occurs   │
                    └──────────────────┘
                             │
                             ▼
                    ┌──────────────────┐
                    │ Check various    │
                    │ control          │
                    │ conditions       │
                    └──────────────────┘
                             │
                             ▼
                      ╱Conflicting╲       YES
                      ╲ condition? ╱───────────────┐
                             │                      │
                            NO                      │
                             │                      ▼
                    ┌──────────────────┐   ┌──────────────────┐
                    │ Check details in │   │ Restore          │
                    │ MTC.             │   │ conflicting      │
                    │ Restore faulty   │   │ condition        │
                    │ location         │   └──────────────────┘
                    └──────────────────┘           │
                             │◄─────────────────────┘
                             ▼
                      ╱  Normal?  ╲        NO
                      ╲           ╱──────────────┐
                             │                    │
                            YES                   ▼
                             │          ┌──────────────────┐
                             ▼          │ Inform           │
                    ┌──────────────────┐│ manufacturer     │
                    │      End         │└──────────────────┘
                    └──────────────────┘
```

f. Disorder on screen

```
        ╭──────────────────╮
        │   Fault occurs   │
        ╰──────────────────╯
                 │
                 ▼
           ╱────────────╲              NO
          ╱ Interlocking ╲──────────────────────────┐
          ╲  normally ？  ╱                          │
           ╲────────────╱                            │
                 │ YES                               │
                 ▼                                   ▼
        ┌──────────────────┐            ┌──────────────────────┐
        │                  │            │   Check LED in Logic │
        │ Adjust or replace│            │ Card, and restore    │
        │       LCD        │            │   faulty location    │
        └──────────────────┘            └──────────────────────┘
                 │                                   │
                 ▼◄──────────────────────────────────┘
           ╱────────────╲              NO
          ╱   Normal ？   ╲──────────────────────────┐
          ╲              ╱                           │
           ╲────────────╱                            ▼
                 │ YES                   ┌──────────────────────┐
                 ▼                       │  Inform manufacturer │
        ╭──────────────────╮            └──────────────────────┘
        │       End        │
        ╰──────────────────╯
```
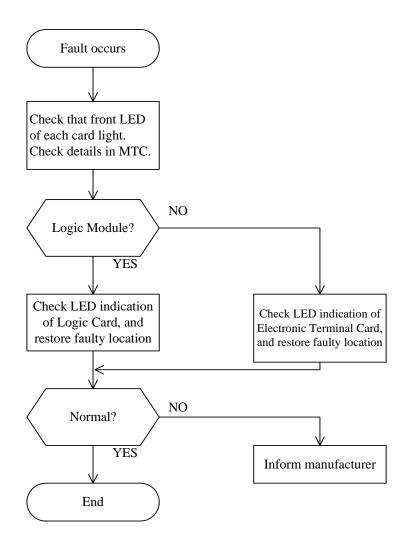
g.    Stoppage of electronic interlocking logic function

```
                    ╭─────────────────╮
                    │   Fault occurs   │
                    ╰─────────────────╯
                            │
                            ▼
              ┌─────────────────────────┐
              │ Check that front LED    │
              │ of each card light.     │
              │ Check details in MTC.   │
              └─────────────────────────┘
                            │
                            ▼
                    ╱─────────────╲              NO
                   ╱ Logic Module? ╲ ──────────────────────┐
                   ╲               ╱                        │
                    ╲─────────────╱                         │
                          │ YES                             │
                          ▼                                 ▼
              ┌─────────────────────┐        ┌───────────────────────────┐
              │ Check LED indication │        │ Check LED indication of    │
              │ of Logic Card, and   │        │ Electronic Terminal Card,  │
              │ restore faulty       │        │ and restore faulty location│
              │ location             │        └───────────────────────────┘
              └─────────────────────┘                       │
                          │ ◄────────────────────────────────┘
                          ▼
                    ╱─────────────╲              NO
                   ╱   Normal?     ╲ ──────────────────────┐
                   ╲               ╱                        │
                    ╲─────────────╱                         │
                          │ YES                             ▼
                          ▼                      ┌─────────────────────┐
                    ╭─────────────╮              │ Inform manufacturer  │
                    │     End      │             └─────────────────────┘
                    ╰─────────────╯
```

## 7.8    Qualifications of inspector

For the maintenance or inspection, employ personnel who have completely read and understood this manual.

## 7.9    Limited scope of inspection

The scope of equipment that can be inspected according to this manual shall be limited to Interlocking Logic Rack, SPHC-PW, SPHC-TT and each personal computer of OPC and MTC, and multi-mode optical fiber cables from Interlocking Logic Rack to OPC and MTC.    For maintenance and handling of other equipment, please refer to the manual of each equipment.

| ⚠ WARNING | |
|---|---|
| ⚠ ❗ | When replacing a card, do not disassemble the card itself.    Otherwise, the equipment might break down. |
| | Before replacing a card, be sure to turn OFF the power switch. Otherwise, the equipment might fail. |
| | Before replacing a card, confirm that no cable or wire is connected to the card.    Otherwise, the cable etc. might be open circuited. |
| | When handling an optical fiber cord, do not bend the cord with a radius smaller than specified minimum bending radius.    Do not strongly impact or load the cord.    Otherwise, the optical fiber cord might be open circuited. |
| | After an optical fiber connector is removed, attach the dedicated cap. Otherwise, the optical fiber connector might fail. |
| | For handling a personal computer, please see the instruction manual of the personal computer.    If the computer is handled without reference to the instruction manual and an abnormality results in the equipment, Kyosan will not warrant the equipment. |
| | Before touching a power supply terminal, be sure to confirm that the power switch is turned OFF.    Otherwise, you might receive an electric shock and the equipment might fail. |

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### 7.10    Preventive maintenance schedule

### 7.10.1    Service life of PCB

Each printed circuit board(PCB) has about 14 to 16 years service life. It is necessary for PCBs to replace with new ones within 16 years after it is put in service at the factory test.

As failure rates of the PCBs in 14 years or longer service will increase, we highly recommended that the total system is to be replaced within 14 years after putting into service.

As the PCBs have no parts which have shorter service lives such as electolysis condensers etc. than above service life, it is not necessary to overhaul the PCBs in advance of replacement.

For KDD172-KY48-2, please refer below.

### 7.10.2    Service life of item other than PCB

Parts and items which are used in the Rack, that are listed below, it is recommended to replace by noted duration before total system replacement.

| Classification of Parts | Item | Durability (year) (Target of exchange period) |
|---|---|---|
| Electronic parts | AC/DC Power supply | 8 |
| | Relay | 8 |
| Journal Module PCB | KDD172-KY48-2 | 8 |

### 7.11    Prohibition of disassemble

WARNING

| | Personal computers, LCD, mouses, etc. used in the equipment have been bought from other manufacturers, therefore do not disassemble or restructure them. If an apparatus is restructured, disassembled or modified by user, Kyosan will not warrant the apparatus.<br><br>Unless this manual permits inspection, replacement, etc., do not disassemble, restructure or modify Interlocking Logic Rack and Control Panel. |
|---|---|

### 7.12 Prevention of connection errors

Optical fiber connectors (FC connectors), Burndy $50^C$ connectors, AMP terminals and Hirose terminals to connect power cables incorporate connectors with common shapes for each type, therefore connectors are not protected from insertion errors.   Please read the following contents carefully, and avoid connection errors.   Otherwise, the equipment might fail, break down or catch fire.

### 7.12.1 Optical fiber

WARNING

| | When connecting optical fibers, carefully check the destination described on the name tag attached to an optical fiber cord and the connector specified in the optical fiber cable system diagram, and connect the cord and the connector without errors.   Otherwise, interlocking functions might stop. |
|---|---|

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### 7.12.2　Inter-rack cable

| ⚠ WARNING | |
|---|---|
| 🔥 ⚠ | When connecting interconnection cable, carefully check the destination described on the name tag attached to the cable and the connector specified in the interconnection cable system diagram, and connect the cable without errors.<br>Otherwise, the equipment might catch fire or fail. |

### 7.12.3　Power cable

| ⚠ WARNING | |
|---|---|
| 🔥 ⚠ | To connect a power cable, carefully confirm which is plus or minus terminal, and connect the cable to the terminal specified in the power cable system diagram.　Otherwise, the equipment might catch fire or fail. |

### 7.12.4　Cable to external circuit

| ⚠ WARNING | |
|---|---|
| 🔥 ⚠ | To connect a power cable, carefully confirm which is plus or minus terminal, and connect the cable to the terminal specified in the power cable system diagram.　Otherwise, the equipment might catch fire or fail. |
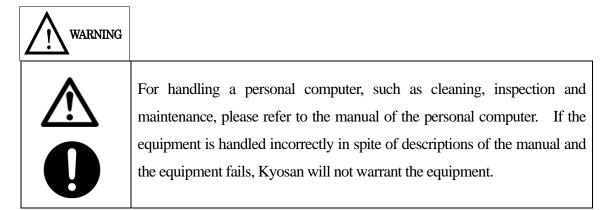
### 7.13　Power isolating operation for maintenance and cleaning
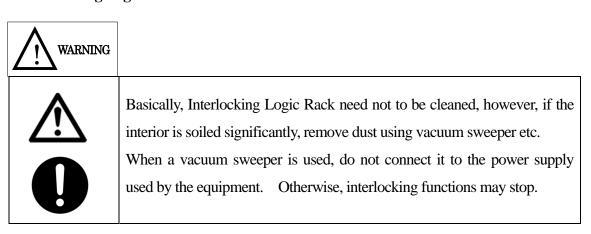
Before cleaning, inspection, maintenance, replacement, etc., be sure to turn OFF the power switch of equipment, according to prescribed procedure.

Otherwise, you might receive an electric shock or the equipment might fail or break down.

#### 7.13.1　Personal computers and related equipment

| ⚠ WARNING |  |
| --- | --- |
| ⚠ ❗ | For handling a personal computer, such as cleaning, inspection and maintenance, please refer to the manual of the personal computer.　If the equipment is handled incorrectly in spite of descriptions of the manual and the equipment fails, Kyosan will not warrant the equipment. |

#### 7.13.2　Interlocking Logic Rack

| ⚠ WARNING |  |
| --- | --- |
| ⚠ ❗ | Basically, Interlocking Logic Rack need not to be cleaned, however, if the interior is soiled significantly, remove dust using vacuum sweeper etc. When a vacuum sweeper is used, do not connect it to the power supply used by the equipment.　Otherwise, interlocking functions may stop. |

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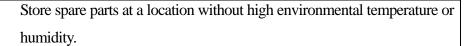
### 7.14　Storage of spare parts

| ⚠ WARNING | |
|---|---|
| ⚠ ❗ | Store spare parts at a location without high environmental temperature or humidity.<br>Also avoid allocation with moisture or fire.<br>Store spare cards in static electricity protective bags.<br>Store spare parts free from impacting or loading.<br>Also correctly store other spare parts. |
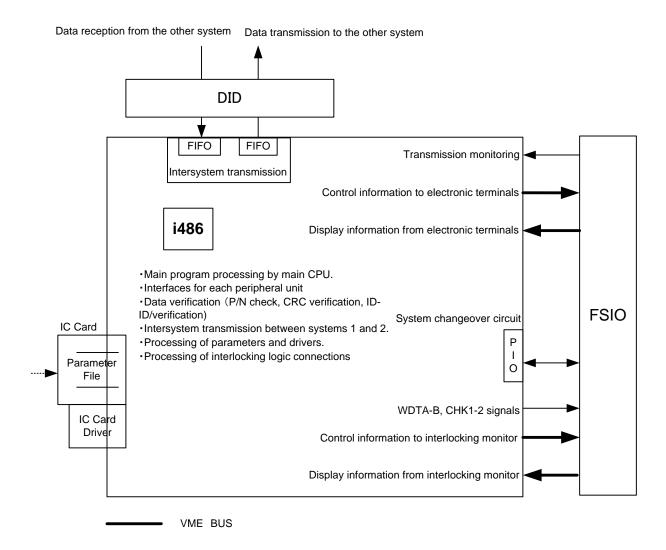
7.15   Attachment
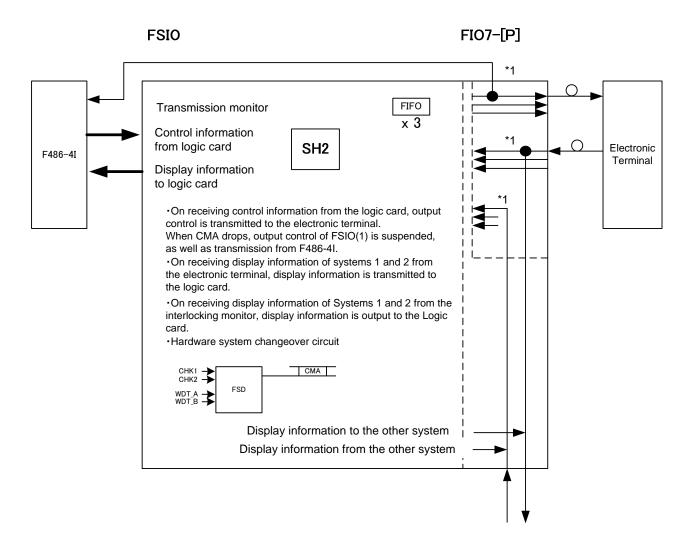
   7.15.1   Card Information Flow Chart

  （1）   Logic Card F486-4I and DID

**Kyosan Electric Mfg. Co., Ltd.**
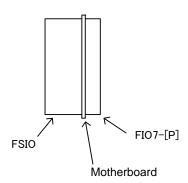
(2)   Interface- Fail Safe Driver Card FSIO and FIO7-[P]

**FSIO**                                                    **FIO7−[P]**



Transmission monitor

Control information
from logic card

Display information
to logic card

・On receiving control information from the logic card, output
control is transmitted to the electronic terminal.
When CMA drops, output control of FSIO(1) is suspended,
as well as transmission from F486-4I.
・On receiving display information of systems 1 and 2 from
the electronic terminal, display information is transmitted to
the logic card.
・On receiving display information of Systems 1 and 2 from the
interlocking monitor, display information is output to the Logic
card.
・Hardware system changeover circuit

CHK1
CHK2
WDT_A
WDT_B
FSD
CMA

Display information to the other system

Display information from the other system

F486−4I

SH2

FIFO
x 3

Electronic
Terminal

─── VME  BUS
─○─  Optical cable

*1 Although the figure above is for
one channel, the same configuration
is applied to all other channels.

FSIO
Motherboard
FIO7−[P]

Kyosan Electric Mfg. Co., Ltd.
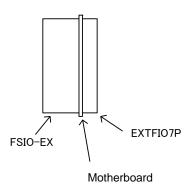
(3)  Interface Card FSIO-EX and EXTFIO7P

**FSIO−EX**                                      **EXTFIO7P**



Transmission monitor

Control information
from logic card

Display information
to logic card

FIFO
x 2

・On receiving control information from the logic card, output
control is transmitted to the electronic terminal.
When CMA drops, output control of FSIO(1) is suspended,
as well as transmission from F486-4I.
・On receiving display information of systems 1 and 2 from
the electronic terminal, display information is transmitted to
the logic card.

Display information to the other system
Display information from the other system

F486−4I

Electronic
Terminal

*1

VME  BUS
Optical cabe

*1 Although the figure above is for
one channel, the same configuration
is applied to all other channels.

FSIO−EX
Motherboard
EXTFIO7P

Kyosan Electric Mfg. Co., Ltd.

(4)　IPU6C



Logic
DC24V
INPUT

SW

DC/DC

Logic
DC5V
OUTPUT

DC/DC

Logic
DC24V
OUTPUT

*

\*　The diode supplies power to the other system.

**Kyosan Electric Mfg. Co., Ltd.**
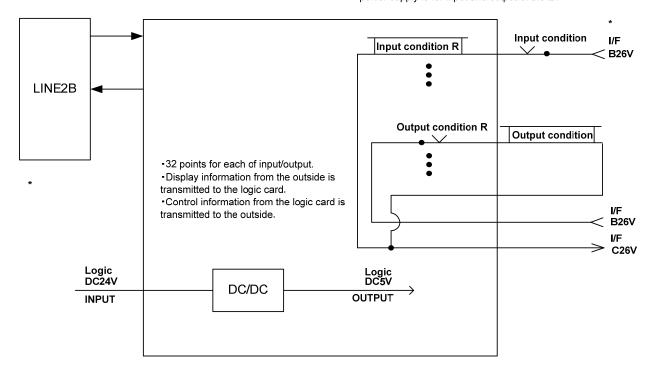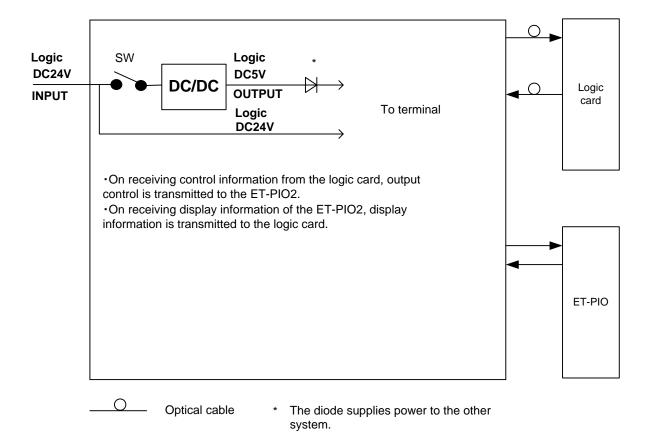
⑸　ET-PIO2

\* For the purpose of protection against outside noise,
 independent power supply has been used for each card.
 The logic power supply is for the logic card.
 The I/F power supply is for input and output of the ET-PIO2.



LINE2B

\*

Input condition R

Input condition

\*

I/F
B26V

Output condition R

Output condition

・32 points for each of input/output.
・Display information from the outside is transmitted to the logic card.
・Control information from the logic card is transmitted to the outside.

I/F
B26V

I/F
C26V

Logic
DC24V

INPUT

DC/DC

Logic
DC5V

OUTPUT

(6)  LINE2B



Logic
DC24V
INPUT

SW

**DC/DC**

Logic
**DC5V**
OUTPUT

*

Logic
**DC24V**

To terminal

・On receiving control information from the logic card, output control is transmitted to the ET-PIO2.
・On receiving display information of the ET-PIO2, display information is transmitted to the logic card.

Logic
card

ET-PIO

—————○————— Optical cable    *   The diode supplies power to the other system.

（7） MMIF2



・32 points for input, 64 points for output.
・Display information from the outside is transmitted to the logic card.
・Control information from the logic card is transmitted to the outside.

*  Use I/F power supply by setting the mother board or use Logic power supply.
 When connecting 2 and 12, it uses I/F power supply (B26).
MMIF2 which is implemented into the Logic Rack is using an outside power supply.
When connecting 1 and 2, it uses Logic power supply (B24).
MMIF2 which is implemented into the Control Panel is using an Logic power supply.

(8)  LINEM2



Logic DC24V INPUT

SW

DC/DC

Logic DC5V OUTPUT

*

To terminals

DC24V

・On receiving control information from the logic card, output control is transmitted to the MMIF2,
・On receiving display information of the MMIF2, display information is transmitted to the logic card.

Logic card

MMIF2

Optical cable

*   The diode supplies power to the other system.

(9)  SPHC-TT



Optical cable

(10)  SPHC-PW

（11）　INIO2-ET

OPC

INIO2-ET

Logic
Module
(System 1)

Logic
Module
(System 2)

SH2

Receiving indication
information from
Logic Module system 1

Transmitting control and
operation information of OPC
to Logic Module system 1

Receiving indication
information from
Logic Module system 2

Transmitting control and
operation information of OPC
to Logic Module system 1

Repeating indication
information from
Logic Module to CPU.

Repeating control and
operation information
of CPU to Logic Module

CPU

────── ISA BUS

──○── Optical fiber cable

（12）　INIO2-MTC

MTC

INIO2-MTC (System 1)

Logic
Module
(System 1)

SPHC
-TT

SH2

Receiving indication
information from
Logic Module system 1

Transmitting control and
operation information of MTC
to Logic Module system 1

Repeating indication
information from
Logic Module to CPU.

Repeating control and
operation information of
CPU to Logic Module

INIO2-MTC (System 2)

Logic
Module
(System 2)

SPHC
-TT

SH2

Receiving indication
information from
Logic Module system 2

Transmitting control and
operation information of MTC
to Logic Module system 2

Repeating indication
information from
Logic Module to CPU.

Repeating control and
operation information of
CPU to Logic Module

CPU

────── ISA BUS

──○── Optical fiber cable

（13） ZPEN3



Celeron
650MHz

Main program processing for
Journal Module
・Time control
・Edition of interlocking status
・Processing of Input/Output
with peripheral devices
・Failure diagnosis of Journal
Module cards

Interlocking status data of
Logic Sys 1

Interlocking status data of
Logic Sys 2

・Time data (10 seconds interval)
・Time data correction command

ZNIO2
for EI
Logic
Sys1

ZNIO2
for EI
Logic
Sys2

MTC

VME  BUS

Ethernet

ZPEN3

Mother Board

（14）　ZNIO2

| SH2 −DSP | | EI Logic |
| --- | --- | --- |
| | Interlocking status data | |
| | Interlocking status data | ZPEN3 |

VME　BUS

Optical fiber cable

ZNIO2

Mother Board

(15)  ZSIO2



SH2
−DSP

・Request command for
interlocking status data
・Time correction command

Interlocking status data
edited by ZPEN3

ZPEN3

・Request command for
interlocking status data
・Time correction command

Interlocking status data
edited by ZPEN3

Protocol
Converter

VME  BUS

RS−232C cable

ZSIO2

Mother Board

(16)  KDD172-KY48-2

```
Logic
DC24V                        ┌─────────┐  DC5V
                             │  DC/DC  ├──────────→
INPUT                        └─────────┘  OUTPUT

                             ┌─────────┐  DC12V
                             │  DC/DC  ├──────────→
                             └─────────┘  OUTPUT
```

KDD172-KY48-2

Mother Board

## 7.15.2   K5BMC EI System General Flow Chart

If impossibility and/or failure of transmission are detected transmission between FSIO/FIO7-[P], FSIO-EX/EXTFIO7P and ET-PIO2/MMIF2 won't be performed.

**Logic Module {F486-4I}**

Transmission monitoring

**Basic Program**
1. When it is turned ON, it initializes hardware and loads programs and parameter fields.
2. "Cycle Control" is a module which controls operating cycle of the program that controls the interlocking logic card.
   Basic functions are fixed cycle control cycle delay control etc .
3. "System Control" controls master/slave systems operation of the interlocking logic card that has been configured as a dual system when master system fails.
   Basic functions are to check whether master system is normal and to changeover to slave system when master system fails.
4. "Output" is a module that outputs control data from the interlocking unit to external units and starts modules regarding transmissions of the ET-NET and the MM-NET drivers.
5. "Input" is a module that inputs indication data from the external units to the interlocking logic card and starts up the modules regarding reception of ET-NET and MM-NET drivers.
6. "Interlocking Program" module makes interlocking functions available by the data log created by the LDC tools.
7. "Inter-system transmission" is a module that interchanges processing results between system 1 and 2 of the interlocking logic card.    It is an essential module that completes the data exchange function between system 1 and 2 of the interlocking unit and synchronization between interlocking cards which are configured as dual systems.

**Logic Processing Area**
Configuration of each logic processing area has been set by basic program as per specific format and length of each area has been set for each station according to the parameter in parameter files .
In the logic processing areas data is exchanged between master and slave systems and out of that data. Processing result area and ET output area are compared by master and slave systems .

**Driver Program**
This is driver program that recognizes cards that are configured in the logic part .

**Parameter File**
It sets cards that are configured in the logic part offsets of terminal constant number etc . and data length to "0".  6 bits in the end of each file indicate checksum and CRC value.
On start-up, the logic card starts reading this file for verifying each parameter setting .

**Data screening**
P/ N check.   CRC verification and ID/ĪD verification are performed.

Receives the conditions of system2 in control, system2 in normal etc.

IC Card
Parameter File
IC Card Driver

PIO

**Intersystem transmission**
FIFO   FIFO

Interlocking Equipment System 1
DID

Interlocking Equipment System 2
DID

FIFO   FIFO
**Intersystem transmission**

The Master system gives notice of processing cycle timing to the Slave system . If processing results do not match between the Master and the Slave systems , the Master system continues control output to outside as the superior system .

Master system's processing timing is input from the slave system to synchronize master system's processing timing with slave system's (synchronization). If the processing results do not match between systems , the slave system stops control output to outside as inferior system.

P_ON initialization
Transmission monitoring

RAM
Cycle Control
System Control
Output
Input
Interlocking Program
Intersystem Transmission
Others

Logic Processing Area

The interlocking program sets data of the logic processing area.

**i486**

PIO

IC Card
Parameter File
IC Card Driver

System A Bus
CPU   RAM   ROM   I/O   → WDT_A
Bus comparator → CHK1 / CHK2
System B Bus
CPU   RAM   ROM   I/O   → WDT_B

**Logic Module {F486-4I}**

Off Line System
Manual Input Data
Interlocking Data

**Peripheral I/O**

**V M E**

**ET SIO+ MT SIO+ FSD {FSIO/FIO7-[P]}**

**Electronic terminals / OPC**
Input and output between the Logic Module and the electronic terminal / OPC are performed as a Fixed-cycle transmission and can use up to 3 lines.

**Interlocking Monitor**
Between the Logic Module and the electronic terminal / OPC, information is transmitted in a fixed- cycle procedure.

**ET SIO {FSIO-EX/ EXPFIO7P}**

**Electronic terminals / OPC**
Between the Logic Module and the electronic terminal/ OPC, information is transmitted in a fixed-cycle procedure and 2 lines can be connected.

**Peripheral I/O**

**V M E**

**ET SIO+ MT SIO+ FSD {FSIO/FIO7-[P]}**

DRAM   SH2
FIFO x3
FSD
CHK1
CHK2
WDT_A
WDT_B
FSD
CMA
SCA

**ET SIO {FSIO-EX/ EXPFIO7P}**
FIFO x2

**Journal Module**

ZNIO2 — Receiving the EI status data every 300 msec.
ZPEN3 — Accumulating EI status data from ZNIO2. Transmit real time information to MTC.
ZSIO2 — Receiving EI status data sending request on every 200ms from DL, and transmit EI status data to DL according to the request. Receiving time correction request when necessary from DL.

Protocol Converter   Data Logger System

LINE2B System 1
LINE2B System 2

Electronic Terminal Line (ET-NET)

Splitter
SPHC -TT
Indication information is transmitted through the wiring

Maintenance System Line (MM-NET)
SPHC -TT

Electronic Terminal Line (ET-NET)

**Electronic Terminal (ET-PIO2 / MMIF2)**

**Electronic Terminal:  ET-PIO2**
The terminal has 2 CPUs (systems U and V) and a comparator.  The comparator is for checking the results processed by these 2 CPUs.
It has an asymmetric diversity in failure mode that stops alternate output of output bit when one of 2 CPUs or the comparator fails or if any discrepancy is found in the processing results from these 2 CPUs.
Primary and secondary sides of the input circuit have been isolated with 2 photo couplers that have been connected in series in the primary side to detect failures of fixation to the ON side.
Verification of inputs is carried out by the diagnosis function. If it decides that the relevant circuit has failed, it makes "0" side ie. Safe side active.

**Electronic Terminal:  MMIF2**
It outputs processing results of single system CPU.

INIO2 has 2 channels.  The Interlocking monitor uses 2 for storage purpose etc.

**MTC**
ChA   INIO2 System 1
ChA   INIO2 System 2

**OPC**
ChA   INIO2
ChB

FSP: Fail-Safe Processor
R:    Control (Load) Relay
PMR: Photo Mos Relay
FSD:  Fail Safe Driver
ROR: Output and diagnosis Relay

**ET-PIO2   Input Circuit**
System 1
FSP
CPU System U
Comparator
CPU System V
Input bit   5V   0V   5V
Checking Singal
R   I/F B26V
I/F C26V
To System 2

**ET-PIO2   Output Circuit**
System 1
FSP
CPU System U
Comparator
CPU System V
CHK1   CHK2
Control bit (1/0)
Control bit '1'
Control bit '0'
FSD   ROR
PMR   ROR
CHK1
CHK2
ROR
I/F B26V
I/F C26V
R
To System 2

Kyosan Electric Mfg. Co., Ltd.

### 7.15.3    K5BMC EI System Standard Configuration

Signal Equipment Room

Logic Rack

OPC (Operator Console)

INIO2

MMIF Sub-Rack

MTC (Maintenance Console)

Logic Sub-Rack

INIO2

ETH I/F

GI 2$^C$

SPHC
-TT

SPHC
-PW

System 1

GI 2$^C$

LINE
M2

MM
IF2

Failure

LINE
M2

F486
-4I

FSIO

FIO7
-[P]

CH1    GI 2$^C$
CH2    GI 2$^C$
CH3    GI 2$^C$

IPU
6C

DID

FSIO
-EX

EXTFI
O7P

CH5    GI 2$^C$

CCIP  (Control Panel)

LINE
M2

MM
IF2

Indication

Control

LINE
M2

ET-PIO Sub-Rack

System 2

GI 2$^C$

SPHC
-TT

SPHC
-PW

GI 2$^C$

LINE
2B

F486
-4I

FSIO

FIO7
-[P]

CH1    GI 2$^C$
CH2    GI 2$^C$
CH3    GI 2$^C$

Relay Rack

FT·OT
Rack

IPU
6C

DID

FSIO
-EX

EXTFI
O7P

CH5    GI 2$^C$

LINE
2B

ET-
PIO2

OT

Field

Signal

Point Machine

Track Circuit

etc

Journal Module

GI 1$^C$    Rx

GI 1$^C$    Rx

ZNIO2

ZPEN3

ZSIO2

RS-232C

Protocol
Converter

Ethernet (ETH)

KDD172
KY48-2

Data Logger
System

NFB

AC230V

AC/DC
Converter

Rack Power
DC24V

DC24V

Central
Monitoring
Unit

# Instruction Manual

# for

# LDC System for Windows

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Version 2

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**Kyosan Electric Mfg. Co., Ltd.**

## Document Revision History

| Ver. No. | Date | Nature of Revision | Author(s) |
|---|---|---|---|
| 1 | 01. Dec. 2003 | First Edition | T. Suzuki |
| 2 | 12. Feb. 2011 | Addition of Windows XP. Addition regarding to IC Card control and Display of Revision history | T. Suzuki |
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# CONTENTS

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## 1.  Introduction

### 1.1 General

The LDC system is able to create circuit diagram data corresponding to any family member of Kyosan's electronic interlocking equipment by user's setting. Therefore, functions and screens may be different with those of this manual depending on a station.

In this manual, all required functions of the LDC system are described.

### 1.2  System configuration

| Hardware/Software | Configuration |
| --- | --- |
| CPU | More than 486 |
| RAM | More than 32MB |
| Required hardware capacity (excluding each station data) | 3MB |
| Operating System | Windows 98 <br> Windows NT <br> Windows 2000 <br> Windows XP |
| Display | VGA <br> Resolution :more than 800 x 600 is recommended . |
| Pointing device | Mouse |
| ROM writer | Pecker11 <br> R4945A <br> RS-232C (cross cable) |

### 1.3  Restrictive matters

#### 1.3.1  Each station data storage

The system has no function of storing each station data automatically. Each station data should be saved manually. There is a possibility that some data cannot be saved in one FD. Use of compression software is recommended for efficient data management.

#### 1.3.2  ROM writer        For K5BMC, ROM writer is not used.

ROM writer supports Pecker 1100 made by AVAL and R4945 by ADVANTEST.

Depending on the version of Pecker 1100, there is an possibility that it cannot communicate with 19200 bps.

In that case, use of 9600 bps is recommended.

#### 1.3.3  New functions added to ver. 1.20

a. Start-up restriction with HASP key.

b. ROM writer now supports R4945A made by ADVANTEST

#### 1.3.4  New functions added to ver. 1.21

a. The system has been so modified that error message concerning HASP key which had been added to ver. 1.20 can be displayed.(For more details of error messages, see Section 6.)

## 2. Function description

### 2.1 Function List

#### 2.1.1 Input of system constant

| No. | Description | Outline of function | Remarks |
|-----|-------------|---------------------|---------|
| 1 | Logical basis fixed number input | Setting of system cycle. | |
| 2 | Terminal basis fixed number input | Defines system cycle, application cycle, etc. | * |
| 3 | Terminal number of units input | Setting of ET numbers. | * |
| 4 | Point machine terminal definition | Setting for output terminals, circuits, etc. are Setting contents are different between simplex system and duplex system. | * |
| 5 | Signal terminal definition | Setting of circuits. | * |
| 6 | AC terminal definition | Setting of output circuits. | * |
| 7 | DC terminal definition | Setting of circuits.(effective only for duplex system ET – DC) | * |
| 8 | Wide use terminal definition | Setting of assignment numbers for every ET and outputs. | * |

Table 2-1

\* For K5BMC, these functions are not used.

#### 2.1.2 Compiling of relay name

| No. | Description | Outline of function | Remarks |
|-----|-------------|---------------------|---------|
| 1 | Input of relay name | Defines names to be used in logical operation for every bit. | |

Table 2-2

#### 2.1.3 Compiling of circuit diagram data

| No. | Description | Outline of function | Remarks |
|-----|-------------|---------------------|---------|
| 1 | Compiling of logical equation | Logical equations can be inputted directly. | |
| 2 | Coil look | Registered logical equations will be indicated by coil names. | |
| 3 | Circuit diagram look | Registered logical equations will be indicated with circuit diagrams. | |

Table 2-3

#### 2.1.4 Compiling

| No. | Description | Outline of function | Remarks |
|-----|-------------|---------------------|---------|
| 1 | Compiling | Creates objects after checking validity of logical equation and relay names. | |

Table 2-4

### 2.1.5  Creation of circuit diagram

| No. | Description | Outline of function | Remarks |
|---|---|---|---|
| 1 | LDC object | Circuit diagrams are created from compiled objects. | |
| 2 | ROM object | Circuit diagrams will be created from objects read from ROM. | |
| 3 | Comparison | Circuit diagrams will be created by making correspondence of contents between LDC objects and ROM objects. | |
| 4 | Disagreement | Circuit diagrams will be created by making correspondence of different logics only between LDC objects and ROM objects. | |

Table 2-5

For K5BMC, please read "ROM" as "IC cards".

### 2.1.6  ROM writer control

| No. | Description | Outline of function | Remarks |
|---|---|---|---|
| 1 | ROM write-in | Data will be written in ROM by controlling ROM writer. | * |
| 2 | ROM read-out | Contents of ROM will be read out by controlling ROM writer. | * |

Table 2-6

* For K5BMC, these functions are not used.

### 2.1.7  Comparing

| No. | Description | Outline of function | Remarks |
|---|---|---|---|
| 1 | Comparing | Comparison between LDC objects and read in objects will be done. | |

Table 2-7

### 2.1.8  IC card control

| No. | Description | Outline of function | Remarks |
|---|---|---|---|
| 1 | IC card write-in | Logic data will be written in IC card . | |
| 2 | IC card read-out | Logic data will be read out from the IC card. | |
| 3 | Comparing parameter | Created logic data and existing logic data are compared. | |
| 4 | Program write-in | Program will be written in IC card . | |
| 5 | Program read-out | Program will be read out from the IC card | |

Table 2-8

### 2.1.9  Displaying revised history

| No. | Description | Outline of function | Remarks |
|---|---|---|---|
| 1 | Revised history | Version No., Checksum Value and Revised date are registered at the timing of the data writing in IC card. These revised history can be checked. | |

Table 2-9

**2.2  Station data management**

Each station data is to be managed and edited as follows.

Both directories, one for managing each station data and the other compiling it, will be defined by LDCDRIVE.CSV.

Station data will be managed with a file (Station setting file) which stores information on directory holding Each station data and so on and its directory.

Station setting file name is to be "Abbreviation of station LDW"

Directory managing each station data has been defined as a data drive in LDCDRIVE.CSV.

|                        |                                        |
|------------------------|----------------------------------------|
| Data drive (directory) | Station setting file 1 (Station1.LDW)  |
|                        | Station setting file 2 (Station2.LDW)  |
|                        | ¥Station1                              |
|                        | Data file of Station1                  |
|                        | ¥Station2                              |
|                        | Data file of Station2                  |
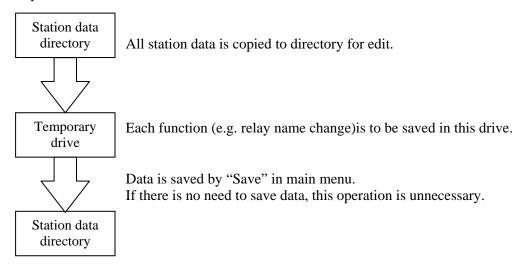
Compilation method

```
┌──────────────┐
│ Station data │      All station data is copied to directory for edit.
│  directory   │
└──────────────┘
       │
       ▼
┌──────────────┐
│  Temporary   │      Each function (e.g. relay name change)is to be saved in this drive.
│    drive     │
└──────────────┘
       │
       ▼
                     Data is saved by "Save" in main menu.
                     If there is no need to save data, this operation is unnecessary.
┌──────────────┐
│ Station data │
│  directory   │
└──────────────┘
```

The contents of temporary drive will be cleared immediately before each station data is read in.

### 2.3   Backup

When station data is revised, a back-up file is created and the previous data is saved.
Each file will be named according to its data type.
Also, for changes in relay name and logic equation source, a revision history is created.
At data revision, registration of the reason will be required.
On revising data for the first time, the following dialog box will appear and reasons for the revision must be typed in the dialog box.

**Registration of modification history**

| History | 1 | OK |
| Name of worker | TEST | |
| Modification reason | NEW CREATION | |
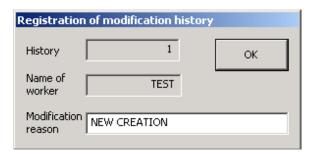
Fig. 2-1

Revision number, operator's name and reasons for the revision are to be specified in SAGYOU.TXT.

Backup file reference table

| No. | File format | Backup format | Example |
|-----|-------------|---------------|------------|
| 1 | CSV | BAK | LOGIC11.BAK |
| 2 | HEN | HBK | RELAY0.HBK |

Table 2-8

HEN format file holds revision history.

### 3. Operation method
#### 3.1 Input of operator's name
For creation and/or modification of station data, Full name code and password of operator is required.

##### 3.1.1 Opening of station data by normal mode.
When the system is started, a dialog is displayed to input an operator's name.
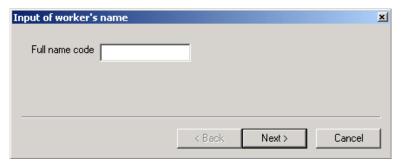
Fig. 3-1

After inputting of Full name code, click [Next] button.
If the name code is registered, the following dialog box to input a password is displayed.
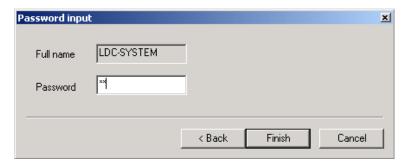
Fig. 3-2

Input the password.
When [Finish] button is clicked, the password will be checked for validity.
If it is OK, main menu will be displayed and all functions can be used.

**3.1.2  Opening of station data by reference mode.**

It is not required to input Full name code if station data is only referred.
Without inputting anything in the dialog box, click [Next] button.
Message below will appear.



Fig. 3-3

If [Ignore] button is clicked, a confirmation dialog box below will be displayed.
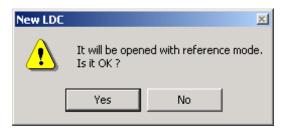


Fig. 3-4

When [Yes] button is clicked, station data can be opened with reference mode.
At the reference mode, data can not be modified nor saved.

### 3.2 Main menu screen

Function buttons are displayed on main menu screen to edit station data.
Function buttons displayed will differ according to each station data.
Function buttons will be displayed by "LDCMAIN.CSV" when station data is read in.

#### 3.2.1 Start from start menu
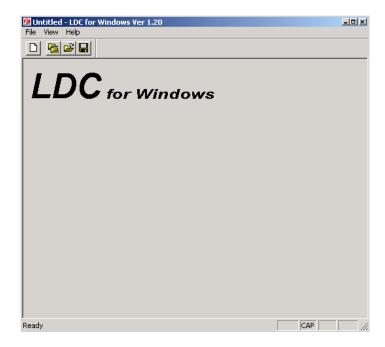


Fig. 3-5

Function buttons will not be displayed until station data is read in as they will differ according to the station data.
When station data is read in, the same page as that in startup from station data will be displayed.

**3.2.2    Start from station data**
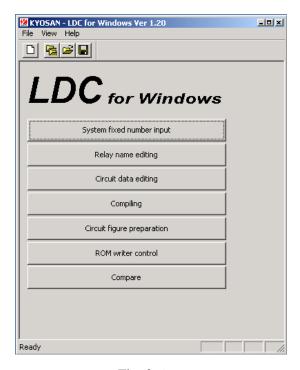


Fig. 3-6

Displayed menu may differ according to each station data.
(The contents of "LDCMAIN.CSV" will be indicated.)

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### 3.2.3 Functions

1) Modification of existing station data
   It will be modified by opening of station data already in existence.
2) Reuse of existing station data
   New station data will be created based on station data already created.
3) New data creation
   Station data will be created from the beginning.
4) Read-in of conventional LDC
   Station data made by LDC of MS – DOS edition will be read in.
5) Save
   Compiled or created station data will be saved on hard disk.

3.2.3.1  Modification of existing station data
Select "File" – "Modification of existing station data", or click
"Open" on tool bar.
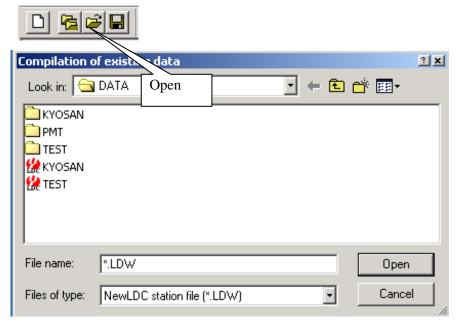


Fig.3-7

Existing station data will be displayed.
Select the file named "Abbreviation for station. LDW".
Click [Open] button.

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3.2.3.2   Reuse of existing station data
Select "File" - "Reuse of existing station data", or click "Reuse" on tool bar.

Reuse
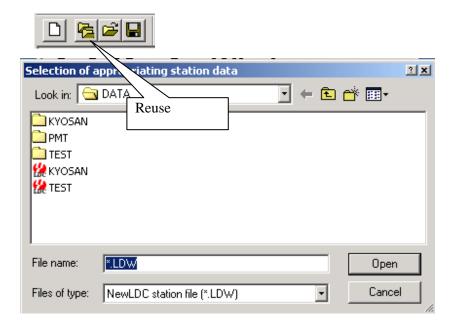
Fig.3-8

Select station data to be reused (LDW file), and click [Open] button.

Fig.3-9

After inputting "Abbreviation for station" and "System form", and click [OK] button.
It is indispensable to input "Abbreviation for station" and "System form".
At default setting, "Abbreviation for station" will be name of station data.

Next, history of creation will be registered.



Fig.3-10

Input appropriate words next to "Modification reason".
Click [OK] button.
This action cannot be omitted.
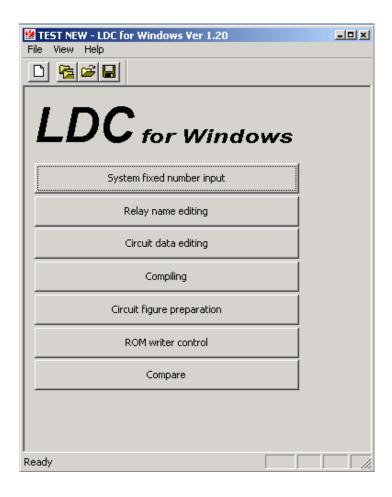


Fig.3-11

New station data which has the same contents as the original will be created.
It is necessary to save new station data.

3.2.3.3   New data creation
Select "File" - "New data creation" or click "New data" on tool bar.



New data

Fig.3-12

Set FD on which is stored "Station setting file" into FD driver.
Click [Yes] button.
Where the station setting file is read from other than FD, also click [Yes] button.
If FD is not set in FD drive, the following message will appear.
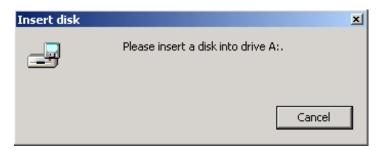


Fig.3-13

Click [Cancel] button. When cancelled, a dialog to select a folder will be displayed.
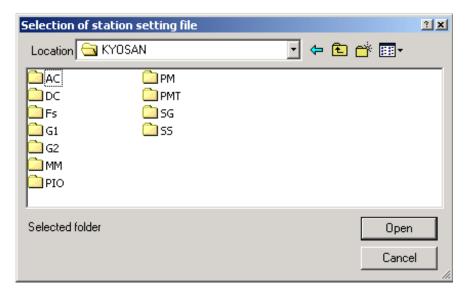


Fig.3-14

Select the folder in which station setting file is stored.
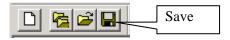
Input "Abbreviation for station" and "System form".



Fig.3-15

It is indispensable to input "Abbreviation for station" and "System form".
"Abbreviation for station" will be used for name of station data of default.

3.2.3.4  Save
Select "File" - "Save", or click "Save" on tool bar.



When it is created by new data creation or reuse of existing station data, a dialog below will be displayed. Input the file name to be stored.
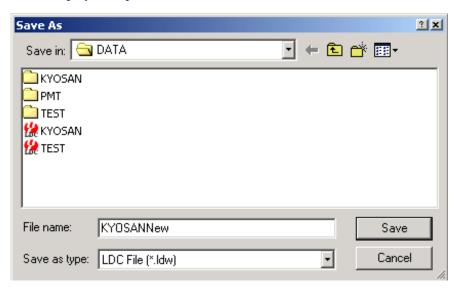


Fig.3-16

File name will be "Abbreviation for station LDW" at default setting.
It is recommended to save it without change.

3.2.3.5    Finish of application

The system can be shut down by clicking "Finish of application" from "File" or system button (x mark on upper right side of the page).

If any modification has been made, the following dialog box will appear.
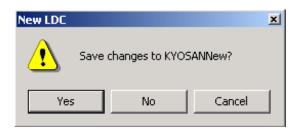


Fig.3-17

[Yes]                : It will be finished after data is saved.
[No]                 : It will be finished without saving data.
[Cancel]         : It will make invalid for operation of finish.

### 3.3  Input of System Constant

For K5BMC, only [Logical basis fixed number input] button in [Input menu for system constants] shall be used.

Setting items of system constant may differ according to the station data.
When [System fixed number input] button on menu screen is clicked, the menu screen for system constant input is displayed as follows.
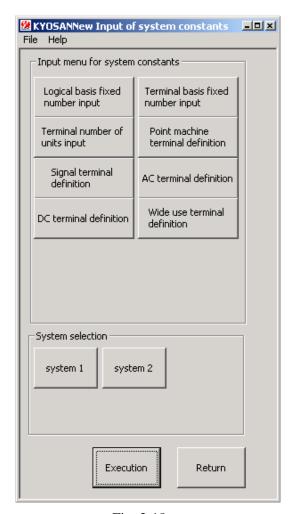


Fig. 3-18

Select an item and a system (only when system selection is effective), and click [Execution] button.
It will return to the main menu by clicking [Return] button.

#### 3.3.1  Input function of system constant
    (1)  Logical basis fixed number input
    (2)  Terminal basis fixed number input
    (3)  Terminal number of units input
    (4)  Point machine terminal definition
    (5)  Signal terminal definition
    (6)  AC terminal definition
    (7)  DC terminal definition
    (8)  Wide use terminal definition

3.3.1.1　Logical basis fixed number input
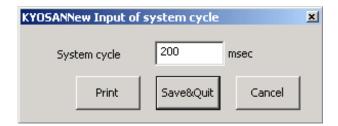


Fig. 3-26

Input data for each item, and then click [Save&Quit] button.
When [Print] button is clicked, the contents being set at present will be printed.
When [Cancel] button is clicked, it will be finished without reflecting modified contents in station data.

Input range

| No. | Item | Min. value | Max. value | Remarks |
|---|---|---|---|---|
| 1 | System cycle | 1 | 9999 | |

Table 3-4

3.3.1.2        Terminal basis fixed number input

For K5BMC, this function is not used.



Fig.3-19

Input data for each item, and then click [Save&Quit].
When [Print] button is clicked, the contents being set at present will be printed.
When [Cancel] button is clicked, it will be finished without reflecting the modified contents in station data.

Input range of each item

| No. | Item | Min. value | Max. value | Remarks |
|---|---|---|---|---|
| 1 | System cycle | 1 | 9999 | |
| 2 | Cycle of terminal | 1 | 9999 | |
| 3 | Rest time of terminal | 0 | 9999 | |
| 4 | Cycle of general use of terminal | 0 | 9999 | |
| 5 | Byte number of control 1 | 0 | 64 | Note 1 |
| 6 | Byte number of control 2 | 0 | 64 | Note 1 |
| 7 | Byte number of control 3 | 0 | 64 | Note 1 |
| 8 | Byte number of control 4 | 0 | 64 | Note 1 |

Table 3-1

(Note 1)
  Total byte number of control 1 to 4 shall be less than 208 bytes.
  Item names are being defined by "SIO1.CSV".

3.3.1.3 Terminal number of units input

For K5BMC, this function is not used.
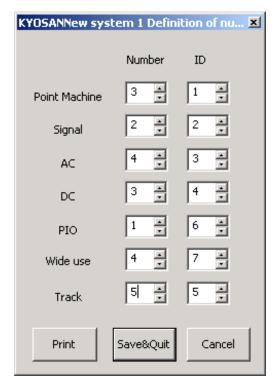


Fig.3-20

Terminal numbers to be used and their ID shall be defined for each system.
Input data for each item, and then click [Save&Quit] button.
When [Print] button is clicked, the contents being set at present will be printed.
When [Cancel] button is clicked, it will be finished without reflecting the modified contents in station data.

Input range of each item

| No. | Item | Min. value | Max. value | Remarks |
|-----|------|-----------|-----------|---------|
| 1 | Number of terminal | 0 | 15 | |
| 2 | ID | 0 | 15 | |

Table 3-2

3.3.1.4   Point machine terminal definition

For K5BMC, this function is not used.
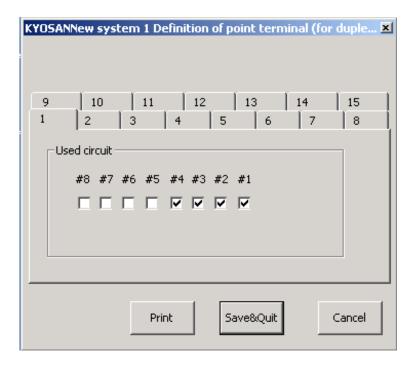


Fig.3-22

Check the circuits in use, and then click [Save&Quit] button.
When [Print] button is clicked, the contents being set at present will be printed.
When [Cancel] button is clicked, it will be finished without reflecting modified
contents in station data.

3.3.1.5 Signal terminal definition

For K5BMC, this function is not used.
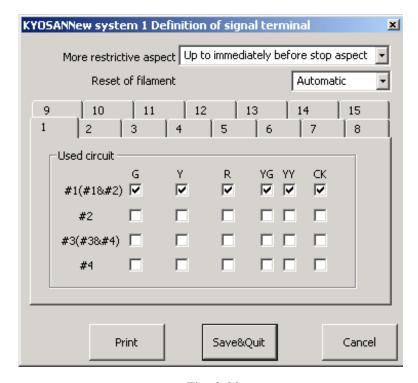


Fig. 3-23

Select data for each item, and then click [Save&Quit] button.
When [Print] button is clicked, the contents being set at present will be printed.
When [Cancel] button is clicked, it will be finished without reflecting modified contents in station data.

"Lower aspect" shall be selected from following items:
(1) None
(2) Before stop aspect
(3) Till stop aspect

"Reset of broken filament" shall be selected from following items:
(1) Automatic
(2) Manual

Limits of check for "circuit – in use" are as follows:
(1) In case that 5-aspects setting is made for # 1(#1 & #2), it will not possible to set for # 2.
(2) Setting method for # 3(# 3 & # 4) and # 4 shall be same as above (1).

3.3.1.6 AC terminal definition

For K5BMC, this function is not used.



Fig.3-24

Select data for each item, and then click [Save&Quit] button.
When [Print] button is clicked, the contents being set at present will be printed.
When [Cancel] button is clicked, it will be finished without reflecting modified contents in station data.

"Resetting of broken filament" shall be selected from following items:
(1) Automatic
(2) Manual

3.3.1.7   DC terminal definition

For K5BMC, this function is not used.
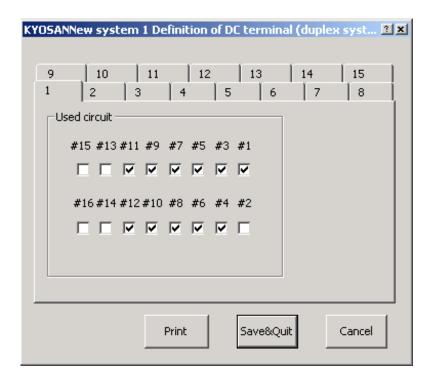


Fig.3-25

Check circuits in use, and then click [Save&Quit] button.
When [Print] button is clicked, the contents being modified will be printed.
When [Cancel] button is clicked, it will be finished without reflecting modified
contents in station data.

3.3.1.8 Wide use terminal definition

For K5BMC, this function is not used.
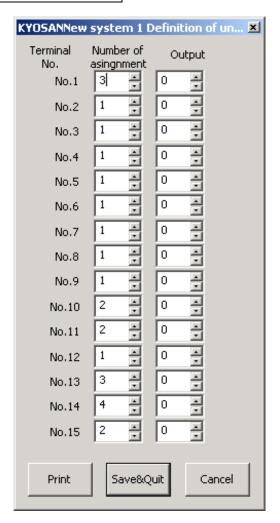


Fig.3-21

Input data for each item, and then click [Save&Quit].
When [Print] button is clicked, the contents being set at present will be printed.
When [Cancel] button is clicked, it will be finished without reflecting modified contents in station data.

Input range for each item

| No. | Item | Min. value | Max. value | Remarks |
|-----|------|-----------|-----------|---------|
| 1 | Terminal number assigned | 0 | 15 | |
| 2 | Output | 0 | 15 | |

Table 3-3

3.3.1.9    Print
It will be able to print setting data from each function.



Fig. 3-27
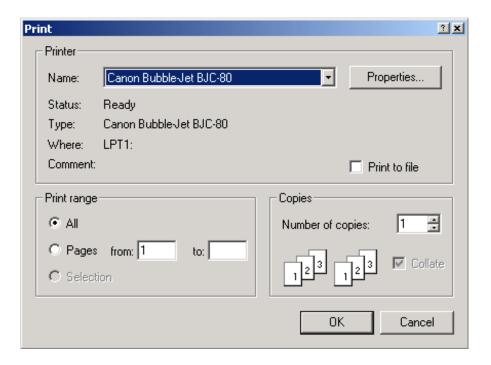
### 3.4  Compiling of relay name
#### 3.4.1        Menu screen

For K5BMC, only [Safety system] button shall be used.
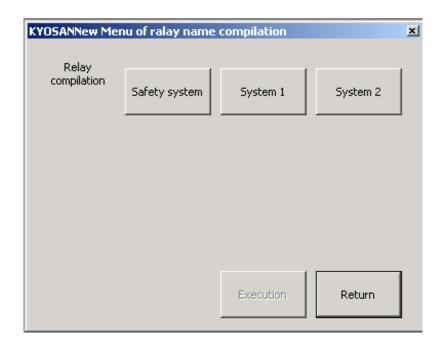


Fig. 3-28

Menu of relay name library to be used in station data is displayed.
[Safety system] button shall be selected at the time of compiling of relay name library.
[System 1]or [System 2] button shall be used to draw up interface logic between systems.
Select each item respectively, and then click [Execution] button.
When [Return] button is clicked, it will return to main menu screen.

### 3.4.2　Compiling of relay name
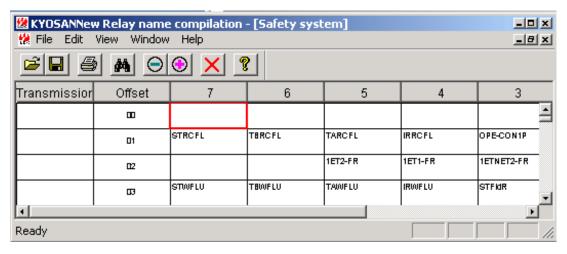


Fig.3-29

Outline of menu function
"File" menu

| | |
|---|---|
| Open | : Other relay name library will be opened. |
| Close | : Input of relay name will be finished with each system unit. |
| Overwritten save | : Relay names under compiling will be saved. |
| Print | : Relay names will be printed. |
| Print Setting | : Printing format will be set. |
| Exit | : It will return to main menu after finish of input of all of relay names. |

"Edit" menu

| | |
|---|---|
| Insertion of line | : One blank line will be inserted at cursor's position and lines will be shifted down thereafter. |
| Deletion of line | : One line will be deleted at cursor's position and lines will be shifted up thereafter. |
| Retrieval | : Relay names will be retrieved. |
| Shift of cursor | : Cursor will be shifted to an instructed position. |
| Right shift | : Relay name will be shifted right from cursor's position. |
| Left shift | : Relay name will be shifted left from cursor' position. |

"View" menu

| | |
|---|---|
| Tool bar | : Tool bar will be changed to display or non-display. |
| Status bar | : Status bar will be changed to display or non-display. |
| Enlargement | : Relay name will be displayed with enlargement. |
| Reduction | : Relay name will be displayed with reduction. |

"Window" menu

It will be able to instruct an display method when many relay name libraries are opened. In addition, opened relay name library will be changed.

Tool bar
It corresponds to "Open", "Save with overwriting", "Print", "Retrieval", "Reduction", "Enlargement", "Error display" and "Version Information" from left side.

3.4.2.1   Open

It will be used to open many relay name libraries at the same a time.
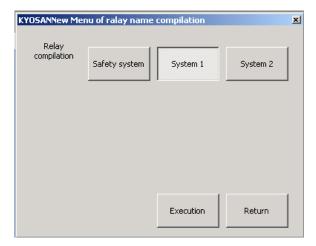


Fig. 3-30

The same dialog as main menu will be displayed.
Select a system button to be edited, and then click [Execution] button.
When a system already opened is selected, the system will become active only.

[Remarks]
If [System 1] or [System 2] drawing up is performed here, it shall be carried out after saving relay names under editing. Edited relay names will not be written in a file until they are saved so that they are not reflected in System 1 or System 2 logic.

3.4.2.2   Close

It will be used to finish relay name compiling for each system unit.
When modifications are made for a relay name library to be finished compiling, a message will be displayed to confirm saving the contents as follows:
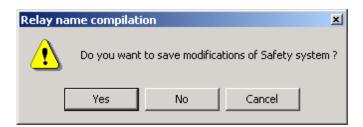


Fig.3-31

[Yes]          :It will be finished after saving.
[No]           :It will be finished without saving.
[Cancel]       :It will be stopped for operation of finish.
Click any button above.

3.4.2.3  Save with overwriting
Relay name library will not be finished, but saved.
No message of confirmation for writing in will be displayed.

3.4.2.4  Print
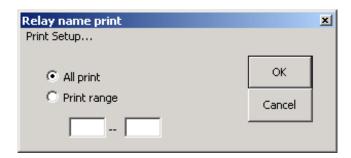


Fig. 3-32

Relay name library under editing will be printed.
When a print range is selected, select the print range by offset address.
Offset address shall be input with hexa - decimal number as same as display.
When the print range was instructed, click [OK] button. Then, a dialog for print will be displayed.
Relay names of 16 offsets in maximum will be printed on 1 page.
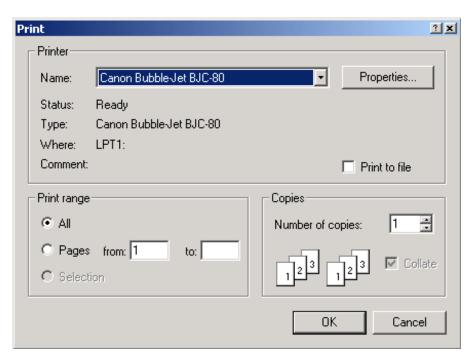


Fig.3-33

When a print range is instructed, total page numbers will be displayed in accordance with the size of relay names so that the instruction shall be made within the range.

3.4.2.5  Finish of application
After closing all relay name libraries, it will return to main menu.
A message of confirmation for saving will be displayed, in the same way for operation of "Close", for any edited relay name library that is not saved.

3.4.2.6   Retrieval



Fig. 3-34

A relay name under compiling shall be retrieved, and shift the cursor at the position of the relay name. Input letters to be retrieved to retrieval letter line, and then click [Retrieval next] button. Since retrieval letter lines are memorized for 16 events in maximum input previously, it will be possible to select a letter line by clicking the down arrow button. Starting position for retrieval is from the present cursor position.

Explanation for option:
   It distinguishes between a capital letter and a small letter:
      When checked, it will be retrieved by judgment that English capital and
      small letters are different letters.
Retrieval form top:
      When checked, it will retrieve from the top ignoring the present cursor
      position.
Remarks:
      Retrieval is made for a relay name including the retrieval letter line that was
      input.

3.4.2.7   Cursor shift



Fig.3-35

A screen will be renewed by shifting of cursor position.
In case that the cursor is shifted to an instructed offset, input the offset and click [Execution] button.
[To the head] or [To the last] button is clicked, the cursor will be shifted to the respective
position.

3.4.2.8 Input relay name
When a relay name is input or modified, the cursor shall be shifted to the position of the relay name, and make double clicking of the name, or depress Enter key.
A dialog for input will be displayed.
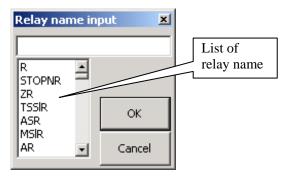


Fig.3-36

Input a relay name, and click [OK] Button. By double clicking of a letter line in "Relay name look", it will be possible to input a letter line in input area.

Another input method:
Click the right side of mouse at input position, and select "Name selection input" from pop up menu.
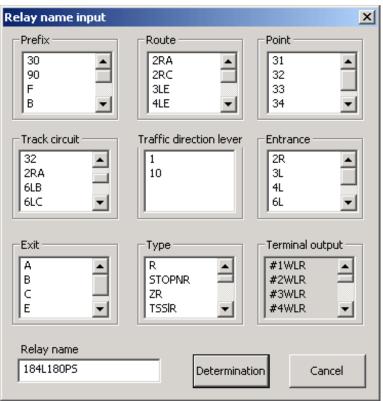


Fig.3-37

Whenever a letter line is selected from a look of "Prefix", "Route", "Type" and so on, the selected letter line will be added in relay name input area.
It is possible to input a letter directly in the relay name input area.
After inputting the relay name, click [Determination] button.
When a relay name is deleted, the relay name shall be cleared, and click [Determination] button.

3.4.2.9  Replacement
"Replacement" is provided to change a relay name and also to change a relay name used in logical equations.
Select "Replace" from pop up menu.
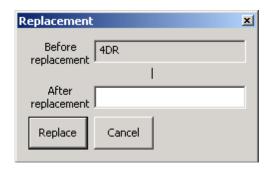


Fig.3-38

Input a relay name after replaced, and click [Replacement] button.
Logical equations to be objects for replacement shall be of a system under compiling.

3.4.2.10  Display for compiling error
A look display is made for relay names that could not be found from result of compiling.
Select "Display for compiling error" of tool bar or pop up menu.



| Relay name | Coil name | Storing location of... | Circuit diagram No. |
|---|---|---|---|
| RCMM1A-FR | RCMM1A-FR | Safety system Co... | 1 |
| 1LLAN-FR | 1LLAN-FR | Safety system Co... | 3 |
| RCMM1A-FR | 1ET1-FR | Safety system Co... | 7 |
| 1LLAN-FR | 1MM1-8OUT | Safety system Co... | 12 |
| 1LLAN-FR | 1MM1-9OUT | Safety system Co... | 13 |
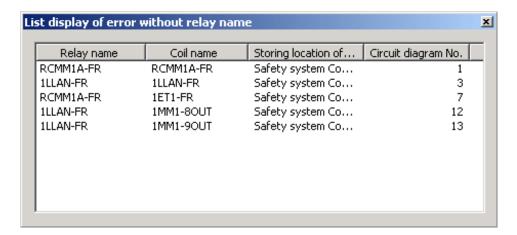
Fig.3-39

It will be possible to edit relay names while displaying this dialog.

### 3.5　Compiling of circuit diagram data
#### 3.5.1　Menu screen

For K5BMC, only [Safety system] button in [Type] menu shall be used.
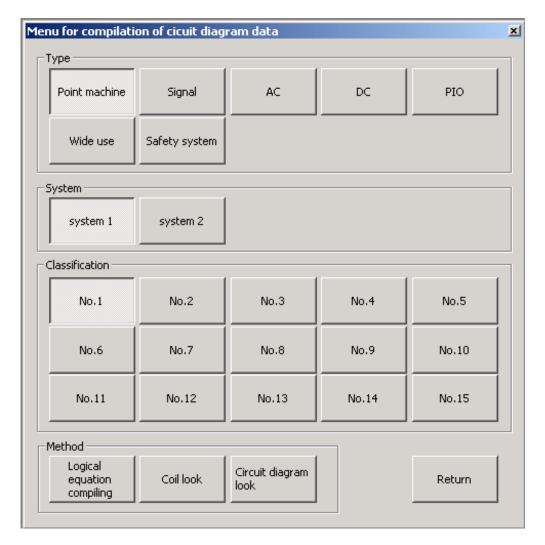
Fig.3-40

Select one item respectively in "Type", "System" and "Classification" and then
click one item in "Method" to display logic equations by a respective indicating method.

Method
Compiling of logic equation　　: Logical data is shown by the boolean algebra method.
Look of coil　　　　　　　　　: Logical data is shown by coil names.
Look of circuit diagram　　　: Logical data is shown by circuit diagrams.

The indication method can be changed freely after opening of logical data.

### 3.5.2 Compiling mode of logic equation
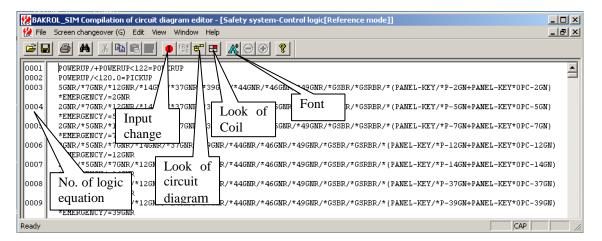


Fig. 3-41

In this mode, logical data shall be input with the form of logic equation.
At the initial display status, it is prohibited to write in.
When [Input change] button of tool bar is clicked, the status will be changed.
Current compiling mode is shown on title bar.
Hollow condition shows the status that it is possible to write in.
It is also possible to change by Insert key.
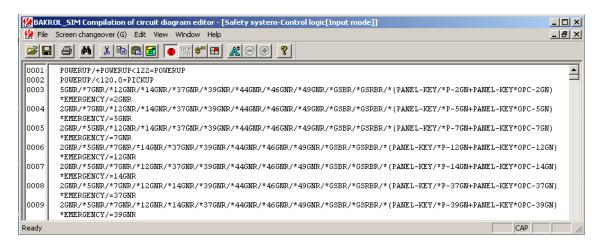


Fig.3-42

This is a possible condition for writing in.
When the right button of mouse is clicked, it can select each kind of function shown in pop up menu.

[Remarks]
Numbers of logic equation are not renewed at input mode.

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3.5.2.1 Input of logic equation

Logic equations are input directly while shifting the cursor by mouse or arrow mark key.(Please confirm that it is under input mode)

In case of inputting relay names, it is possible to perform name selection input as same as relay name compiling.

Select "Name selection input" from pop up menu.
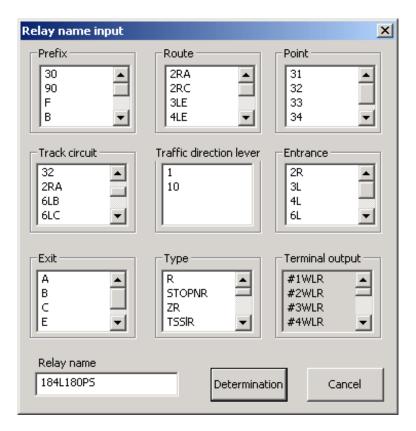


Fig.3-43

After drawing up a relay name, click [Determination] button to insert the relay name at cursor's position.

3.5.2.2 Display mode changeover

It is possible to change the display mode by clicking a changeover button of [Circuit diagram look] or [Coil look].

3.5.2.3 Cut and Paste function

Cut and paste function of Windows standard can be used for compiling of logic equation. It shall be operated from a button of tool bar or "Compiling" menu.

By using this function, operations of copy and shift can be made between circuit diagram data.

In addition, an equation can be inserted from editor of other text base (e.g. memo note).

It is possible for operation to return only once by "Return to before" of "Compiling" menu.

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3.5.2.4 Font

It is possible to change the font of letter displayed by [Font] button.
Please adjust the size of font to be easy to see.
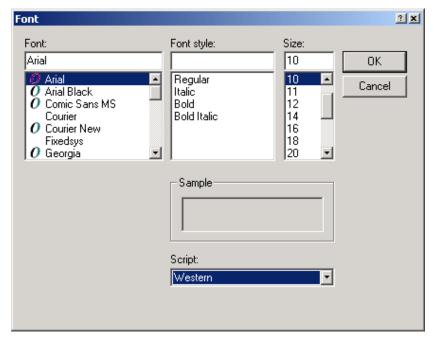


Fig.3-44

Please note that the style can not be changed.

[Remarks]

When the size of font is changed, it may happen occasionally that a logic equation does not correspond with its number of the logic equation. In that case, operation of "Input change" shall be made. When it is reference mode, it shall be changed to input mode and returned to the reference mode again.
When it is input mode, it shall be made to reference mode.

3.5.2.5 Display of circuit diagram

It is possible to confirm by displaying a circuit diagram of cursor's position.
Select "Circuit diagram display" from pop up menu.
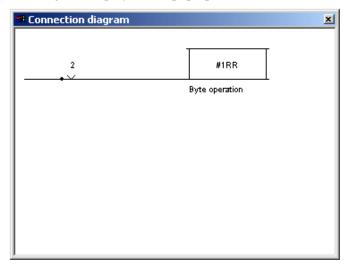


Fig.3-45

Click "x" mark of the upper right to close the screen.

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3.5.2.6 Cursor jump
Display renewal will be made together with shift of cursor to an instructed logic equation.
Select "Cursor jump" from pop up menu.
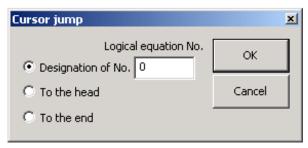


Fig.3-46

When a number is instructed, input a logic equation number.

3.5.2.7 Error retrieval
Compiling error will be displayed.
Select "Error display" from pop up menu.
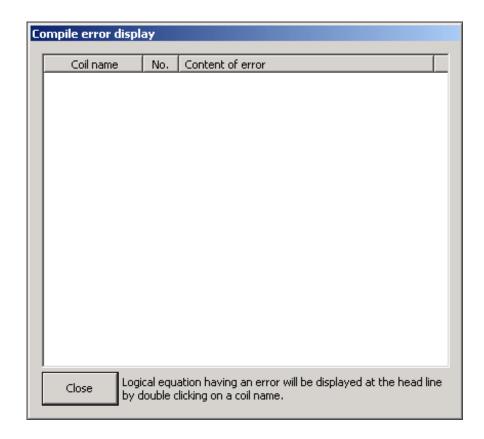


Fig.3-47

When a coil name displayed at the left side is clicked double, the erred logic equation will be displayed at the head line.

3.5.2.8　Change of circuit name
It is carried out to add or delete a circuit name in display of logic equations.
Select "Circuit name change" from pop up menu.
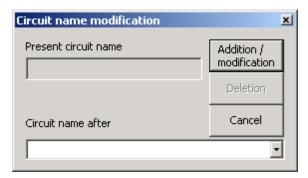


Fig.3-48

A circuit name shall be inserted in front of a logic equation at cursor's position.
The circuit name after changed shall be input at input area for circuit name, and click [Addition change] button. When down arrow mark button at right side
is clicked, circuit names registered at the present are shown in a list so that it is possible to select from the list.
If the circuit name being input does not exist in the list, it will be added in the list.
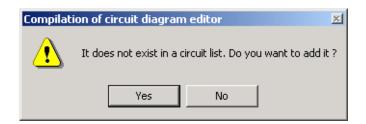


Fig.3-49

In case to delete a circuit name, shift the cursor just below the logic equation for which the circuit name is shown and click "Circuit name change".
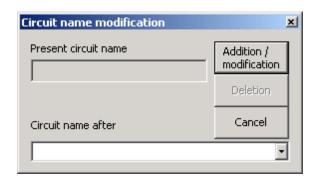


Fig.3-50

Since [Deletion] button becomes effective, click [Deletion] button.

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### 3.5.3   A look mode for coil
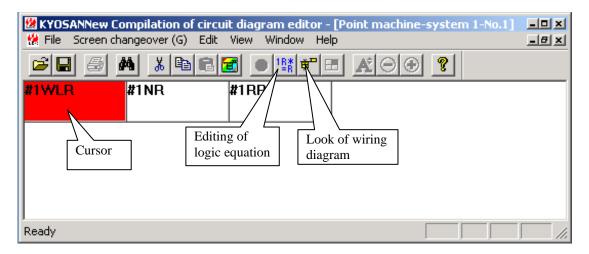


Fig.4-51

Coil names of logic equations (relay names at the right side) will be displayed at a look.
Two indicating methods are provided for display order, one is the order of logic equations and the other is the going up order.
When the right button of mouse is clicked, pop up menu will be displayed so that it can select each kind of function.

3.5.3.1  Circuit diagram display
It is possible to confirm by displaying a circuit diagram of the cursor's position.
Select "Circuit diagram display" from pop up menu.
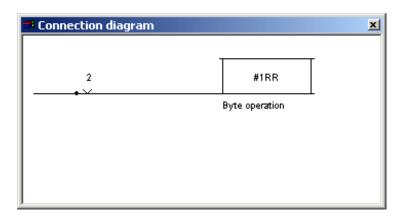


Fig.3-52

3.5.3.2  Addition of circuit diagram
It adds circuit diagram data just before the cursor's position.
Select "Addition of circuit diagram" from pop up menu.
Circuit diagram editor shall be started up to add a circuit diagram.

3.5.3.3  Deletion of circuit diagram
There are two methods for deletion.
1) Select "Deletion of circuit diagram" from pop up menu.
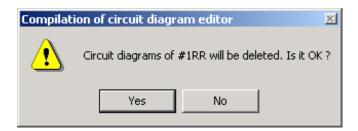


Fig.3-53

A message to confirm for deletion will be displayed.
The deleted circuit diagram by this operation will not be possible to return to the original status.
2) Select "Cut" from compiling menu or tool bar.
The deleted circuit diagram by this operation is memorized in clip board so that it will be possible to return to the original status with "Paste".

3.5.3.4  Cut and Paste functions
It will be possible to copy, shift and delete circuit diagrams by using cut and paste functions of compiling menu or tool bar.
"Cut"      :Circuit diagram data of cursor's position is deleted and memorized at the same time.
"Copy"     :Circuit diagram data of cursor's position is memorized.
"Paste"    :Circuit diagram data memorized is inserted just before cursor's position.

Accordingly, following functions will be realized:
"Cut" + "Paste" = Shift
"Copy" + "Paste" = Copy

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3.5.3.5   Shift of circuit diagram
Circuit diagram data at cursor's position will be shifted to an optional position.
Select "Shift of circuit diagram" from pop up menu.



**Coil look (shift of circuit diagram)**

Object coil   #1NR

Logical equation at
  ○ Forward
  ○ To backward

Click a position to be shifted.

[OK]   [Cancel]
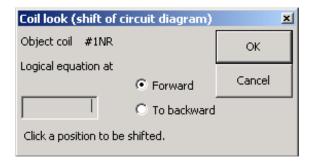
Fig.3-54

When a dialog is displayed, select a coil of a shifted position. Shift the cursor by using mouse.
Information for the circuit diagram data of the shifted position will be displayed in a dialog.

3.5.3.6   Copy of circuit diagram
Circuit diagram data at cursor's position will be copied at an optional position.
Select "Copy of circuit diagram" from pop up menu.



**Coil look (copy of circuit diagram)**

Object coil   #1RR

Logical equation at
  ○ Forward
  ○ To backward

Click a location to be copied.

[OK]   [Cancel]
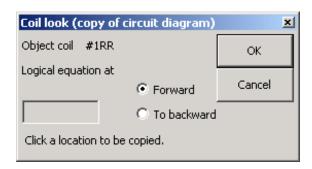
Fig.3-55

When a dialog is displayed, select a coil of a copied position.
Shift the cursor by using mouse.
Information for the circuit diagram of the copied position will be displayed in a dialog.

3.5.3.7   Error retrieval
It is possible to shift the cursor to a coil having compiling error as same as the case of compiling mode of logic equation.
Select "Error retrieval" from pop up menu.

### 3.5.4 A look mode of circuit diagram
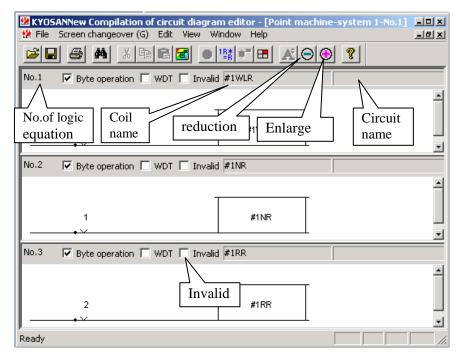


Fig.3-56

It is a circuit diagram with * mark on a logic equation number that becomes
an object for operation. Circuit diagram data with checking on "Invalid" will be deleted
from a compiling object while leaving its equation.
As source data, comment marks of (;) will be inserted at the head as follows:
 ; TEST1* TEST 2 = TEST
When the right side button of mouse is clicked, pop up menu is displayed so that it will
be possible to select each kind of function.

3.5.4.1 Enlargement and reduction
  It will change a display size for circuit diagram.

3.5.4.2 Addition of circuit diagram
  Circuit diagram data will be added just before the position of cursor.
  Select "Addition of circuit diagram" from pop up menu. Circuit diagram editor will be
  started up to add circuit diagrams.

3.5.4.3 Deletion of circuit diagram
  Select "Deletion of circuit diagram" from pop up menu. A message of confirmation
  for deletion will be displayed.
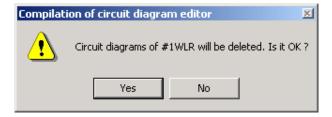


Fig.3-57

Circuit diagram data deleted by this operation is not possible to return to the original
status.

3.5.4.4  Shift of circuit diagram
Circuit diagram data at the cursor's position can be shifted to another position.
Select "Shift of circuit diagram" from pop up menu.
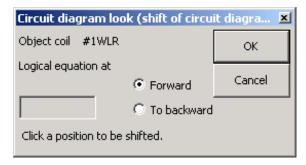


Fig.3-58

When a dialog is displayed, select a circuit diagram of a shifted position.
By scrolling a display screen, click the circuit diagram of the shifted position.
Information for circuit diagram data of the shifted position will be displayed in a dialog.

3.5.4.5  Copy of circuit diagram
Circuit diagram data at cursor's position will be copied at an optional position.
Select "Copy of circuit diagram" from pop up menu.
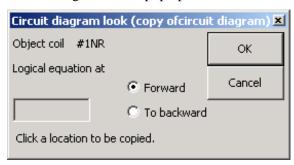


Fig.3-59

When a dialog is displayed, select a circuit diagram of a copied position.
By scrolling a display screen, click the circuit diagram of the copied position.
Circuit diagram data of the copied position will be displayed in a dialog.

3.5.4.6  Error retrieval
It is possible to display a circuit diagram having a compiling error in the same way of logic equation compiling mode.
Select "Error retrieval" from pop up menu.

3.5.4.7  How to change the numbers of diagrams to be displayed
Right click, point to "Change over for number of display" and then click the number you want to change to.
Up to 5 circuit diagrams can be displayed.

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### 3.5.5 Common tool bar
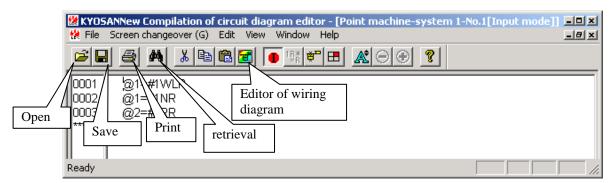


Fig.3-60

3.5.5.1 Open
Other logic equation will be opened.
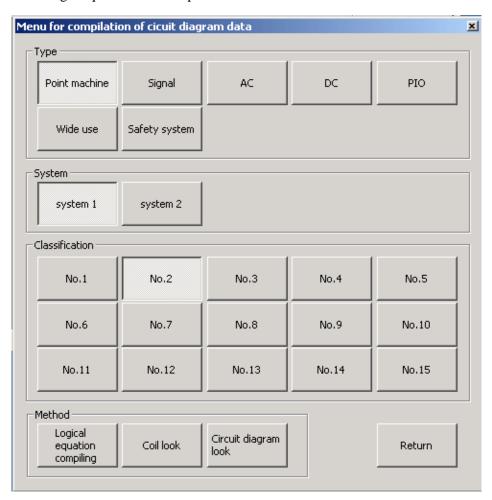


Fig.3-61

It is the same as the menu screen.
It is possible for opened circuit diagram data to change over from "Window menu".

3.5.5.2 Save
Circuit diagram data displayed at present will be saved in hard disk.
It is, however, temporary data under compiling to be modified.

3.5.5.3 Retrieval
(1) Compiling mode of logic equation
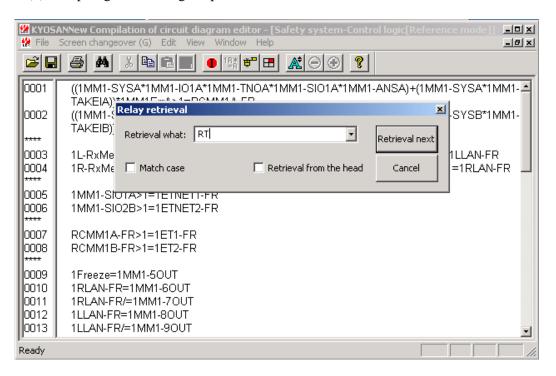


Fig.3-62

A relay name in which retrieval letters are included will be retrieved one after
another. Retrieved letters will be displayed in reversal status.
(2) A look mode for coil
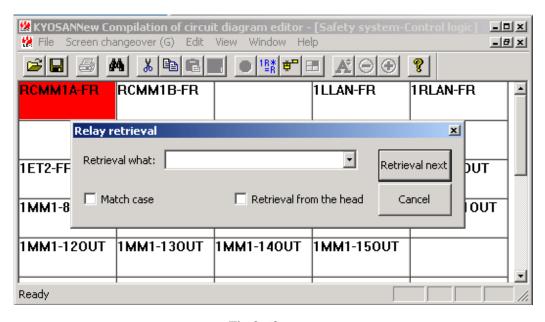


Fig.3-63

Shift the cursor to a coil name in which retrieval letters are included.

(3) A look mode for circuit diagram
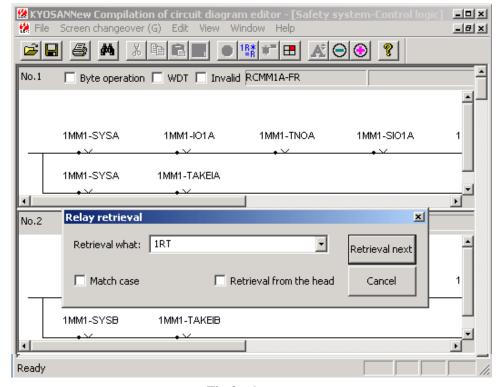


Fig.3-64

The circuit diagram, in which the relay name of retrieval letters is used, is displayed at the head.

### 3.5.5.4  Circuit diagram editor
It shall drive editor for circuit diagram to edit circuit data.
Circuit diagram data at the position of cursor become an object for compiling.

### 3.5.5.5  Print
Source of logic equation and circuit diagram (source) will be printed.



Fig.3-65

A range of print shall be made by instruction of pages.

**3.5.6   Others**

3.5.6.1 Starting of circuit diagram editor
When it starts firstly circuit diagram editor after installing, a message below will be displayed. It is because that program name of circuit diagram editor is not decided.



Fig.3-66

Instruct a program of circuit editor.
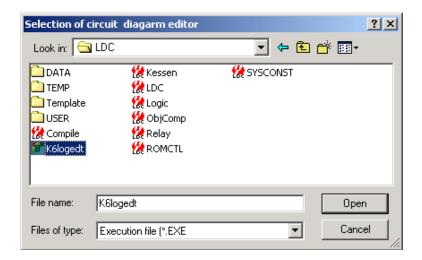


Fig.3-67

Program name of circuit editor will be memorized at registry, so it will be possible from next time to start without any instruction.

### 3.6  Compiling

For K5BMC, only [Safety system] button in [Type] shall be used.
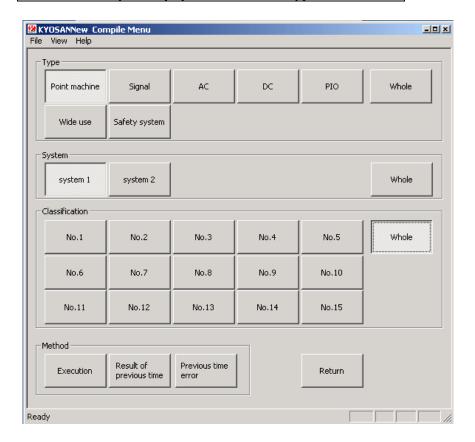


Fig. 4-68

### 3.6.1  Execution of compiling
Select "Type", "System" and "Classification", and click [Execution] button to start compiling.
Process status and result of compiling will be displayed by a dialog below.
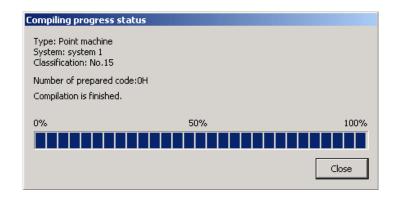


Fig.3-69

When there is an error, the object will not be renewed.
Click [Previous time error] button to display contents of the error.
When [Stop] button is clicked during compiling, it is possible to stop compiling in halfway.
If it is stopped, the object will not be renewed

### 3.6.2 Result of previous time
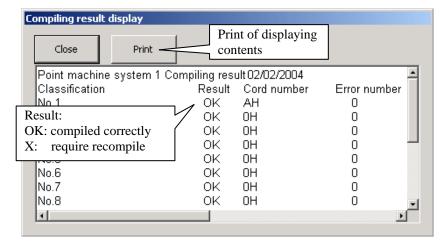


Fig.4-70

Compiling result of previous time will be displayed.

A number of classification with mark of OK in the Result Line is the one compiled correctly. However, it is required to recompile when mark of X exists in either line of Logic Equation, Relay Name or Cycle.

Logic Equation : Mark of X is shown when corresponding equation was changed after compiling.

Relay Name : Mark of X is shown when relay name of corresponding system was changed after compiling.

Cycle : Mark of X is shown when system cycle or terminal cycle of corresponding system was changed after compiling.

### 3.6.3 Previous time error
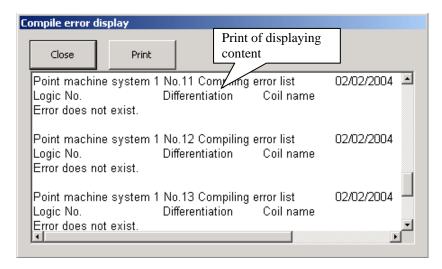


Fig.3-71

Contents of compiling error will be displayed with a look for each classification unit.

### 3.6.4 Compilation error list

| Error No. | Contents | Measures |
|---|---|---|
| C1001 | 2 or more operators are in succession. | Logical equation source is modified. |
| C1002 | An operator and " =" adjoining. | Logical equation source is modified. |
| C1002 | " (" doesn't match with operator. | Logical equation source is modified. |
| C1004 | Number of " )" is incorrect. | Logical equation source is modified. |
| C1005 | " )" and relay name adjoin. | Logical equation source is modified. |
| C1006 | 2 or more relay names adjoining. | Logical equation source is modified. |
| C1007 | Too long relay name (it should be within 20 letters.) | Logical equation source is modified. |
| C1008 | Number of " =" is incorrect. | Logical equation source is modified. |
| C1009 | Delay mark is incorrect. | Logical equation source is modified. |
| C1010 | Number of parentheses is incorrect. | Logical equation source is modified. |
| C1011 | Delay data is incorrect. | Logical equation source is modified. |
| C1012 | 2 or more slash marks adjoining. | Logical equation source is modified. |
| C1013 | Relay name and " (" adjoining. | Logical equation source is modified. |
| C1014 | There is operator in right side. | Logical equation source is modified. |
| C1015 | " )" and slash mark adjoining. | Logical equation source is modified. |
| C1016 | Operator and slash mark adjoining. | Logical equation source is modified. |
| C1017 | There is no relay name ahead of operator. | Logical equation source is modified. |
| C1018 | @ mark is not in position. | Logical equation source is modified. |
| C1019 | 2 or more @ marks are adjoining. | Logical equation source is modified. |
| C1020 | Byte calculation cannot be performed during bit calculation. | Logical equation source is modified. |
| C1021 | Byte calculation cannot be performed. | Logical equation source is modified. |
| C1022 | Delay counter has already exceeded FFFFH. | Logical equation source is modified. Basic constant is modified. |
| C1023 | There is no relay name in the right side. | Logical equation source is modified. |
| C2001 | Delay operators has been detected during byte calculation. | Logical equation source is modified. |
| C2002 | Delay time over | Logical equation source is modified. |
| C2003 | Too big object | Logical equation source is modified. |
| C2004 | The relay name has already existed. | Logical equation source is modified. |
| C2005 | The relay name cannot be found. | Logical equation source and relay name are modified. |
| C2006 | There is no relay name in the left side. | Logical equation source and relay name are modified. |
| C2007 | The relay name of right side cannot be found. | Logical equation source and relay name are modified. |
| C2008 | Too big object for one logic | Logical equation source is modified. |
| C3001 | This relay name already exists. | Logical equation is verified. |

C1XXX : Error in the grammar
C2XXX : Error at the time of object creation
C3XXX : Warning error. An object can be created.

### 3.7  Circuit diagram creation
#### 3.7.1          Menu screen

For K5BMC, only [Safety system] button in [Type] shall be used.
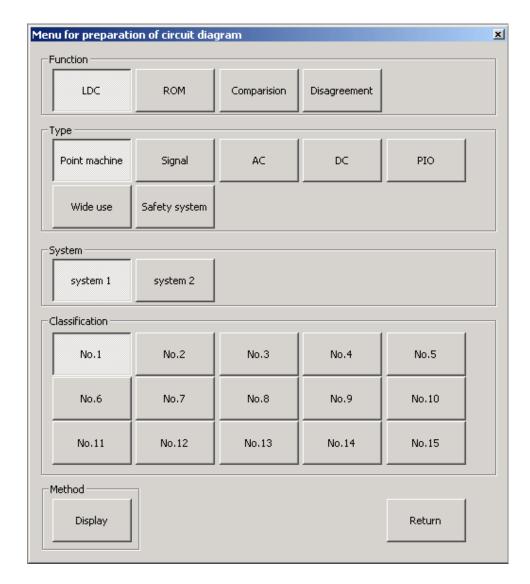


Fig.3-72

Select "Function", "Type", "System" and "Classification" and then click [Display] button.
It will be possible to print after displaying.
Regarding functions:
  LDC          : Circuit diagrams of compiled objects will be drawn up.
  ROM          : Circuit diagrams of read from objects will be drawn up.
  Comparison   : Circuit diagrams will be created at the same time for compiled objects and read from objects both of which have the same coil name.
  Disagreement : After result of comparison between compiled objects and read in objects, different circuit diagrams only will be drawn up.

**3.7.2  Display of circuit diagram**

Example of circuit diagram display
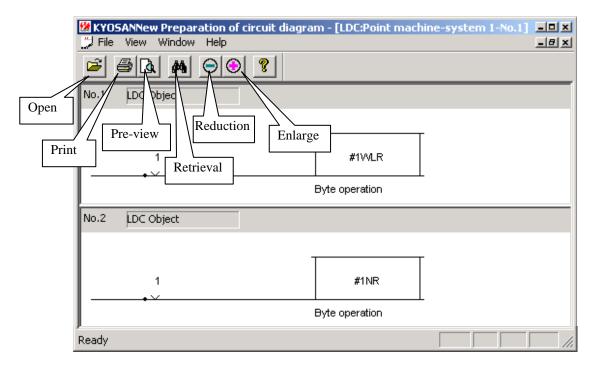


Fig. 3-73

In this example, 2 circuit diagrams are displayed at one screen. It will be possible to set the number of circuit diagrams to be displayed from 1 to 5 by "Change over of display number" of pop up menu which is displayed by clicking of the right side of mouse.

3.7.2.1  Open
     The same dialog as menu screen will be displayed.
     It is possible to display several circuit diagrams simultaneously.
3.7.2.2  Enlargement and reduction
     The size of circuit diagrams in displaying will be changed.
3.7.2.3  Retrieval
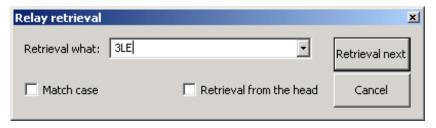


Fig. 3-74

Input a relay name to be retrieved in the line of retrieval, and then click [Retrieval next] button.
A circuit diagram in which the retrieved relay name is included will be displayed.

3.7.2.4　Print
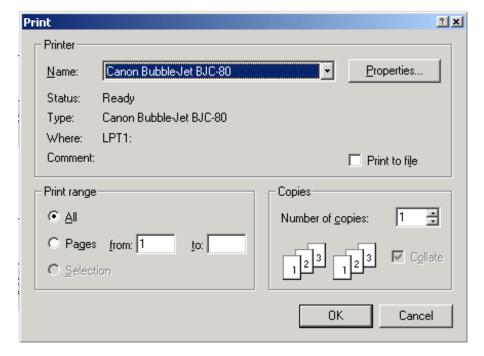


Fig. 3-75

Print range shall be instructed by page designation.
Confirm corresponding page numbers by preview.

3.7.2.5　Preview



Fig.3-76
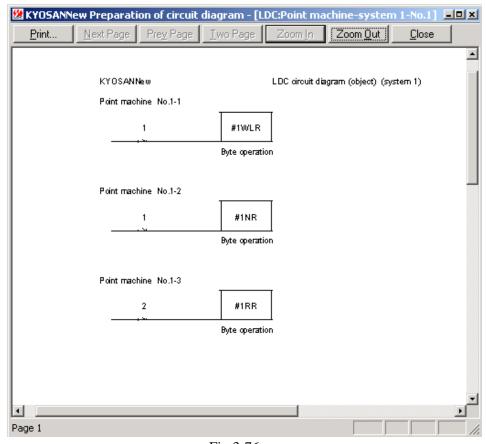
### 3.8   ROM writer control

For K5BMC, this function is not used.
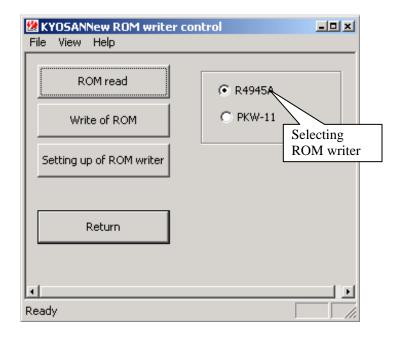
Fig.3-77

Following functions are provided for control menu of ROM writer:
1) ROM read
   Logic data will be read out from already created ROM.
2) Write of ROM
   Created logic data will be read in.
3) Setting up of ROM writer
   Setting of ROM writer (Pecker 1100) and communication protocol will be made.

When performing ROM write-in and read out, it shall be confirmed that ROM writer is connected with PC correctly.

### 3.8.1 ROM write-in

For K5BMC, this function is not used.
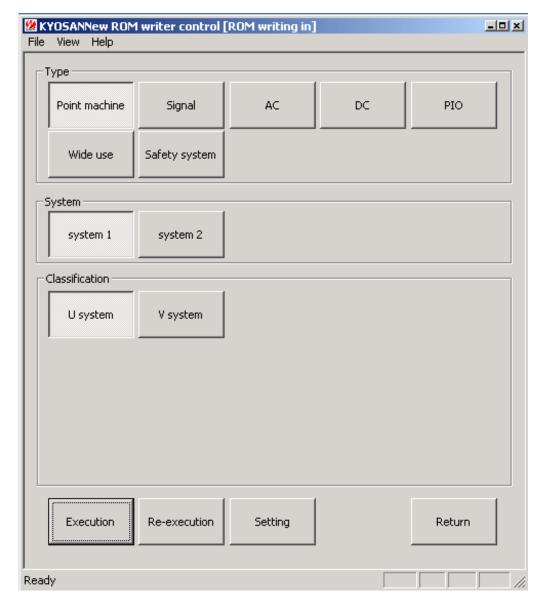


Fig. 3-78

Select "Type", "System" and "Classification" and then click each button.

[Execution] : It will create data ROM.
[Re-execution] : It will perform re-write on data ROM.
[Setting] : It will perform setting of ROM writer.
[Return] : It will return to ROM writer control menu.

3.8.1.1 Execution
　　　　Compiled object data will be sent to ROM writer.
　　　　Select "Type", "System" and "Classification", and then click [Execution]
　　　　button.
　　　　When it is not possible to make ROM write-in, a message will be displayed.



Fig.3-79

Such message above will be displayed.

When all data of write-in are correct, a massage below will be displayed.



Fig.3-80

When the above message is displayed, it shall be made to on line mode by the
operation from ROM writer panel.



Fig.3-81

3.8.1.2   Re-execution
　　　　Data on ROM writer memory will be written on data ROM with "Re-execution".
　　　　It will be used to create the same data ROM in the plural number.

### 3.8.2 ROM read in

For K5BMC, this function is not used.
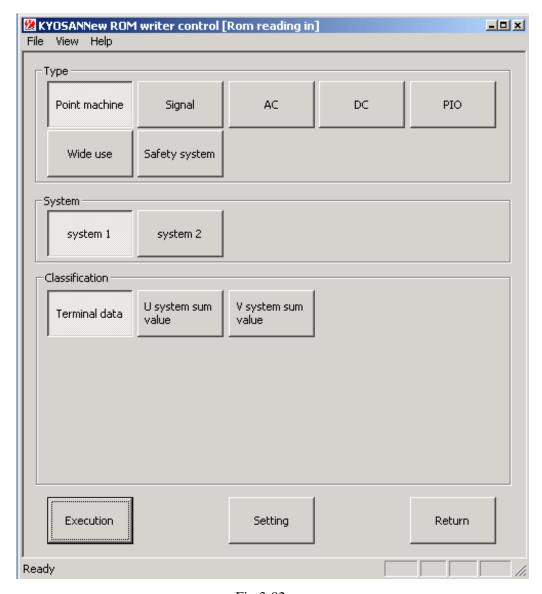


Fig.3-82

Select "Type", "System" and "Classification", and then click each button.
      [Execution]    :It will create data ROM.
      [Setting]           :It will set for ROM writer.
      [Return]    :It will return to ROM writer control menu.

3.8.2.1 Execution

Set ROM which will perform read in to ROM writer, and select "Type", "System" and "Classification" and then click [Execution] button.



Fig. 3-83

Where "R4945" is selected, the following dialog box will be displayed.



Fig. 3-84

Where this dialog box is displayed, change mode to "Online" by operating ROM writer panel.

### 3.8.3  ROM writer setting

For K5BMC, this function is not used.



In case of selected ROM writer is R4945A, here is indicated "R4945A".
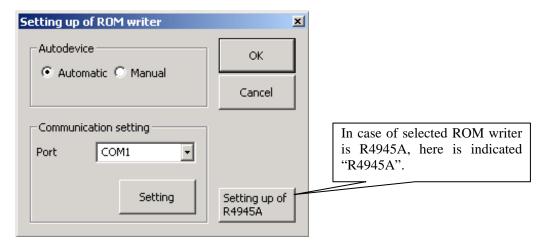
Fig. 3-85

3.8.3.1 Automatic device
It shall be decided whether ROM writer will judge kinds of ROM automatically or it will instruct kinds of ROM manually.
When instructed the manual method, a look for ROM will be displayed at the time of write-in and read-out of ROM, so select a ROM. It shall select the automatic method usually.
Even if selected "Automatic." a dialog for setting manually will be displayed when no data for identification of its kind is available in the ROM.

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3.8.3.2  Setting of communication port
It shall set for communication port (RS-232C).
A look for ports available for PC will be displayed by operations of arrow mark
button. Select a port with which ROM writer is connected, and click [Setting] button.
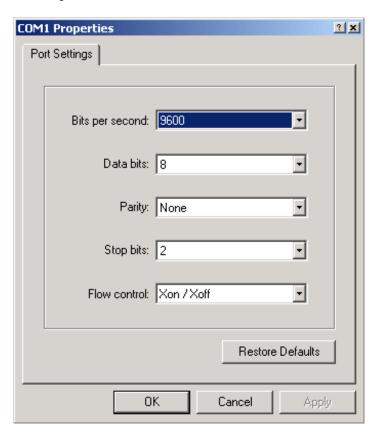


Fig. 3-86

When the arrow mark button at the right side of input column of each item is clicked,
available data for setting will be displayed. Instruct the data by mouse clicking.

Pecker setting
Operations of ROM writer side in accordance with communication setting will be displayed.
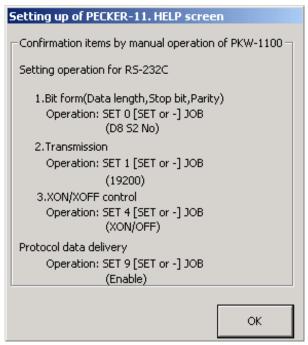


Fig. 3-87

It shall be kept depressing of set button or '-' (minus) button until the descriptions in parentheses are displayed for each write-in set item on the panel of ROM writer.
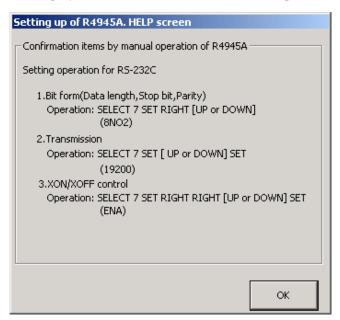


Fig.3-88

[Remark]
Setting contents of ROM writer will be decided when [OK] button is clicked.
For example, even if [OK] button is clicked after a change in the setting dialog for communication port, setting for communication port will be cancelled if [Cancel] button is clicked in the first dialog.

Setting of ROM writer can be made from [Setting] button in ROM read-out and ROM write-in menu.

### 3.9  Comparison

For K5BMC, only [Safety system] button in [Type] shall be used.
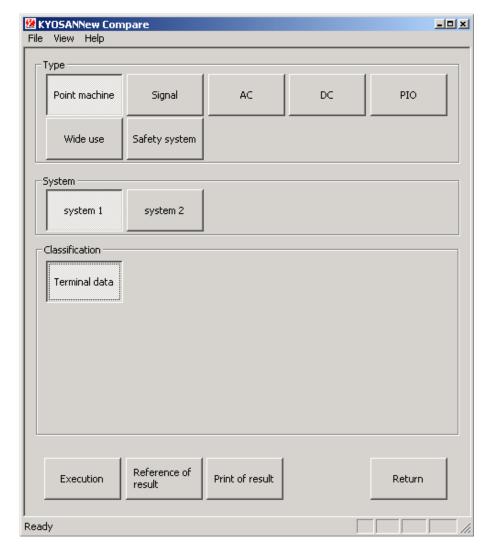


Fig. 3-90

It will compare the present object with the read object .
Designate "Type", "System" and "Classification", and click each button.
[Execution]                :It will perform the comparison.
[Reference of result]       :It will display the result of comparison.
[Print of result]           :It will print the result of comparison.

### 3.9.1          Execution of comparison

When a comparison is completed, a message below will be displayed.
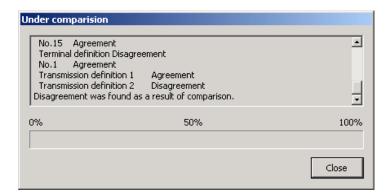


Fig. 3-91

Confirm the result of comparison.
When a disagreement exists in the result of comparison, it will be possible to confirm details of the result with "Reference of result".
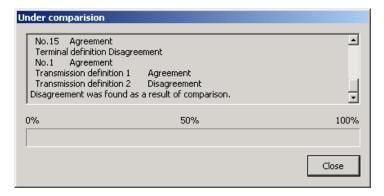


Fig. 3-92

This is an example for the case when an error exists in comparison.

### 3.9.2 Reference of result
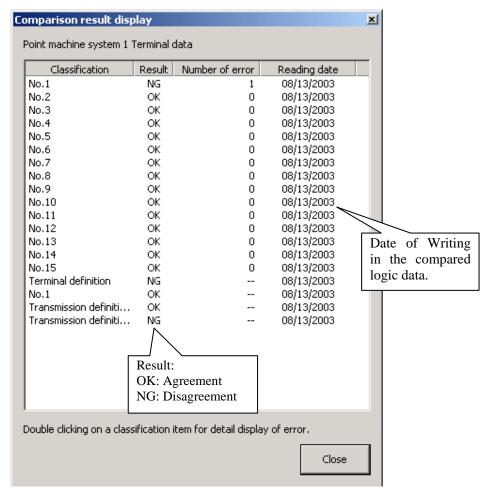


Fig. 3-93

Detail information will be displayed by double clicking on an item of classification when an error exists.

Following message will be displayed when no error exists.



Fig. 3-94

Detail display
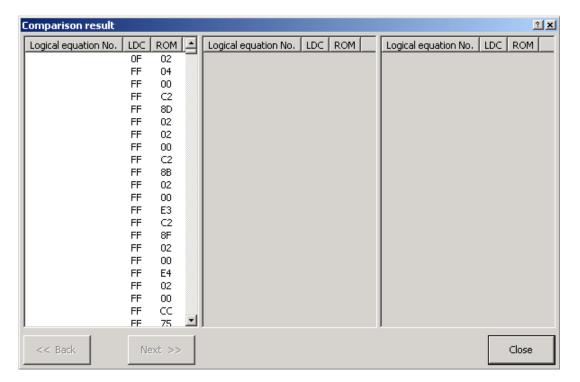


Fig. 3-95

It compares the present object with the read object by every circuit diagram data and only different portions will be displayed.
Logic equation number of the left side is the one in the present object, and the right side logic equation number is the one in the read object.

### 3.9.3    Print of result
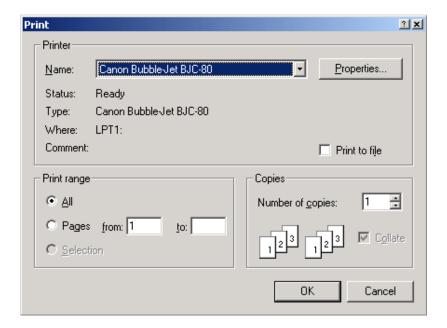


Fig. 3-96

Print of compared results will be possible only for all contents.
It will be also possible to designate a particular page.

**3.10  Setting of printer**
     It will explain about setting of a common printer for each function.
   **3.10.1  Setting of printer**
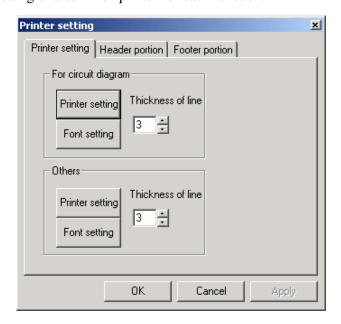


Fig. 3-97

     It will be possible to set separately printing of circuit diagram and the one of others.
     For example, printing of circuit diagram is set for A3 size in horizontal and other printing for A4 in vertical.
     The size of line will be effective for print using a ruled line (at default setting = 3).
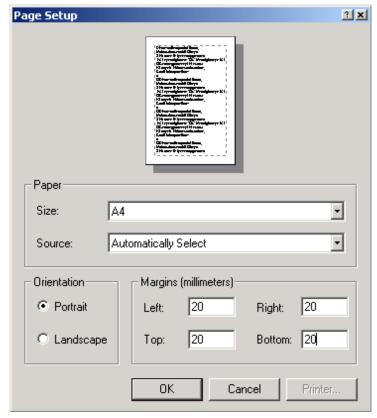


Fig.3-98

     It is possible to set paper's size, print direction and a margin.
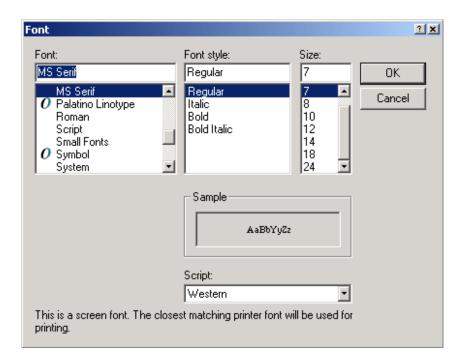
Fig. 3-99

It is possible to set font, style and size for print.

This information will be memorized as station data.

### 3.10.2 Header portion
It will designate items to be printed in the head line of printing sheet.
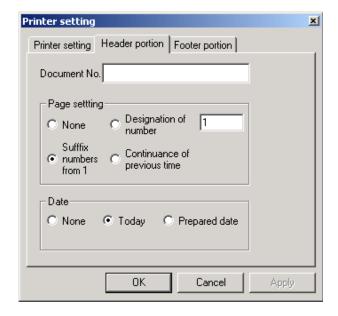


Fig. 3-100

Document number
Input any letters to be printed on the upper right of printing sheet within 32 letters.
Page setting

| | |
|---|---|
| None | : No page number is printed. |
| Suffix numbers from 1 | : Page numbers are printed from 1. However, the designated number is printed if page designation was made in a dialog for print. |
| Designation of number | : Page numbers are printed from the designated number. |
| Continuance of previous time | : Page numbers are printed from the next page number printed previously. |

Date

| | |
|---|---|
| None | : No date is printed. |
| Today | : Date of printing day is printed. |
| Prepared date | : It is printed with the date when data was renewed last. |

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### 3.10.3  Footer portion
It will designate items to be printed in the final line of printing sheet.



Fig. 3-101
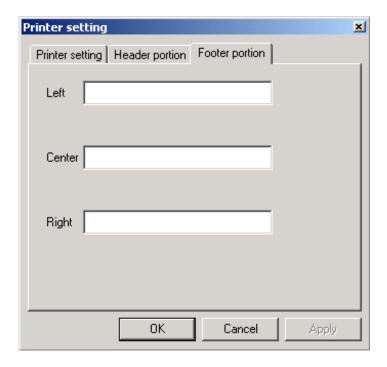
### 3.11    Main menu window of Off-line system

For the K5BMC, [IC Card] and [History] buttons of [7. Writing IC Card] menu shall be used.



Fig. 3-102
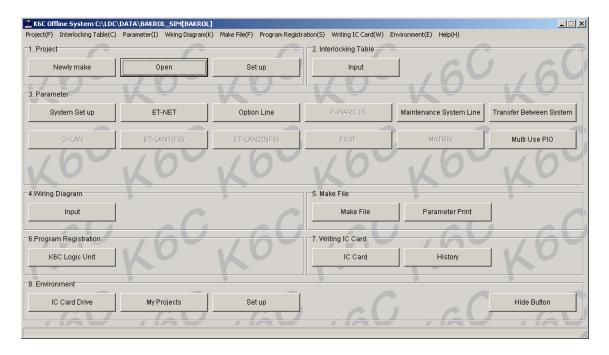
### 3.12  IC card control
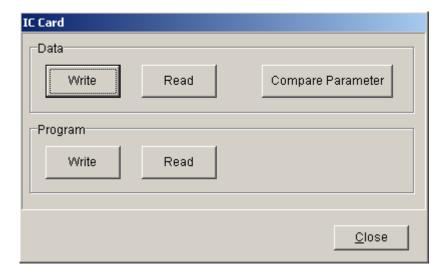


Fig. 3-103


By [IC card] button in [7.Writing IC Card] box in main menu window of Off-line system window(Fig.3-102) is clicked, above window(Fig.3-103) is appeared.

This IC card control has following functions.
- IC card data writing in
    By clicking [Write] button of [Data], Logic data is written in the IC card.
- IC card data reading out
    By clicking [Read] button of [Data], Logic data is read out from the IC card.
- Comparing data
    By clicking [Compare parameter] button of [Data], comparing the created logic data and existing logic data is carried out.
- IC card program writing in
    By clicking [Write] button of [Program], program is written in the IC card.
- IC card program reading out
    By clicking [Read] button of [Program], program is read out from the IC card.

When the writing in the IC card or reading out from the IC card is carried out, please check that the IC card is correctly inserted in IC card slot of PC.

### 3.13   Displaying revised history
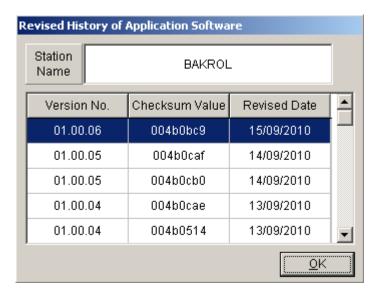


Fig. 3-104

By [History] button in [7.Writing IC Card] box in main menu window of Off-line system window(Fig.3-102) is clicked, above window(Fig.3-104) is appeared.

Version No., Checksum Value and Revised Date are registered and shown at each timing of the Logic data writing in IC card.

# MTC Failure Display Specification

# for K5BMC Electronic Interlocking System

Document No. Z914-C73000030E

Version 5

12. Feb. 2011

## Document Revision History

| Ver. No. | Date | Nature of Revision | Author(s) |
|---|---|---|---|
| 1 | 12. Jul. 2010 | First Edition | T. Suzuki |
| 2 | 11. Aug. 2010 | Improvement in function, Words-and-phrases correction and Reexamination of message | T. Suzuki |
| 3 | 12. Nov. 2010 | Revised by addition of Journal Module | T. Suzuki |
| 4 | 13. Dec. 2010 | Reviced by checking the card level screen name and the item name. Reviced by checking the MTC message corresponding to the card level failure | T. Suzuki |
| 5 | 12. Feb. 2011 | Adding explanation of pop-up diagnostic screen. Correcting the screen of out field equipment, the table of status of out field equipment and misword. | Y. Kanno |
| | | | |
| | | | |
| | | | |

# TABLE OF CONTENTS

## 1.  Scope

This document applys to display indication of Maintenance Console(MTC).

## 2.  Display Transition Diagram



Dot-line shows only status indication and not Button.
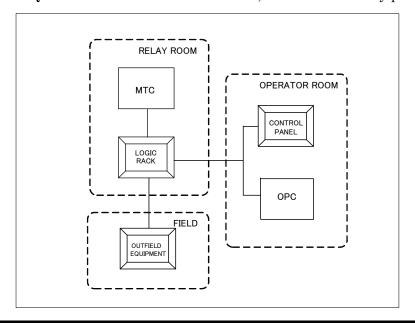
## 3.  MTC DISPLAY

### 3.1  General System Display

General System Display is shown on the MTC.

Unless specified, system status is to be indicated in green for normal and in red for abnormal.

In case of abnormality, the audio alarm is provided.

Switching from the General System Display below to linked display, e.g. LOGIC RACK, OUTFIELD EQUIPMENT or CONTROL PANEL, can be achieved by pressing each button.
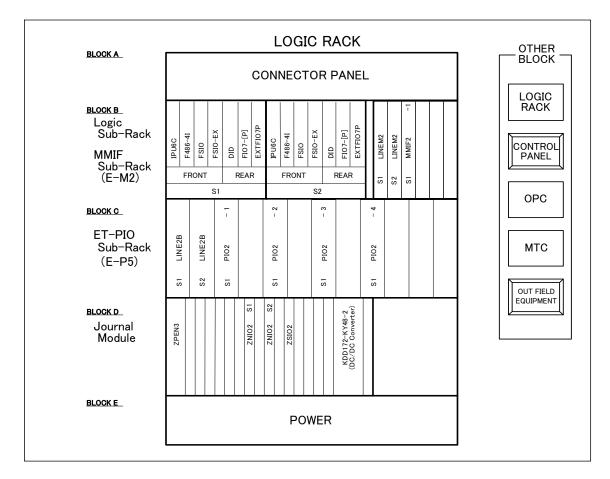
## 3.2   Logic Rack Mounting Display

LOGIC
RACK

By pressing LOGIC RACK button on the General System Display, the screen shift to LOGIC RACK mounting display below.

Each card status is to be indicated in green for normal and in red for abnormal.

**LOGIC RACK**

OTHER BLOCK

BLOCK A

CONNECTOR PANEL

BLOCK B
Logic Sub-Rack

MMIF Sub-Rack (E-M2)

IPU6C, F486-4I, FSIO, FSIO-EX, DID, FIO7-[P], EXTFIO7P | IPU6C, F486-4I, FSIO, FSIO-EX, DID, FIO7-[P], EXTFIO7P | LINEM2, LINEM2, MMIF2, -1

FRONT   REAR   FRONT   REAR
S1   S2
S1   S2   S1

BLOCK C
ET-PIO Sub-Rack (E-P5)

LINE2B, LINE2B, PIO2 -1, PIO2 -2, PIO2 -3, PIO2 -4
S1   S2   S1   S1   S1   S1

BLOCK D
Journal Module

ZPEN3, ZNIO2 S1, ZNIO2 S2, ZSIO2, KDD172-KY48-2 (DC/DC Converter)

BLOCK E
POWER

OTHER BLOCK:
LOGIC RACK
CONTROL PANEL
OPC
MTC
OUT FIELD EQUIPMENT

1)   When any card in the Logic Sub-Rack, MMIF Sub-Rack, ET-PIO Sub-Rack and Journal Module on the above-screen is clicked, it will shift to the card level display shown in the following clause.

2)   By clicking Push button of the OTHER BLOCK portion (for example  CONTROL PANEL ), it shifts to the detail display of relevance.

The color of Push button of the OTHER BLOCK portion is usually white. When it is selected, it is indicated in yellow, and in case of impossible to use it indicates in gray.

## 3.3 Card Level Display

When any card portion in Logic Sub-Rack, MMIF Sub-Rack, ET-PIO Sub-Rack and Journal Module is clicked in the LOGIC RACK mounting display of the preceding clause, it will shift to the Card Level Display shown in this clause.
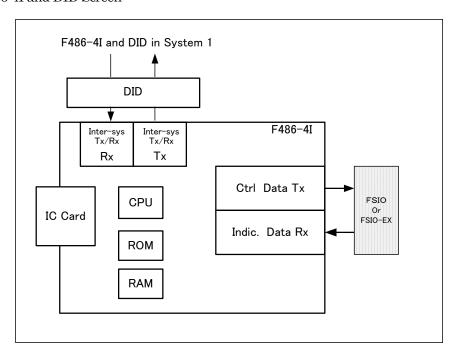
The status of each card is indicated with green in normal and with red in abnormalities.

The display of each card level shall be displayed to objective card, and the figure of the card level is shown for mounted cards of the each system.
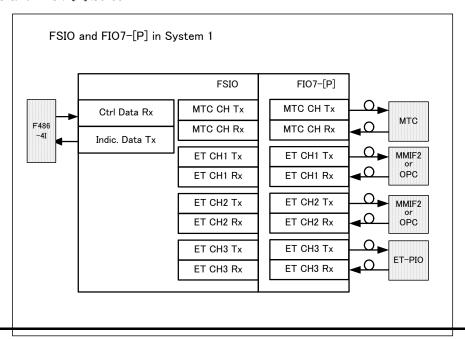
### 3.3.1 Logic Block

Each Card Level Display can be indicated in system 1 and 2 each.

1) F486-4I and DID Screen
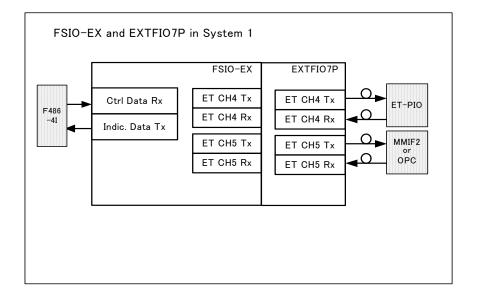


2) FSIO and FIO7-[P] Screen
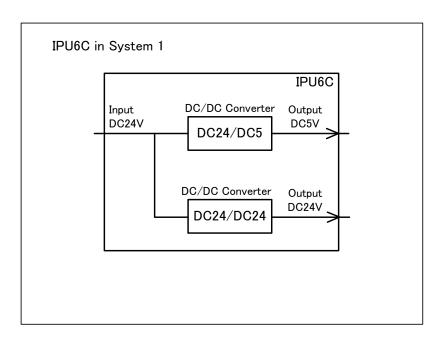
3) FSIO-EX and EXTFIO7P Screen



4) IPU6C Screen
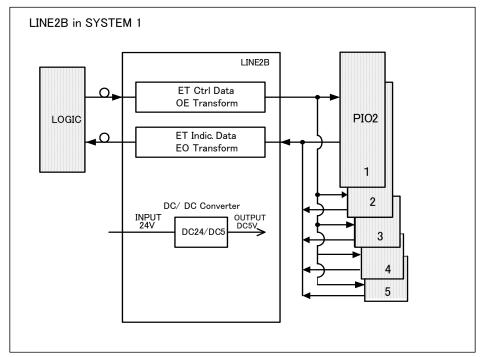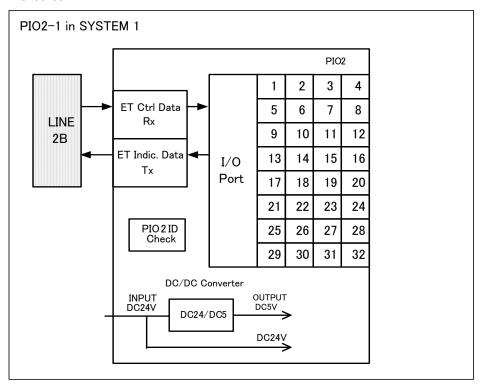
### 3.3.2  ET-PIO Block

Each Card Level display can be indicated according to mounted cards of each system

1）LINE2B Screen



2) ET-PIO Screen
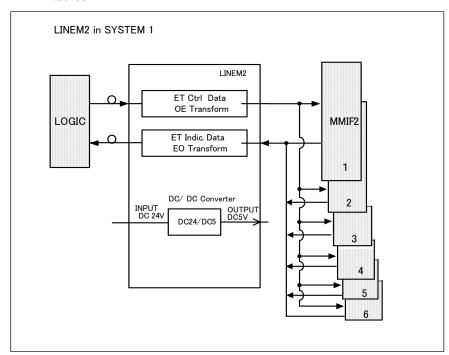


The result of status of Circuit No. of ET-PIO2 I/O is displayed collectively each four I/Os such as
1 2 3 4, 5 6 7 8, etc.
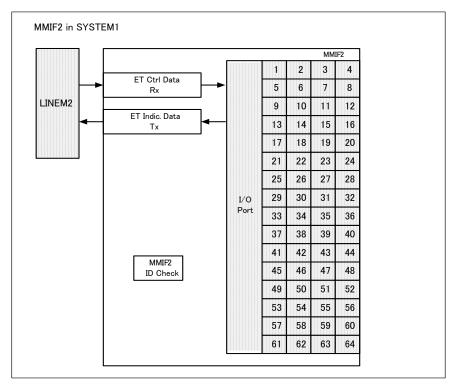
### 3.3.3  MMIF Block
Each Card Level display can be indicated according to mounted cards of each system

1) LINEM2 Screen



2) MMIF2 Screen
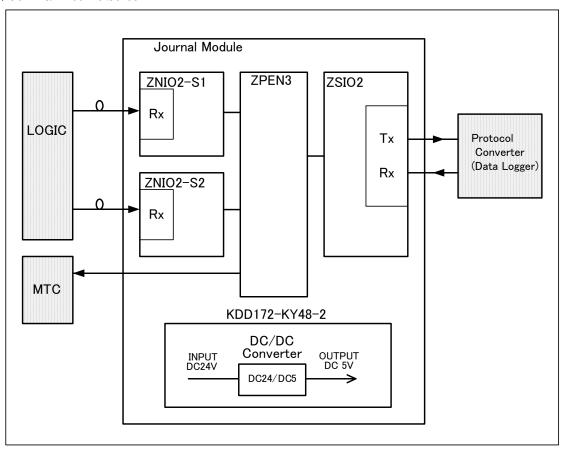


In this screen, the indication of I/O port and the right side from No.1 to 64 shall be totally colored gray, since there is no indication condition.

### 3.3.4  Journal Module

(1) Journal Module Screen
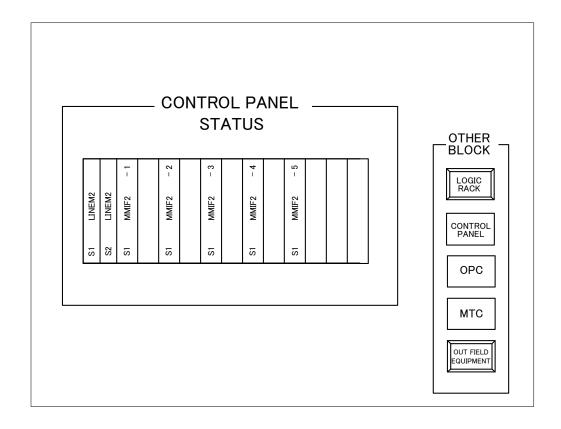
## 3.4  Control Panel Display

CONTROL
PANEL

By pressing CONTROL PANEL button on the General Sytem Display, shifting to CONTROL PANEL Display below can be achieved.

Each card status is to be indicated in green for normal and in red for abnormal.

When any card and ET-card portion on the display below are clicked, it will shift to the card level display as same of clause "3.3.3 MMIF Block"



CONTROL PANEL STATUS

LINEM2 / LINEM2 / MMIF2 –1 / MMIF2 –2 / MMIF2 –3 / MMIF2 –4 / MMIF2 –5
S1 / S2 / S1 / S1 / S1 / S1 / S1

OTHER BLOCK

LOGIC RACK
CONTROL PANEL
OPC
MTC
OUT FIELD EQUIPMENT

**Kyosan Electric Mfg. Co., Ltd.**
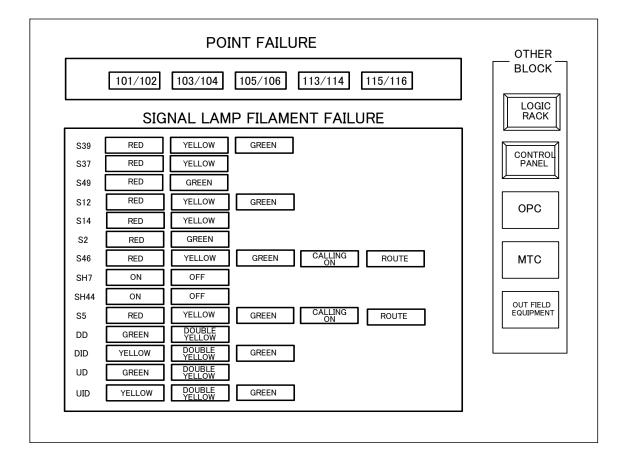
## 3.5  Out Field Equipment Display

| OUTFIELD EQUIPMENT |
| --- |

By pressing OUT FIELD EQUIPMENT button on the General Sytem Display, switching to OUT FIELD EQUIPMENT Display below can be achieved.

Each card status is to be indicated in green for normal and in red for abnormal.

Out Field Equipment (Example)

## 4. Indication Contents of each card and the card level Status

Each card and the card level Status are indicated with colors, normal in green and abnormal in red.
When a failure or abnormality is occurred, "message of failure" (message of following table + "occur") is appeared on MTC display corresponding to the each card level item of the following table. When the failure or abnormality is recoverd, "message of recover" (message of following table + "recover") is appeared on the MTC display.

### 4.1 The List of Sub-Rack Level Status ( corresponding to each card)

1) Logic Sub-Rack

| Test No. | Check Item | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|
| 1 | IPU6C | S1-IPU6C-FL | 1 | * |
| 2 | F486-4I | S1-F486-4I-FL | 1 | * |
| 3 | FSIO | S1-FSIO-FL | 1 | * |
| 4 | FSIO-EX | S1-FSIO-EX-FL | 1 | * |
| 5 | DID | S1-DID-FL | 1 | * |
| 6 | FIO7-[P] | S1-FIO7-P-FL | 1 | * |
| 7 | EXTFIO7P | S1-EXTFIO7P-FL | 1 | * |
| 8 | IPU6C | S2-IPU6C-FL | 1 | * |
| 9 | F486-4I | S2-F486-4I-FL | 1 | * |
| 10 | FSIO | S2-FSIO-FL | 1 | * |
| 11 | FSIO-EX | S2-FSIO-EX-FL | 1 | * |
| 12 | DID | S2-DID-FL | 1 | * |
| 13 | FIO7-[P] | S2-FIO7-P-FL | 1 | * |
| 14 | EXTFIO7P | S2-EXTFIO7P-FL | 1 | * |

2) ET-PIO Sub-Rack

| Test No. | Check Item | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|
| 1 | S1 LINE2B | S1-LINE2B-FL | 1 | * |
| 2 | S2 LINE2B | S2-LINE2B-FL | 1 | * |
| 3 | S1 PIO2 -1 | S1-PIO-1-FL | 1 | * |
| 4 | S1 PIO2 -2 | S1-PIO-2-FL | 1 | * |
| 5 | S1 PIO2 -3 | S1-PIO-3-FL | 1 | * |
| 6 | S1 PIO2 -4 | S1-PIO-4-FL | 1 | * |

3) MMIF Sub-Rack

| Test No. | Check Item | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|
| 1 | S1 LINEM2 | S1-LINEM2-FL | 1 | * |
| 2 | S2 LINEM2 | S2-LINEM2-FL | 1 | * |
| 3 | S1 MMIF2 -1 | S1-MM-1-FL | 1 | * |

*The corresponding yellow message pop-up screen will appear on MTC for the ease of maintenance.

4) Journal Module

| Test No. | Check Item | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|
| 1 | ZPEN3 | ZPEN3-FL | 1 | * |
| 2 | ZNIO2 S1 | ZNIO2-S1-FL | 1 | * |
| 3 | ZNIO2 S2 | ZNIO2-S2-FL | 1 | * |
| 4 | ZSIO2 | ZSIO2-FL | 1 | * |
| 5 | KDD172-KY48-2 | J-DD_CON-FL | 1 | * |

## 4.2   The List of Card Level Status ( corresponding to each item in the card)

### 4.2.1   Logic Sub-Rack

1) F486-4I and DID

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | CPU | LOGIC_S1_F486-4I | CPU_fail | S1-F486-CPU-FL | 1 | * |
| 2 | ROM | LOGIC_S1_F486-4I | ROM_fail | S1-F486-ROM-FL | 1 | * |
| 3 | RAM | LOGIC_S1_F486-4I | RAM_fail | S1-F486-RAM-FL | 1 | * |
| 4 | Ctrl Data Tx | LOGIC_S1_F486-4I | Ctrl-Data-Tx_fail | S1-F486-Tx-FL | 1 | * |
| 5 | Indic. Data Rx | LOGIC_S1_F486-4I | Indic.-Data-Rx_fail | S1-F486-Rx-FL | 1 | * |
| 6 | Inter-sys Tx/Rx Rx | LOGIC_S1_F486-4I | InterSys-Tx/Rx_Rx_fail | S1-DID-Rx-FL | 1 | * |
| 7 | Inter-sys Tx/Rx Tx | LOGIC_S1_F486-4I | InterSys-Tx/Rx_Tx_fail | S1-DID-Tx-FL | 1 | * |
| 8 | IC Card | LOGIC_S1_F486-4I | IC-Card_fail | S1-IC-Card-FL | 1 | * |
| 9 | DID | | S1-DID_fail | S1-DID-FL | 1 | * |
| 10 | CPU | LOGIC_S2_F486-4I | CPU_fail | S2-F486-CPU-FL | 1 | * |
| 11 | ROM | LOGIC_S2_F486-4I | ROM_fail | S2-F486-ROM-FL | 1 | * |
| 12 | RAM | LOGIC_S2_F486-4I | RAM_fail | S2-F486-RAM-FL | 1 | * |
| 13 | Ctrl Data Tx | LOGIC_S2_F486-4I | Ctrl-Data-Tx_fail | S2-F486-Tx-FL | 1 | * |
| 14 | Indic. Data Rx | LOGIC_S2_F486-4I | Indic.-Data-Rx_fail | S2-F486-Rx-FL | 1 | * |
| 15 | Inter-sys Tx/Rx Rx | LOGIC_S2_F486-4I | InterSys-Tx/Rx_Rx_fail | S2-DID-Rx-FL | 1 | * |
| 16 | Inter-sys Tx/Rx Tx | LOGIC_S2_F486-4I | InterSys-Tx/Rx_Tx_fail | S2-DID-Tx-FL | 1 | * |
| 17 | IC Card | LOGIC_S2_F486-4I | IC-Card_fail | S2-IC-Card-FL | 1 | * |
| 18 | DID | | S2-DID_fail | S2-DID-FL | 1 | * |

*The corresponding yellow message pop-up screen will appear on MTC for the ease of maintenance.

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2) FSIO and FIO7-[P]

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | Ctrl Data Rx | LOGIC_S1_FSIO | Ctrl-Data_Rx_fail | S1-FSIO-Data-Rx-FL | 1 | * |
| 2 | Indic. Data Tx | LOGIC_S1_FSIO | Indic.-Data_Tx_fail | S1-FSIO-Data Tx-FL | 1 | * |
| 3 | MTC CH Tx | LOGIC_S1_FSIO | MTC-CH_Tx_fail | S1-FSIO-MTCCH-Tx-FL | 1 | * |
| 4 | MTC CH Rx | LOGIC_S1_FSIO | MTC-CH_Rx_fail | S1-FSIO-MTCCH-Rx-FL | 1 | * |
| 5 | ET CH1 Tx | LOGIC_S1_FSIO | ET-CH1_Tx_fail | S1-FSIO-CH1Tx-FL | 1 | * |
| 6 | ET CH1 Rx | LOGIC_S1_FSIO | ET-CH1_Rx_fail | S1-FSIO-CH1Rx-FL | 1 | * |
| 7 | ET CH2 Tx | LOGIC_S1_FSIO | ET-CH2_Tx_fail | S1-FSIO-CH2Tx-FL | 1 | * |
| 8 | ET CH2 Rx | LOGIC_S1_FSIO | ET-CH2_Rx_fail | S1-FSIO-CH2 Rx-FL | 1 | * |
| 9 | ET CH3 Tx | LOGIC_S1_FSIO | ET-CH3_Tx_fail | S1-FSIO-CH3 Tx-FL | 1 | * |
| 10 | ET CH3 Rx | LOGIC_S1_FSIO | ET-CH3_Rx_fail | S1-FSIO-CH3 Rx-FL | 1 | * |
| 11 | MTC CH Tx | LOGIC_S1_FIO7-[P] | MTC-CH_Tx_fail | S1-FIO7-MTC-Tx-FL | 1 | * |
| 12 | MTC CH Rx | LOGIC_S1_FIO7-[P] | MTC-CH_Rx_fail | S1-FIO7-MTC-Rx-FL | 1 | * |
| 13 | ET CH1 Tx | LOGIC_S1_FIO7-[P] | ET-CH1_Tx_fail | S1-FIO7-CH1-Tx-FL | 1 | * |
| 14 | ET CH1 Rx | LOGIC_S1_FIO7-[P] | ET-CH1_Rx_fail | S1-FIO7-CH1-Rx-FL | 1 | * |
| 15 | ET CH2 Tx | LOGIC_S1_FIO7-[P] | ET-CH2_Tx_fail | S1-FIO7-CH2-Tx-FL | 1 | * |
| 16 | ET CH2 Rx | LOGIC_S1_FIO7-[P] | ET-CH2_Rx_fail | S1-FIO7-CH2-Rx-FL | 1 | * |
| 17 | ET CH3 Tx | LOGIC_S1_FIO7-[P] | ET-CH3_Tx_fail | S1-FIO7-CH3-Tx-FL | 1 | * |
| 18 | ET CH3 Rx | LOGIC_S1_FIO7-[P] | ET-CH3_Rx_fail | S1-FIO7-CH3-Rx-FL | 1 | * |
| 19 | Ctrl Data Rx | LOGIC_S2_FSIO | Ctrl-Data_Rx_fail | S2-FSIO-Data-Rx-FL | 1 | * |
| 20 | Indic. Data Tx | LOGIC_S2_FSIO | Indic.-Data_Tx_fail | S2-FSIO-Data Tx-FL | 1 | * |
| 21 | MTC CH Tx | LOGIC_S2_FSIO | MTC-CH_Tx_fail | S2-FSIO-MTCCH-Tx-FL | 1 | * |
| 22 | MTC CH Rx | LOGIC_S2_FSIO | MTC-CH_Rx_fail | S2-FSIO-MTCCH-Rx-FL | 1 | * |
| 23 | ET CH1 Tx | LOGIC_S2_FSIO | ET-CH1_Tx_fail | S2-FSIO-CH1Tx-FL | 1 | * |
| 24 | ET CH1 Rx | LOGIC_S2_FSIO | ET-CH1_Rx_fail | S2-FSIO-CH1Rx-FL | 1 | * |
| 25 | ET CH2 Tx | LOGIC_S2_FSIO | ET-CH2_Tx_fail | S2-FSIO-CH2Tx-FL | 1 | * |
| 26 | ET CH2 Rx | LOGIC_S2_FSIO | ET-CH2_Rx_fail | S2-FSIO-CH2 Rx-FL | 1 | * |
| 27 | ET CH3 Tx | LOGIC_S2_FSIO | ET-CH3_Tx_fail | S2-FSIO-CH3 Tx-FL | 1 | * |
| 28 | ET CH3 Rx | LOGIC_S2_FSIO | ET-CH3_Rx_fail | S2-FSIO-CH3 Rx-FL | 1 | * |
| 29 | MTC CH Tx | LOGIC_S2_FIO7-[P] | MTC-CH_Tx_fail | S2-FIO7-MTC-Tx-FL | 1 | * |
| 30 | MTC CH Rx | LOGIC_S2_FIO7-[P] | MTC-CH_Rx_fail | S2-FIO7-MTC-Rx-FL | 1 | * |
| 31 | ET CH1 Tx | LOGIC_S2_FIO7-[P] | ET-CH1_Tx_fail | S2-FIO7-CH1-Tx-FL | 1 | * |
| 32 | ET CH1 Rx | LOGIC_S2_FIO7-[P] | ET-CH1_Rx_fail | S2-FIO7-CH1-Rx-FL | 1 | * |
| 33 | ET CH2 Tx | LOGIC_S2_FIO7-[P] | ET-CH2_Tx_fail | S2-FIO7-CH2-Tx-FL | 1 | * |
| 34 | ET CH2 Rx | LOGIC_S2_FIO7-[P] | ET-CH2_Rx_fail | S2-FIO7-CH2-Rx-FL | 1 | * |
| 35 | ET CH3 Tx | LOGIC_S2_FIO7-[P] | ET-CH3_Tx_fail | S2-FIO7-CH3-Tx-FL | 1 | * |
| 36 | ET CH3 Rx | LOGIC_S2_FIO7-[P] | ET-CH3_Rx_fail | S2-FIO7-CH3-Rx-FL | 1 | * |

*The corresponding yellow message pop-up screen will appear on MTC for the ease of maintenance.

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3) FSIO-EX and EXTFIO7P

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | Ctrl Data Rx | LOGIC_S1_FSIO-EX | Ctrl-Data_Rx_fail | S1-FSIO-EX-Data-Rx-FL | 1 | * |
| 2 | Indic. Data Tx | LOGIC_S1_FSIO-EX | Indic.-Data_Tx_fail | S1-FSIO-EX-Data-Tx-FL | 1 | * |
| 3 | ET CH4 Tx | LOGIC_S1_FSIO-EX | ET-CH4_Tx_fail | S1-FSIO-CH4-Tx-FL | 1 | * |
| 4 | ET CH4 Rx | LOGIC_S1_FSIO-EX | ET-CH4_Rx_fail | S1-FSIO-CH4-Rx-FL | 1 | * |
| 5 | ET CH5 Tx | LOGIC_S1_FSIO-EX | ET-CH5_Tx_fail | S1-FSIO-CH5-Tx-FL | 1 | * |
| 6 | ET CH5 Rx | LOGIC_S1_FSIO-EX | ET-CH5_Rx_fail | S1-FSIO-CH5-Rx-FL | 1 | * |
| 7 | ET CH4 Tx | LOGIC_S1_EXTFIO7P | ET-CH4_Tx_fail | S1-EX-FIO7-CH4-Tx-FL | 1 | * |
| 8 | ET CH4 Rx | LOGIC_S1_EXTFIO7P | ET-CH4_Rx_fail | S1-EX-FIO7-CH4-Rx-FL | 1 | * |
| 9 | ET CH5 Tx | LOGIC_S1_EXTFIO7P | ET-CH5_Tx_fail | S1-EX-FIO7-CH5-Tx-FL | 1 | * |
| 10 | ET CH5 Rx | LOGIC_S1_EXTFIO7P | ET-CH5_Rx_fail | S1-EX-FIO7-CH5 Rx-FL | 1 | * |
| 11 | Ctrl Data Rx | LOGIC_S2_FSIO-EX | Ctrl-Data_Rx_fail | S2-FSIO-EX-Data-Rx-FL | 1 | * |
| 12 | Indic. Data Tx | LOGIC_S2_FSIO-EX | Indic.-Data_Tx_fail | S2-FSIO-EX-Data-Tx-FL | 1 | * |
| 13 | ET CH4 Tx | LOGIC_S2_FSIO-EX | ET-CH4_Tx_fail | S2-FSIO-CH4-Tx-FL | 1 | * |
| 14 | ET CH4 Rx | LOGIC_S2_FSIO-EX | ET-CH4_Rx_fail | S2-FSIO-CH4-Rx-FL | 1 | * |
| 15 | ET CH5 Tx | LOGIC_S2_FSIO-EX | ET-CH5_Tx_fail | S2-FSIO-CH5-Tx-FL | 1 | * |
| 16 | ET CH5 Rx | LOGIC_S2_FSIO-EX | ET-CH5_Rx_fail | S2-FSIO-CH5-Rx-FL | 1 | * |
| 17 | ET CH4 Tx | LOGIC_S2_EXTFIO7P | ET-CH4_Tx_fail | S2-EX-FIO7-CH4-Tx-FL | 1 | * |
| 18 | ET CH4 Rx | LOGIC_S2_EXTFIO7P | ET-CH4_Rx_fail | S2-EX-FIO7-CH4-Rx-FL | 1 | * |
| 19 | ET CH5 Tx | LOGIC_S2_EXTFIO7P | ET-CH5_Tx_fail | S2-EX-FIO7-CH5-Tx-FL | 1 | * |
| 20 | ET CH5 Rx | LOGIC_S2_EXTFIO7P | ET-CH5_Rx_fail | S2-EX-FIO7-CH5 Rx-FL | 1 | * |

4) IPU6C

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | DC24/DC5 | LOGIC_S1_IPU6C | DC24/DC5_fail | S1-IPU6-D24-5-FL | 1 | * |
| 2 | DC24/DC24 | LOGIC_S1_IPU6C | DC24/DC24_fail | S1-IPU6-D24-24-FL | 1 | * |
| 3 | DC24/DC5 | LOGIC_S2_IPU6C | DC24/DC5_fail | S2-IPU6-D24-5-FL | 1 | * |
| 4 | DC24/DC24 | LOGIC_S2_IPU6C | DC24/DC24_fail | S2-IPU6-D24-24-FL | 1 | * |

*The corresponding yellow message pop-up screen will appear on MTC for the ease of maintenance.

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### 4.2.2  ET-PIO Sub-Rack
#### 1) LINE2B

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | ET Ctrl Data OE Transform | ET-PIO_S1_LINE2B | ET-Ctrl-Data-OE_fail | S1-LINE2B-OE-FL | 1 | * |
| 2 | ET Indic. Data EO Transform | ET-PIO_S1_LINE2B | ET-Indic.-Data-EO_fail | S1-LINE2B-EO-FL | 1 | * |
| 3 | DC24/DC5 | ET-PIO_S1_LINE2B | DC24/DC5_fail | S1-LINE2B-D24-5-FL | 1 | * |
| 4 | ET Ctrl Data OE Transform | ET-PIO_S2_LINE2B | ET-Ctrl-Data-OE_fail | S2-LINE2B-OE-FL | 1 | * |
| 5 | ET Indic. Data EO Transform | ET-PIO_S2_LINE2B | ET-Indic.-Data-EO_fail | S2-LINE2B-EO-FL | 1 | * |
| 6 | DC24/DC5 | ET-PIO_S2_LINE2B | DC24/DC5_fail | S2-LINE2B-D24-5-FL | 1 | * |

#### 2) PIO2

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | ET Ctrl Data Rx | ET-PIO_S1_PIO2-n | ET-Ctrl-Data-Rx_fail | S1-PIO-Rx-FL | 1 | n=1 to 4 * |
| 2 | ET Indic. Data Tx | ET-PIO_S1_PIO2-n | ET-Indic.-Data-Tx_fail | S1-PIO-Tx-FL | 1 | n=1 to 4 * |
| 3 | PIO2 ID CHECK | ET-PIO_S1_PIO2-n | PIO2-ID-CHECK_fail | S1-PIO-IDCHECK-FL | 1 | n=1 to 4 * |
| 4 | DC24/DC5 | ET-PIO_S1_PIO2-n | DC24/DC5_fail | S1-PIO2-D24-5-FL | 1 | n=1 to 4 * |
| 5 | I/O | ET-PIO_S1_PIO2-n | I/O_fail | S1-PIO-IO-FL | 1 | n=1 to 4 * |
| 6 | 1 2 3 4 | ET-PIO_S1_PIO2-n | Circuit-0_Fail | S1-PIO-IO-Circuit-0_FL | 1 | n=1 to 4 * |
| 7 | 5 6 7 8 | ET-PIO_S1_PIO2-n | Circuit-1_Fail | S1-PIO-IO-Circuit-1_FL | 1 | n=1 to 4 * |
| 8 | 9 10 11 12 | ET-PIO_S1_PIO2-n | Circuit-2_Fail | S1-PIO-IO-Circuit-2_FL | 1 | n=1 to 4 * |
| 9 | 13 14 15 16 | ET-PIO_S1_PIO2-n | Circuit-3_Fail | S1-PIO-IO-Circuit-3_FL | 1 | n=1 to 4 * |
| 10 | 17 18 19 20 | ET-PIO_S1_PIO2-n | Circuit-4_Fail | S1-PIO-IO-Circuit-4_FL | 1 | n=1 to 4 * |
| 11 | 21 22 23 24 | ET-PIO_S1_PIO2-n | Circuit-5_Fail | S1-PIO-IO-Circuit-5_FL | 1 | n=1 to 4 * |
| 12 | 25 26 27 28 | ET-PIO_S1_PIO2-n | Circuit-6_Fail | S1-PIO-IO-Circuit-6_FL | 1 | n=1 to 4 * |
| 13 | 29 30 31 32 | ET-PIO_S1_PIO2-n | Circuit-7_Fail | S1-PIO-IO-Circuit-7_FL | 1 | n=1 to 4 * |

*The corresponding yellow message pop-up screen will appear on MTC for the ease of maintenance.

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### 4.2.3  MMIF Sub-Rack

#### 1) LINEM2

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | ETCtrl Data OE Transform | MMIF_S1_LINEM2 | ET-Ctrl-Data-OE_fail | S1-LINEM-OE-FL | 1 | * |
| 2 | ET Indic. Data EO Transform | MMIF_S1_LINEM2 | ET-Indic.-Data-EO_fail | S1-LINEM-EO-FL | 1 | * |
| 3 | DC24/DC5 | MMIF_S1_LINEM2 | DC24/DC5_fail | S1-LINEM-D24-5-FL | 1 | * |
| 4 | ETCtrl Data OE Transform | MMIF_S2_LINEM2 | ET-Ctrl-Data-OE_fail | S2-LINEM-OE-FL | 1 | * |
| 5 | ET Indic. Data EO Transform | MMIF_S2_LINEM2 | ET-Indic.-Data-EO_fail | S2-LINEM-EO-FL | 1 | * |
| 6 | DC24/DC5 | MMIF_S2_LINEM2 | DC24/DC5_fail | S2-LINEM-D24-5-FL | 1 | * |

#### 2) MMIF2

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | ETCtrl Data Rx | MMIF_S1_MMIF2-n | ET-Ctrl-Data-Rx_fail | S1-MM-n-Rx-FL | 1 | n=1   * |
| 2 | ET Indic. Data Tx | MMIF_S1_MMIF2-n | ET-Indic.-Data-Tx_fail | S1-MM-n-Tx-FL | 1 | n=1   * |
| 3 | MMIF2 ID CHECK | MMIF_S1_MMIF2-n | MMIF2-ID-CHECK_fail | S1-MM-n-IDCHECK-FL | 1 | n=1   * |
| 4 | I/O-1 | MMIF_S1_MMIF2-n | I/O_fail | S1-MM-n-IO-FL | 1 | n=1   * |

### 4.2.4  Journal Module

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | ZPEN3 | JOURNAL_ ZPEN3 | Card_fail | ZPEN3-FL | 1 | * |
| 2 | ZNIO2- S1 | JOURNAL_ZNIO2_S1 | Card_Main_fail | ZNIO2-S1_M-FL | 1 | * |
| 3 | ZNIO2 -S2 | JOURNAL_ZNIO2_S2 | Card_Main _fail | ZNIO2-S2_M-FL | 1 | * |
| 4 | ZSIO2 | JOURNAL_ ZSIO2 | Card_Main_fail | ZSIO2_M-FL | 1 | * |
| 5 | DC24/DC5 | JOURNAL_DC/DC | Converter_fail | J-DD_CON-FL | 1 | * |
| 6 | ZNIO2-S1 Rx | JOURNAL_ZNIO2_S1 | Rx_fail | ZNIO2-S2-Rx-FL | 1 | * |
| 7 | ZNIO2-S2 Rx | JOURNAL_ZNIO2_S2 | Rx_fail | ZNIO2-S2-Rx-FL | 1 | * |
| 8 | ZSIO2 Tx/Rx | JOURNAL_ ZSIO2 | Tx/Rx_fail | ZSIO2-Rx-FL | 1 | * |
| 9 | ZPEN3 | JOURNAL | Rx_stop_fail | J-RX-STOP-FL | 1 | * |
| 10 | ZPEN3 | JOURNAL | Rx_data_fail | J-RX-DATA-FL | 1 | * |

*The corresponding yellow message pop-up screen will appear on MTC for the ease of maintenance.

## 4.3  The List of Status Level of Other Block

### 4.3.1  MMIF for Control Panel

1) MMIF Sub-Rack for Control Panel

| Test No. | Check Item | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|
| 1 | S1 LINEM2 | CP-S1-LINEM2-FL | 1 | * |
| 2 | S2 LINEM2 | CP-S2-LINEM2-FL | 1 | * |
| 3 | S1 MMIF2 -1 | CP-S1-MM-1-FL | 1 | * |
| 4 | S1 MMIF2 -2 | CP-S1-MM-2-FL | 1 | * |
| 5 | S1 MMIF2 -3 | CP-S1-MM-3-FL | 1 | * |
| 6 | S1 MMIF2 -4 | CP-S1-MM-4-FL | 1 | * |
| 7 | S1 MMIF2 -5 | CP-S1-MM-5-FL | 1 | * |
| 8 | Logic Rack | | | Push Button |
| 9 | CONTROL PANEL | | | Push Button |
| 10 | OPC | | | Push Button |
| 11 | MTC | | | Push Button |
| 12 | OUT FIELD EQUIPMENT | | | Push Button |

2) Card for LINEM2

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | ETCtrl Data OE Transform | CCIP_S1_LINEM2 | ET-Ctrl-Data-OE_fail | S1-LINEM-OE-FL | 1 | * |
| 2 | ET Indic. Data EO Transform | CCIP_S1_LINEM2 | ET-Indic.-Data-EO_fail | S1-LINEM-EO-FL | 1 | * |
| 3 | DC24/DC5 | CCIP_S1_LINEM2 | DC24/DC5_fail | S1-LINEM-D24-5-FL | 1 | * |
| 4 | ETCtrl Data OE Transform | CCIP_S2_LINEM2 | ET-Ctrl-Data-OE_fail | S2-LINEM-OE-FL | 1 | * |
| 5 | ET Indic. Data EO Transform | CCIP_S2_LINEM2 | ET-Indic.-Data-EO_fail | S2-LINEM-EO-FL | 1 | * |
| 6 | DC24/DC5 | CCIP_S2_LINEM2 | DC24/DC5_fail | S2-LINEM-D24-5-FL | 1 | * |

3) Card for MMIF2

| Test No. | Check Item | Message in case of failure occurs/recovers | | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|---|
| 1 | ETCtrl Data Rx | CCIP_S1_MMIF2-n | ET-Ctrl-Data-Rx_fail | S1-MM-n-Rx-FL | 1 | n=1 to 5   * |
| 2 | ET Indic. Data Tx | CCIP_S1_MMIF2-n | ET-Indic.-Data-Tx_fail | S1-MM-n-Tx-FL | 1 | n=1 to 5   * |
| 3 | MMIF2 ID CHECK | CCIP_S1_MMIF2-n | MMIF2-ID-CHECK_fail | S1-MM-n-IDCHECK-FL | 1 | n=1 to 5   * |
| 4 | I/O-1 | CCIP_S1_MMIF2-n | I/O_fail | S1-MM-n-IO-FL | 1 | n=1 to 5   * |

*The corresponding yellow message pop-up screen will appear on MTC for the ease of maintenance.

### 4.3.2  The Status of Out Field Equipment （an example）

| Test No. | Check Item | Message in case of failure occurs/recovers | Relay Name | Nomal bit status | Note |
|---|---|---|---|---|---|
| 1 | 101/102 | Point_101/102_fail | 101.2KUR | 1 | ** |
| 2 | 103/104 | Point_103/104_fail | 103.4KUR | 1 | ** |
| 3 | 105/106 | Point_105/106_fail | 105.6KUR | 1 | ** |
| 4 | 113/114 | Point_113/114_fail | 113.4KUR | 1 | ** |
| 5 | 115/116 | Point_115/116_fail | 115.6KUR | 1 | ** |
| 6 | S39 RED | Sig_39_R_lamp_fail | 39RGKERMF | 0 | ** |
| 7 | S39 YELLOW | Sig_39_Y_lamp_fail | 39HKEWMF | 0 | ** |
| 8 | S39 GREEN | Sig_39_G_lamp_fail | 39DGKEWMF | 0 | ** |
| 9 | S37 RED | Sig_37_R_lamp_fail | 37RGKERMF | 0 | ** |
| 10 | S37 YELLOW | Sig_37_Y_lamp_fail | 37HGKEWMF | 0 | ** |
| 11 | S49 RED | Sig_49_R_lamp_fail | 49RGKERMF | 0 | ** |
| 12 | S49 YELLOW | Sig_49_Y_lamp_fail | 49DGKEWMF | 0 | ** |
| 13 | S12 RED | Sig_12_R_lamp_fail | 12RGKERMF | 0 | ** |
| 14 | S12 YELLOW | Sig_12_Y_lamp_fail | 12HKEWMF | 0 | ** |
| 15 | S12 GREEN | Sig_12_G_lamp_fail | 12DGKEWMF | 0 | ** |
| 16 | S14 RED | Sig_14_lamp_fail | 14RGKERMF | 0 | ** |
| 17 | S14 YELLOW | Sig_14_Y_lamp_fail | 14HGKEWMF | 0 | ** |
| 18 | S2 RED | Sig_2_R_lamp_fail | 2RGKERMF | 0 | ** |
| 19 | S2 YELLOW | Sig_2_Y_lamp_fail | 2DGKEWMF | 0 | ** |
| 20 | S46 RED | Sig_46_R_lamp_fail | 46RGKERMF | 0 | ** |
| 21 | S46 YELLOW | Sig_46_Y_lamp_fail | 46HKEWMF | 0 | ** |
| 22 | S46 GREEN | Sig_46_G_lamp_fail | 46DGKEWMF | 0 | ** |
| 23 | S46 CALLING ON | Sig_CO46_calling_on_lamp_fail | CO46HGKEWMF | 0 | ** |
| 24 | S46 ROUTE | Sig_46UG_Y_lamp_fail | 46UGKEWMF | 0 | ** |
| 25 | SH7 ON | Shunt_7_ON_lamp_fail | 7ONGKEWMF | 0 | ** |
| 26 | SH7 OFF | Shunt_7_OFF_lamp_fail | 7OFFGKEWMF | 0 | ** |
| 27 | SH44 ON | Shunt_44_ON_lamp_fail | 44ONGKEWMF | 0 | ** |
| 28 | SH44 OFF | Shunt_44_OFF_lamp_fail | 44OFFGKEWMF | 0 | ** |
| 29 | S5 RED | Sig_5_R_lamp_fail | 5RGKERMF | 0 | ** |
| 30 | S5 YELLOW | Sig_5_Y_lamp_fail | 5HKEWMF | 0 | ** |
| 31 | S5 GREEN | Sig_5_G_lamp_fail | 5DGKEWMF | 0 | ** |
| 32 | S5 CALLING ON | Sig_CO5_calling_on_lamp_fail | CO5HGKEWMF | 0 | ** |
| 33 | S5 ROUTE | Sig_5UG_Y_lamp_fail | 5UGKEWMF | 0 | ** |
| 34 | DD GREEN | Sig_DD_G_lamp_fail | DDDGKEWMF | 0 | ** |
| 35 | DD DOUBLE YELLOW | Sig_DD_YY_lamp_fail | DDHHGKEWMF | 0 | ** |
| 36 | DID YELLOW | Sig_DID_Y_lamp_fail | DIDHGKEWMF | 0 | ** |
| 37 | DID DOUBLE YELLOW | Sig_DID_YY_lamp_fail | DIDHH-DGKEWMF | 0 | ** |
| 38 | DID GREEN | Sig_DID_G_lamp_fail | DIDDGKEWMF | 0 | ** |

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| 39 | UD GREEN | Sig_UD_G_lamp_fail | UDDGKEWMF | 0 | ** |
|----|----------|-------------------|-----------|---|-----|
| 40 | UD DOUBLE YELLOW | Sig_UD_YY_lamp_fail | UDHHGKEWMF | 0 | ** |
| 41 | UID YELLOW | Sig_UID_Y_lamp_fail | UIDHGKEWMF | 0 | ** |
| 42 | UID DOUBLE YELLOW | Sig_UID_YY_lamp_fail | UIDHH-DGKEWMF | 0 | ** |
| 43 | UID GREEN | Sig_UID_G_lamp_fail | UIDDGKEWMF | 0 | ** |
| 44 | Logic Rack | | | | Push Button |
| 45 | CONTROL PANEL | | | | Push Button |
| 46 | OPC | | | | Push Button |
| 47 | MTC | | | | Push Button |
| 48 | OUT FIELD EQUIPMENT | | | | Push Button |

** The status corresponding to the Relay Name in the above table can be confirmed by the window of Online information (Relay status) of MTC.

## 5.  The MTC message corresponding to failure for K5BMC EI

### 5.1  Logic Sub-Rack
### 5.1.1  IPU6C
(1) DC24/DC5
   1) Check the input voltage DC24V of the Logic Sub-Rack. (rating 21.6V to 26.4V)
   2) Then, check the output voltage DC5V at the measuring terminal of the IPU6C card. (rating 5V to 5.25V)
   3) If the voltage described at 2) is normal, change the IPU6C card.
   4) If the voltage described at 1) is abnormal, check the output voltage of the AC/DC converter bottom of the Logic Rack and change the converter if the voltage is not suitable.

(2) DC24/DC24
   1) Check the input voltage DC24V of the Logic Sub-Rack. (rating 21.6V to 26.4V)
   2) Then, check the output voltage DC24V at the measuring terminal of the IPU6C card. (rating 21.6V to 26.4V)
   3) If the voltage described at 2) is abnormal, change the IPU6C card.
   4) If the voltage described at 1) is abnormal, check the output voltage DC24V of the AC/DC converter at the bottom of the Logic Rack and change the converter if the voltage is not suitable.

### 5.1.2  F486-4I and DID
(1) CPU
   1) Turn the power SW of IPU6C card OFF and then ON. (reset operation)
   2) If failure is not recovered, change the F486-4I card.
(2) ROM
   3) Turn the power SW of IPU6C card OFF and then ON. (reset operation)
   4) If failure is not recovered, change the F486-4I card.

(3) RAM
   1) Turn the power SW of IPU6C card OFF and then ON. (reset operation)
   2) If failure is not recovered, change the F486-4I card.

(4) IC Card
   1) Check the IC Card inserted to the F486-4I card
   2) If failure is not recovered, turn the power SW of IPU6C card OFF and then ON. (reset operation)
   3) If failure is not recovered yet, change the F486-4I card.

(5) Ctrl Data Tx
   1) Check that all the CPU, ROM and RAM in F486-4I card are normal.
   2) If the state is normal, change the F486-4I card.

(6) Indic. Data Rx
   1) Check that the FSIO or FSIO-EX card is normal.
   2) If the state described at 1) is normal, change the F486-4I card.
   3) If the failure is not recovered yet, change the FSIO or FSIO-EX card.

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(7) Inter-sys Tx/Rx Rx

    1) Check that all the CPU, ROM and RAM in F486-4I card of the other system are normal.

    2) If the state described at 1) is normal, change the F486-4I card or DID card of own system.

    3) If the state described at 1) is abnormal, change the F486-4I card or DID card of the other system.

    4) If failure is not recovered yet, change the Logic Sub-Rack.

(8) Inter-sys Tx/Rx Tx

    1) Check that all the CPU, ROM and RAM in F486-4I card are normal.

    2) If this state is normal, change the F486-4I card.

(9) DID

    1) Check that all the CPU, ROM and RAM in F486-4I card of the other system are normal.

    2) If state described at 1) is normal, change the F486-4I card or DID card of own system.

    3) If state described at 1) is abnormal, change the F486-4I card or DID card of other system.

    4) If failure is not recovered yet, change the Logic Sub-Rack.

### 5.1.3  FSIO and FIO7-[P]

(1) Ctrl Data Rx

    1) Change the FSIO card.

    2) If failure is not recovered, change the FIO7-[P] card.

(2) Indic. Data Tx

    1) Change the FSIO card.

    2) If failure is not recovered, change the FIO7-[P] card.

(3) MTC CH Tx

    1) Change the FSIO card.

    2) If failure is not recovered, change the FIO7-[P] card.

(4) ET CH1 Tx

    1) Change the FSIO card.

    2) If failure is not recovered, change the FIO7-[P] card.

(5) ET CH2 Tx

    1) Change the FSIO card.

    2) If failure is not recovered, change the FIO7-[P] card.

(6) ET CH3 Tx

    1) Change the FSIO card.

    2) If failure is not recovered, change the FIO7-[P] card.

(7) MTC CH Rx

    1) Check that the MTC operation is normal.

    2) Check the optical cable connection of the MTC CH Tx. (from CN5T of FIO7-[P] to RD of INIO2)

    3) Check the optical cable connection of the MTC CH Rx. (from SD of INIO2 to CN5R of FIO7-[P])

    4) If failure is not recovered, change the optical cable of MTC CH Tx. (described at 2))

5) If failure is not recovered yet, change the optical cable of MTC CH Rx. (described 3))

6) If failure is not recovered yet more, change the FIO7-[P] card.

7) If failure is not recovered yet, change the FSIO card.

(8) ET CH1 Rx

1) Check that the Electronic Terminal is connected to the ET CH1(CN1R and CN1T of FIO7-[P]) with optical cable.

2) If the Electronic Terminal is connected, check the optical cable connection of ET CH1 Tx. (CN1T of FIO7-[P])

3) Check the optical cable connection of ET CH1 Rx. (CN1R of FIO7-[P])

4) If failure is not recovered, change the optical cable of ET CH1 Tx. (described at 2))

5) If failure is not recovered yet, change the optical cable of ET CH1 Rx. (described at 3))

6) If failure is not recovered yet, change the FIO7-[P] card.

7) If failure is still not recovered yet, change the FSIO card.

(9) ET CH2 Rx

1) Check that the Electronic Terminal is connected to the ET CH2(CN2R and CN2T of FIO7-[P]) with optical cable.

2) When the Electronic Terminal is connected, check the optical cable connection of ET CH2 Tx. (CN2T of FIO7-[P])

3) Check the optical cable connection of ET CH2 Rx. (CN2R of FIO7-[P])

4) If failure is not recovered, change the optical cable of ET CH2 Tx. ( described 2))

5) If failure is not recovered yet, change the optical cable of ET CH2 Rx. (described at 3))

6) If failure is not recovered yet, change the FIO7-[P] card.

7) If failure is not recovered yet, change the FSIO card.

(10) ET CH3 Rx

1) Check that the Electronic Terminal is connected to the ET CH3(CN3R and CN3T of FIO7-[P]) with optical cable.

2) Whenthe Electronic Terminal is connected, check the optical cable connection of ET CH3 Tx. (CN3T of FIO7-[P])

3) Check the optical cable connection of ET CH3 Rx. (CN3R of FIO7-[P])

4) If failure is not recovered, change the optical cable of ET CH3 Tx. ( described 2))

5) If failure is not recovered yet, change the optical cable of ET CH3 Rx. (described at 3))

6) If failure is not recovered yet, change the FIO7-[P] card.

7) If failure is not recovered yet, change the FSIO card.

### 5.1.4  FSIO-EX and EXTFIO7P

(1) Ctrl Data Rx

1) Change the FSIO-EX card.

2) If failure is not recovered, change the EXTFIO7P card.

(2) Indic. Data Tx

1) Change the FSIO-EX card.

2) If failure is not recovered, change the EXTFIO7P card.

(3) ET CH4 Tx

 1) Change the FSIO-EX card.

 2) If failure is not recovered, change the EXTFIO7P card.

(4) ET CH5 Tx

 1) Change the FSIO-EX card.

 2) If failure is not recovered, change the EXTFIO7P card.

(5) ET CH4 Rx

 1) Check that the Electronic Terminal is connected to the ET CH4(CN11R&CN11T of EXTFIO7P) with optical cable.

 2) When the Electronic Terminal is connected, check the optical cable connection of ET CH4 Tx. (CN11T of EXTFIO7P)

 3) Check the optical cable connection of ET CH4 Rx. (CN11R of EXTFIO7P)

 4) If failure is not recovered, change the optical cable of the ET CH4 Tx. (described at 2))

 5) If failure is not recovered yet, change the optical cable of ET CH4 Rx. (described at 3)).

 6) If failure is not recovered yet, change the EXTFIO7P card.

 7) If failure is not recovered yet, change the FSIO card.

(6) ET CH5 Rx

 1) Check that the Electronic Terminal is connected to the ET CH5(CN12R&CN12T of EXTFIO7P) with optical cable.

 2) If the Electronic Terminal is connected, check the optical cable connection of ET CH5 Tx. (CN12T of EXTFIO7P)

 3) Check the optical cable connection of ET CH5 Rx. (CN12R of EXTFIO7P)

 4) If failure is not recovered, change the optical cable of ET CH5 Tx. (described at 2))

 5) If failure is not recovered yet, change the optical cable of ET CH5 Rx. (described at 3))

 6) If failure is not recovered yet, change the EXTFIO7P card.

 7) If failure is still not recovered yet, change the FSIO-EX card.

## 5.2  ET-PIO Sub-Rack

### 5.2.1  LINE2B

(1) ET Ctrl Data OE transform

 1) Check the optical cable connection of Rx. (from Ach R of LINE2B to Tx of FIO7-[P] or EXTFIO7P)

 2) If failure is not recovered, change the optical cable of Rx. (described 1)).

 3) If failure is not recovered yet, change the LINE2B card.

(2) ET Indic. Data EO transform

 1) Check the optical cable connection of Tx. (from Ach T of LINE2B to Rx of FIO7-[P] or EXTFIO7P)

 2) Check the optical cable connection of Rx. (from Ach R of LINE2B to Tx of FIO7-[P] or EXTFIO7P)

 3) If failure is not recovered, change the optical cable of Tx. (described at 1))

 4) If failure is not recovered yet, change the optical cable of Rx. (described at 2))

 5) If failure is not recovered yet, change the LINE2B card.

(3) DC24/DC5

    1) Check the input voltage DC24V of the ET-PIO Sub-Rack. (rating 21.6V to 26.4V)

    2) Then, check the output voltage DC5V at the measuring terminal of of the LINE2B card. (rating 5V to 5.25V)

    3) If the voltage described at 2) is normal, change the LINE2B card.

    4) If the voltage described at 1) is abnormal, check the input voltage DC24V of the AC/DC converter bottom of the Logic Rack and then change the converter if the voltage is not suitable.

### 5.2.2   ET-PIO2

(1) ET Ctrl Data Rx

    1) Check the optical cable connection ofLINE2B Rx.

    2) If failure is not recovered, change the optical cable of LINE2B Rx.

    3) If failure is not recovered yet, change the PIO2-LOG card.

    4) If failure is not recovered yet, change the LINE2B card.

(2) ET Indic. Data Tx

    1) Check the optical cable connection of LINE2B Tx.

    2) Check the optical cable connection of LINE2B Rx.

    3) Change the optical cable of LINE2B Tx.

    4) Change the optical cable of LINE2B Rx.

    5) Change the PIO2-LOG card.

(3) I/O Port

    1) Check and record the LED indication of the front panel of the PIO2-LOG card, and then refer to the maintenance manual.

    2) Turn the power SW of PIO2-LOG card OFF and then ON.

    3) If the failure is not recovered, change the PIO2-LOG card.

    4) When the failure is recovered, leave the card at the slot and observe for a while.

    5) If the failure occurs again, change the PIO2-LOG card.

(4)   PIO2 ID Check

    1) Turn the power SW of PIO2-LOG card OFF and then ON.

    2) If the failure is not recovered, change the PIO2-LOG card.

    3) If the failure is not recovered yet, change the ET-PIO Sub-Rack.

(5) DC24/DC5

    1) Check the input voltage DC24V of ET-PIO Sub-Rack.

    2) If the voltage is normal, change the PIO2-LOG card.

    3) If the voltage is abnormal, check the AC/DC converter at the bottom of the Logic Rack, and change the converter if the voltage is not suitable.

### 5.3  ET-MMIF Sub-Rack
### 5.3.1  LINEM2
(1) ET Ctrl Data OE transform
  1) Check the optical cable connection of Rx. (from Ach R of LINEM2 to Tx of FIO7-[P] or EXTFIO7P)
  2) If failure is not recovered, change the optical cable of Rx. (described at 1))
  3) If failure is not recovered yet, change the LINEM2 card.

(2) ET Indic. Data. EO transform
  1) Check the optical cable connection of Tx. (from Ach T of LINEM2 to Rx of FIO7-[P] or EXTFIO7P)
  2) Check the optical cable connection of Rx. (from Ach R of LINEM2 to Tx of FIO7-[P] or EXTFIO7P)
  3) If failure is not recovered, change the optical cable of Tx. (described at 1))
  4) If failure is not recovered yet, change the optical cable of Rx. (described at 2))
  5) If failure is not recovered yet, change the LINEM2 card.

(3) DC24/DC5
  1) Check the input voltage DC24V of the ET-MMIF Sub-Rack.   (rating 21.6V to 26.4V)
  2) Then, check the output voltage DC5V at the measuring terminal of the LINEM2 card. (Rating 5V to 5.25V)
  3) If the voltage described at 2) is normal, change the LINEM2 card.
  4) If the voltage described at 1) is abnormal, check the output voltage DC24V of AC/DC converter at the bottom of the Logic Rack, and change the converter if the voltage is not suitable.

### 5.3.2  MMIF2
(1) ET Ctrl Data Rx
  1) Check the optical cable connection of the LINEM2 Rx. (from Tx of FIO7-[P] or EXTFIO7P to Ach Rx of LINEM2)
  2) If failure is not recovered, change the optical cable of LINEM2 Rx. (described at 1))
  3) If failure is not recovered yet, change the MMIF2 card.
  4) If failure is not recovered yet, change the LINEM2 card.

(2) ET Indic. Data Tx
  1) Check the optical cable connection of the LINEM2 Tx. (from Ach T of LINEM2 to Rx of FIO7-[P] or EXTFIO7P)
  2) Check the optical cable connection of the LINEM2 Rx. (from Tx of FIO7-[P] or /EXTFIO7P to A ch R of LINEM2)
  3) If failure is not recovered, change the optical cable of LINEM2 Tx. (described at 1))
  4) If failure is not recovered yet, change the optical cable of LINEM2 Rx. (described at 2))
  5) If failure is not recovered yet, change the MMIF2 card.

(3) MMIF2 ID Check
  1) Turn the power SW of MMIF2 card OFF and then ON. (reset operation)
  2) If failure is not recovered yet, change the MMIF2 card.

## 5.4　Journal Module

### 5.4.1　KDD172-KY48-2

(1) DC24/DC5

　　1) Check that all the LED indications of DC24V, DC12V and DC5V on KDD172-KY48-2 card light.

　　2) If only LED indication of DC24V is abnormal, check the input voltage DC24V of Journal Module. (rating 21.6V to 26.4V)

　　3) If input voltage described at 2) is abnormal, check the output voltage DC24V of AC/DC converter at the bottom of the Logic Rack, and change the converter if the voltage is not suitable.

　　4) If the DC12V LED or DC5V LED are abnormal, change the KDD172-KY48-2 card.

### 5.4.2　ZPEN3

(1) All kinds of failure

　　1) Turn the power SW of Journal Module OFF and then ON. (reset operation)

　　2) If the failure is not recovered, change the ZPEN3 card.

### 5.4.3　ZNIO2-S1

(1) All kinds of failure except Rx port

　　1) Turn the power SW of Journal Module OFF and then ON. (reset operation)

　　2) If the failure is not recovered, change the ZNIO2 card.

(2) Rx port

　　1) Check the optical cable connection of Rx. (from SPHC-TT of system 1 to LOGIC-S1 RD of ZNIO2).

　　2) If the failure is not recovered, change the optical cable of Rx. (described at 1))

　　3) If the failure is not recovered yet, change the ZNIO2 card.

### 5.4.4　ZNIO2-S2

(1) All kinds of failure except Rx port

　　1) Turn the power SW of Journal Module OFF and then ON. (reset operation)

　　2) If the failure is not recovered yet, change the ZNIO2 card.

(2) Rx port

　　1) Check the optical cable connection of Rx. (from SPHC-TT of system 2 to LOGIC-S2 RD of ZNIO2)

　　2) If the failure is not recovered, change the optical cable of Rx. (described at 1))

　　3) If the failure is not recovered yet, change the ZNIO2 card.

### 5.4.5　ZSIO2

(1) All kinds of failure except Rx/Tx port

　　1) Turn the power SW of Journal Module OFF and then ON. (reset operation)

　　2) If the failure is not recovered, change the ZSIO2 card.

(2) Rx/Tx port

　　1) Check the RS232C cable connection from the Data Logger (Protocol Converter).

　　2) If the failure is not recovered, change the RS232C cable. (described at 1))

　　3) If the failure is not recovered yet, change the ZSIO2 card.