K5BMC

ELECTRONIC INTERLOCKING MANUAL

TECHNICIAN/JUNIOR ENGINEER LEVEL

KYOSAN INDIA PVT LTD.

Hand Book for Electronic Interlocking model K5BMC

- Installation, Maintenance & Trouble Shooting -

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Kyosan Electric Mfg. Co., Ltd.

29-1, Heiancho 2 chome, Tsurumi-ku, Yokohama, JAPAN

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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 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 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 includes information and instructions which, if not followed, could result in partly fault or damage of equipment as well as loss of the data.

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

- All or part of contents of the manual shall not be reproduced without permission.
- 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.

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- 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.
- Windows 2000 and Windows XP are registered trade marks of Microsoft, U.S.A.
- 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)

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.

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%)

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

-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%	

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
			No. of inputs and outputs		Transmission/reception, 3+2 channels
			Electric conditions		As transmission medium, optical cables are used.
			Transmission rate		31.2Kbps
			Transmission channel		Optical cables
	F486- 4I	Type			32 bits (i486)
		Operating frequency			40MHz
		Memory capacity		ROM	1 Mbytes
				RAM	2 Mbytes
		Error detection			Bus comparator Watchdog timer 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
			RAM	1 Mbytes
		Parallel input circuit	No. of ports	8 pcs.
			System	24V power supply, photo coupler isolation
		Parallel output circuit	No. of ports	12 pcs
			System	24V power supply, photo coupler isolation
		Checking input circuit	No. of ports	12 pcs
			System	24V power supply, photo coupler isolation
		Logic module normal output circuit	No. of ports	1 pc.
			System	24V power supply, photo coupler isolation
		Monitoring circuit	Transmission system	Serial transmission, optical cables
			No. of channels	1 pc.
			Transmission rate	307.2Kbps
		Electronic terminal line	Transmission system	Serial transmission, optical cables
			No. of channels	3 pcs.
			Transmission rate	31.2 Kbps
	FSIO-EX	Electronic terminal line	Transmission system	Serial transmission, optical cables
			No. of channels	2 pcs.
			Transmission rate	31.2 Kbps

- 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	

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	

4.4 Journal Module

4.4.1 ZPEN3 (Main processing part of Journal Module)

Item		Performance
CPU		Celeron 650MHz 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 Maximum of two connection is possible by using external connector and internal PC card connector.
	VGA	Controller : build in chipset (VRAM; using Main memory) Resolution : 280×1,024dot : 16.77million colour 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 Internal RAM 8K Byte External RAM 1M Byte shared RAM 16K Byte	
Transfer method	serial transmission, 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 Internal RAM 8K Byte External RAM 1M Byte 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

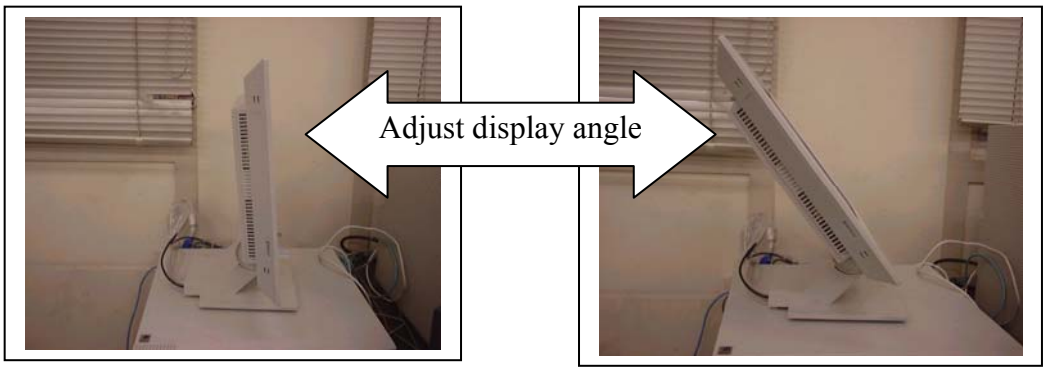
Please be careful to the following precautions for your health and normal operation of Operator Console.

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.



Adjusting brightness/contrast of LCD display

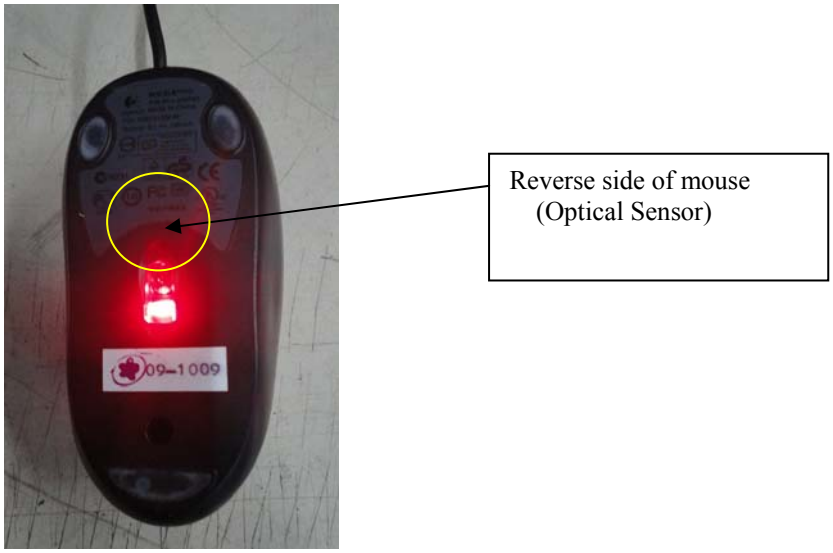
Adjust brightness and contrast of the screen.

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

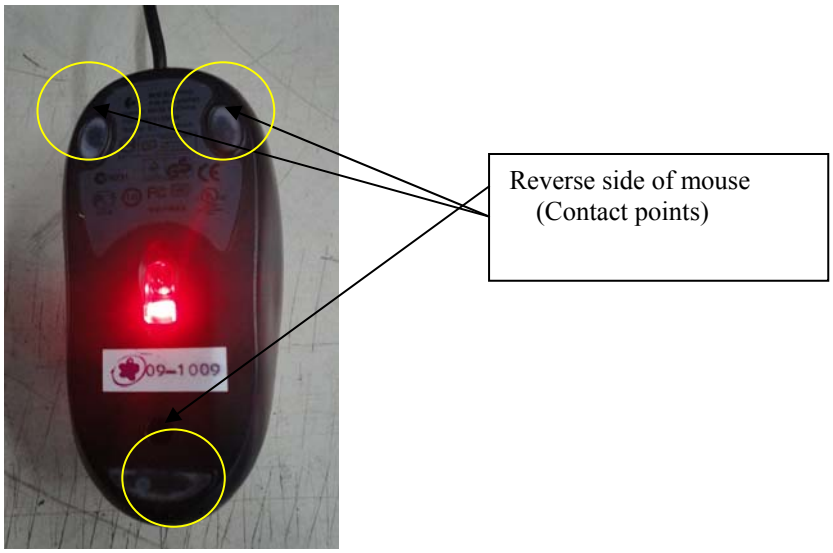
If the optical sensor is covered with dust or contact points of bottom phase are soiled, the mouse pointer may move sluggishly. For such cases, cleaning is required.

Cleaning of optical sensor



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



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

	
 	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.

	
  	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. When a fan etc. is rotating, do not touch it with hands or insert your cloths or hair in it. Do not touch internal wiring of the rack of card or power cable. Otherwise, you might receive an electric shock.

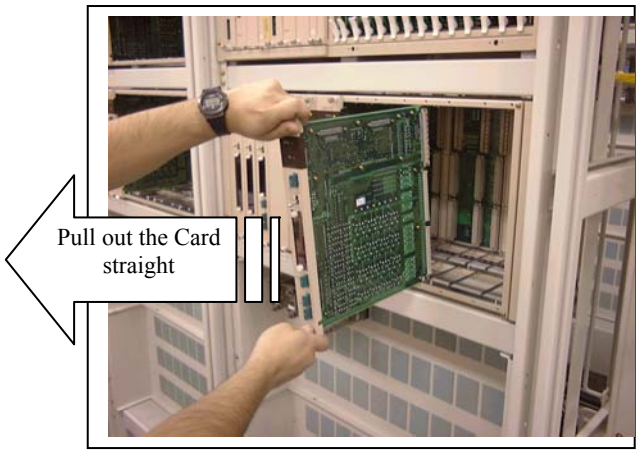
5.2 Card and IC Card replacing method

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

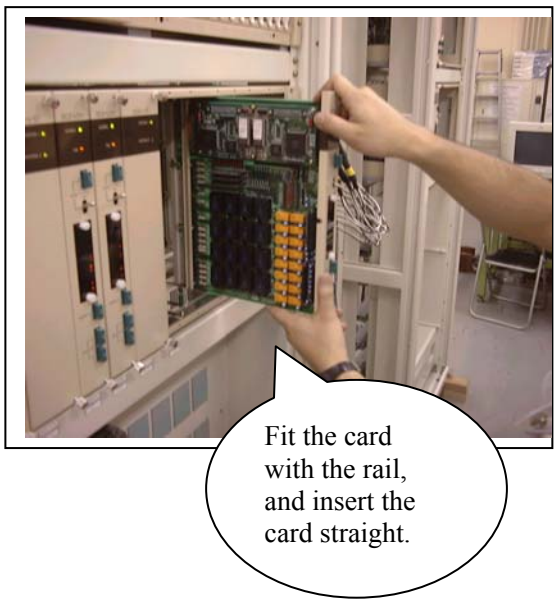
Turn OFF the power switch of each card. Remove card fixing screws. Next, pull out the card straight.



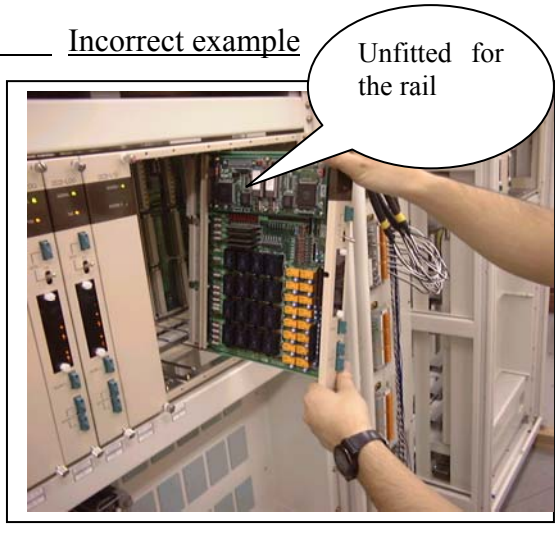
(2) Inserting the card

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



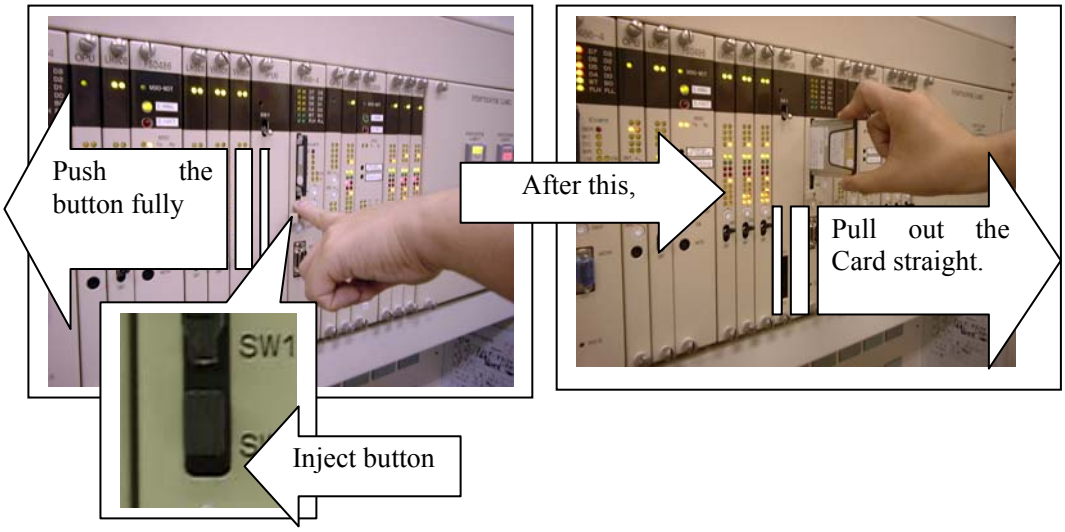
Incorrect example



5.2.2 IC Card replacing method

(1) Removing IC Card

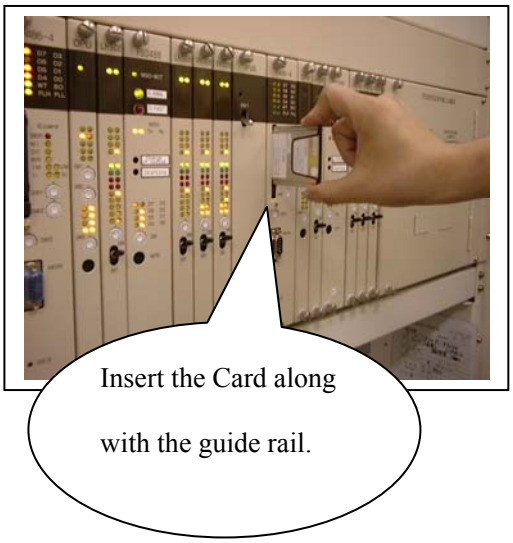
Turn OFF the power switch of IPU6C card . After removing inject button guard, push the inject button fully up to the innermost and then the IC Card comes out slightly. Next, hold the top and bottom of the IC Card firmly and pull out the Card straight.



(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

5.3 Logic Module handling precautions

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.

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.

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.

Do not replace an IC etc. on a card board of the Logic Module or disassemble a stack of cards, using screwdriver.

Handling precautions of optical fiber cords or cables
- When an optical fiber connector is not used, be sure to apply caps. (Dust-proof)
- Keep a bending radius of no less than 500 mm.
- Do not step or put anything on them.
- When pulling an optical fiber connector, keep a tension of less than 5 kg.
- Do not strongly vibrate or impact a cord or cable.

Carefully protect an IC card from static electricity, and never touch contacts of the card during handling. Otherwise, the IC card might fail.

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.

If the setting of card switch (Dip-Switch) in the Logic Module is changed, interlocking functions stop. Do not touch the Dip Switch.

 	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. Be sure to house spare parts or replaced card in static electricity protective bags. Otherwise, they might break down due to static electricity. Do not operate with wet hands, 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. Be sure to house replaced cards in static electricity protective bags. Otherwise, they might break down due to static electricity. After replacing the power supply card, install wires to the terminal board exactly according to the prescribed procedure. Do not operate the equipment with wet hands. Otherwise, you might receive an electric shock.

5.4 Electronic Terminal Module

Electronic Terminal handling precautions

 	Do not turn OFF the power switch without performing prescribed preparations, otherwise Electronic Interlocking functions might stop. 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.

  	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. 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. 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. 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. Be sure to house spare parts or replaced card in static electricity protective bags. Otherwise, a card might break down due to static electricity. 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. Be sure to collect replaced cards in static electricity protective bags. Otherwise, they might break down due to static electricity. After replacing the power supply card, install wires to the terminal board exactly according to the prescribed procedure. Do not operate the equipment with wet hands. Otherwise, you might receive an electric shock.

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%	

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.

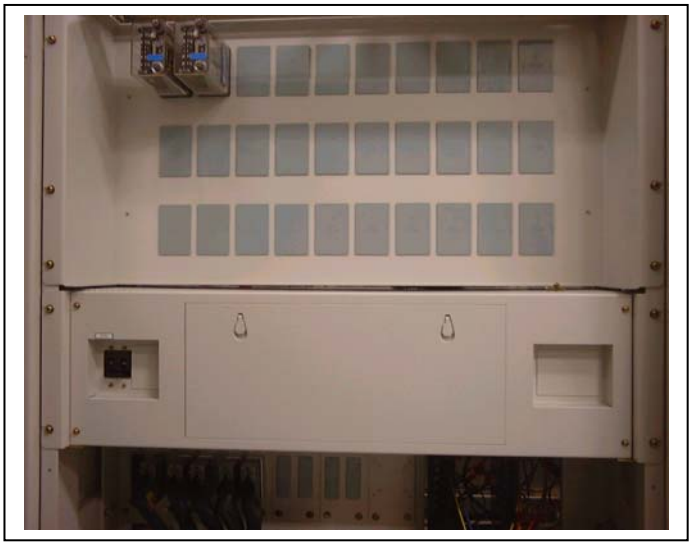
Front

Rear

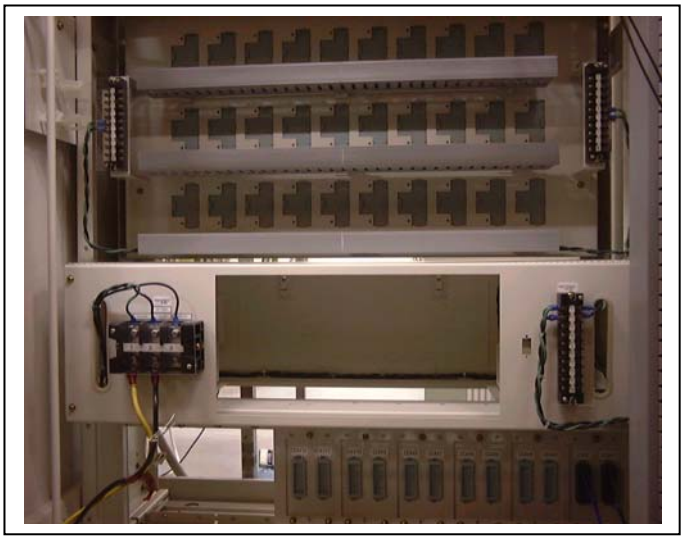
(2) Interlocking Logic Rack

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

Do not inadvertently turn OFF(NFB),
otherwise functions of the EI Equipment might stop.

Before replacing a power supply unit, turn OFF the main switch. (NFB)

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.

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.

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.

Also, do not remove accessories such as protective cover.

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.

Be sure to collect replaced unit in static electricity protective bags.

A unit might break down due to static electricity.

Do not work with wet hands, otherwise you might receive an electric shock.

 	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

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

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.

When handling a relay, do not vibrate or shock the relay.

Otherwise, faulty contact of the relay might result.

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.

Do not remove fixing screws of the relay cover.
Otherwise, faulty contact or relay failure might occur.

Do not touch contact parts of relay and jack with bare hands. Otherwise, faulty contact or rust might be caused.

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

Contacts

- Pin contacts

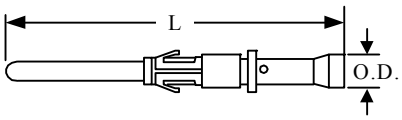


Fig. 1

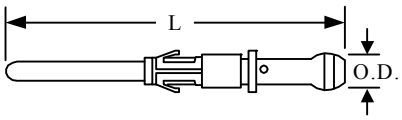


Fig. 2

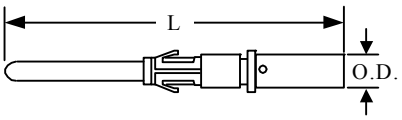


Fig. 3

Model	Pin OD (mm)	Applied conductor					Fig No.	Dimensions (mm)		Crimping tool				Removing tool
		Size		Covering OD		Pencilling length (mm) (±0.5)		L	O.D.	M8ND	M10S-1		BANDOMATIC	
		Stranded(mm^2)	Single(Φ mm)	Min	Max					Dies	Dies	Stop bushing	Indenter kit model	
RM24M-9D28	1.59	0.13 ~0.24	0.4 ~ 0.5	0.9	1.6	5.0	1	25.9	2.6	N24RT-10	S-9	SL-40	AMK-9	RX20-25V2J
				1.4	1.63						S-10			
RM20M-13D28		0.30 ~0.61	0.65 ~ 0.8	1.2	1.8		2		2.9	N20RT-30	S-10		AMK-6	
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

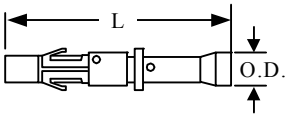


Fig. 1

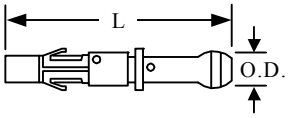


Fig. 2

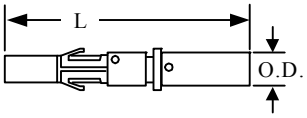


Fig. 3

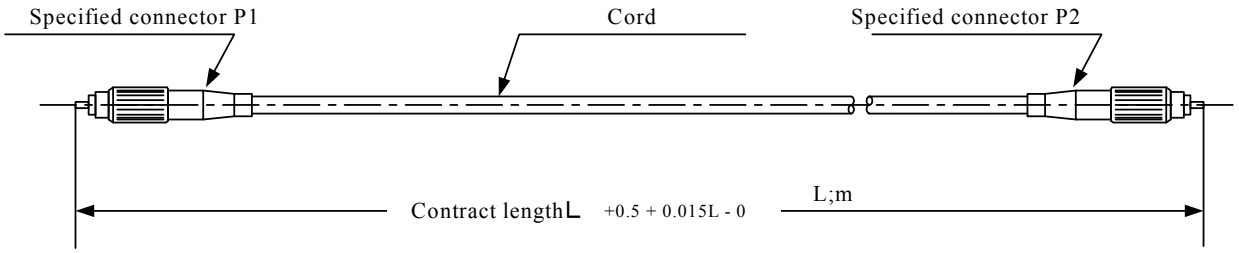
Model	Pin OD (mm)	Applied conductor					Fig No.	Dimensions (mm)		Crimping tool				Removing tool
		Size		Covering OD(mm)		Penciling length (±0.5)		L	O.D.	M8ND	M10S-1		BANDOMATIC	
		Stranded(mm^2)	Single(Φ mm)	Min	MAX					Dies	Dies	Stop bushing	Indenter kit model	
RC24M-9D28	1.59	0.13 ~0.24	0.4 ~0.5	0.9	1.6	5.0	1	18.0	2.6	N24RT-10	S-9	SL-40	AMK-9	RX20-25V2J
				1.4	1.63						S-10			
RC20M-13D28		0.30 ~0.61	0.65 ~0.8	1.2	1.8		2		2.9	N20RT-30	S-10		AMK-6	
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		-	

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



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 ± 1
Clad OD		125 ± 2.0μm
Eccentricity		1μm or less
Buffer layer		Silicon resin (OD 0.4mm)
Sheath	Material	Nylon
	Outside Size	0.9 ± 0.1mm
Structure		Fig-1

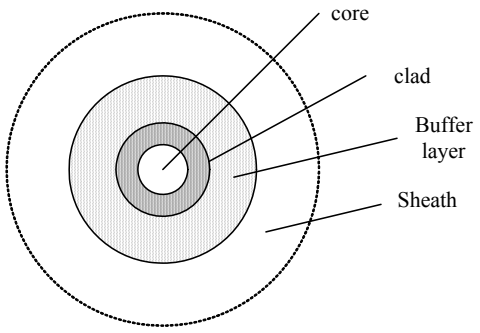


Fig-1

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

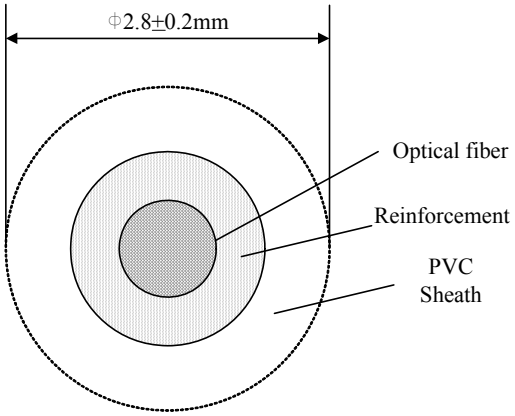


Fig-2

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

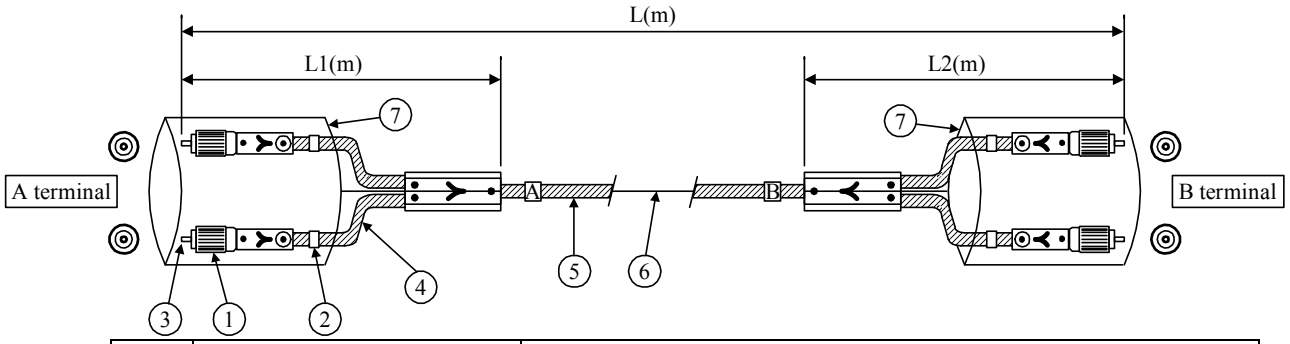
∗1 : Note that individual coupling loss shall be 0.5 dB or less.

∗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)

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 Two core s = 26 Four cores = 30 Six core s = 40 Eight core s = 60
6	Optical fiber		G1(G1 50/125) G(GI 62.5/125) S1(SM 10/125)
7	Protective tube		-

Optical fiber handling precautions

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.

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.

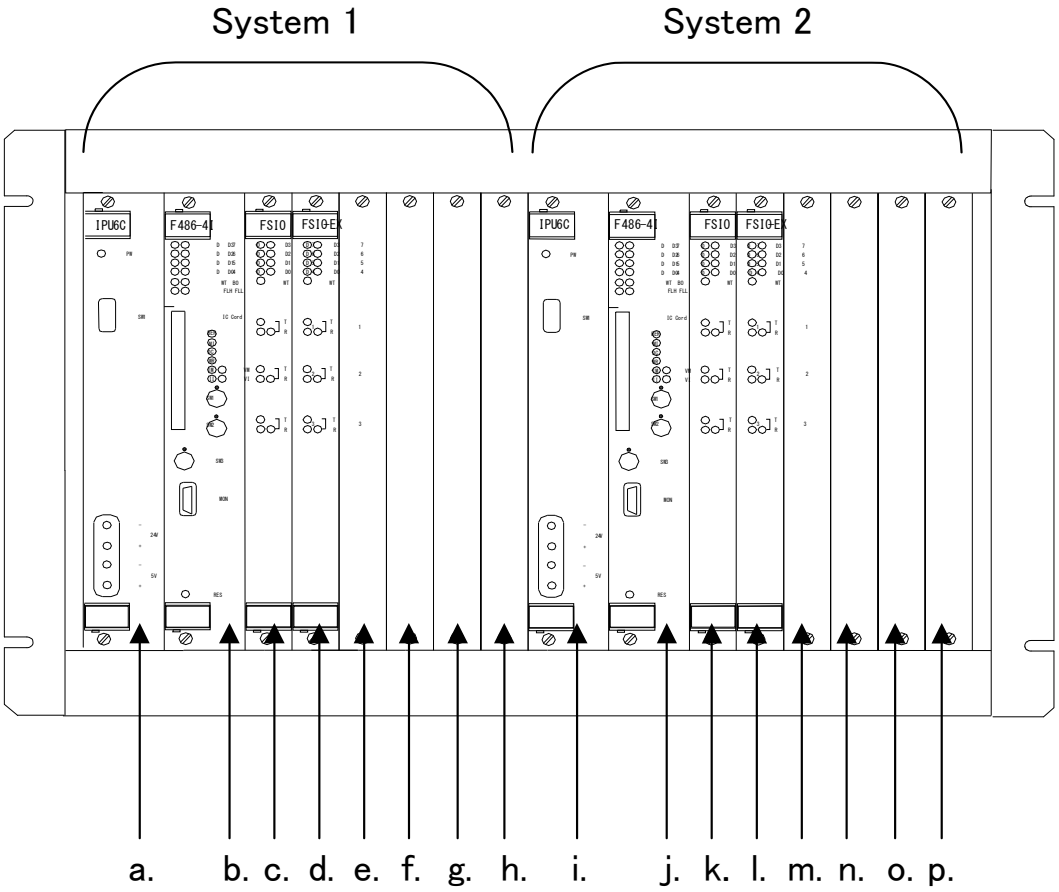
Do not place anything on an optical fiber during storage.

6. Equipment description

6.1 Logic Module

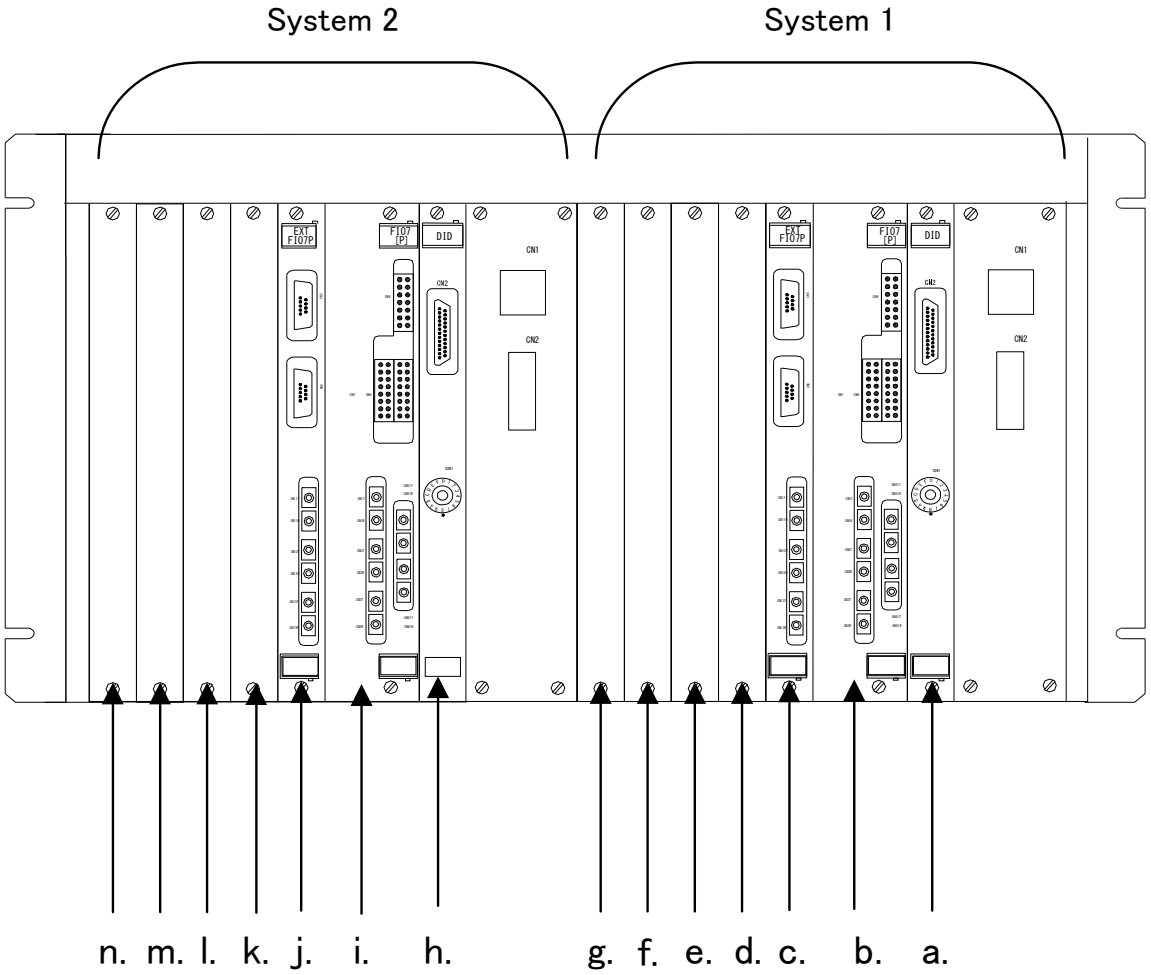
Precautions of Logic Module operating and storing cards are described below.

(1) Cards mounting view in Logic Module (front)



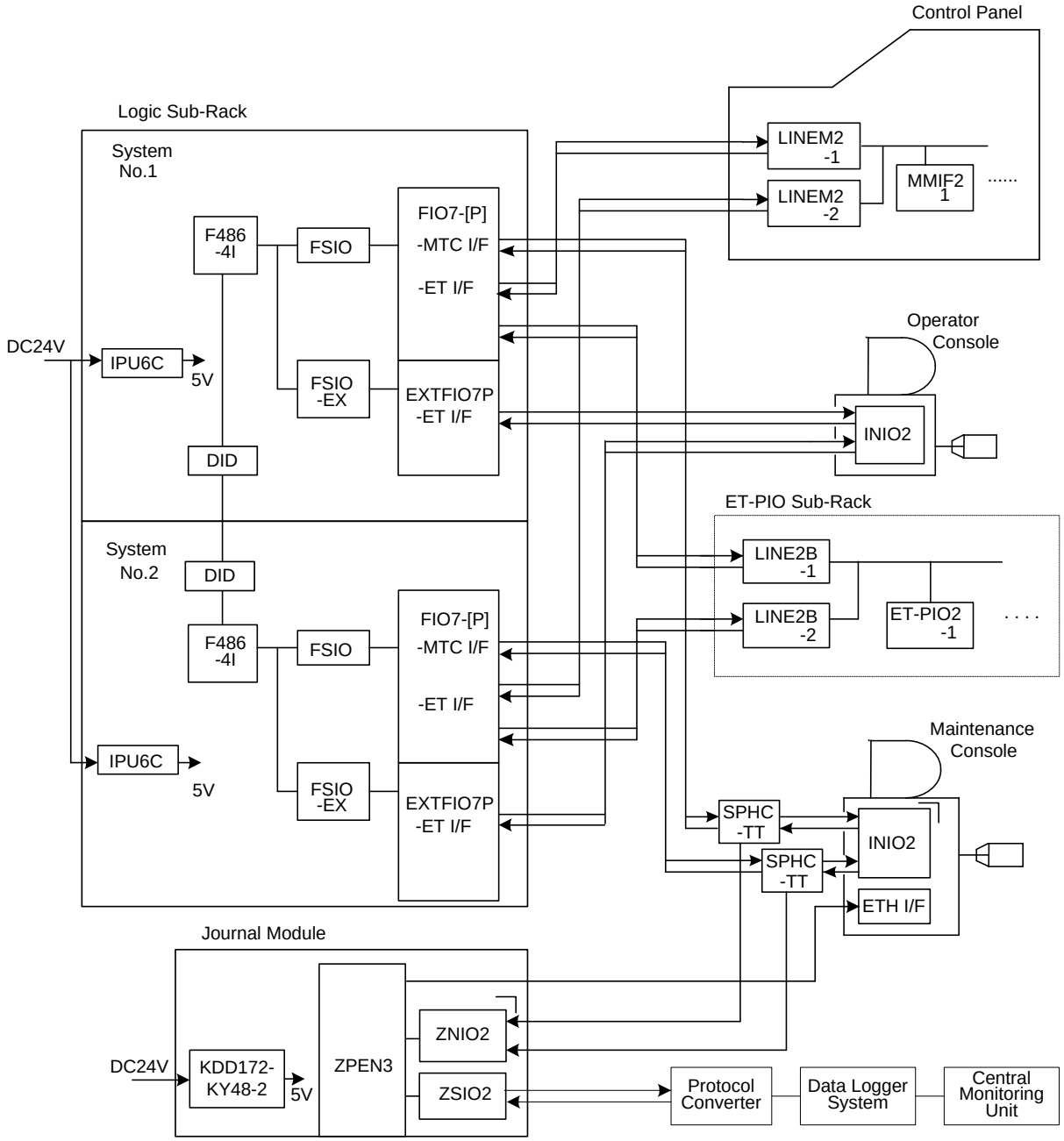
No.	Card (System 1)	No.	Card (System 2)
a.	IPU6C	i.	IPU6C
b.	F486-4I	j.	F486-4I
c.	FSIO	k.	FSIO
d.	FSIO-EX	l.	FSIO-EX
e.	Vacancy	m.	Vacancy
f.	Vacancy	n.	Vacancy
g.	Vacancy	o.	Vacancy
h.	Vacancy	p.	Vacancy

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

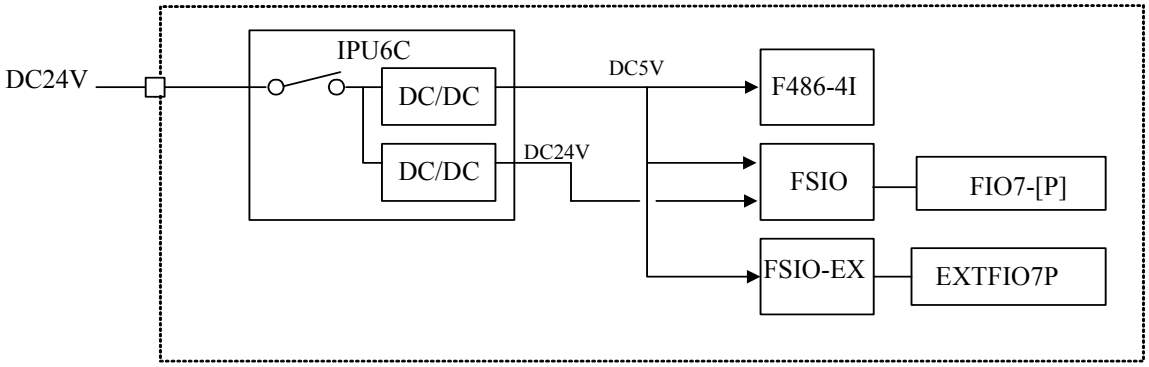
(2) Configuration of Logic Module and ET-NET



(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

	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.

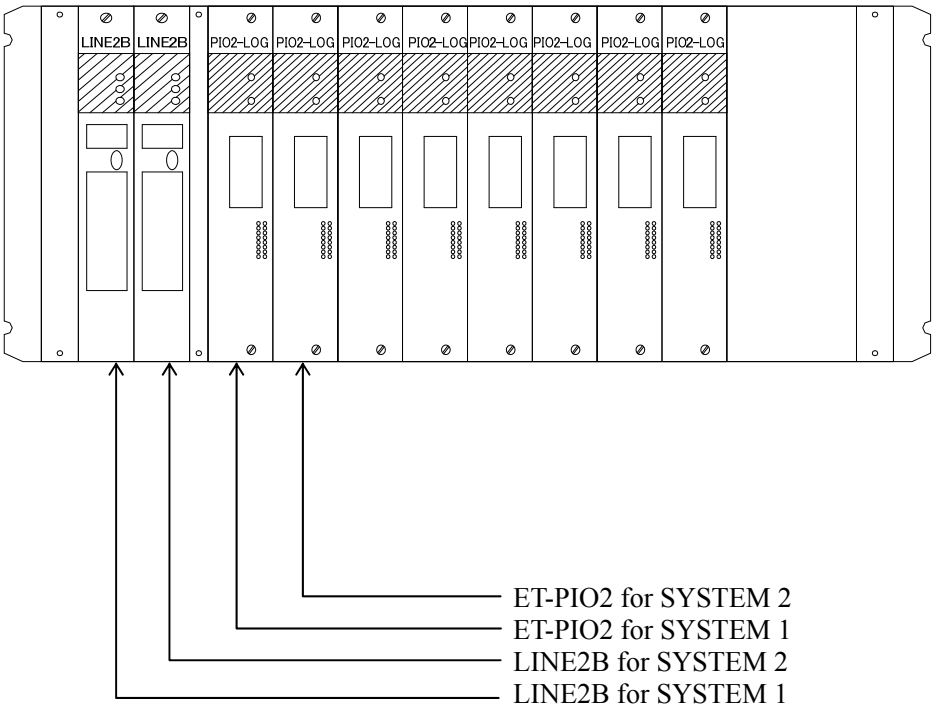
6.1.7 DID Card

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

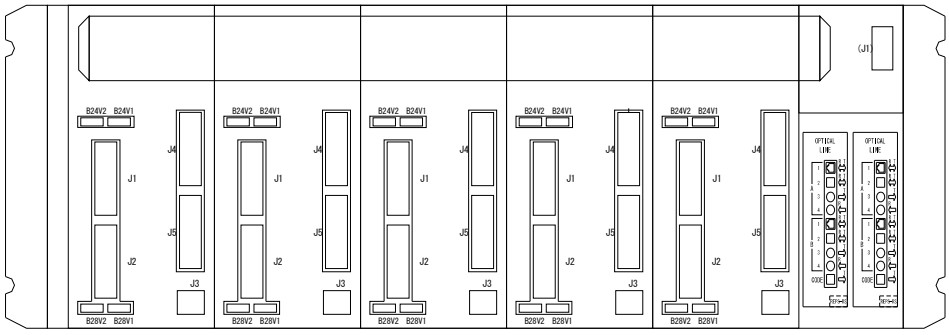
6.2 Electronic Terminal Module

Electronic terminal operating precautions are described below.

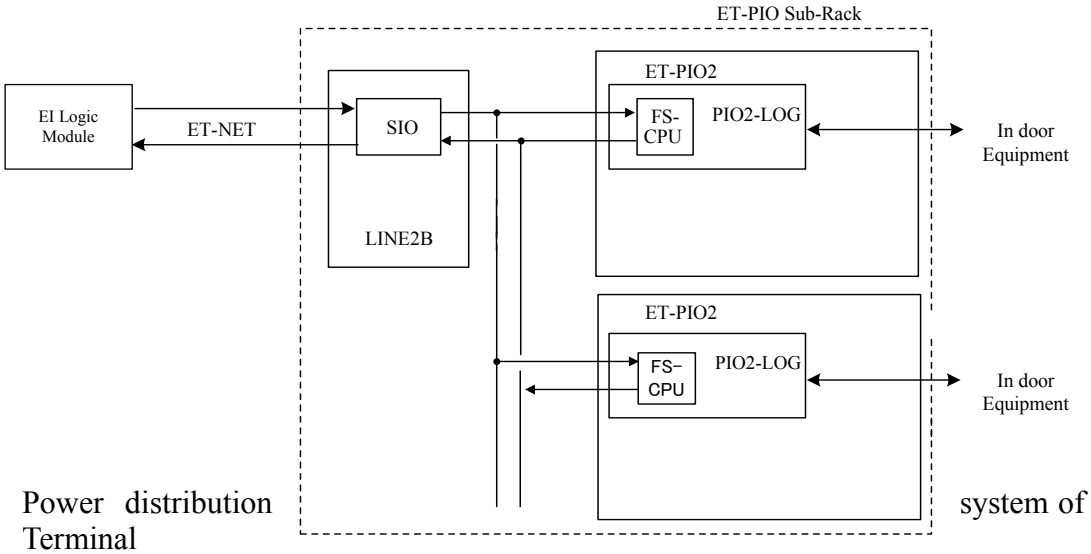
Mounting view of Electronic Terminal of ET-PIO Sub-Rack



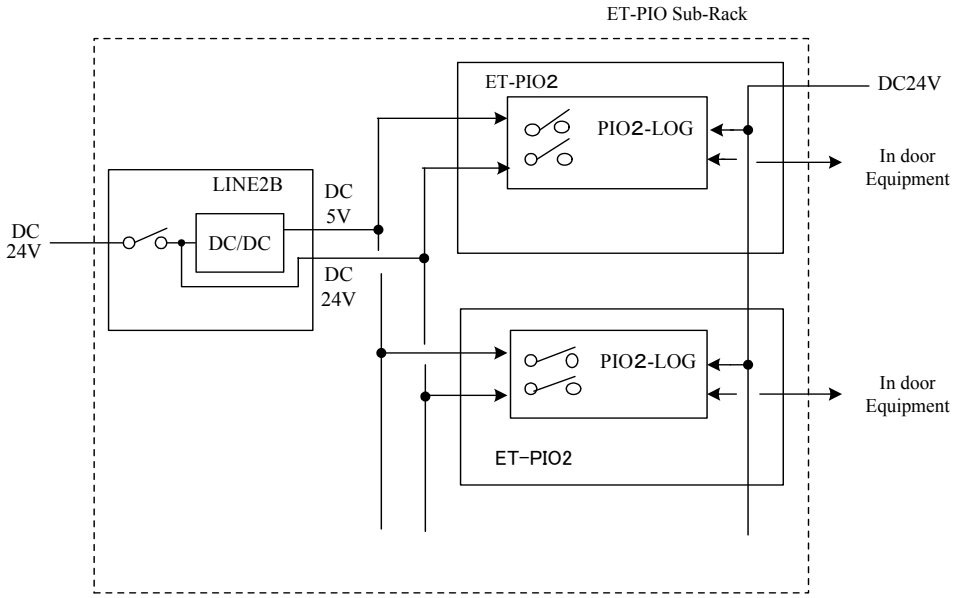
Rear View of ET-PIO Sub-Rack



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)

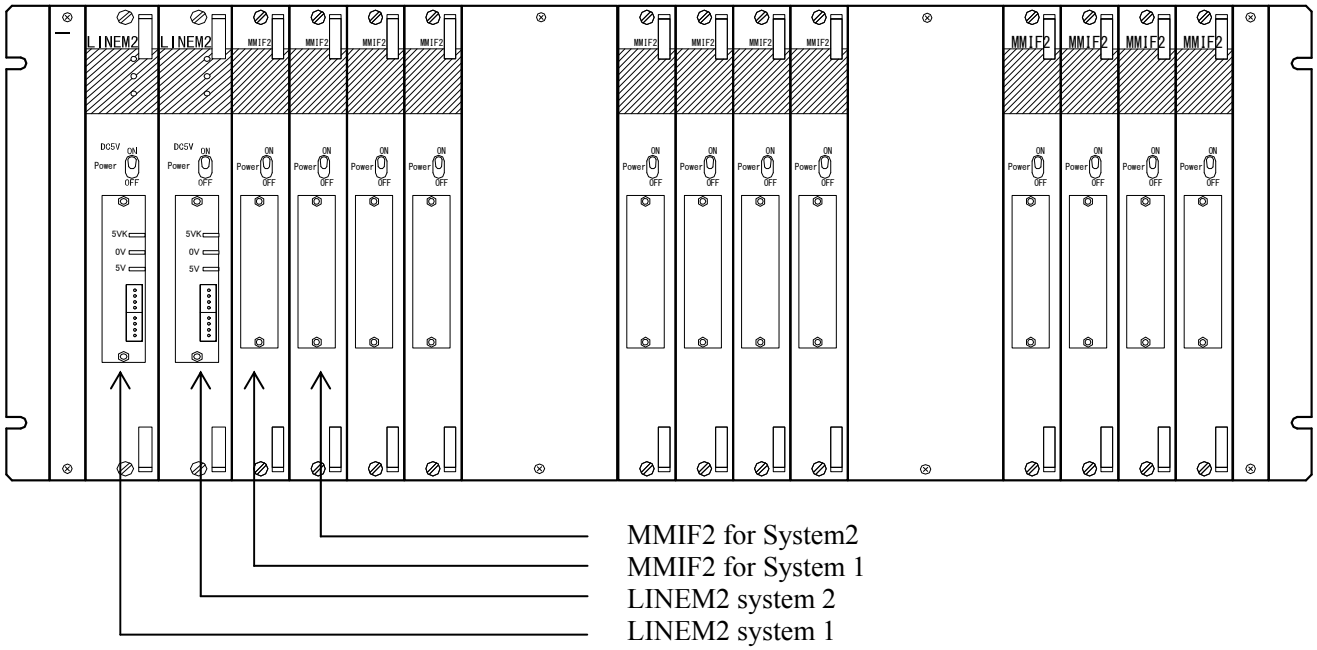
Front

Rear

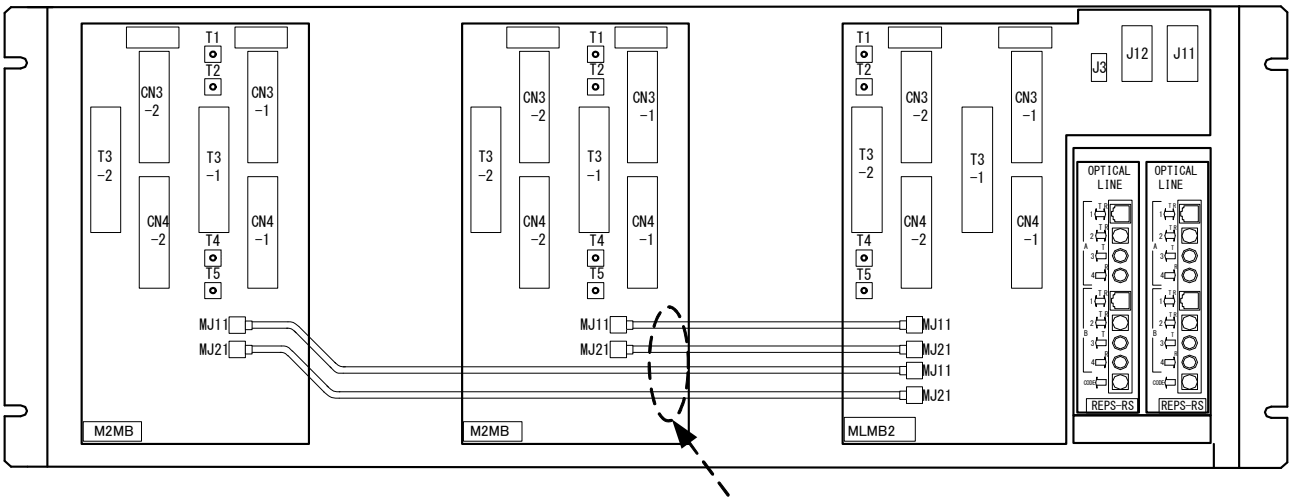
Card Mounting on MMIF2 Terminal

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

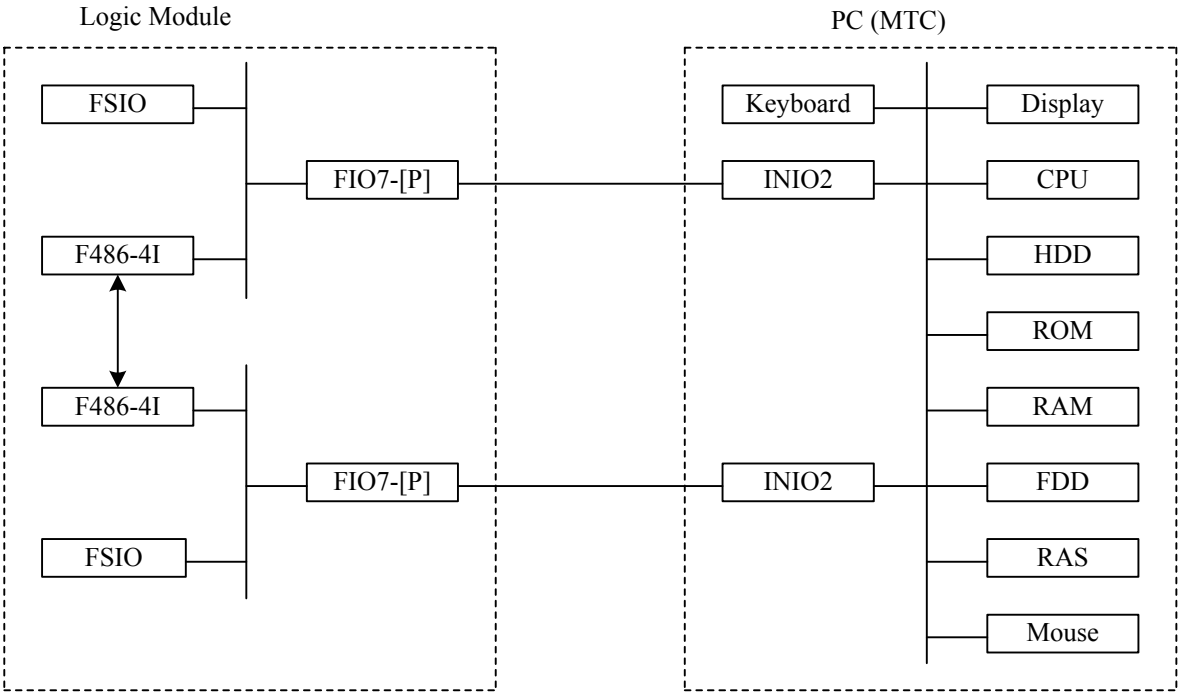
Front View



Rear View



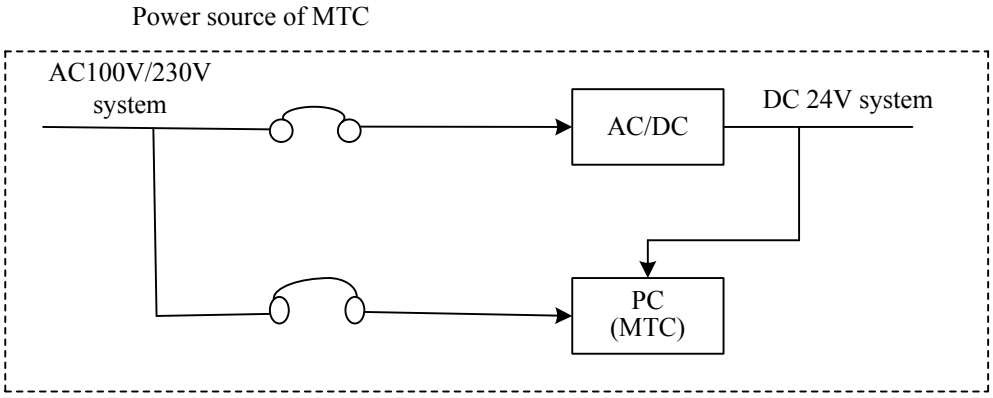
(1) Connection configuration between MTC and Interlocking Logic Module



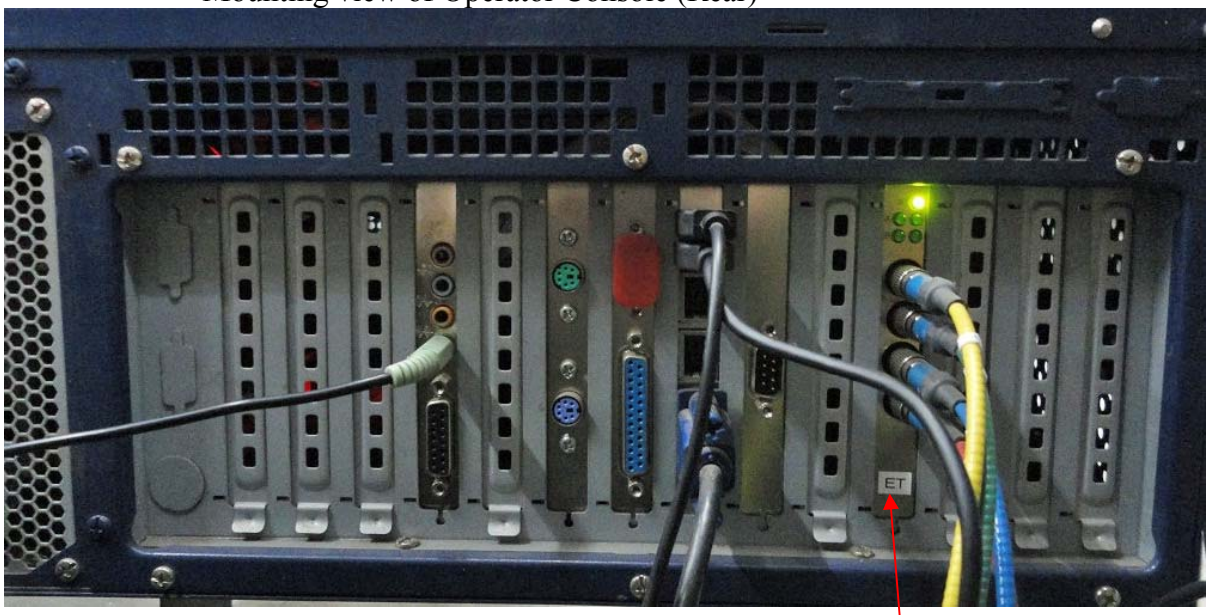
The Logic Module and MTC are connected by serial transmission using optical fiber cable.

(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.



Mounting view of Operator Console (Rear)



Name	Card name
a	INIO2

6.3.1 SPHC-PW Card

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

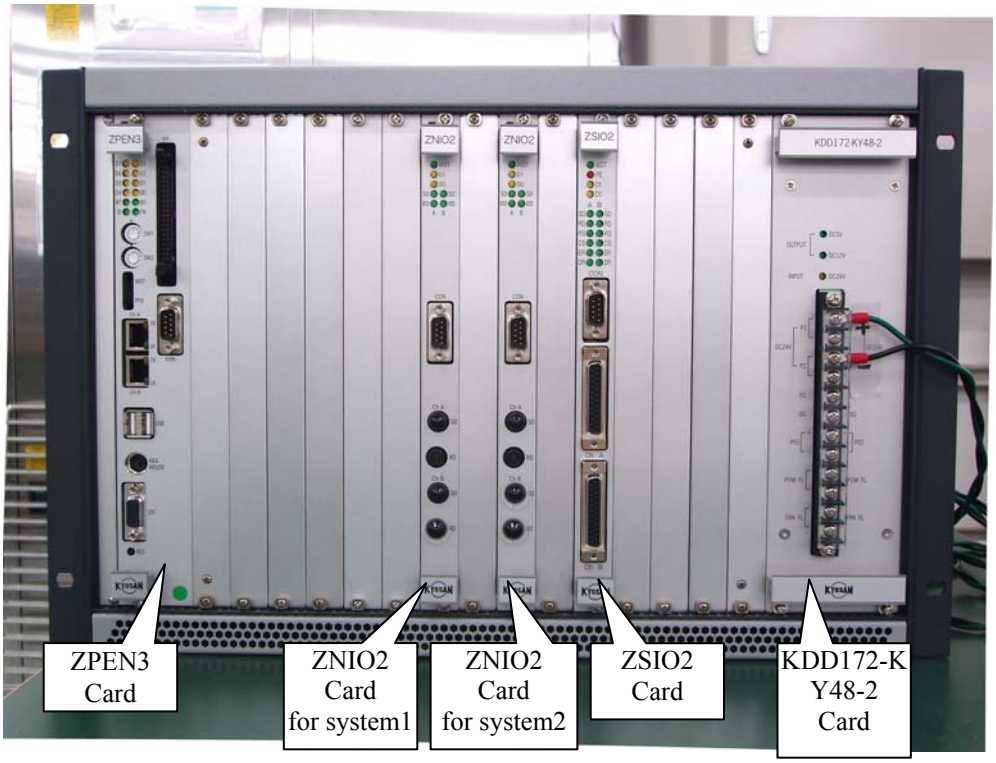
6.3.2 SPHC-TT Card

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

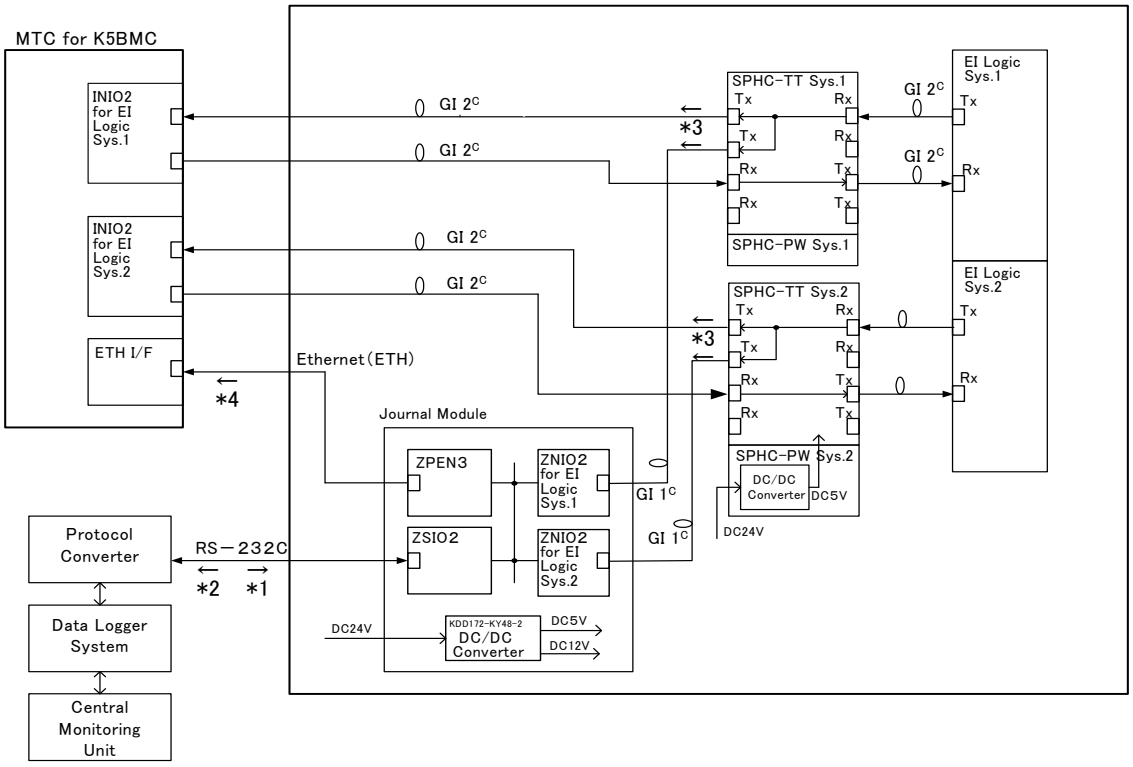
6.3.3 INIO2 Card

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



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.

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.)

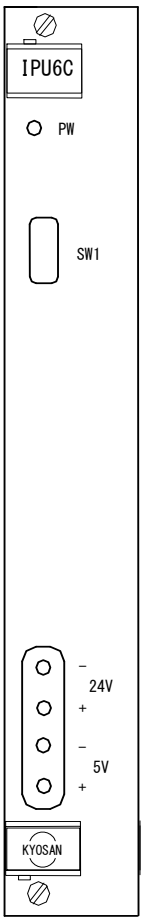
The Electronic Terminal Rack starts up by turning on the NFB. When started up completely, normal indication (G) of the Electronic Terminal lights and shows normal operation. (See the LED indication of the card.)

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



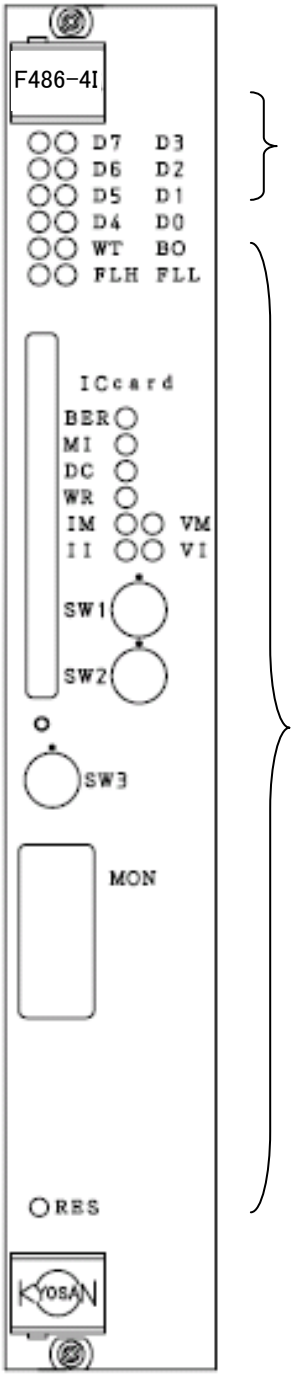
	Function
PW	Power supply normal ON
SW1	Power switch (outputs 5V, 24V) *1
5V+, -	Trimmer resistance to adjust output 5V *2
24V+, -	Trimmer resistance to adjust output 24V *2

*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)

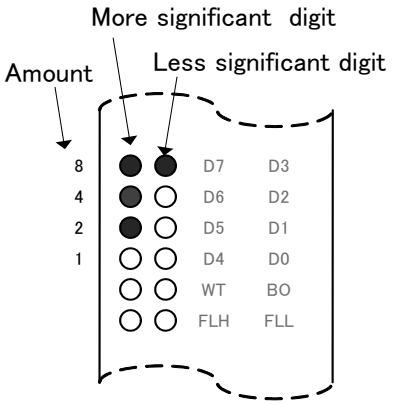
MI, DC, WR, IM, VM, II, VI: Status of Hardware (Refer to Table 1.1.2)

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 = EH
Less significant digit
8 = 8H

→ 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

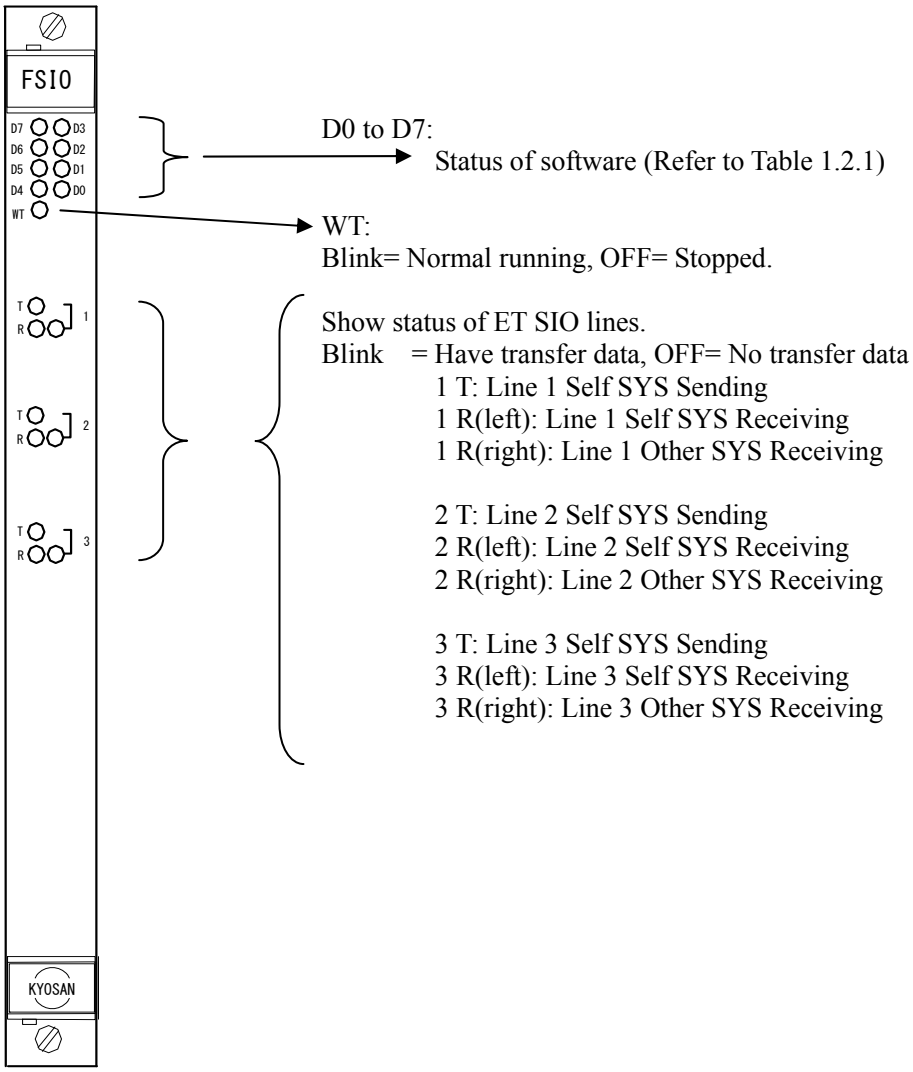


Table 1.2.1

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

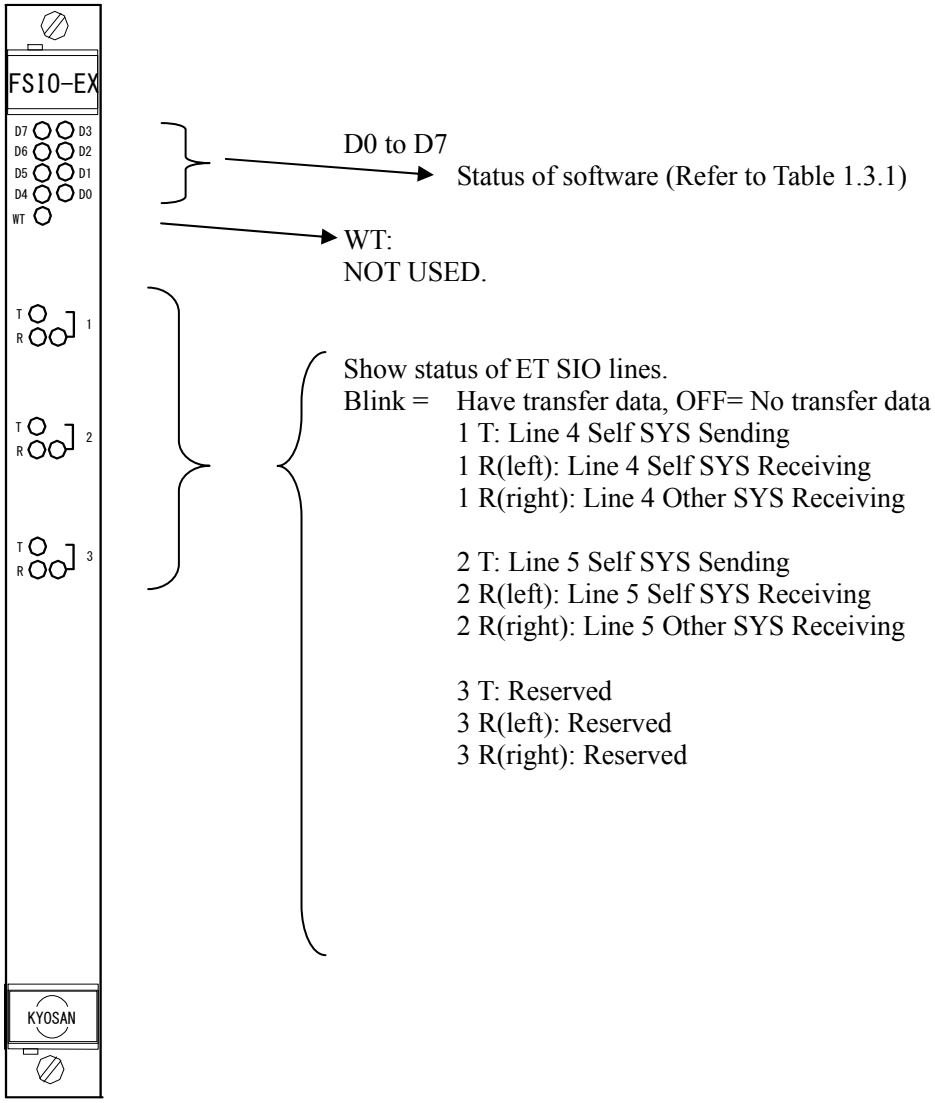
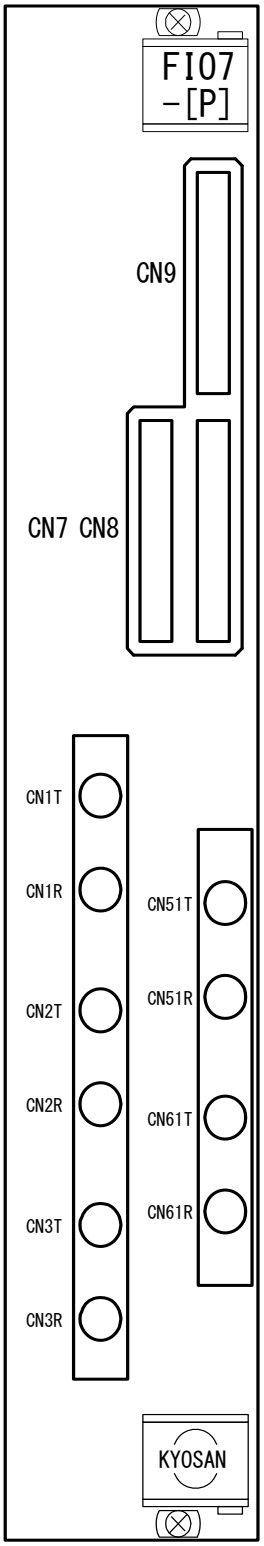


Table 1.3.1

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)

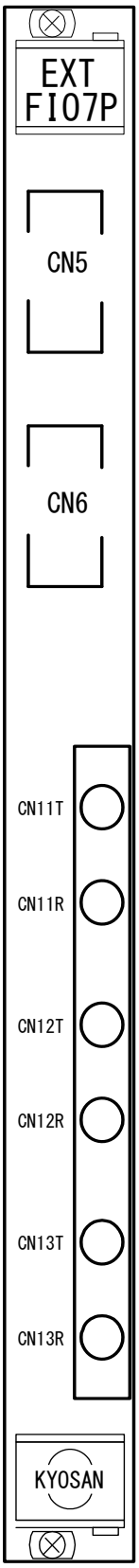
CN2T: ET Line 2 (Output Only)
CN2R: ET Line 2(Input Only)

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

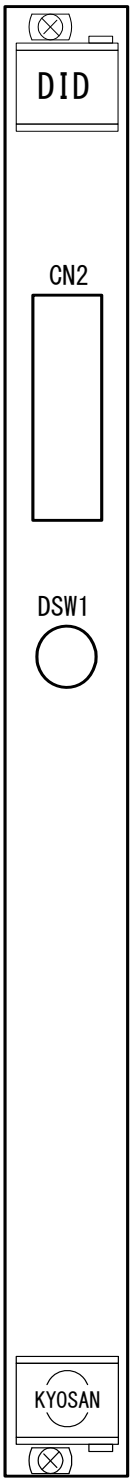
CN6: Reserved

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

7.2.7 DID Card

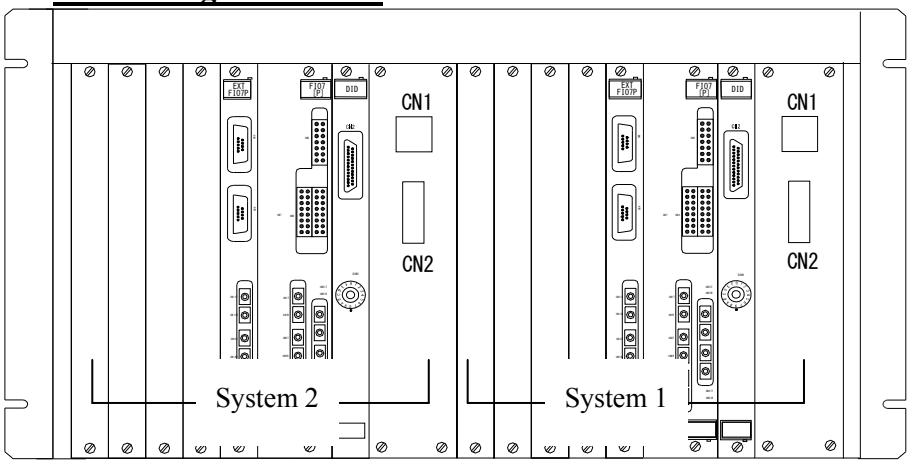


CN2: Station ID Jumper Connector

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



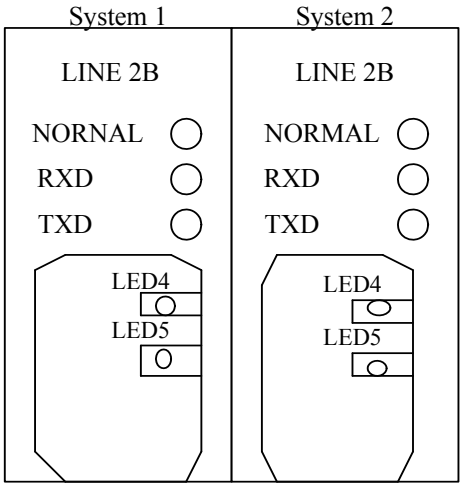
CN1 is Logic Module power input connector for System 1 or 2.
CN2 is Logic Module fault output connector for System 1 or 2.

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.

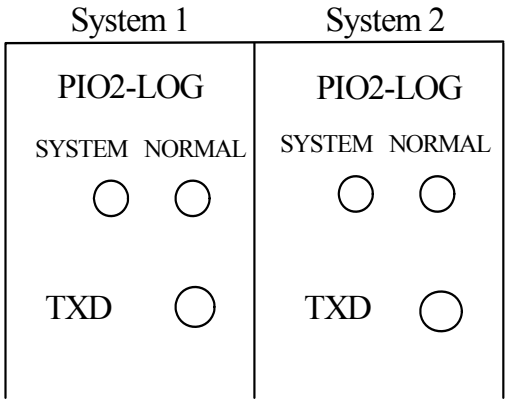
7.3.1 Electronic Terminal

(1) LINE2B Card



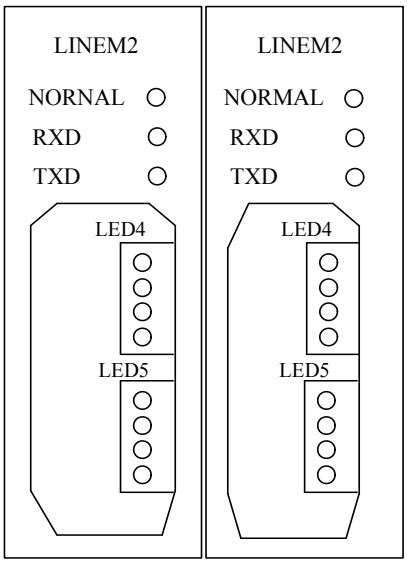
NORMAL	Meaning ----Terminal transmission & 5V power supply normal Indication status----ON for normal, OFF for fault
RXD	Meaning ----Reception from safety system Indication status----ON during reception
TXD	Meaning ----Transmission to safety system Indication status----ON during transmission
LED 4	Meaning ----Terminal transmission normal Indication status----ON for normal
LED 5	Meaning ----5V power supply normal Indication status----ON for normal

(2) ET-PIO2 Card



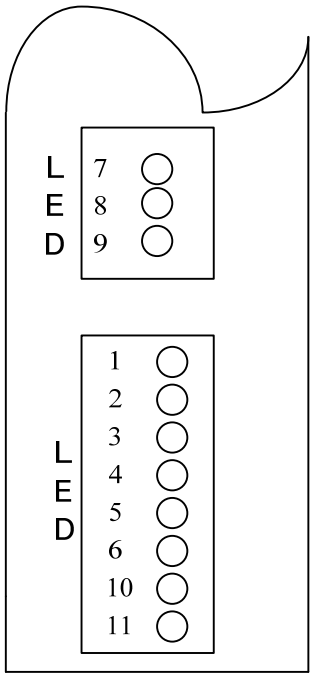
SYSTEM	Meaning ---- Comparator (FLR) is normal Indication status---- ON for normal, OFF for fault
NORMAL	Meaning ---- All function is normal Indication status---- ON for normal, OFF for fault
TXD	Meaning ---- Transmission Indication status---- ON during transmission

(3) LINEM2 card



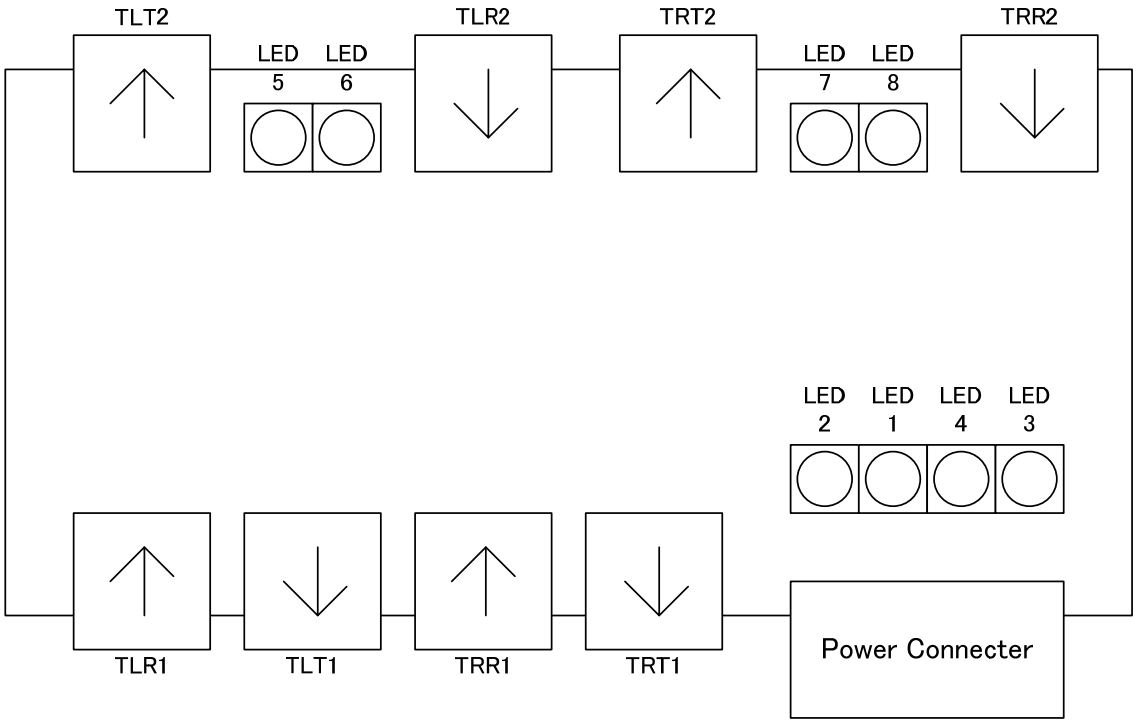
NORMAL	Meaning ----5V power supply normal Indication status----ON for normal, OFF for fault
RXD	Meaning ----Reception from safety system Indication status----ON during reception
TXD	Meaning ----Transmission to safety system Indication status----ON during transmission
LED 4	Not Used
LED 5	Not Used

(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

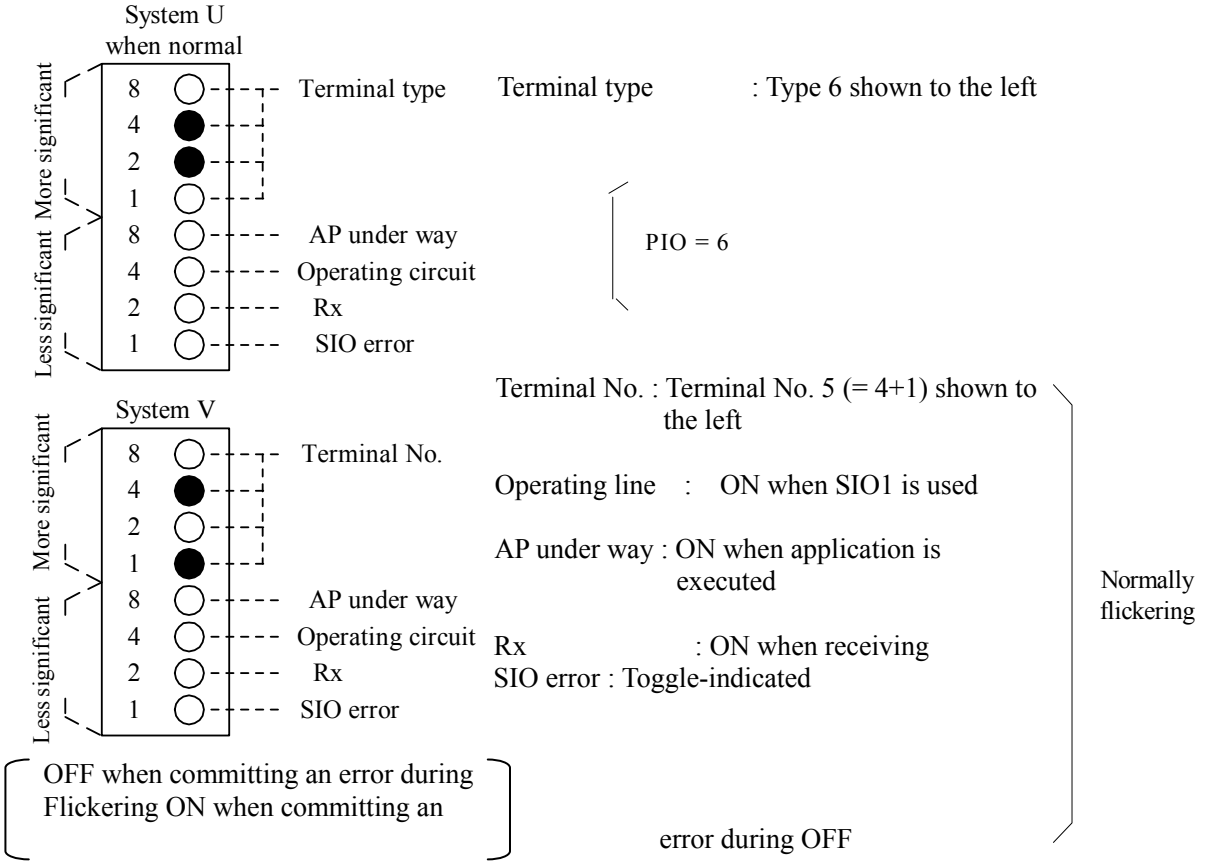


LED1	Blink when data receiving (TLR1 Optical Line)
LED2	Blink when data sending (TLT1 Optical Line)
LED3	Blink when data receiving (TRR1Optical Line)
LED4	Blink when data sending (TRT1 Optical Line)
LED5	Blink when data sending (TLT2 Optical Line)
LED6	Blink when data receiving (TLR2 Optical Line)
LED7	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.

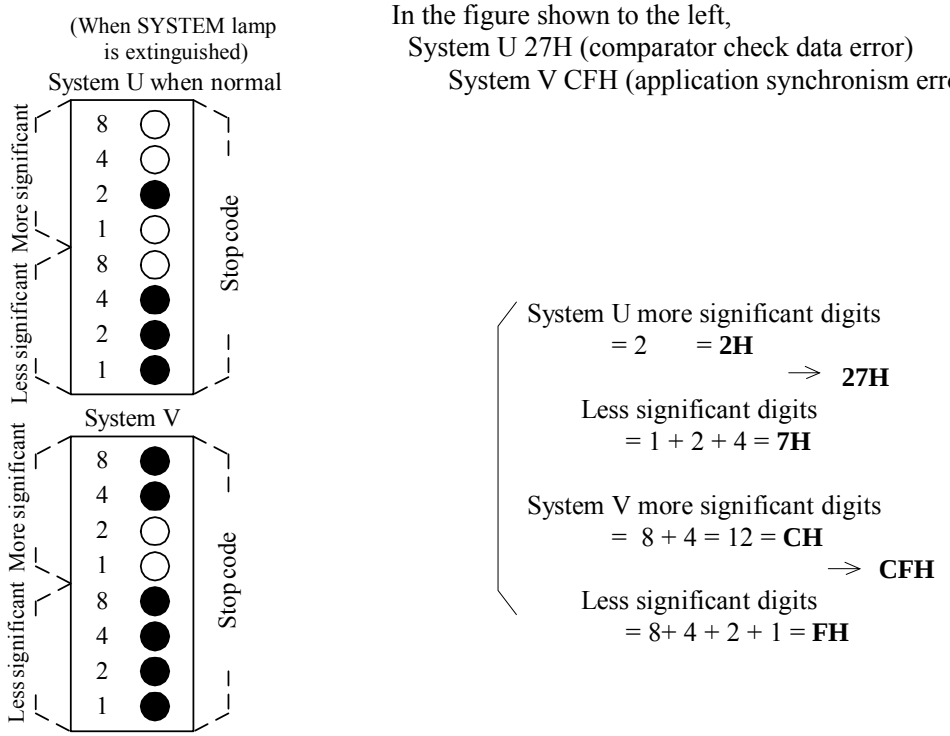
a. Details of normal indication codes



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

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

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



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

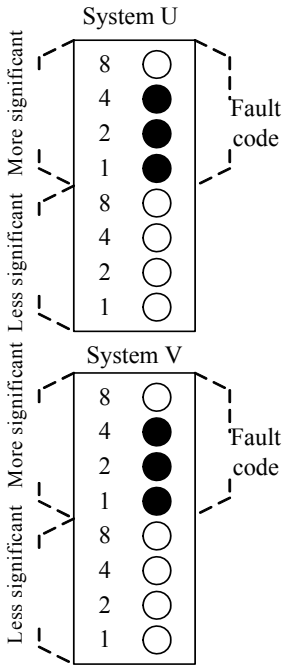
“Buffer register data” include “Terminal No. data” and “Control output data”.
“Important data” include “Control output data”.

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 7H = (= 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

1 1 H

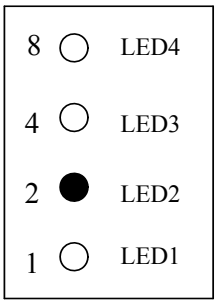
↑ ↑

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



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

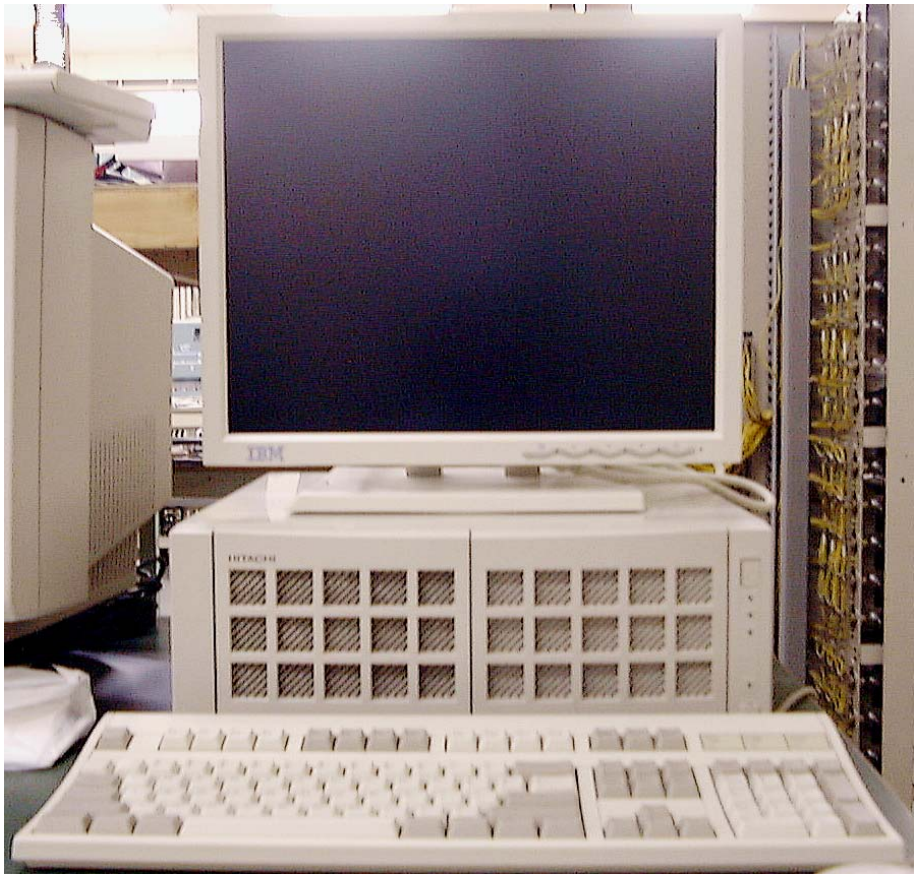
LED4	No serial input for continuous 3 cycles
LED3	No polling input to terminal for continuous 4 cycles
LED2	Input data error
LED1	Transmission supervising error

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

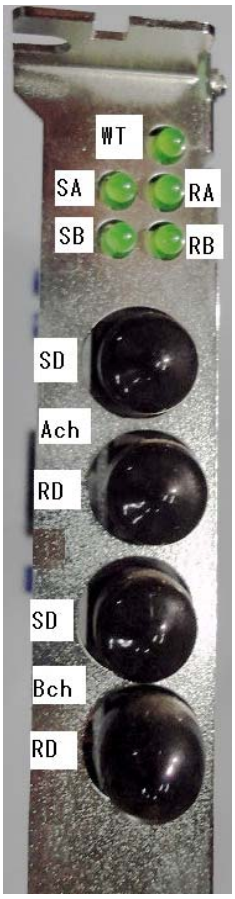
Front



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

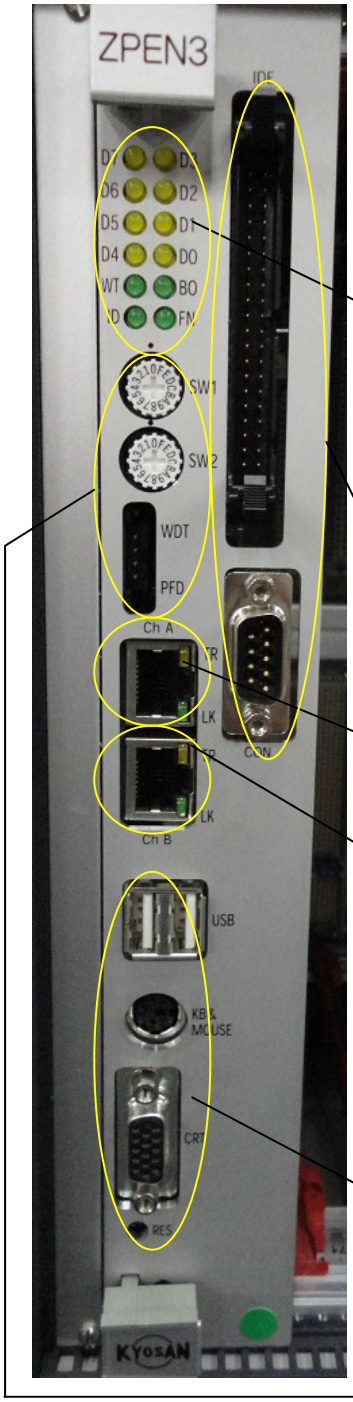


Item	Function
WT	Lighted when CPU in module is normal
SA	Lighted when transmission data exist in A channel
RA	Lighted when reception data exist in A channel
SB	Lighted when transmission data exist in B channel
RB	Lighted when reception data exist in B channel
Ach-SD	FC type optical connector for transmission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

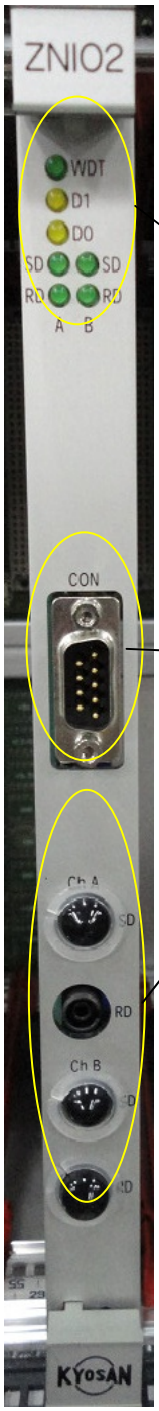
D7	Status of ZPEN3 card	Blink : Normal ON or OFF : Failure
D6	Status of ZNIO2 card for system 1	ON : Normal OFF : Failure
D5	Status of ZNIO2 card for system 2	ON : Normal OFF : Failure
D4	Status of ZSIO2 card	ON : Normal OFF : Failure
D3	Status of KDD172-KY48-2 card	ON : Normal OFF : Failure
D2	ZNIO2 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.



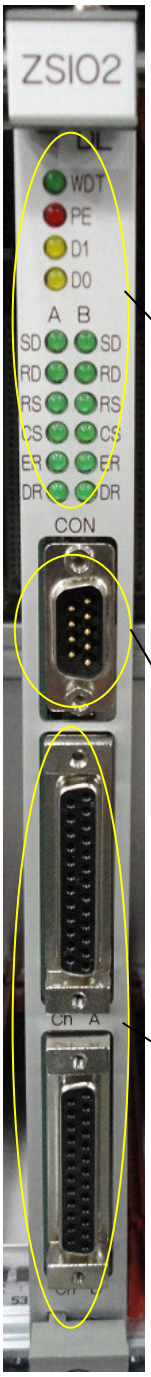
LED indications

WDT	Status of ZNIO2 card	ON : Normal 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



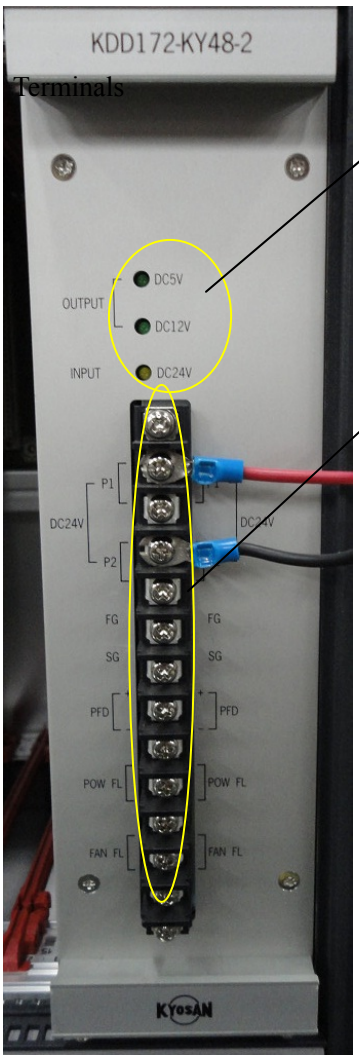
LED indications

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

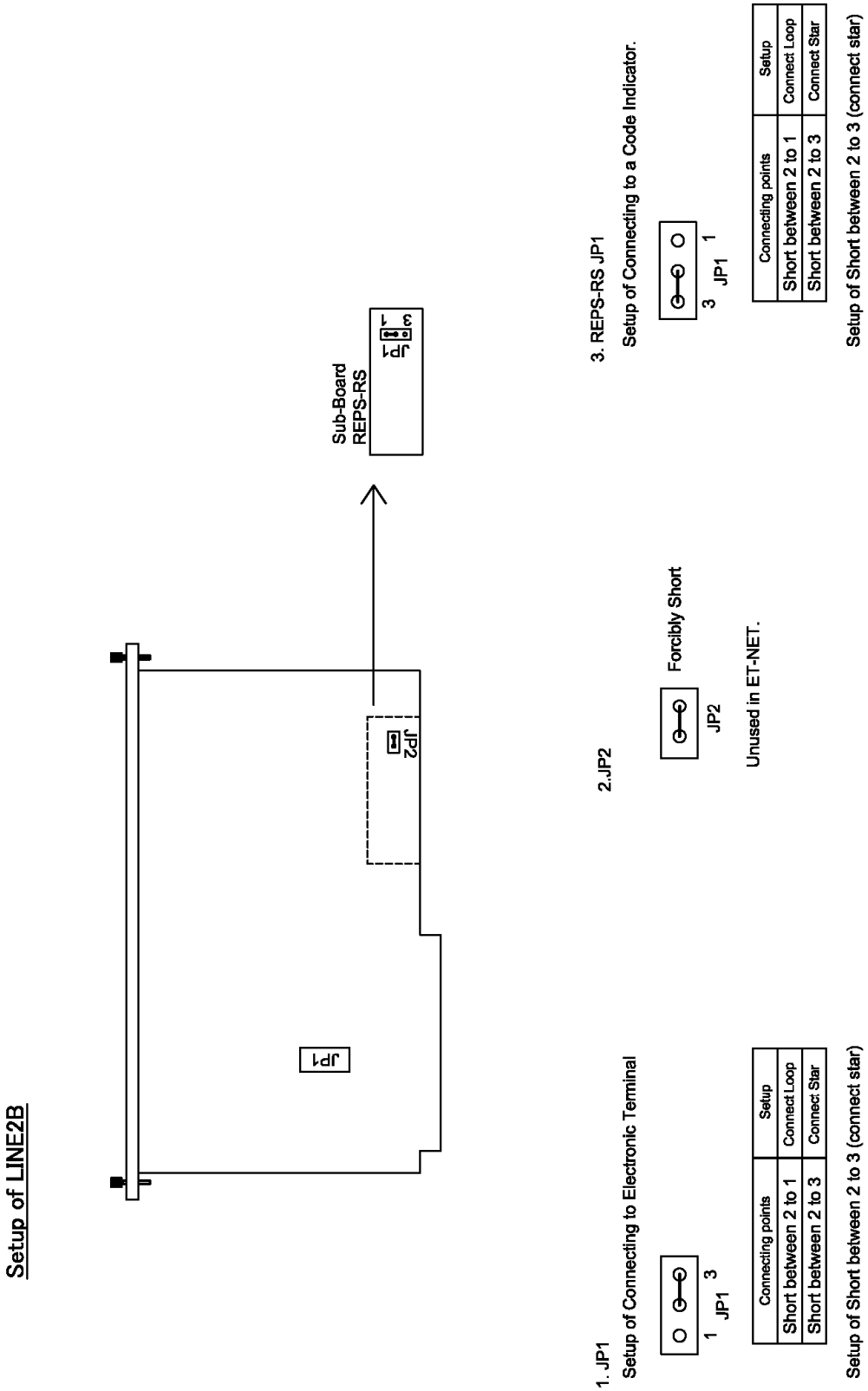


LED indications

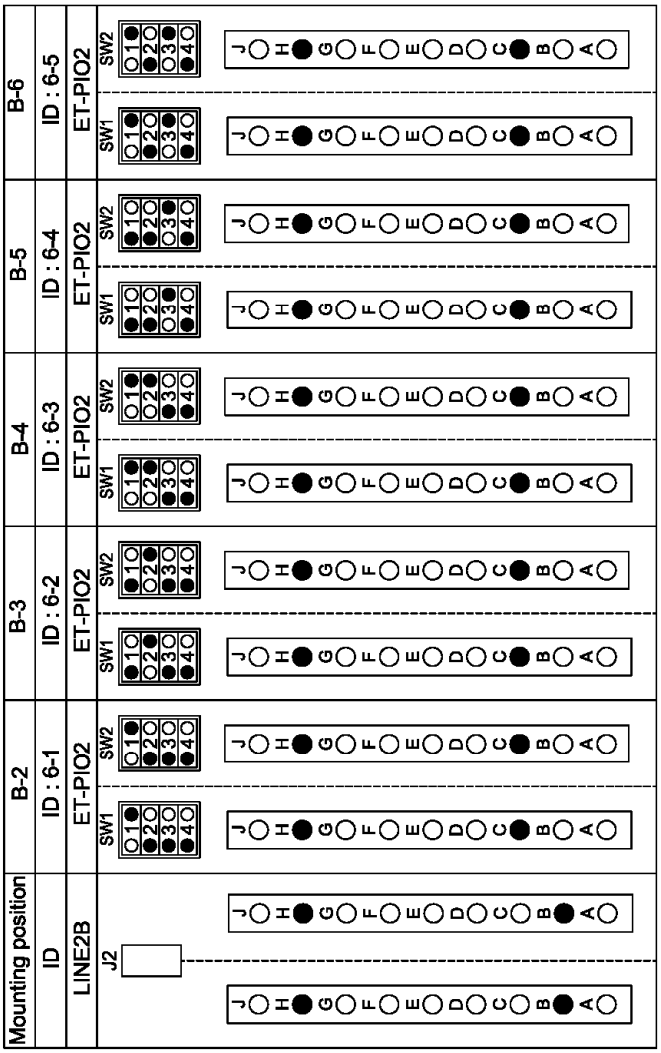
DC5V	DC5V power status	ON : Normal OFF : Failure
DC12V	DC12V power status	ON : Normal OFF : Failure
DC24V	DC24V power status	ON : Normal OFF : Failure

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 Setup of Unit



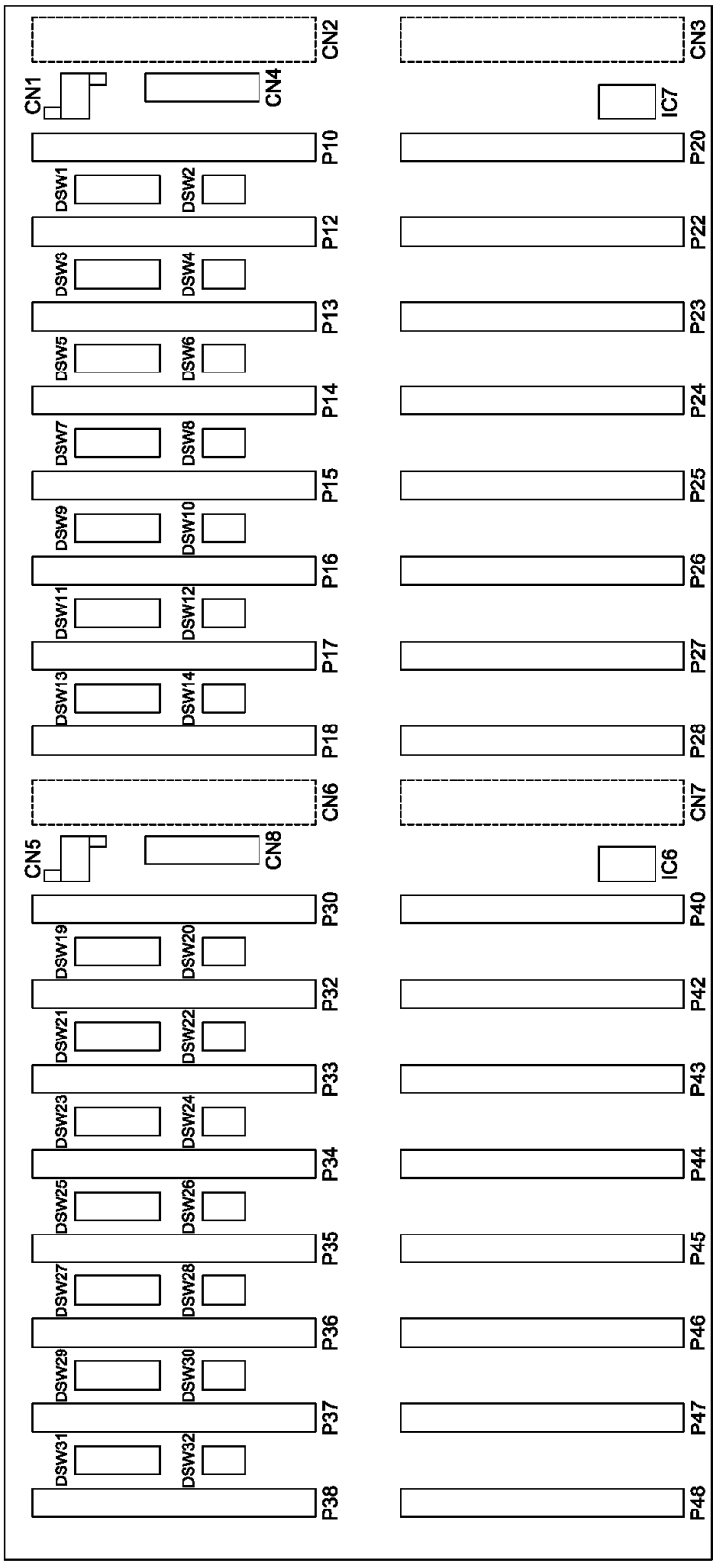
Setup of Electronic terminal polarity key



1. Setup of J2 in LINE2B on the Motherboard.
   Operating State of the ET-PIO2
   - Single System Operation : Jumper Short between 1 to 6 and 2 to 7.
   - Double System Operation : Open

   Setup of Connecting to Electronic Terminal.
   - Connect Star : Open
   - Connect Loop : Jumper Short between 4 to 5 and 8 to 9.

Setup of Mother-Board of Logic Part

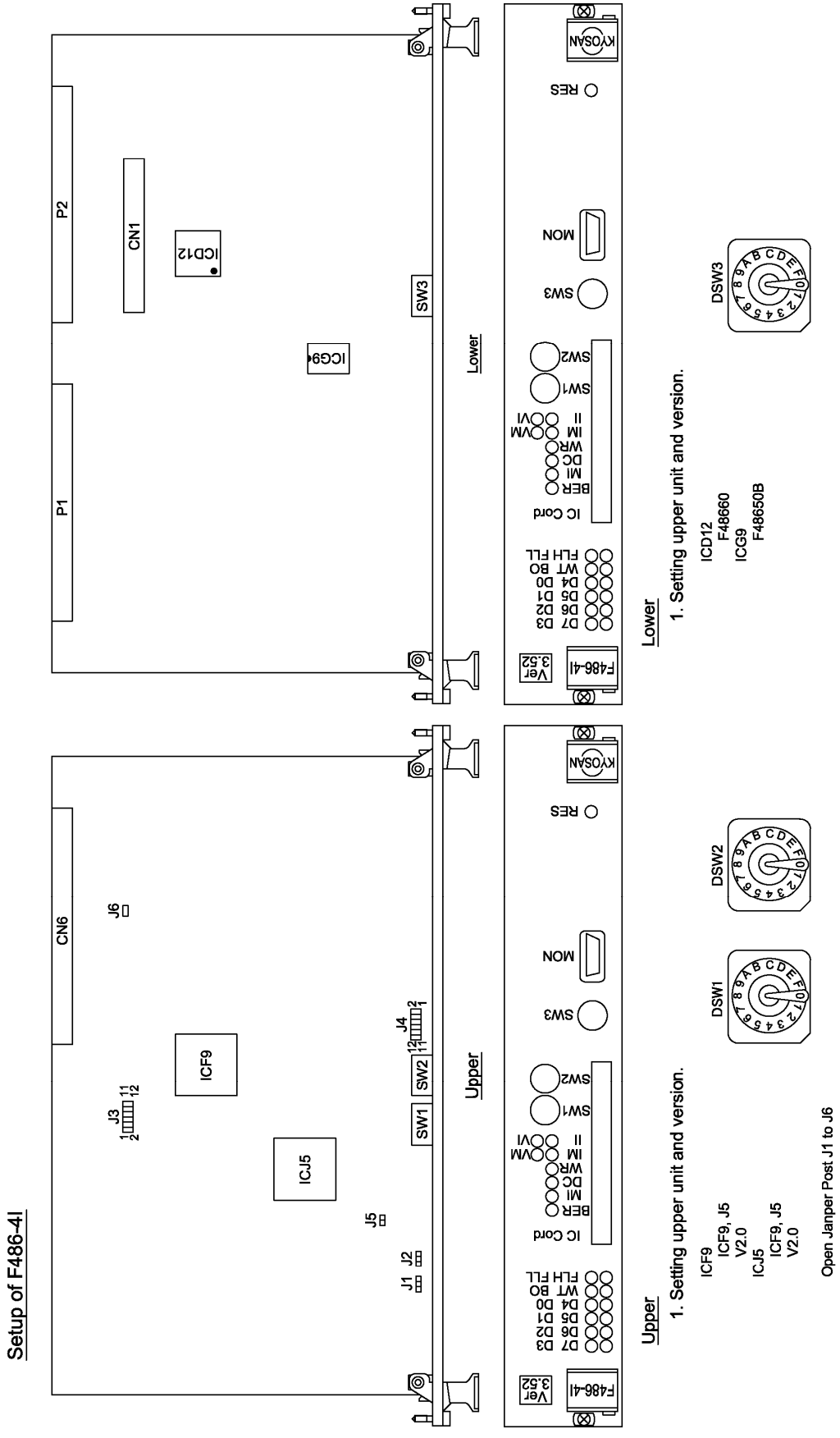


1. Setting
DSW1,3,5,7,9,11,13,19,21,23,25,27,29,31

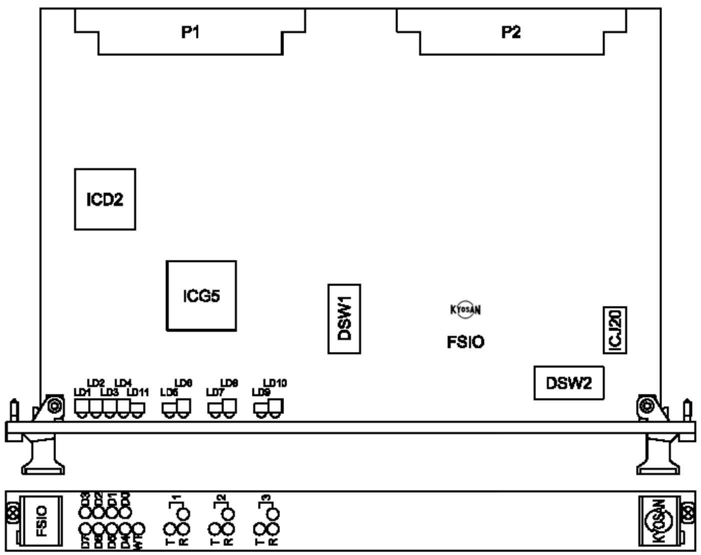
It sets all as "on"

2. Setting
DSW2,4,6,8,10,12,14,20,22,24,26,28,30,32

It sets all as "on"


Setup of F486-4I
Upper
Lower
CN6
CN1
P1
P2
J6
J5
J1
J2
J3
J4
ICF9
ICJ5
ICD12
ICG9
SW1
SW2
SW3
DSW1
DSW2
DSW3
MON
RES
KYOSAN
F486-4I
Ver 3.52
IC Card
BER
MI
WR
DC
IM
II
VM
VI
D7 D3
D6 D2
D5 D1
D4 D0
WT BO
FLH FLL
1. Setting upper unit and version.
ICD12
F48660
ICG9
F48650B
1. Setting upper unit and version.
ICF9
ICF9, J5
V2.0
ICJ5
ICF9, J5
V2.0
Open Janper Post J1 to J6

Setup of FSIO



1. Setup

・DSW1

Setup of Software function.

No.	Setup	Set contents
1	ON	Transmissin of Fail-safe, Low speed mode. (31.2kbps)
	OFF	Transmissin of Fail-safe, High speed mode. (124.8kbps)
2	ON	Maintenance System Disable.
	OFF	Standard mode.
3	ON / OFF	Unused
4	ON / OFF	Unused
5	ON / OFF	
6	ON / OFF	Used debug mode.
7	ON / OFF	When Standard mode : Setting all "OFF".
8	ON / OFF	

Setup of this Station.

ON 1 2 3 4 5 6 7 8 OFF

"●" Mark Shows the position of the knob of DSW.

・DSW2

Setup of Handware Function.

No.	Setup	Set contents
1	ON	VME base address (First) (000000h)
	OFF	VME base address (Second) (008000h)
2	ON / OFF	Unused
3	ON / OFF	Unused
4	ON / OFF	Unused
5	ON / OFF	Unused
6	ON	Line1 (First Unit) / Line4 (Second Unit). Transmission of Fail-safe, Low speed mode (31.2kbps)
	OFF	Line1 (First Unit) / Line4 (Second Unit). Transmission of Fail-safe, High speed mode (124.8kbps)
7	ON	Line2 (First Unit) / Line5 (Second Unit). Transmission of Fail-safe, Low speed mode (31.2kbps)
	OFF	Line2 (First Unit) / Line5 (Second Unit). Transmission of Fail-safe, High speed mode (124.8kbps)
8	ON	Line3 (First Unit). Transmission of Fail-safe, Low speed mode (31.2kbps)
	OFF	Line3 (First Unit). Transmission of Fail-safe, High speed mode (124.8kbps)

Setup of this Station.

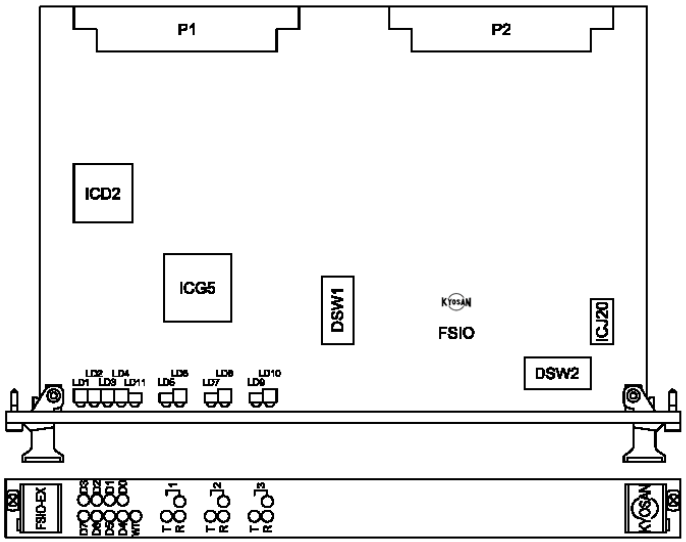
ON 1 2 3 4 5 6 7 8 OFF

"●" Mark Shows the position of the knob of DSW.

2. Writing IC Version

・ICD2
FIO00 ICD2
・ICG5
MTSIO V2.00
・ICJ20
L2E2O3 7CF7

Setup of FSIO-EX



1. Setup

DSW1

Setup of Software Function.

No.	Setup	Set contents
1	ON / OFF	Setup of Transmission rate.
2	ON / OFF	
3	ON / OFF	Unused
4	ON / OFF	Unused
5	ON / OFF	Setup of the Time of Timeout K-NET Line.
6	ON / OFF	
7	ON / OFF	Unused
8	ON / OFF	Unused

Setup of Transmission rate.

DSW1 1	DSW1 2	Transmission rate
ON	ON	1.2~76.8kbps
OFF	ON	307.2kbps
ON	OFF	Unused
OFF	OFF	614.4kbps

Setup of this Station

● Mark Shows the position of the knob of DSW.

Setup of the Time of Timeout K-NET Line.(P : Primary, S : Secondary)

Transmission rate \ Setting DSW	DSW1 5:ON 6:ON	DSW1 5:OFF 6:ON	DSW1 5:ON 6:OFF	DSW1 5:OFF 6:OFF
1.2kbps	P 10.00 / S 32.00	P 11.50 / S 34.00	P 12.50 / S 36.00	P 14.00 / S 40.00
2.4kbps	P 5.70 / S 17.10	P 6.10 / S 18.30	P 6.50 / S 19.50	P 8.00 / S 24.00
4.8kbps	P 2.96 / S 8.76	P 3.36 / S 10.06	P 3.76 / S 11.26	P 5.26 / S 15.76
9.6kbps	P 1.58 / S 4.73	P 1.98 / S 5.93	P 2.38 / S 7.13	P 3.88 / S 11.63
19.2kbps	P 0.89 / S 2.67	P 1.29 / S 3.87	P 1.69 / S 5.07	P 3.19 / S 9.57
38.4kbps	P 0.55 / S 1.64	P 0.95 / S 2.84	P 1.35 / S 4.04	P 2.85 / S 8.54
76.8kbps	P 0.38 / S 1.12	P 0.78 / S 2.32	P 1.18 / S 3.52	P 2.68 / S 8.02
307.2kbps	P 0.25 / S 0.74	P 0.65 / S 1.94	P 1.05 / S 3.14	P 2.55 / S 7.64
614.4kbps				

・DSW2

Setup of Hardware Function.

No.	Setup	Set contents	
1	ON	No use.	
	OFF	VME Base address (008000h)	
2	ON / OFF	Unused	
3	ON / OFF	Unused	
4	ON / OFF	Unused	
5	ON / OFF	Unused	
6	ON	Line4 Transmission of Fail-safe Low speed mode(31.2kbps)	When don't use ET-NET, Setup "ON".
	OFF	Line4 Transmission of Fail-safe High speed mode(124.8kbps)	
7	ON	Line5 Transmission of Fail-safe Low speed mode(31.2kbps)	
	OFF	Line5 Transmission of Fail-safe High speed mode(124.8kbps)	
8	ON	Unused	
	OFF		

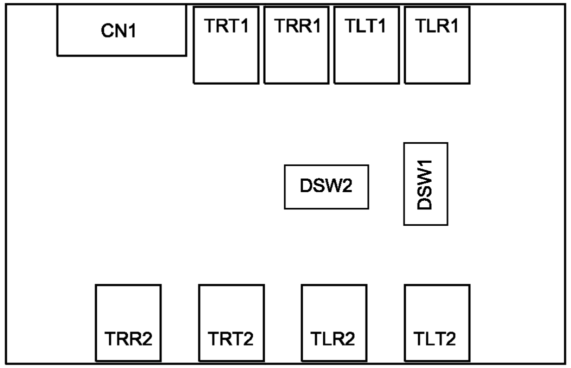
Setup of this Station

● Mark Shows the position of the knob of DSW.

2. Writing IC Version

・ICD2
FSIO00 ICD2
・ICG5
MTSIO V1.08
・ICJ20
L2E2O3 7CF7

Setup of SPHC-TT



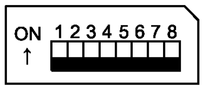
1. Setup of SW1

SW	SW Number	1	2	3	4	5	6	7	8
1	Connector	TLR1	TRT1	TLT1	TRR1	TLR2	TRR2	—	—
	Inverter Circuit	ON	ON	ON	ON	ON	ON	—	—
	Buffer Circuit	OFF	OFF	OFF	OFF	OFF	OFF	—	—

"—" Unused

Setup of Buffer

SW1



■ Mark shows the position of the knob of SW.

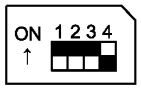
2. Setup of SW2

SW	SW Number	1	2	3	4
2	1 on 1 Circuit	OFF	OFF	ON	—
	1 on 2 Circuit	ON	ON	ON	—
	Switch System	ON	ON	OFF	—

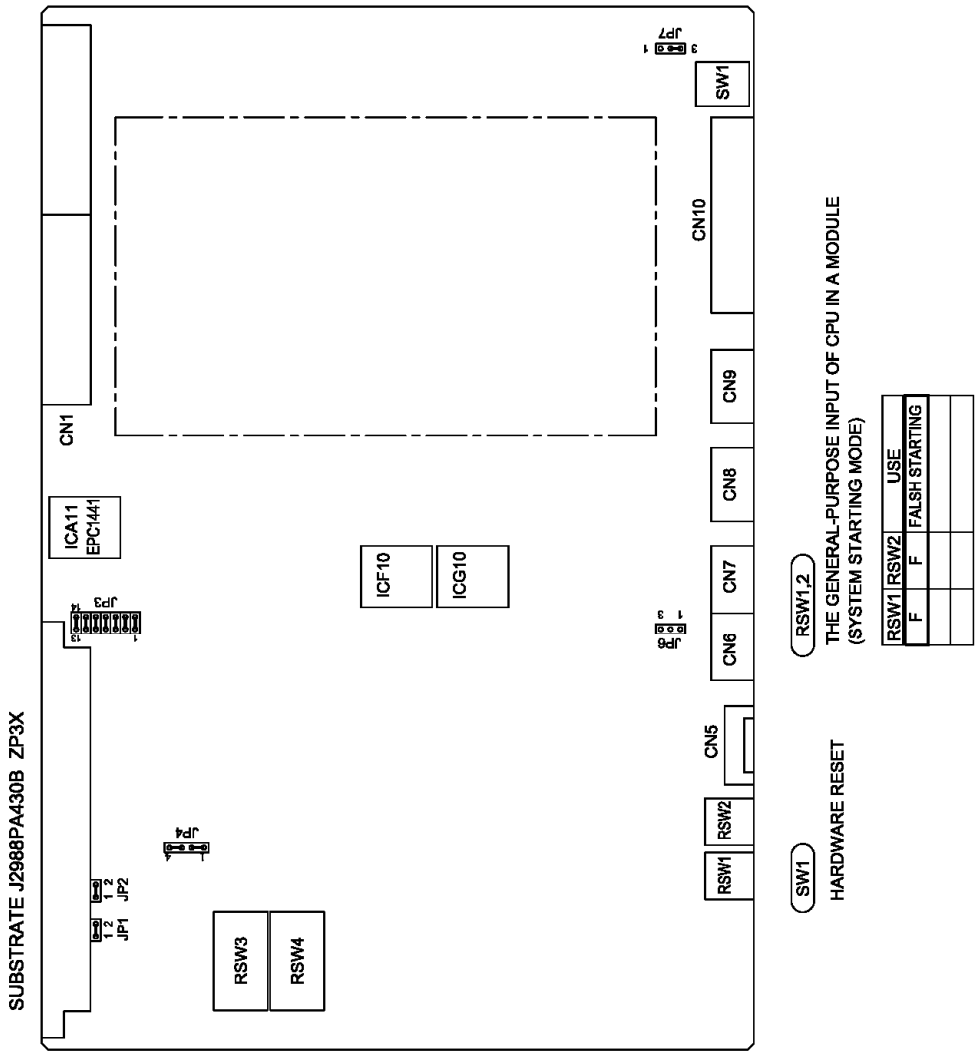
"—" Unused

Setup of 1 on 2 Circuit

SW2



■ Mark shows the position of the knob of SW.



JP1,2,4,RSW3 : SYSTEM CONTROLLER

	ON	OFF
JP1	1-2	—
JP2	1-2	—
JP4	1-2 3-4	2-3
RSW3	0	1

JP3 : INTERRUPT HANDLER

JUMPER	1-2	3-4	5-6	7-8	9-10	11-12	13-14
IRQ NUMBER	1	2	3	4	5	6	7

JP6 : DETECTION OF A POWER DISCONTINUITY

JUMPER	1-2	2-3
INPUT POWER SUPPLY	AC	DC

OPEN

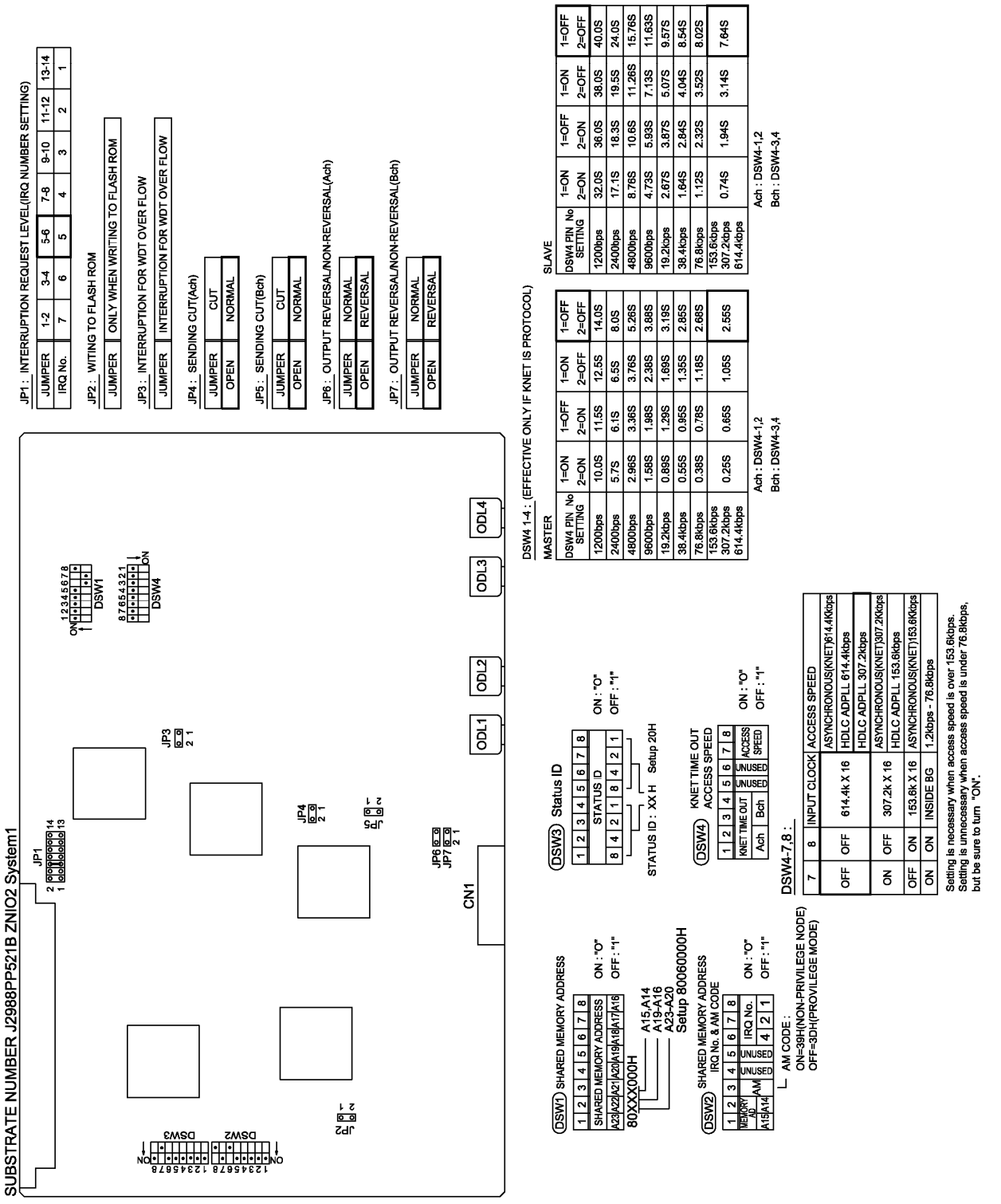
JP7 : CLOCK,MEMORY BACKUP

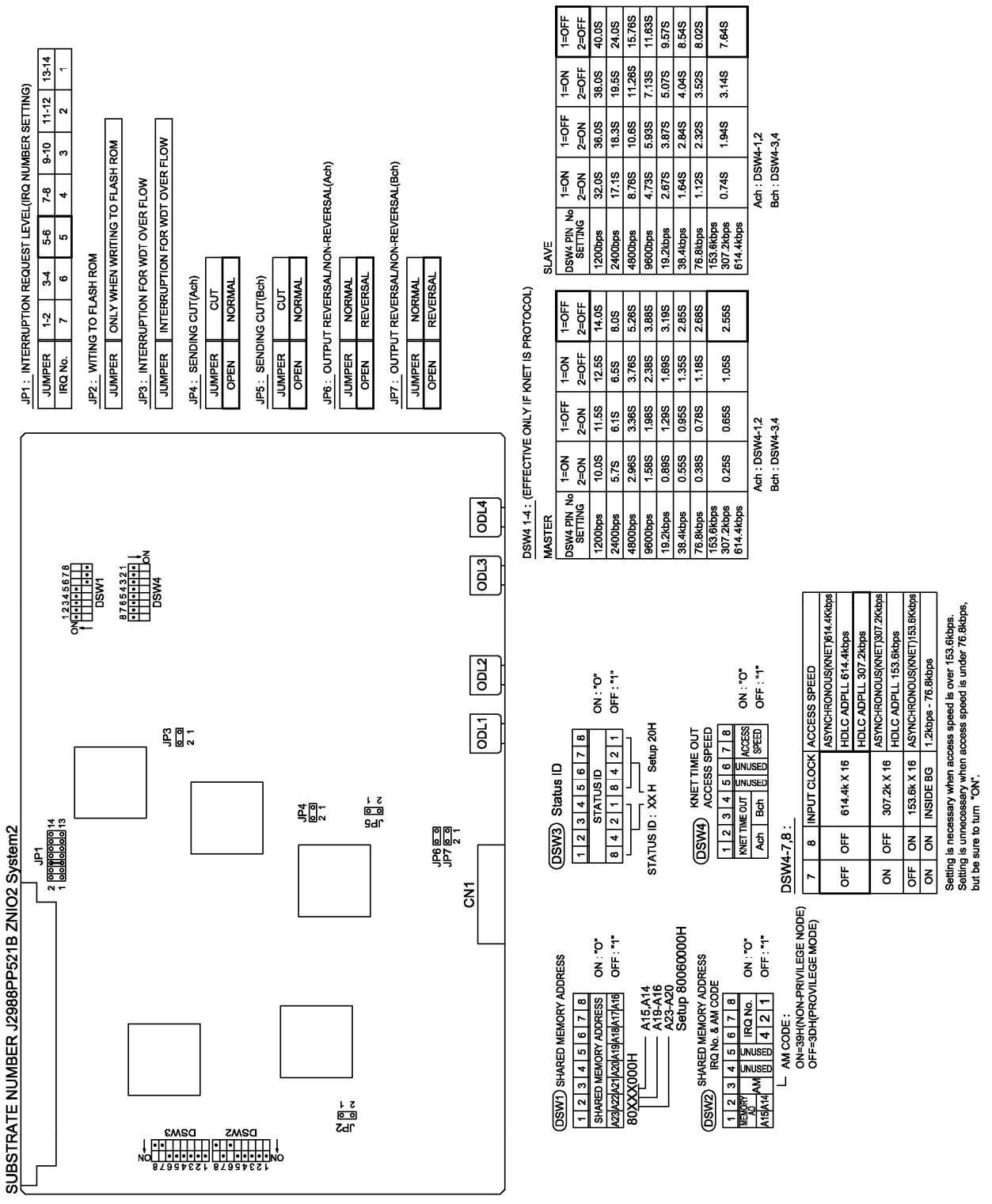
JUMPER	1-2	2-3
BACKUP	—	CHARGE
WHEN NOT USING IT	DISCHARGE	—

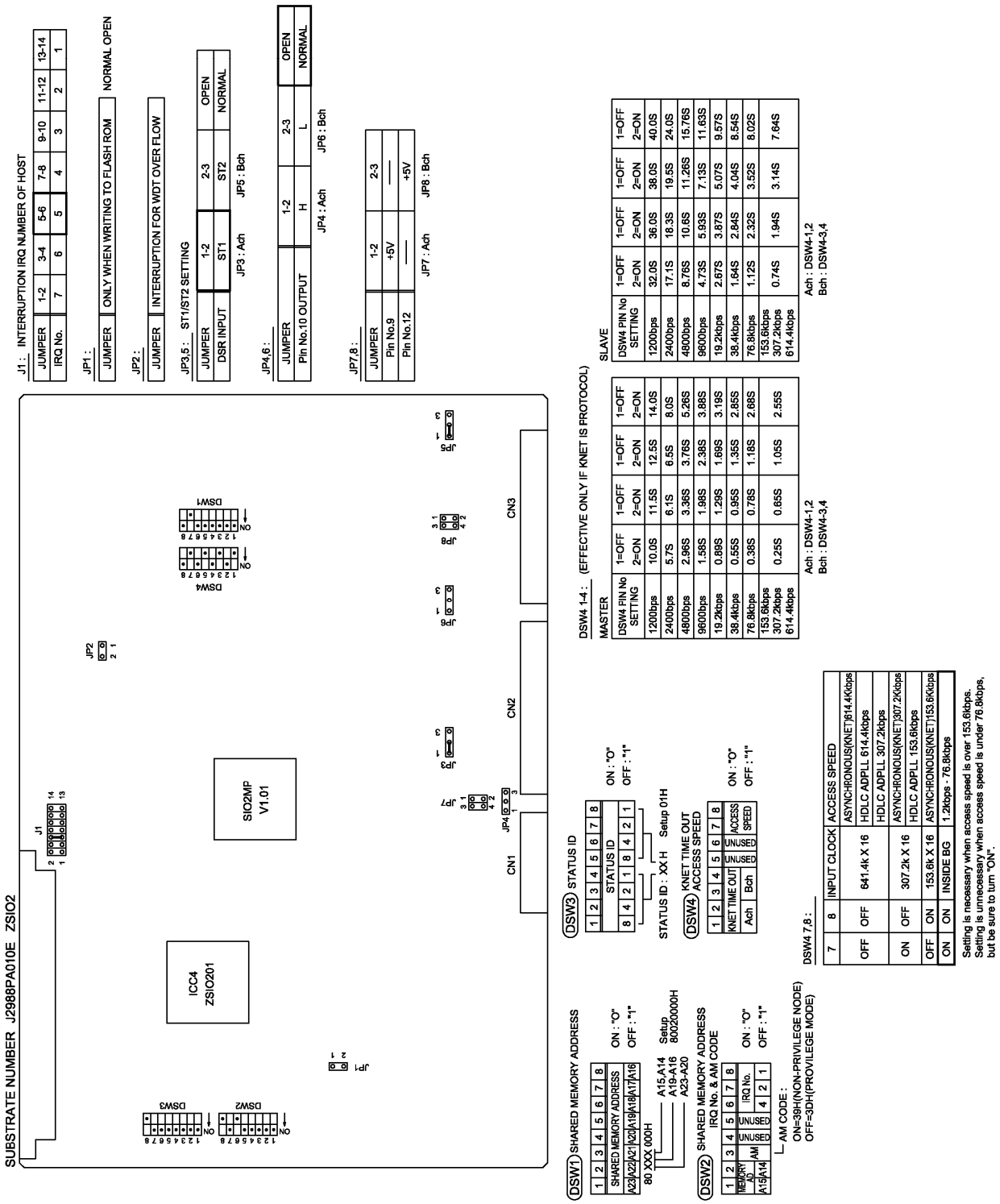
Placing JP7 in DISCHARGE must be done for three minutes or more, when pulling out the module after using JP7 as CHARGE.
Be careful that the capacitor short-circuits if you do not follow the handling above.

RSW4 : WDT TIMER SETTING

SETTING OF RSW4	F	A	E	9	D	B	C	8
TIMER	9.6Sec	1.6Sec	2.4Sec	3.2Sec	4Sec	5Sec	8Sec	0.8Sec


SUBSTRATE NUMBER J2988PP521B ZNIO2 System1
JP1 : INTERRUPTION REQUEST LEVEL(IRQ NUMBER SETTING)
JUMPER 1-2 3-4 5-6 7-8 9-10 11-12 13-14
IRQ No. 7 6 5 4 3 2 1
JP2 : WITING TO FLASH ROM
JUMPER ONLY WHEN WRITING TO FLASH ROM
JP3 : INTERRUPTION FOR WDT OVER FLOW
JUMPER INTERRUPTION FOR WDT OVER FLOW
JP4 : SENDING CUT(Ach)
JUMPER CUT
OPEN NORMAL
JP5 : SENDING CUT(Bch)
JUMPER CUT
OPEN NORMAL
JP6 : OUTPUT REVERSAL/NON-REVERSAL(Ach)
JUMPER NORMAL
OPEN REVERSAL
JP7 : OUTPUT REVERSAL/NON-REVERSAL(Bch)
JUMPER NORMAL
OPEN REVERSAL
DSW4 1-4 : (EFFECTIVE ONLY IF KNET IS PROTOCOL)
MASTER
DSW4 PIN No SETTING 1=ON 2=ON 1=OFF 2=OFF 1=ON 2=OFF 1=OFF 2=ON 1=ON 2=OFF 1=OFF 2=OFF
1200bps 10.0S 11.5S 12.5S 14.0S 32.0S 36.0S 38.0S 40.0S
2400bps 5.7S 6.1S 6.5S 8.0S 17.1S 18.3S 19.5S 24.0S
4800bps 2.96S 3.36S 3.76S 5.26S 8.76S 10.6S 11.26S 15.76S
9600bps 1.58S 1.98S 2.38S 3.88S 4.73S 5.93S 7.13S 11.63S
19.2kbps 0.89S 1.29S 1.69S 3.19S 2.67S 3.87S 5.07S 9.57S
38.4kbps 0.55S 0.95S 1.35S 2.85S 1.64S 2.84S 4.04S 8.54S
76.8kbps 0.38S 0.78S 1.18S 2.68S 1.12S 2.32S 3.52S 8.02S
153.6kbps 307.2kbps 614.4kbps 0.25S 0.65S 1.05S 2.55S 0.74S 1.94S 3.14S 7.64S
Ach : DSW4-1,2
Bch : DSW4-3,4
SLAVE
DSW4 PIN No SETTING 1=ON 2=ON 1=OFF 2=OFF 1=ON 2=OFF 1=OFF 2=ON 1=ON 2=OFF 1=OFF 2=OFF
1200bps 32.0S 36.0S 38.0S 40.0S
2400bps 17.1S 18.3S 19.5S 24.0S
4800bps 8.76S 10.6S 11.26S 15.76S
9600bps 4.73S 5.93S 7.13S 11.63S
19.2kbps 2.67S 3.87S 5.07S 9.57S
38.4kbps 1.64S 2.84S 4.04S 8.54S
76.8kbps 1.12S 2.32S 3.52S 8.02S
153.6kbps 307.2kbps 614.4kbps 0.74S 1.94S 3.14S 7.64S
Ach : DSW4-1,2
Bch : DSW4-3,4
DSW1 SHARED MEMORY ADDRESS
SHARED MEMORY ADDRESS A23 A22 A21 A20 A19 A18 A17 A16
ON : "0"
OFF : "1"
80XXXX00H
A15-A14
A19-A16
A23-A20
Setup 80060000H
DSW2 SHARED MEMORY ADDRESS IRQ No. & AM CODE
MEMORY AD A15 A14
AM
UNUSED
IRQ No.
UNUSED
AM CODE :
ON=39H(NON-PRIVILEGE NODE)
OFF=3DH(PROVILEGE MODE)
DSW3 Status ID
STATUS ID
ON : "0"
OFF : "1"
STATUS ID : XX H Setup 20H
DSW4 KNET TIME OUT ACCESS SPEED
KNET TIME OUT
Ach Bch
UNUSED
UNUSED
ACCESS SPEED
ON : "0"
OFF : "1"
DSW4-7,8 :
7 8 INPUT CLOCK ACCESS SPEED
OFF OFF 614.4k X 16 ASYNCHRONOUS(KNET)614.4Kbps
HDLC ADPLL 614.4kbps
HDLC ADPLL 307.2kbps
ON OFF 307.2k X 16 ASYNCHRONOUS(KNET)307.2Kbps
HDLC ADPLL 153.6kbps
OFF ON 153.6k X 16 ASYNCHRONOUS(KNET)153.6Kbps
ON ON INSIDE BG 1.2Kbps - 76.8Kbps
Setting is necessary when access speed is over 153.6kbps.
Setting is unnecessary when access speed is under 76.8kbps,
but be sure to turn "ON".
JP1
JP3
JP4
JP5
JP6
JP7
CN1
ODL1
ODL2
ODL3
ODL4
DSW1
DSW2
DSW3
DSW4


SUBSTRATE NUMBER J2988PP521B ZNIO2 System2
JP1 : INTERRUPTION REQUEST LEVEL(IRQ NUMBER SETTING)
JUMPER 1-2 3-4 5-6 7-8 9-10 11-12 13-14
IRQ No. 7 6 5 4 3 2 1
JP2 : WITING TO FLASH ROM
JUMPER ONLY WHEN WRITING TO FLASH ROM
JP3 : INTERRUPTION FOR WDT OVER FLOW
JUMPER INTERRUPTION FOR WDT OVER FLOW
JP4 : SENDING CUT(Ach)
JUMPER CUT
OPEN NORMAL
JP5 : SENDING CUT(Bch)
JUMPER CUT
OPEN NORMAL
JP6 : OUTPUT REVERSAL/NON-REVERSAL(Ach)
JUMPER NORMAL
OPEN REVERSAL
JP7 : OUTPUT REVERSAL/NON-REVERSAL(Bch)
JUMPER NORMAL
OPEN REVERSAL
DSW4 1-4 : (EFFECTIVE ONLY IF KNET IS PROTOCOL)
MASTER
DSW4 PIN No SETTING 1=ON 2=ON 1=OFF 2=OFF 1=ON 2=OFF 1=OFF 2=OFF
1200bps 10.0S 11.5S 12.5S 14.0S 32.0S 36.0S 38.0S 40.0S
2400bps 5.7S 6.1S 6.5S 8.0S 17.1S 18.3S 19.5S 24.0S
4800bps 2.96S 3.36S 3.76S 5.26S 8.76S 10.6S 11.26S 15.76S
9600bps 1.58S 1.98S 2.38S 3.88S 4.73S 5.93S 7.13S 11.63S
19.2kbps 0.89S 1.29S 1.69S 3.19S 2.67S 3.87S 5.07S 9.57S
38.4kbps 0.55S 0.95S 1.35S 2.85S 1.64S 2.84S 4.04S 8.54S
76.8kbps 0.38S 0.78S 1.18S 2.68S 1.12S 2.32S 3.52S 8.02S
153.6kbps 307.2kbps 614.4kbps 0.25S 0.65S 1.05S 2.55S
Ach : DSW4-1,2
Bch : DSW4-3,4
SLAVE
DSW4 PIN No SETTING 1=ON 2=ON 1=OFF 2=OFF 1=ON 2=OFF 1=OFF 2=OFF
1200bps 32.0S 36.0S 38.0S 40.0S
2400bps 17.1S 18.3S 19.5S 24.0S
4800bps 8.76S 10.6S 11.26S 15.76S
9600bps 4.73S 5.93S 7.13S 11.63S
19.2kbps 2.67S 3.87S 5.07S 9.57S
38.4kbps 1.64S 2.84S 4.04S 8.54S
76.8kbps 1.12S 2.32S 3.52S 8.02S
153.6kbps 307.2kbps 614.4kbps 0.74S 1.94S 3.14S 7.64S
Ach : DSW4-1,2
Bch : DSW4-3,4
DSW1 SHARED MEMORY ADDRESS
SHARED MEMORY ADDRESS A23 A22 A21 A20 A19 A18 A17 A16
ON : "0" OFF : "1"
80XXXX00H
A15,A14
A19-A16
A23-A20
Setup 80060000H
DSW2 SHARED MEMORY ADDRESS IRQ No. & AM CODE
MEMORY AD A15 A14
AM
UNUSED
IRQ No.
AM CODE :
ON=39H(NON-PRIVILEGE NODE)
OFF=3DH(PROVILEGE MODE)
ON : "0" OFF : "1"
DSW3 Status ID
STATUS ID
STATUS ID : XX H Setup 20H
ON : "0" OFF : "1"
DSW4 KNET TIME OUT ACCESS SPEED
KNET TIME OUT Ach Bch
UNUSED
ACCESS SPEED
ON : "0" OFF : "1"
DSW4-7,8 :
7 8 INPUT CLOCK ACCESS SPEED
OFF OFF 614.4k X 16 ASYNCHRONOUS(KNET)614.4Kbps
HDLC ADPLL 614.4Kbps
HDLC ADPLL 307.2Kbps
ON OFF 307.2k X 16 ASYNCHRONOUS(KNET)307.2Kbps
HDLC ADPLL 153.6Kbps
OFF ON 153.6k X 16 ASYNCHRONOUS(KNET)153.6Kbps
ON ON INSIDE BG 1.2kbps - 76.8kbps
Setting is necessary when access speed is over 153.6kbps.
Setting is unnecessary when access speed is under 76.8kbps, but be sure to turn "ON".
JP1 JP2 JP3 JP4 JP5 JP6 JP7 CN1 ODL1 ODL2 ODL3 ODL4 DSW1 DSW4 DSW2 DSW3


SUBSTRATE NUMBER J2988PA010E ZSIO2
SIO2MP V1.01
ICC4 ZSIO201
CN1
CN2
CN3
J1
JP1
JP2
JP3
JP4
JP5
JP6
JP7
JP8
DSW1
DSW2
DSW3
DSW4
J1: INTERRUPTION IRQ NUMBER OF HOST
JUMPER 1-2 3-4 5-6 7-8 9-10 11-12 13-14
IRQ No. 7 6 5 4 3 2 1
JP1 : JUMPER ONLY WHEN WRITING TO FLASH ROM NORMAL OPEN
JP2 : JUMPER INTERRUPTION FOR WDT OVER FLOW
JP3,5 : ST1/ST2 SETTING
JUMPER 1-2 2-3 OPEN
DSR INPUT ST1 ST2 NORMAL
JP3 : Ach JP5 : Bch
JP4,6 :
JUMPER 1-2 2-3 OPEN
Pin No.10 OUTPUT H L NORMAL
JP4 : Ach JP6 : Bch
JP7,8 :
JUMPER 1-2 2-3
Pin No.9 +5V —
Pin No.12 — +5V
JP7 : Ach JP8 : Bch
DSW1 SHARED MEMORY ADDRESS
SHARED MEMORY ADDRESS A23 A22 A21 A20 A19 A18 A17 A16
ON : "0" OFF : "1"
80 XXX 000H
A15,A14 Setup 80020000H
A19-A16
A23-A20
DSW2 SHARED MEMORY ADDRESS IRQ No. & AM CODE
MEMORY A0 A15 A14
AM
IRQ No.
UNUSED
AM CODE : ON=39H(NON-PRIVILEGE NODE) OFF=3DH(PROVILEGE MODE)
DSW3 STATUS ID
STATUS ID 8 4 2 1
STATUS ID : XX H Setup 01H
DSW4 KNET TIME OUT ACCESS SPEED
KNET TIME OUT UNUSED ACCESS SPEED
Ach Bch
DSW4 1-4 : (EFFECTIVE ONLY IF KNET IS PROTOCOL)
Ach : DSW4-1,2
Bch : DSW4-3,4
MASTER
DSW4 PIN No SETTING 1=OFF 2=ON 1=OFF 2=ON 1=OFF 2=ON
1200bps 10.0S 11.5S 12.5S 14.0S
2400bps 5.7S 6.1S 6.5S 8.0S
4800bps 2.96S 3.36S 3.76S 5.26S
9600bps 1.58S 1.98S 2.38S 3.88S
19.2kbps 0.89S 1.29S 1.69S 3.19S
38.4kbps 0.55S 0.95S 1.35S 2.85S
76.8kbps 0.38S 0.78S 1.18S 2.68S
153.6kbps
307.2kbps 0.25S 0.65S 1.05S 2.55S
614.4kbps
SLAVE
DSW4 PIN No SETTING 1=OFF 2=ON 1=OFF 2=ON 1=OFF 2=ON
1200bps 32.0S 36.0S 38.0S 40.0S
2400bps 17.1S 18.3S 19.5S 24.0S
4800bps 8.76S 10.6S 11.26S 15.76S
9600bps 4.73S 5.93S 7.13S 11.63S
19.2kbps 2.67S 3.87S 5.07S 9.57S
38.4kbps 1.64S 2.84S 4.04S 8.54S
76.8kbps 1.12S 2.32S 3.52S 8.02S
153.6kbps
307.2kbps 0.74S 1.94S 3.14S 7.64S
614.4kbps
Ach : DSW4-1,2
Bch : DSW4-3,4
DSW4 7,8 :
7 8 INPUT CLOCK ACCESS SPEED
OFF OFF 641.4K X 16 ASYNCHRONOUS(KNET)614.4Kbps
HDLC ADPLL 614.4kbps
HDLC ADPLL 307.2kbps
ON OFF 307.2K X 16 ASYNCHRONOUS(KNET)307.2Kbps
HDLC ADPLL 153.6kbps
OFF ON 153.6K X 16 ASYNCHRONOUS(KNET)153.6Kbps
ON ON INSIDE BG 1.2kbps - 76.8kbps
Setting is necessary when access speed is over 153.6kbps.
Setting is unnecessary when access speed is under 76.8kbps, but be sure to turn "ON".

8. Cabling

All cable shall be supplied as per IS Railway standards and comply with standard practice of laying. The inter-connecting cabling shall be carried out from Relay Racks / CT Racks to EI cabinet. Refer "Typical Disposition MAP of K5BMC EI System" for overall System view.

8.1 Colour coding of wires/cables

(0.2SQ) Blue/Black colour wire is provided for Non-vital input / vital input circuits. (0.2SQ) Red/Black colour wire is provided for Non-vital output / vital output circuits. The multimode OFC GI 2C of 50/125 is to be used between operator console (OPCs), Maintenance Console (MTC), MMIF and Electronics Interlocking (EI) system Logic Rack.

8.2 Labeling

All cable ends are provided with proper identification Tags made of non-deteriorating material. All terminals will have identification markers. In the racks, Column / row will be numbered and also, all the major equipments used in the system / sub system will have proper labels or painting for easy identification.

8.3 Termination

A perfect termination is gastight, therefore corrosion free and amounts to a cold weld of the parts being connected. Wires are to be terminated shall match with the correct size of the crimp contacts. If these basic requirements are to be met, highly reliable connections with low contact resistance and high resistance to corrosive attack are assured.

8.4 Spare core termination

Cables having spare conductors will be terminated in the spare terminals and will have proper tags for future use. In case of non-availability of Terminals, spare conductor ends will be insulated and neatly separated cable wise with proper identification tags.

8.5 Insulation

The following shall be provided with proper Insulation from ground.

- Mat and Rubber bushes between racks/ Panel and floor.
- Hylum sheet and PVC separators between ladders and Racks / Walls.
- PVC cable trays for all the wires/cables runs.
- PVC tape / sleeve wrapped over the flat connecting to the angles of the ladder for insulation between wires / cables and ladder.

8.6 Surge protection practices

The IEEE specification contains update and new parts, which provide detailed guidelines for effective surge protection of signalling equipment and systems.

8.7 Power protection

Power protection is much important in a signaling facility. The power supply is distributed throughout the equipment rooms and is often toughed with other wiring. The staged protection refers to primary, secondary & tertiary levels and DC & data line equipment. In K5BMC system 110V/24V DC/DC converter has been used to provide 24 VDC output.

8.8 AC power protection

Primary AC line protection:

In AC line feeds, primary protection begins at the service entrance. In severe lightning areas, primary protection begins at the service entrance inside the equipment rooms. The preference for primary side protection is the block type MOVs.

It is better to use two or more in a fused, parallel fashion with indicators lamps across the fuse. In this way, it will be known if any one MOV is shorted and because of the parallel redundant configuration, line protection continues.

8.8.1 Secondary / Tertiary AC line protection

Secondary protection levels in AC feeds are only effective if sufficient isolation Impedance exists between the primary and secondary protectors. The needed amount of isolation number is not easy to arrive at. Tertiary protection is generally found within the equipment itself. No fuse breaker **(**MCB) is used in EI line protection.

8.9 Data line equipment protection

Data line are mainly on the OFC cable between EI to OPC, MTC and Hard panel. So no risk of electric surge. However between Data Logger to EI twisted pair serial communication is there.

Twisted pair wiring:

It consists of two identical wires wrapped together in a double helix. Both wires in the pair have the same impedance to ground, making it a balance from neighboring cables or external source.

Isolation:

Isolation of field wiring is through relay rack. So no external surge / spikes can damage the EI system.

8.10 Interface protection

8.10.1 Non– vital I/O interface protection

Normal indoor OFC cable is used to interface panel and Non- vital boards, where the panel room is adjacent to K5BMC equipment room. If the panel room is at a distance from the K5BMC equipment room. i.e. in a different building, then underground OFC and twisted pair jelly filled cables are used for power supply to Hard Panel.

8.10.2 Vital I/O interface protection requirements

The Vital inputs from the field to the K5BMC equipment are read through a relay contact. Since reading through relay contacts provides galvanic isolation to the vital inputs/ outputs.

In order to provide adequate maintenance, It shall be preferable to lay cables from the CT rack on PVC/ Aluminum cable trays. The cables shall be terminated at both ends using prefab connections at EI end.

9. Relay rack

The racks shall install adequate space to house fuse boxes of 1.6 Amp and 0.6 Amp for each circuit protection of non deteriorating type from standard manufacturer. All mounting of fuses shall be on insulated fire proof sheet of suitable material to provide electrical isolation. The racks shall be insulated from the ground to prevent any external extraneous feeding of unwanted supply. It shall have anti vibration pads.

The rack shall provide sufficient strength and coated with anti corrosive paint, Enameled paint for preventing corrosion, rust. Installation of capacitors and resistors shall be provided on racks for holding power to external devices i.e. point machine. Proper rating of such devices is essential for functioning of circuits. Inter racks wiring shall be through Tag Block.

9.1 Wiring practices

Ladders:

Cable ladders insulated horizontally shall have sufficient space to facilitate cable pulling and cleating /stapping.

It is isolated from racks and wall via rubber bush & hylum sheet. All power cables and I/O cables & interconnection wires shall run different ladders. Ladder width shall be 2/3rd of rack width and it is ensured that it carries fewer amounts of cables & avoid bends / damages.

Maximum distance between the supports is provided every 3 meters.

All surfaces are cleaned prior to bolting together.

Cables runs:

All the cable / wire run will have smooth surface.

Sharp bending will be avoided when coming to racks. Cable entry holes in the Racks will have correct size rubber beedings. Ladders will be used for Interconnection of cable runs.

PVC Troughs with cover will be used for Intra- connections.

Cable systems:

Cable shall be separated into Power cable, Communication cable, I/O cable and Panel cable. Sufficient cable spare length shall be provided for equipment, which needs future adjustment.

Cable splicing shall be avoided. Cable insulated resistance must be 20 mega ohms. Cable should be arranged properly for maintenance.

Clean wiring:

Wires carrying extremely small currents that are prone to EMI and other disturbance.

Dirty wiring:

Wires regularly carrying large varying currents or currents that are subjected to EMI or other disturbance caused transient conditions which can couple with adjacent wiring. Dirty wiring will be separated as much as possible from clean wiring.

Input & output wiring:

The input and output wiring to a particular unit should be separated from power wiring and ideally not run in parallel, i.e. , all input wires are bunched together and are routed in a separate trough from power wiring. All output wires are bunched together and are routed in a separate trough from power wiring. All power wires are bunched together and are routed in a separate trough from input and output wiring.

All output wiring from signalling & power supply units to the K5BMC system shall be considered as 'clean' wiring and routed by the shortest practical path, even if it runs via intermediate distribution fuses or terminals.

Power wiring:

The power supply wiring and equipment should be located closed to K5BMC and other electronic equipment to minimize the length of low voltage power leads. The power supply feeding to external equipment will be separated from the supply that feeds internal equipment to ensure that external surges and transients are not directly connected to the internal bus bars.

Earth wires associated with main power supply will be installed to the applicable standards specified but these shall be kept as short as possible and well away from the signalling power supply.

Cables & Wires will be kept as short as possible from power supply to minimize induced noise.

Case / house wiring will also be arranged to minimize noise.

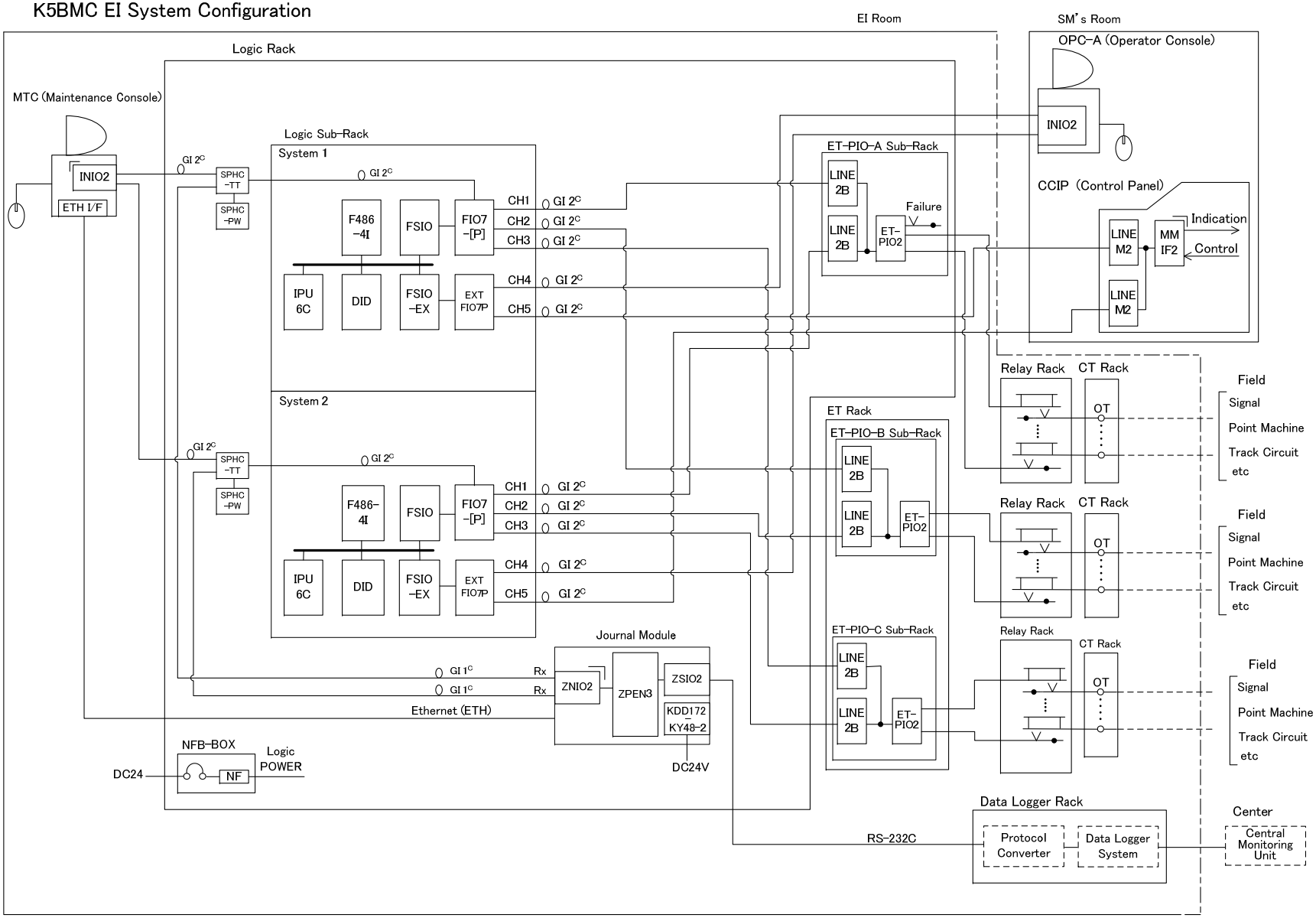
To avoid transient voltage, surge suppression device is installed in K5BMC system.

Serial link wiring:

For maximum noise mitigation serial data is through OFC cable (The conductors wires if there shall be twisted pairs.). The purpose of this structure is to minimize capacitive, inductive and RF coupling. The cable shields must be earthed at one end only.

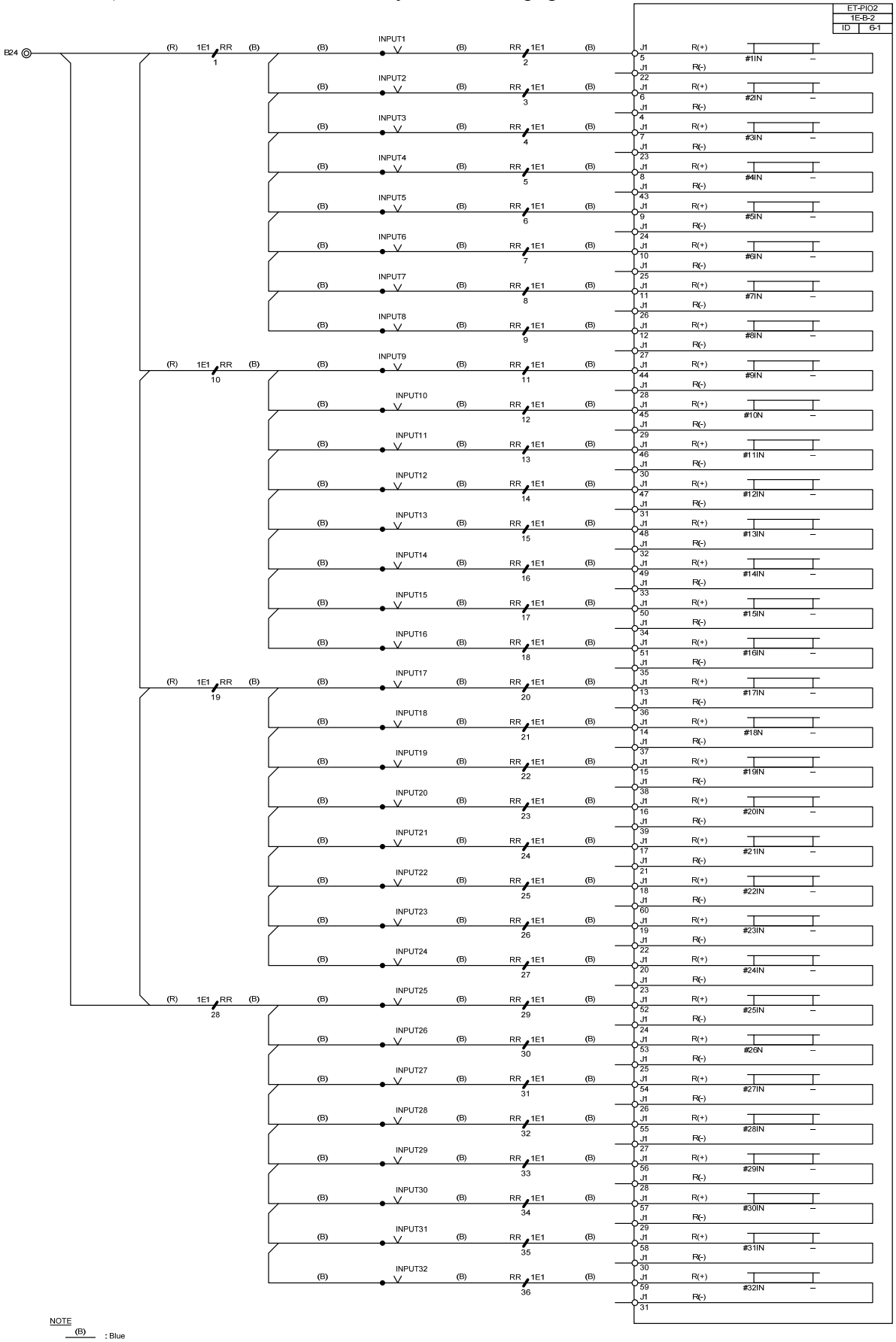
10. Typical System Configuration

K5BMC EI System Configuration



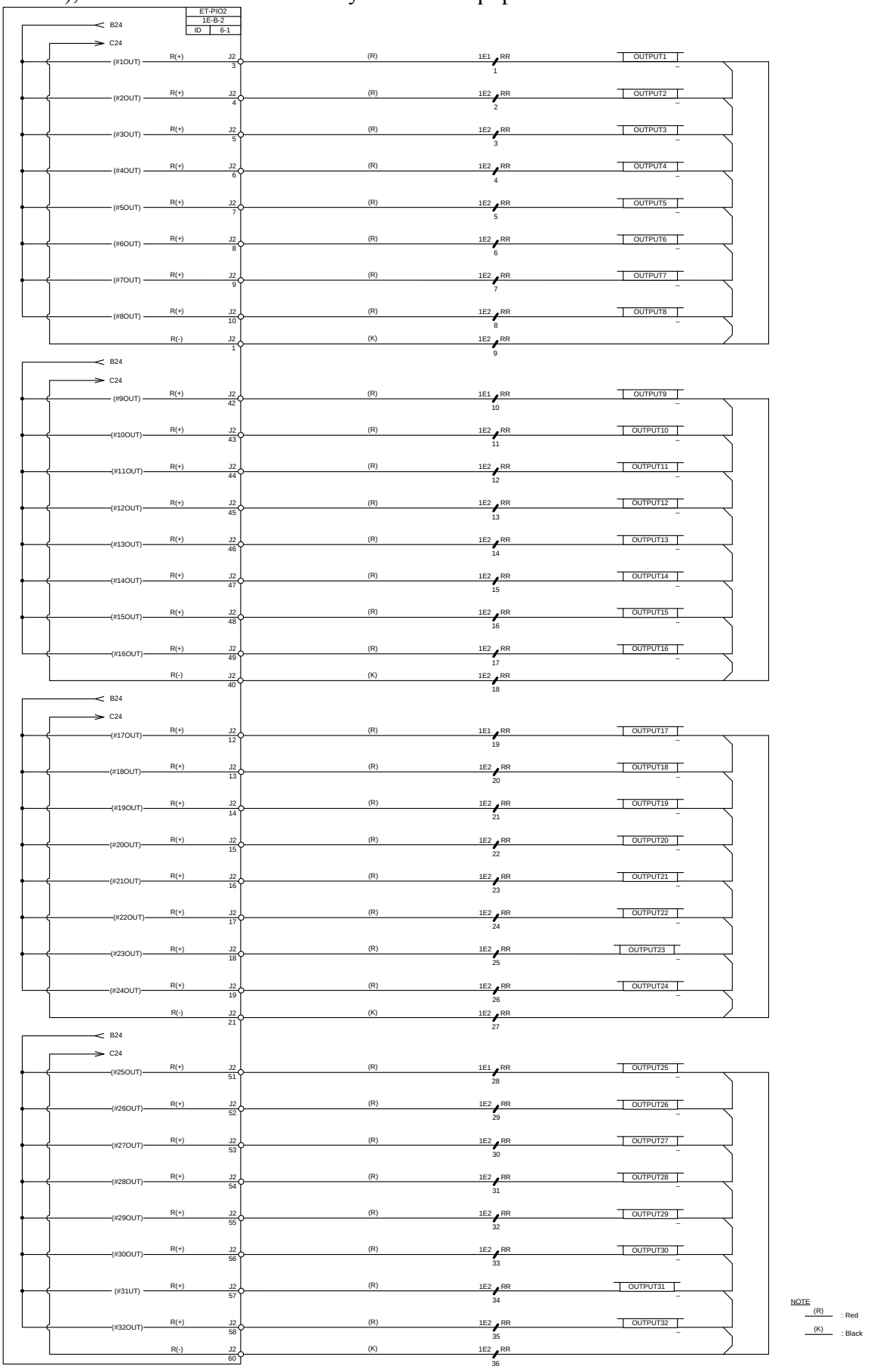
11. Typical Vital Input Circuit

Each ET-PIO2 is provided with 32 input ports(for the field gear status like point detection, track status etc.), and it can be connected only to indoor equipment.



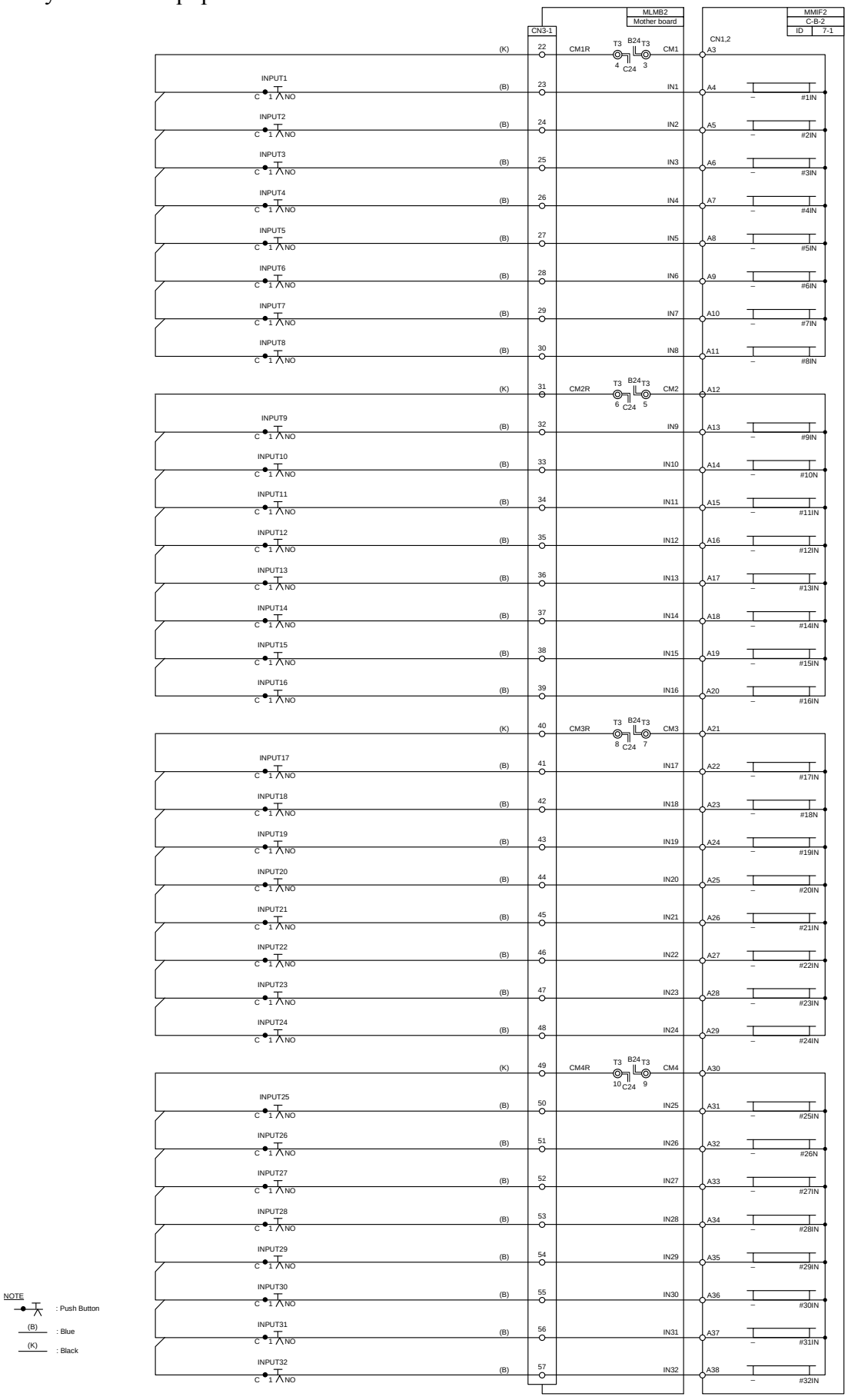
12. Typical Vital Output Circuit

Each ET-PIO2 is provided with 32 output ports(for the field gears like signals, point machines etc.), and it can be connected only to indoor equipment.



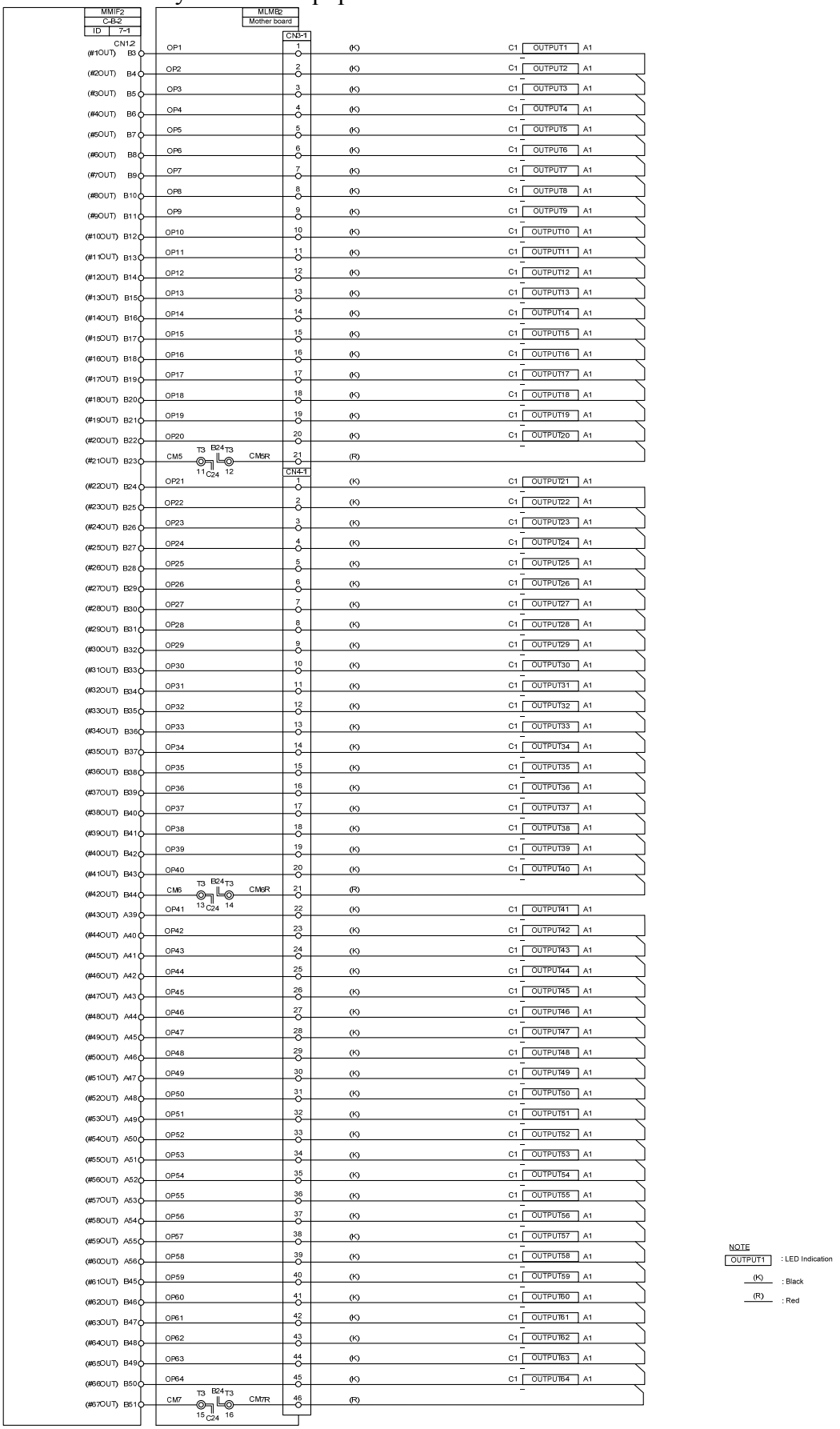
13. Typical Non-Vital Input Circuit

Each MMIF2 is provided with 32 input ports(for push buttons etc.), and it can be connected only to indoor equipment.

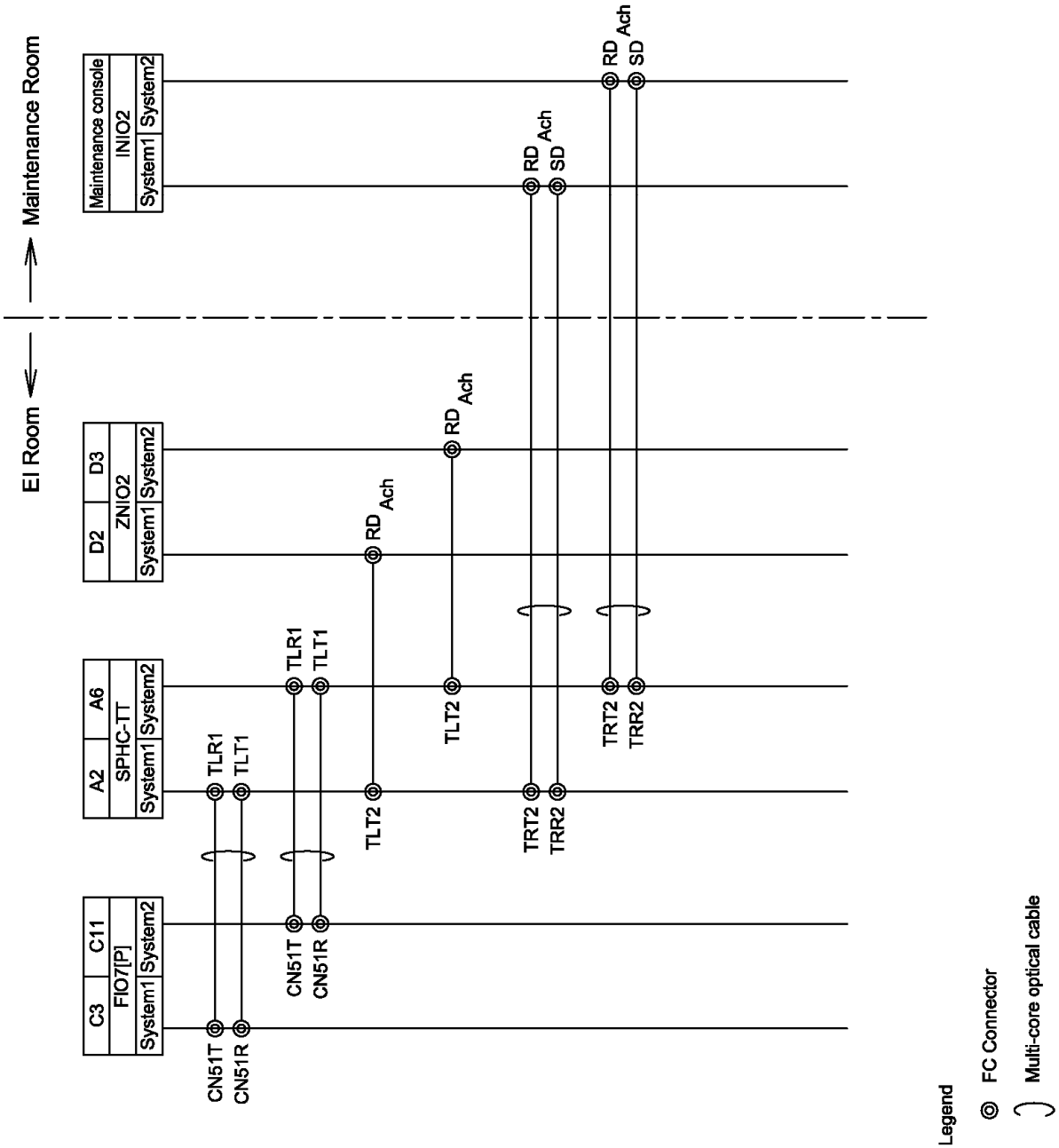


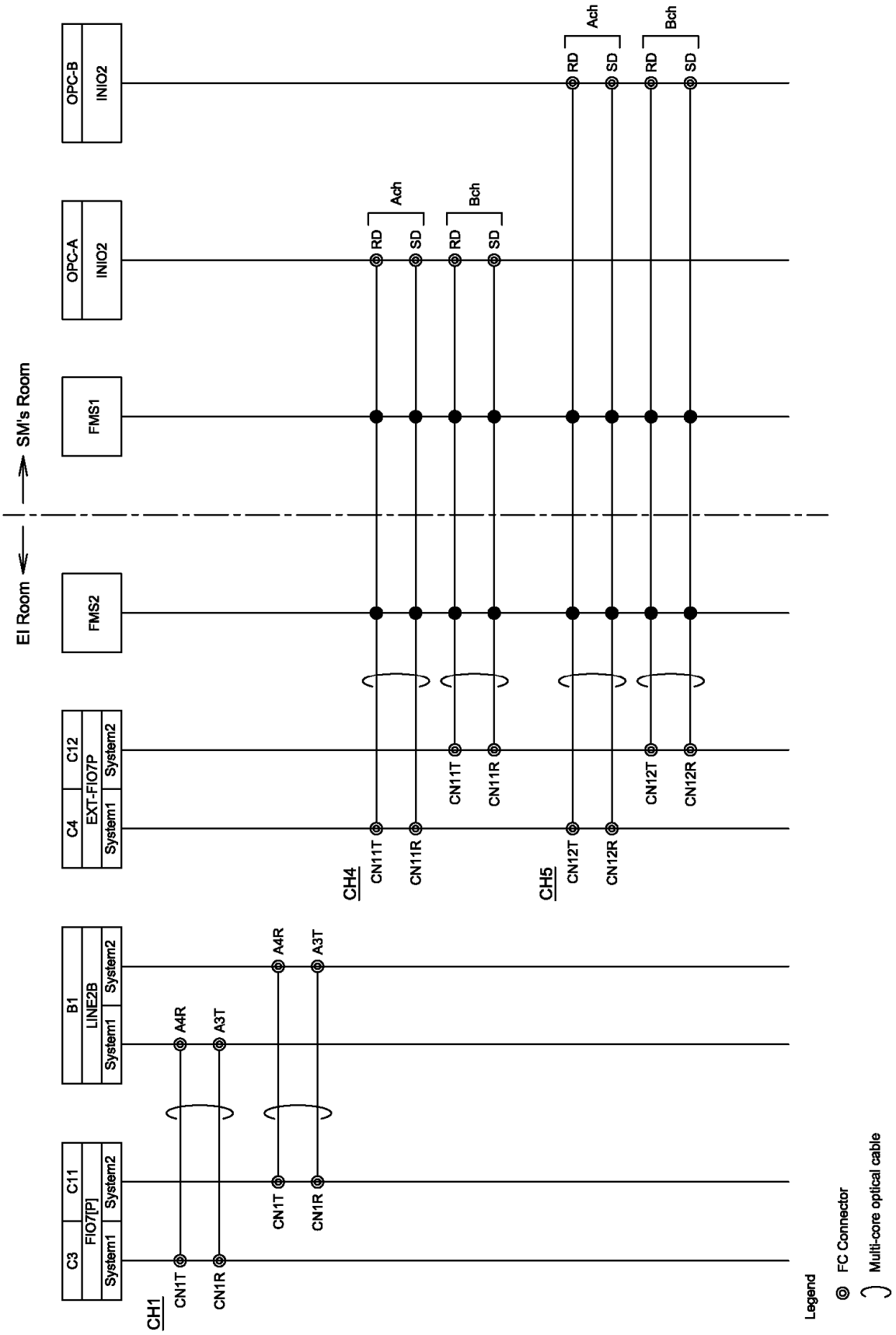
14. Typical Non-Vital Output Circuit

Each MMIF2 is provided with 64 output ports(for LED indications etc.), and it can be connected only to indoor equipment.



15. Typical Inter Optical Fiber Cable




OPC-B
INIO2
OPC-A
INIO2
FMS1
SM's Room
EI Room
FMS2
C4
C12
EXT-FIO7P
System1
System2
B1
LINE2B
System1
System2
C3
C11
FIO7[P]
System1
System2
Ach
Bch
RD
SD
CN11T
CN11R
CN12T
CN12R
CN1T
CN1R
A4R
A3T
CH1
CH4
CH5
Legend
FC Connector
Multi-core optical cable

16. Reasons of no earthing for EI

16.1 Introduction

Basically we don't earth the K5BMC EI and keep it in floating condition against the ground. In this regard, we are going to explain in the following.

16.2 Prevention of inflow of lightening surge and exogenous noise

Since electronic interlocking systems (EI) are the purpose of the use and an electric devices, inflow of lightening surge and exogenous noise have to be prevented into EI systems. The countermeasure against them are followings.

1) prevention of inflow of lightening surge from electric power line
A lightening surge proof transformer is installed in the AC power-system of an electronic interlocking system for preventing the inflow of the lightning surge from the power line system outside.
2) Relay interface
EI system is insulates electrically from external device and wiring, and EI system is prevented external surge inflow as relay I/F
3) Grounding of the cable shield between the relay rack and OT rack
Cable between relay rack and OT rack is used with cable shield, and the shield is grounded to be clarified the prevention of the surge/noise inflow to the EI systems from the outside.
4) The connection with a control panel is used optical fiber.
The connection between the EI in an equipment room and control panel installed in the separated place is used the optical fiber cable.

16.3 Reason for no earthing

It is necessary to carry out the countermeasures which prevents that a lightning surge passes into the ground through the EI system after implementing the countermeasures of lightning surge inflow prevention described above clause.

1) Insulation between each sub-racks and main-rack
The Sub-racks such as Logic sub-rack, Electronic Sub-rack etc., are insulated from main rack. This countermeasure is also to prevents that serge passes to the ground through equipment.
2) Insulation between a rack and the ground
The electronic interlocking system rack itself is installed on an insulator, and it is not grounded. It is also one of the countermeasure which prevents the serge passes to the ground through equipment.

These countermeasures are as explaining in attachment.
By these countermeasures, EI systems which Kyosan supplied until now have been operating stably, and we have no report about the any problem from each railway operating company who is maintaining.

<<Provisions for Lightning Damage to EI System in India>>

Measures for preventing lightning damages to the EI system follow.

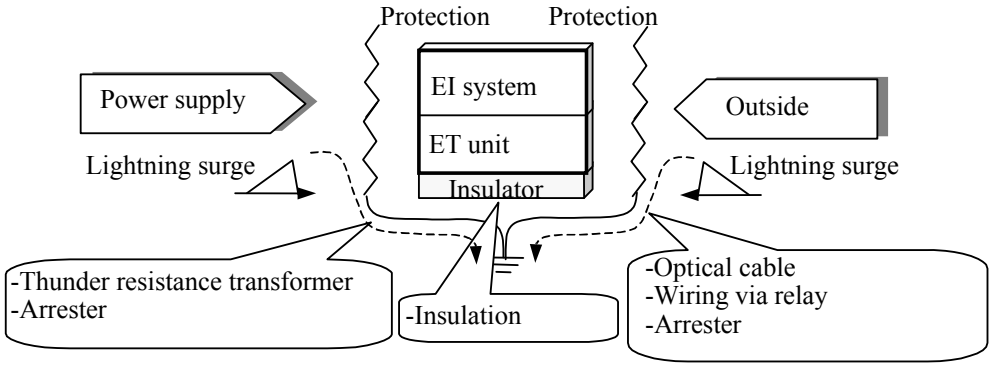


Figure 1 Basic concept

1. Provisions for lightning damage to the system
   1) Measures for lightning surge are to be taken.
   2) Measures for direct lightning can not be taken.

2. Units to which measures for preventing damages are to be taken.
   1) The electronic circuits (See figure 2-a)

3. Surge types
   1) Vertical surge: Surge between conductors and the ground
   2) Lateral surge: Surge between conductors

4. Main points (See figure 1)
   1) To prevent lightning surge influx as much as possible
   2) and to prevent defluxion of surge entered.

5. Lightning surge approach path and measures for preventing its approach
   1) Influx to the power supply
      a. Set the lightning surge impulse voltage below the specified value(See figure 2-b).
      b. Insert a arrester etc. into the power inlet to let the lightning surge flow to the ground(See figure 2-c).
      c. Insert a thunder resistance transformer (ZT) to reduce lightning surge entered(See figure 2-d).
      d. Separate primary and secondary wirings of the thunder resistance transformer to prevent the lightning surge transferring from the primary side to the secondary side(See figure 2-e).

   2) Approach from the ground
      a. Set each earth resistance value below the specified value (See figure 2-f)
      b. Separate between earths according to the standard(See figure2-g).
      c. Separate between earth wirings to prevent lightning surge transition (See figure2-h).

3) Influx to cables between equipment rooms
   a. Use the optical cables for preventing lightning damages (See figure 2-i).
   b. Using metal cables via a relay completely can prevent flux of the lightning surge.

4) Influx to field equipment
   a. As the signal protective device has been configured such that units and circuits have been isolated from the ground from a safety viewpoint, preventive measures for lightning surge will be very difficult for direct control from the electronic terminals. Thus, cables are wired via a relay to reduce the lightning surge (See figure 2-j).
   b. To prevent lightning surge transition to the electronic terminals, the wirings from outside and those from the electronic terminals are separated (See figure 2-k).

6. Measures for reducing defluxion of lightning surge entered
   Isolate the EI system and the electronic terminal units from floors and ladders with wood bases or bakelite board (See figure 2-l).

Preventive Measures against Lightning Damages

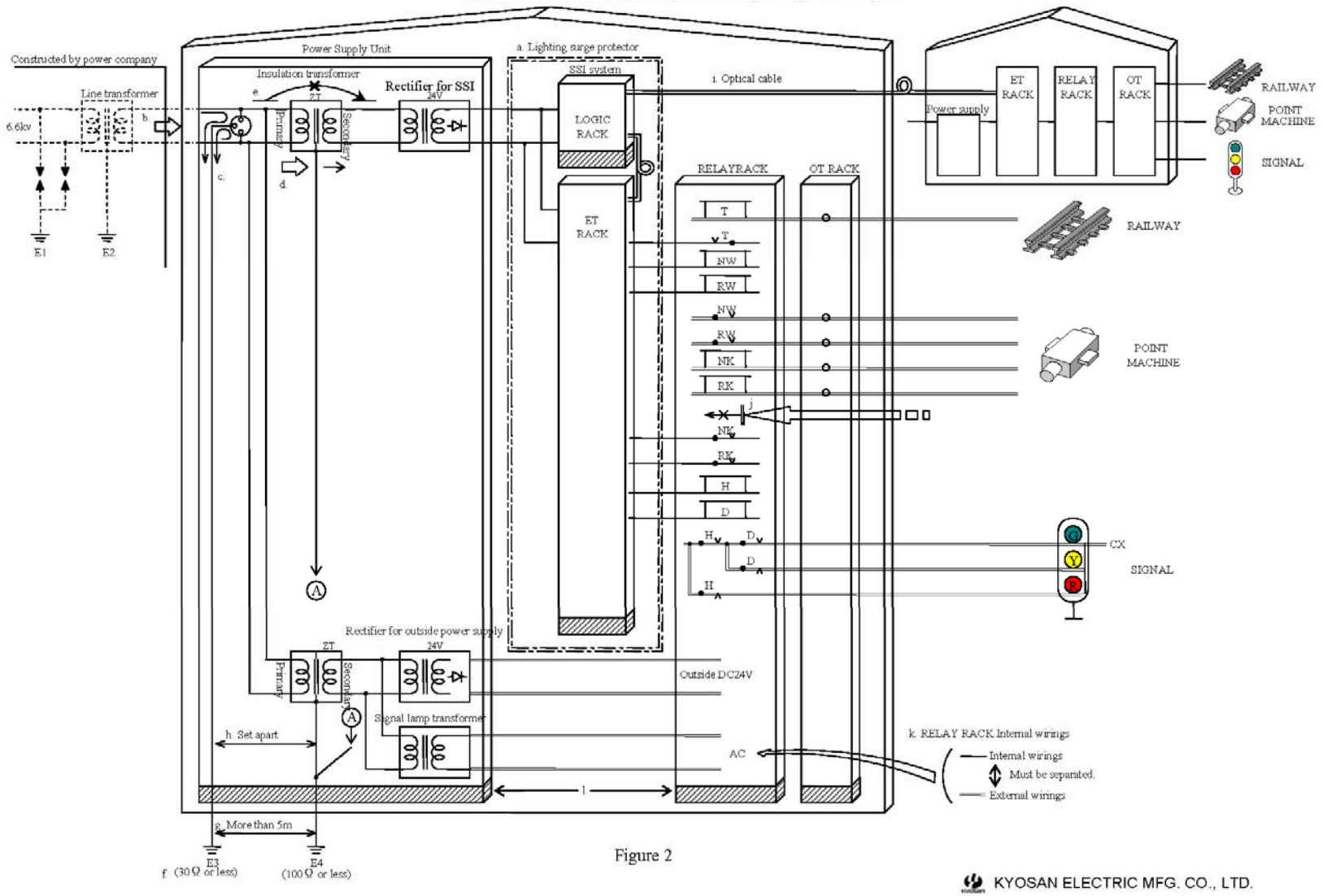


Figure 2

KYOSAN ELECTRIC MFG. CO., LTD.

17. Pre-commissioning Check List for K5BMC Electronic Interlocking System

Name and Type of Equipment: K5BMC Electronic Interlocking System			**Specification No.:** RDSO/SPN/192/2005		
Name and Address of manufacturer/ Supplier:			**Serial No. of the equipment:**		
Station / Section / Yard Name:			**Division / Zonal Railway**		
Executive Software			**Application Software**		
File Name	**Version No.**	**Checksum Value**	**Station Name**	**Version No.**	**Checksum Value**
K6LGC_J3.EXP	C3.82	0047F003			
K6STP_C5.EXP	C5.00	000B66D4			
K6ET_J3.EXP	C3.82	00186A7B			
K6MTN_I5.EXP	I5.01	0010F8AF			

Reference Documents:

1. K5BMC Installation Manual
2. Maintenance Manual for K5BMC Electronic Interlocking System Ver.3
3. MTC Failure Display Specification for K5BMC Electronic Interlocking System Ver.5
4. OPC Operation Manual Ver.4
5. Reasons of no earthing for SSI dated 20. Nov. 2009
   (including Provisions for Lightning Damage to EI System in India)
6. Electronic Interlocking (EI) System Wiring Diagram for each station
7. Selection Table for each station
8. LDC Wiring Diagram for each station

Note: The installation works should be strictly adhered and checked before commissioning covering all points in the following table:

Check List:

S. No	Check Point	Observed Result OK/Not OK	Remarks
	The Installation Status Inspection regarding Grounding in the Signal Equipment Room		
1	Check that the earthing and lightning protection for this installation is in accordance with the document of "Reasons of no earthing for SSI dated 20. Nov. 2009" (including Provisions for Lightning Damage to EI System in India).		
2	Check that each rack (Logic rack, Relay rack, OT/FT rack) in signal equipment room is not grounded.		
3	Check that earth pit and pipe burial is done as per each earthing.		
4	Check that signal equipment room EBB (Earth Bonding Bar) is not connected to power room EBB, and these EBBs are enough separated each other.		
5	Before connecting Earth Bonding Bar (EBB) to earth pit, measure earth resistance of grounding around the earth pit and confirm that is less than 1 ohm.		
6	Measure earth resistance of system earth pit and check that is less than 1 ohm.		
7	Connect EBB to system earth pit and measure earth resistance of the EBB. Check that the resistance is less than 1 ohm.		
8	The cables between Relay rack and OT/FT rack should be electrically shielded. Check that all cable shields are grounded at the OT/FT rack side. The shield is for preventing surge or noise inflow to EI system from outside.		
9	Check that the grounding terminals of surge protective device and lightning surge proof transformer are securely connected to EBB in signal equipment room.		
	Visual Inspection of Power Devices for Signal System		
10	Check that the power distribution within signal equipment room for signal system such as rectifier or external devices is through the surge protective device and/or lightning surge proof transformer according to Fig. 2 of "Reasons of no earthing for SSI dated 20. Nov.2009 (including Provisions for Lightning Damage to EI System in India)".		
	Ladder visual inspection		
11	Check that the Ladder is installed as per the interface circuit diagram.		
12	Check whether the ladder is insulated from racks and the wall.		
13	The width of the ladder is from 200mm to 800mm as a standard. Check whether it use what RDSO's specified.		
	Ladder and cable path between rack		
14	About the cable path between the rack, check it according to the details showed in Electronic Interlocking wiring diagram.		
	Visual Inspection of K5BMC EI Logic Rack		
15	Check that proper ventilation is provided in the rack.		
16	Check that adequate space for maintenance is available in the rack.		
17	Check that the cards are inserted in the respective slots as per the EI Wiring Diagram.		
18	Check for the RDSO inspection stamp in EI EQUIPMENTS.		

S. No	Check Point	Observed Result OK/Not OK	Remarks
19	Check that locking arrangement is provided for front door.		
20	Check that locking arrangement is provided for rear door.		
21	Check that dummy cards are inserted on the unused slots.		
22	Check that the nameplate contains serial no. and mfg. date.		
23	Check that each sub-racks such as Logic sub-rack or Electronic sub-racks are insulated from the Logic rack.		
24	Check that all the cards are fixed firmly to the respective slots of sub-rack with fixing screws.		
25	Check that the wire ends of terminals or connectors shall be crimped with correct size lugs and there are no loose connections at the terminals.		
26	Check that all the wiring of terminals or connectors should be properly lugged and securely tightened.		
27	Check whether it use Bolt terminal of 4mm in Bus Bar and Wire terminal.		
28	In order to display the EI System Wiring Diagram, check whether the Burndy connector is fixed and connected to each position.		
29	Check whether the relay for WDT directed to Relay panel of Connector parts in the EI System wiring diagram is installed.		
30	Check whether the RS232C connector is firmly fixed by the installation screw of the connector.		
31	In order to display the EI System Wiring Diagram, check whether the SOURIAU's connector is fixed and connected to each position in the back surface of motherboard of the Logic Unit.		
32	In order to display the EI System Wiring Diagram, check whether the MIC's connector is fixed and connected to each position in the back surface of motherboard of the Electronic Terminal Unit.		
33	Check whether the Logic Unit and Electronic Terminal are connected to Circuit Protector and Noise Filter in System 1 and System 2 respectively from DC/DC converter of 24V of configuration of n+1.		
	Wiring and Routing of the K5BMC EI Logic Rack		
34	Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram. Check the power input part especially the 3.5SQ electric wire of UL1015 is used. When it is not specified particularly, 2.0SQ between Bus Bar and Wire terminal and 1.25SQ between Wire terminal and each Sub-Rack. Also check the Input/Output section that used 0.5SQ.		
35	Check that the wirings for logic power, interface of electronic terminal and outer power line are respectively separated and conducted in each wiring duct.		
36	Check that the RS232C cables and wiring duct are routed and harnessed properly.		
37	Check that the metal connectors of each sub-racks, such as the Logic sub-rack and the Electronic terminal sub-racks, are properly fixed.		
38	Check that the connectors of metal cables between racks are properly fixed to the receptacles and rack.		
39	Check that all the optical connectors are fastened with no slack and the caps has been put on all the unused optical connector.		
40	Check that optical fiber cables are uses GI optical cable (GI 50/125), bent in suitable curve (radius 30mm or more) and protected with sheath.		

S. No	Check Point	Observed Result OK/Not OK	Remarks
41	Check that cable glands are provided for all the incoming and outgoing wires of the rack.		
	Visual Inspection of Relay Rack		
42	Check that the wire ends of terminals or connectors shall be crimped with correct size lugs and there are no loose connections at the terminals.		
43	About the wiring, check if you have followed the displayed details on the Electronic Interlocking device wiring diagram. When it is not specified particularly, check if you used 1.25SQ of UL1015 for power section and 0.5SQ of UL1015 for Internal section.		
44	Check that the type or arrangement of the relays inserted in the relay racks are as per the relay mounting chart in EI wiring diagram.		
45	Check that the wiring is carried out following the EI wiring diagram and the rack has RDSO inspection seal.		
46	Check that wirings from outside and wirings from electronic terminals are crossed at right angle in order to prevent electrical induction.		
47	Check that all wires have proper lugs and are inserted properly in the terminal sub-racks.		
48	Check that proper identification markers are attached to all terminals.		
49	Check whether the cable is connected to System 1 and System 2 respectively from DC/DC converter of 24V of configuration of n+1.		
	Visual Inspection of OT/FT Rack		
50	Check that wire ends of terminals or connectors shall be crimped with correct size lugs and there are no loose connections at the terminals.		
51	Check that the wiring is carried out following EI wiring diagram and the rack has RDSO inspection seal.		
52	Check that all wires have proper lugs and are inserted properly in the terminal sub-racks.		
53	Check that proper identification markers are attached to all terminals.		
54	Check mechanical dimensions of fuse so that the fuse fits in fuse holder properly in accordance with EI system wiring diagram and there is no loose connection.		
55	Check whether the Wago terminal is used as an OT terminal.		
56	Check whether the Bolt terminal of 6mm is used in FT terminal.		
	Visual Inspection of CCIP		
57	Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram. Check the power input part especially the 3.5SQ electric wire of UL1015 is used.		
58	Regarding wiring of terminals or connectors, check that the wire ends shall be crimped with correct size lugs and there are no loose connections at the terminals.		
59	Check that the yard layout on CCIP panel is as per the approved signalling plan.		
60	Check that two redundant power inputs are provided for the panel.		
61	Check that power supply line and interface wiring for input boards as well as output boards should be isolated each other.		

S. No	Check Point	Observed Result OK/Not OK	Remarks
62	Check whether the cable is connected to System 1 and System 2 respectively from DC/DC converter of 24V of configuration of n+1.		
	Visual Inspection of PC for OPC (VDU)		
63	Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram. Check the power input part especially the 3.5SQ electric wire of UL1015 is used.		
64	Check that surge suppressor is provided for PC power input of OPC.		
65	Check proper power connections from IPS to PC of OPC.		
66	Check that all optical connections are fastened without slack and also connections with keyboard, mouse and monitor also shall be proper without slack.		
67	Check whether the cable is connected from DC/DC converter of 24V of configuration of n+1.		
68	Check that optical fiber cables are uses GI optical cable (GI 50/125), bent in suitable curve (radius 30mm or more) and protected with sheath.		
	Visual Inspection of PC for MTC		
69	Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram. Check the power input part especially the 3.5SQ electric wire of UL1015 is used.		
70	Check that surge suppressor is provided for PC power input of MTC.		
71	Check proper power connections from IPS to PC of MTC.		
72	Check that all optical connections are fastened without slack and also connections with keyboard, mouse and monitor also shall be proper without slack.		
73	Check whether the cable is connected from DC/DC converter of 24V of configuration of n+1.		
74	Check that optical fiber cables are uses GI optical cable (GI 50/125), bent in suitable curve (radius 30mm or more) and protected with sheath.		
	Check points after turning on K5BMC EI		
75	Check that power supplies for all signal equipment, NFB, OPC, MTC and Data Logger etc. have been turned on.		
76	Check that all switches of IPU6C in Logic sub-rack, LINE2Band PIO2-LOG in PIO sub-rack and LINEM2 and MMF2 in MMIF sub-rack have been turned on.		
77	Check that all switches of LINEM2 and MMIF2 in MMIF sub-rack have been turned on.		
78	Check electric voltage of all measuring points and confirm all of those voltages are within standard range according to the voltage checklist.		
79	Check that EI status is normal through General System Display of MTC.		
80	Check that yard layout on OPC is as per approved signalling plan.		
81	Check that the RGB colour bar on the bottom of OPC screen is flashing continually.		
82	Check that all the emergency operations on OPC are protected with password.		

S. No	Check Point	Observed Result OK/Not OK	Remarks
83	Check that RDSO approved Data-logger is connected to EI and also checked by the Data Logger that all events are logged in with date and time stamp.		
84	Check that the file name, Version No. and CRC checksums of Executive softwares in system 1 and system 2 are same with values of the software what RDSO already verified.		
85	Check that the station name, Version No. and the CRC checksums of the application softwares in system 1 and system 2 are same with values of the software what RDSO already verified.		

Functional Tests

Functional Tests by mock connection

System in use changeover inspection

In advance of the tests, verify that all the normal indicators are light up.

No.	Items	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Logic rack/logic card	Confirm normal operation with system 1 and 2. Set two or more routes, and then proceed following operation.	Route settings are confirmed at LCD display at Operator Console. Normal operation is confirmed at indication of F486-4I card.		
		(1) Turn OFF the power supply of Logic Module system 1	System 2 must become active (in use). Indication in LCD display should not change (keeping normal condition) and system must be in working order.		
		(2) Turn the system 1 power switch ON.	System 1 must start up and revert to redundant operation.		
		(3) Turn OFF the power supply of Logic Module system 2	System 1 must become active(in use). Indication in LCD display should not change. System must be in working order.		
		(4) Turn system 2 power supply ON.	System 2 must start up and revert to redundant operation.		
		(5) . Turn OFF the power supply of Logic Module system 2	System 1 must become active(in use).		

Interlocking functional Test

For Functional testing of route setting and point control, Operator Console is to be used.

Status of each external equipment such as point switch indications, track circuits and signal proceed aspects etc. are to be confirmed at Operator Console LCD.

The system shall be tested functionally for all the signals, point operation, emergency point operation, route cancellation, emergency route cancellation, level crossing and crank handles of all the routes.

Functional test is to be simulated with using C.P. which is for setting simulating condition of input and output of MMIF2s and ET-PIOs.

Contents of function test

No.	Items	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Track circuit	Turn ON/OFF the switches on C.P.	Indicated position of the track circuit must correspond with track name.		
2	Points	Perform changeover operation of points.	Indicated direction of points must correspond with point no.		
3	Route setting and cancellation of route	Perform route setting and cancellation of route for all the signals on possible routes as per selection table.	Corresponding route must be set for all the signals and cancelled.		

Interlocking inspection

a) Point lock by route control

No.	Item	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Point lock	(1) Perform route setting operation.	Route must be set. Proceed aspect of signal must be indicated.		
		(2) Perform switchover operation of points.	Points should not be switched.		
		(3) Restore route and switch points.	Points must be changed to controlled direction.		

b) Lock inspection between routes

Route A (test route) and route B which is specified in the column of "Signal and Point Lock" in the Interlocking Control Table, is to be inspected as follows.

No.	Item	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Route normal position lock	Perform route setting operation for route A.	Route A must be set. Proceed aspect of signal must be indicated.		
		(1) Perform route setting operation for route B.	Route B should not be set. Proceed aspect of signal for route A must remain indicated.		
		Perform operations of route restoration for route A and route setting for route B.	Stop aspect must be indicated for route A, route B should be set and proceed aspect of signal must be indicated for route B.		

Signal control inspection (with track circuit and point machine conditions)

Inspection for the track circuits specified in the column of "In run track circuit of selection table" is carried out.

No.	Item	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Track condition	(1) Perform route setting operation.	Route must be set. Proceed aspect of signal must be indicated.		
		(2) Short track circuit concerning signal control.	Stop aspect must be indicated for route.		
		(3) Release track circuit concerning signal control.	Proceed aspect of signal must be indicated for route.		
2	Points condition	(1) Perform route setting operation.	Route must be set. Proceed aspect of signal must be indicated.		
		(2) Turn points indicators concerning signal control ON/OFF individually.	When point indicators are turned OFF, stop aspect must be indicated.		

Point Lock inspection

Point inspection is to be carried out for normal and reverse position of points per concerned track.

No.	Item	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Points	Short track of points and operate point to the opposite direction against cleared direction.	Points should not switch over.		
		Release track which shorted above and operate points to the opposite direction against cleared direction.	Points must switch over.		

Approach route lock inspection

a) Between routes and points

This inspection is to be carried out by shorting track circuits specified in "In run track circuit" rows in the Selection Table for the related routes.

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	(1) Perform route setting operation.	Route must be set.		
	(2) Operate points to the opposite direction.	Any of concerned points should not switch over.		
	(3) Move the vehicle (pick up and drop of track relays)	Points in route section should not switch over. After passes of vehicle from route set section the point of that section should be switch over.		

b) Between signals

Between two signals, one (A) that is under inspection and the other (B) which is opposite one, is to be inspected.

No.	Item	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Normal position lock	After setting route for A, short the first track circuit in ahead of signal and cancel route for A.	Route for A must remain locked.		
		Perform route setting for signal B, which is the opposite one of signal A.	Route for B should not be set.		
		Operate train along route for A.	Route for B must be set with appropriate track circuit picked up.		

Approach lock or stick lock

The inspection is carried out for the checking of approach stick relay.

No.	Item	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Where there is approach lock	(1) Cancel route without shorting of track circuit in approach lock section.	Stop aspect must be indicated for route. The related points must be unlocked		
		(2) Short track circuits in approach lock section.	Stop aspect must be indicated for signal.		
2	Where there is no approach lock	(1)After setting route, cancel it.	Stop aspect must be indicated for route. The related points must be unlocked.		
		(2)Short track circuits in ahead of signal.	Stop aspect must be indicated for signal. The related points must be unlocked.		

Inspection between parallel routes

Setting and cancellation of routes which don't overlap any related routes are to be inspected.

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Perform route setting operation.	The route must be set. Proceed aspect of signal must be indicated for the route.		
2	Set route which doesn't overlap the route set first.	The following route must be set. Proceed aspect of signal must be indicated for the route set first and the following route.		

Slot Normal

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Press related CH button for releaseing crank handle.	Related CHZYR on MTC must indicate 1 and UNCRKEW and GNCRKEW indications on Control Panel must start flashing.		
2	Perform route setting opearationon Control Panel.	The route must not be set.		
3	Reverse crank handle release.	Related route must be set.		
4	Press related d CH button for releasing crank handle.	Crank handle must not be released.		
5	Press ECHYN button for crank handle emergency release.	Crank handle must not be released.		

Failure functional inspection

Fault information inspection (Logic card)

No.	Item	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	System 1 failure	Press [Reset] button on system 1 F486-4I card.	System 2 must become active (in use). Confirm at F486-4I card.		
		(1) Let [Reset] button go.	System 1 normal indicator must light up with system 2 remaining active.		
2	System 2 failure	Press [Reset] button on system 2 F486-4I card.	System 1 must become active (in use). Confirm at F486-4I card.		
		(1) Let [Reset] button go.	System 2 normal indicator must light up with system 1 remaining active.		
3	System 1 power OFF	(1) Turn System 1 logic IPU6C card power supply OFF.	System 2 must become active (in use). Confirm at F486-4I card.		
		(2) Turn system 1 power supply ON.	System 1 normal indicator must light up with system 2 remaining active.		
4	System 2 power OFF	(1) Turn system 2 logic IPU6C card power supply OFF.	System 1 must become active (in use). Confirm at F486-4I card.		
		(2) Turn system 2 power supply ON.	System 1 must remain active and system 2 normal indicator must light up.		

Fault information inspection (Electronic terminal card)

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Turn power supply switch of related electronic terminal card OFF.	Failure must occur.		
2	Turn power supply switch of LINEM2/LINE2B card of system1 OFF.	Failure must occur.		
3	Turn power supply switch of LINEM2/LINE2B card of system2 OFF after recovery of system 1.	Failure must occur.		
4	Turn power supply switches of LINEM2/LINE2B card of both system 1 and 2 OFF after recovery of system 2.	Failure must occur.		

Signal sequence inspection

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1.	Set route.	Signal aspects must be in accordance with the Signal Sequence Table.		

Fail safe related inspection
HBP (Check for indicating lock)

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Set the HRBP input to '0' with no setting route and pull out the relay. (Less than 3 sec.)	The indication circuit of cleared direction of the related route must light up.		
2	Put (mount) the relay back and set the HRBP input to '1'.	The route must be cancelled and the indication circuit for truck must go off.		
3	Set the HRBP input to '0' with no setting route and pull out the relay. (More than 3 sec.)	Logic Power supply shall be turn off by cut off relay.		

PORBP (Check for point control relay)

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1	Clear the related route.	The indication circuit for route and the proceed aspect must right up.		
2	Pull out the relay and then set the PORBP input to '0'. (Less than 10 sec.)	The stop aspect must light up and the indication circuit for route must light up steadily.		
3	Return back (mount) the relay, and then set back the PORBP input to '1'.	The indication circuit for route and the proceed aspect must light up.		
4	Pull out the relay and then set the PORBP input to '0'. (More than 10 sec.)	Logic Power supply shall be turned off by cut off relay.		

Data Logger connecting test

Transmission Data check inspection

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1.	Connect the Protocol Converter to Journal Module with RS-232C cable. Check the relay status of "ZSIO2-RX-FL" normal on MTC.	" ZSIO2-RX-FL" on MTC display should be "1".		

Real Time synchronous check inspection

No.	Procedure	Criteria	Observed Result OK/Not OK	Remarks
1.	Time correction command is carried out from the Data Logger.	MTC time is synchronized to Data Logger time.		
2	Time correction command is transmitted from Data Logger with the MTC power off, and then MTC shall be started up (turn on)	After MTC is start up, MTC time is synchronized to Data Logger time.		

VOLTAGE CHECK LIST (1/2)

	BLOCK	Power Supply Type	Voltage Adjustment Point	Voltage Measuring Point	Measurements	Observed Result OK/Not OK	Remarks
LOGIC RACK	E	DC24V (LOGIC POWER)		8C-A 1,5			At no load
				8C-A 3,7			At no load
		DC26V (I/F POWER)		8C-B 1,5			At no load
				8C-B 3,7			At no load
	B	DC24V (LOGIC POWER)		B1 CN1 3, 1			
				B9 CN1 3, 1			
			IPU6C (B-1)	IPU6C 24V measuring terminal (B-1)			
			IPU6C (B-9)	IPU6C 24V measuring terminal (B-9)			
				LINEM2 J11- 6, 7			
				LINEM2 J12- 6, 7			
		DC5V	IPU6C (B-1)	IPU6C 5V measuring terminal (B-1)			
			IPU6C (B-9)	IPU6C 5V measuring terminal (B-9)			
			LINEM2(SYSTEM1)	MMIF2 5V measuring terminal (B-18)			
			LINEM2(SYSTEM2)	MMIF2 5V measuring terminal (B-18)			
	C	DC24V (LOGIC POWER)		J1-6,8 (C-1)			
			LINE2B (SYSTEM1)	LINE2B 24V measuring terminal (SYSTEM1)			
			LINE2B (SYSTEM2)	LINE2B 24V measuring terminal (SYSTEM2)			
		DC26V (I/F POWER)		ET-PIO2 6-1 J3-1,3 (C-2)			
				ET-PIO2 6-2 J3-1,3 (C-3)			
				ET-PIO2 6-3 J3-1,3 (C-4)			
				ET-PIO2 6-4 J3-1,3 (C-5)			
		DC5V	LINE2B (SYSTEM1)	LINE2B 5V measuring terminal (C-1)			
			LINE2B (SYSTEM2)	LINE2B 5V measuring terminal (C-1)			
	D	DC24V (LOGIC POWER)		KDD172-KY48-2 P1, P2			
	A			SPHC-PW CN1-3,4 (For System 1 SPHC-TT)			
				SPHC-PW CN1-3,4 (For System 2 SPHC-TT)			
		DC5V	System 1 SPHC-PW	System 1 SPHC-TT CN1-1,2			
			System 2 SPHC-PW	System 2 SPHC-TT CN1-1,2			

VOLTAGE CHECK LIST(2/2)

	System 1 SPHC-TT CN1-1,2	System 1 SPHC-TT CN1-1,2	System 1 SPHC-TT CN1-1,2	Measurements	Observed Result OK/Not OK	Remarks
CONTROL PANEL	DC24V (LOGIC POWER)		LINEM2 J11 - 6, 7 (System 1)			
			LINEM2 J12 - 6, 7 (System 2)			
			SPHC-PW CN1-3,4 (For System 1 SPHC-TT)			
			SPHC-PW CN1-3,4 (For System 2 SPHC-TT)			
	DC5V	LINEM2 (System 1)	MMIF2 7-4 5V measurement terminal			
		LINEM2 (System 2)	MMIF2 7-4 5V measurement terminal			
		SPHC-PW (System 1)	SPHC-TT CN1-1,2 (System 1)			
		SPHC-PW (System 2)	SPHC-TT CN1-1,2 (System 2)			

MTC Failure Display Specification

for K5BMC Electronic Interlocking System

Document No. Z914-C73000030E

Version 5

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Kyosan Electric Mfg. Co., Ltd.
29-1, Heiancho 2 chome, Tsurumi-ku, Yokohama, JAPAN

Document Revision History

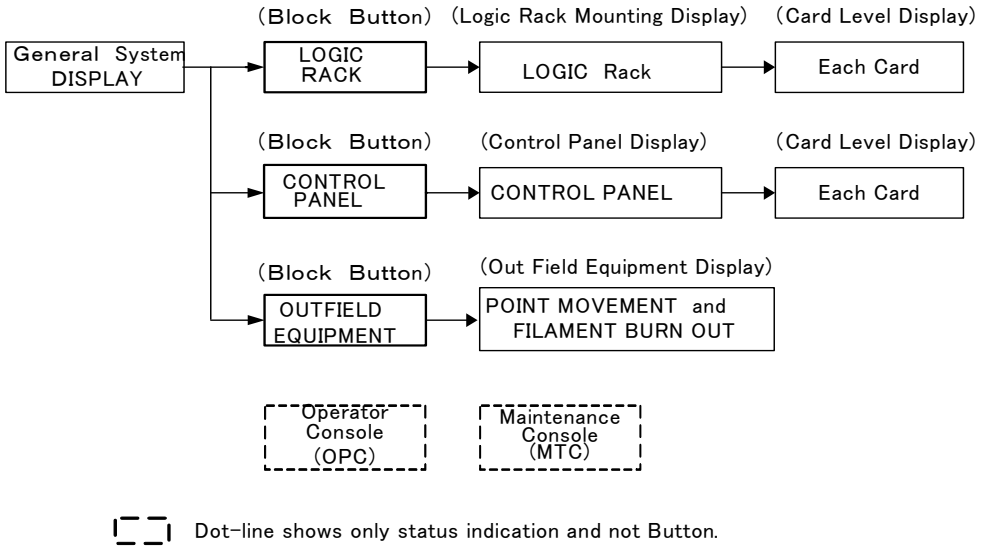
Ver. No.	Date	Nature of Revision	Author(s)
1	12. Jul. 2010	First Edition	T. Suzuki
2	11. Aug. 2010	Improvement in function, Words-and-phrases correction and Reexamination of message	T. Suzuki
3	12. Nov. 2010	Revised by addition of Journal Module	T. Suzuki
4	13. Dec. 2010	Reviced by checking the card 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).

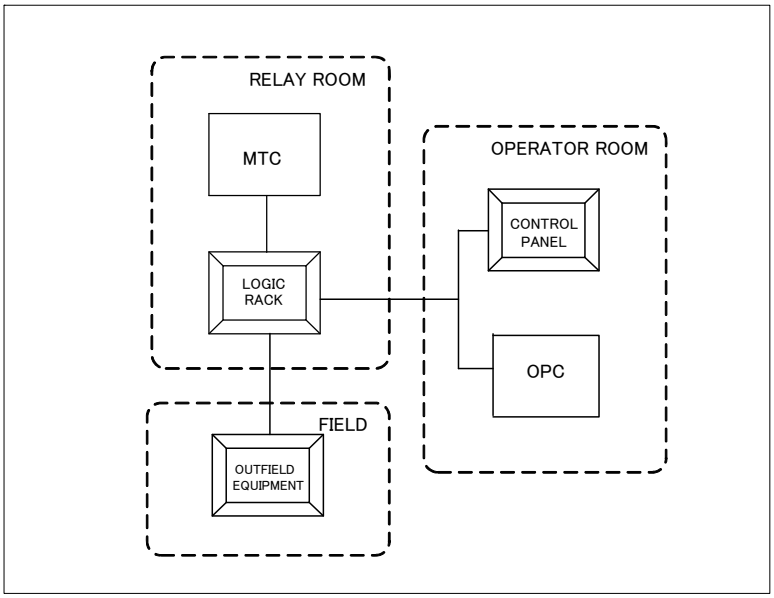
2. Display Transition Diagram



3. MTC DISPLAY

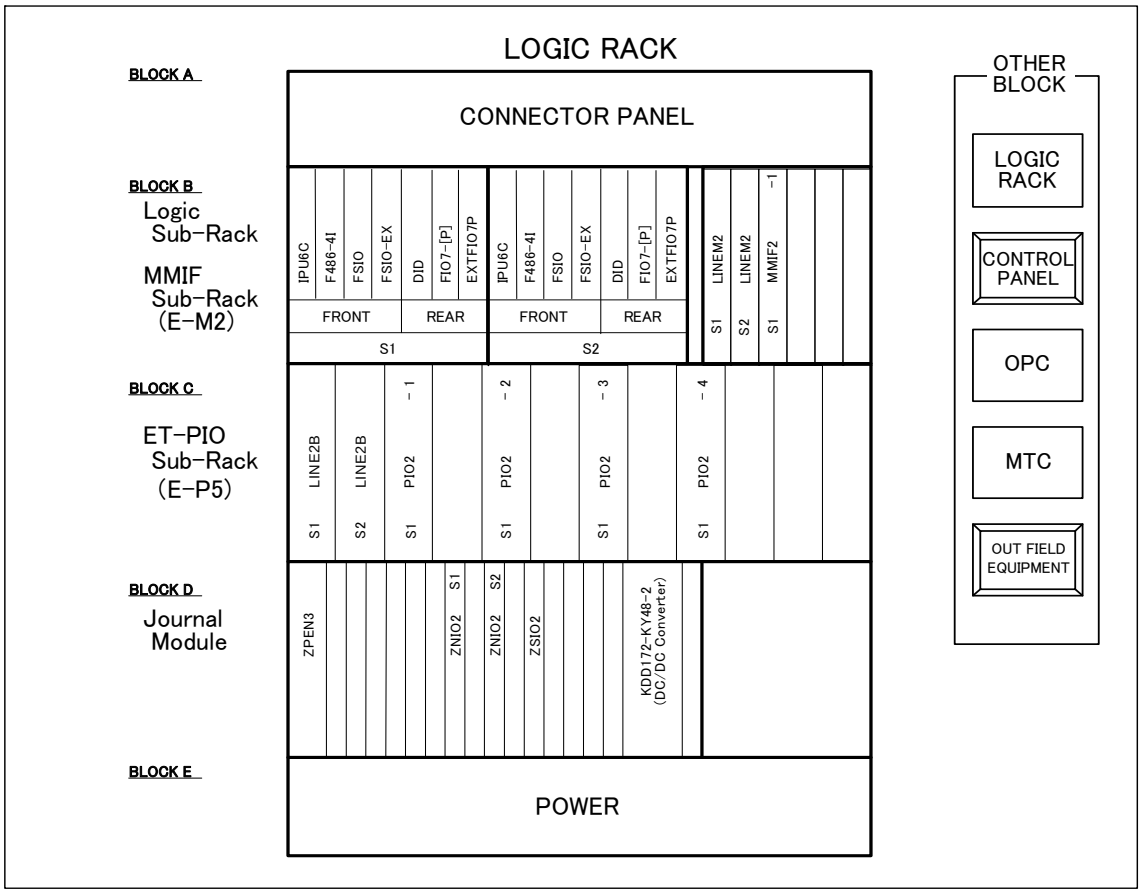
3.1 General System Display

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

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.



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 

), 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.

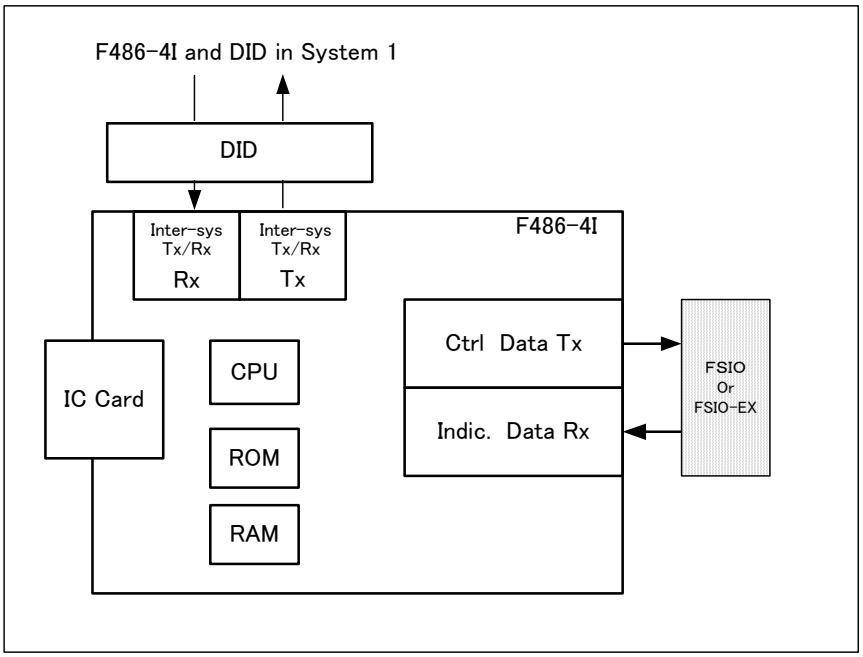
The status of each card is indicated with green in normal and with red in abnormalities.

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.

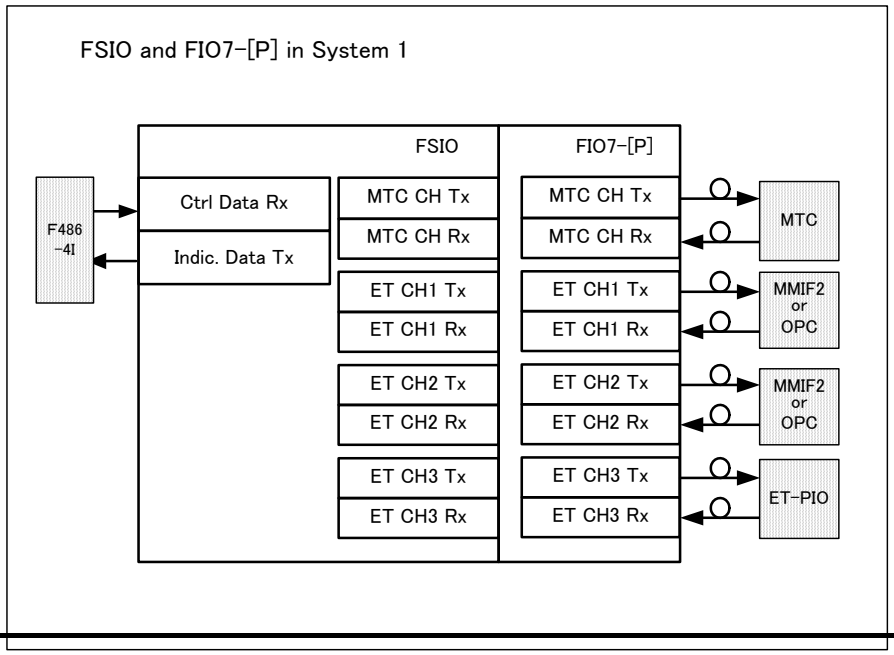
3.3.1 Logic Block

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

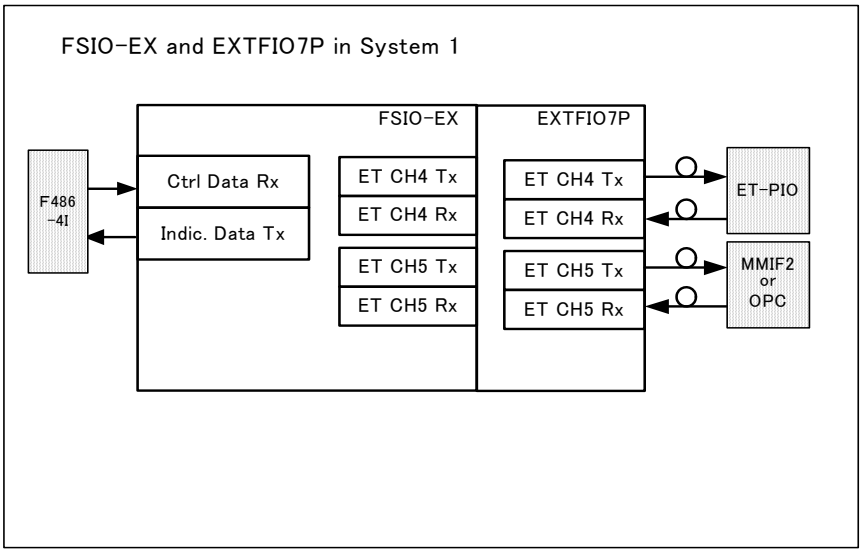
1) F486-4I and DID Screen



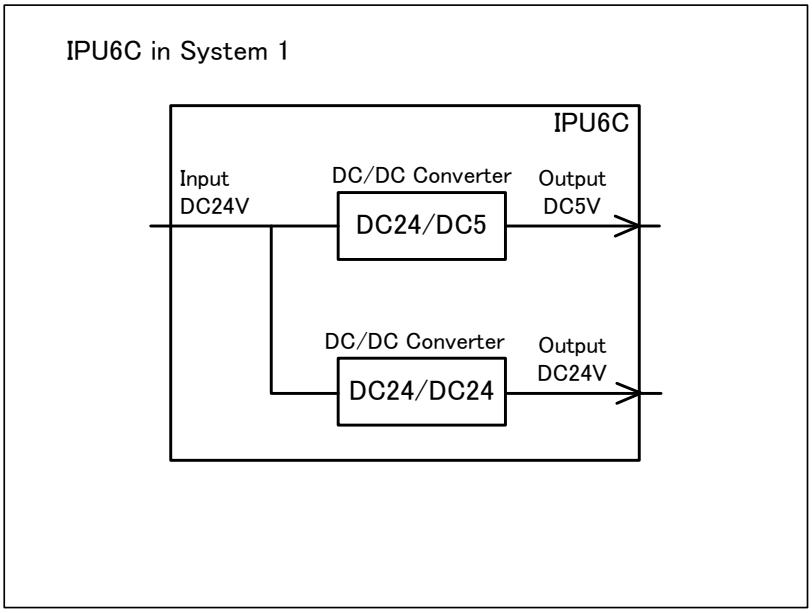
2) FSIO and FIO7-[P] Screen



3) FSIO-EX and EXTFIO7P Screen



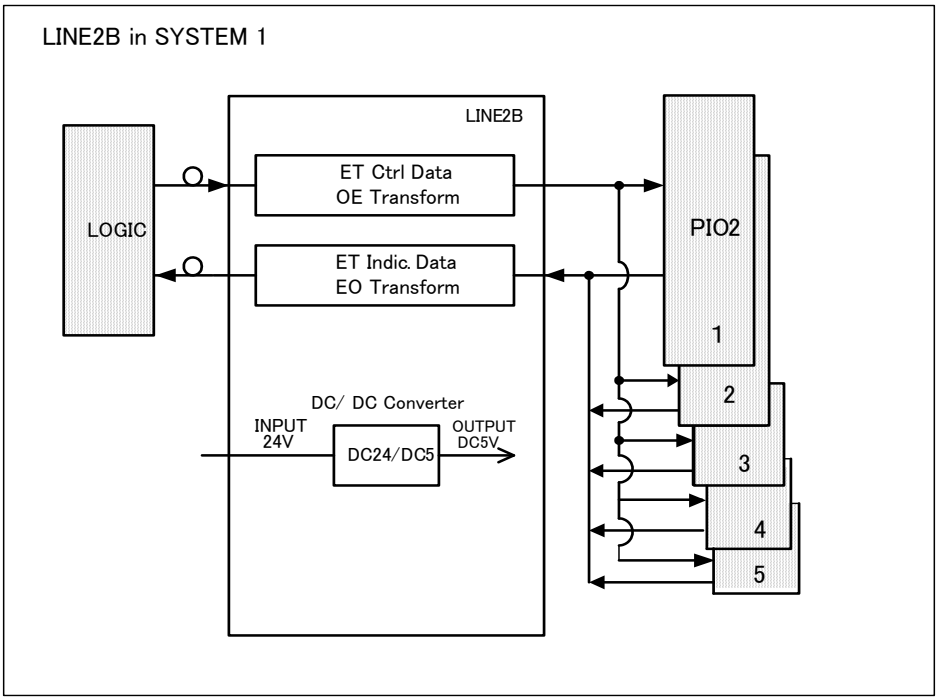
4) IPU6C Screen



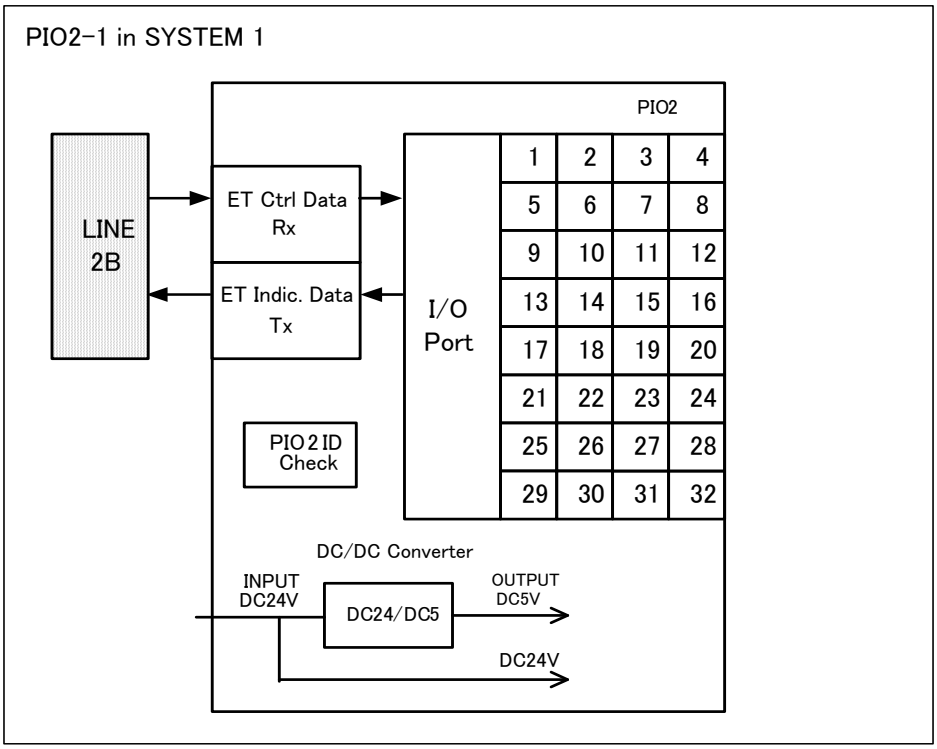
3.3.2 ET-PIO Block

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

1）LINE2B Screen



2) ET-PIO Screen

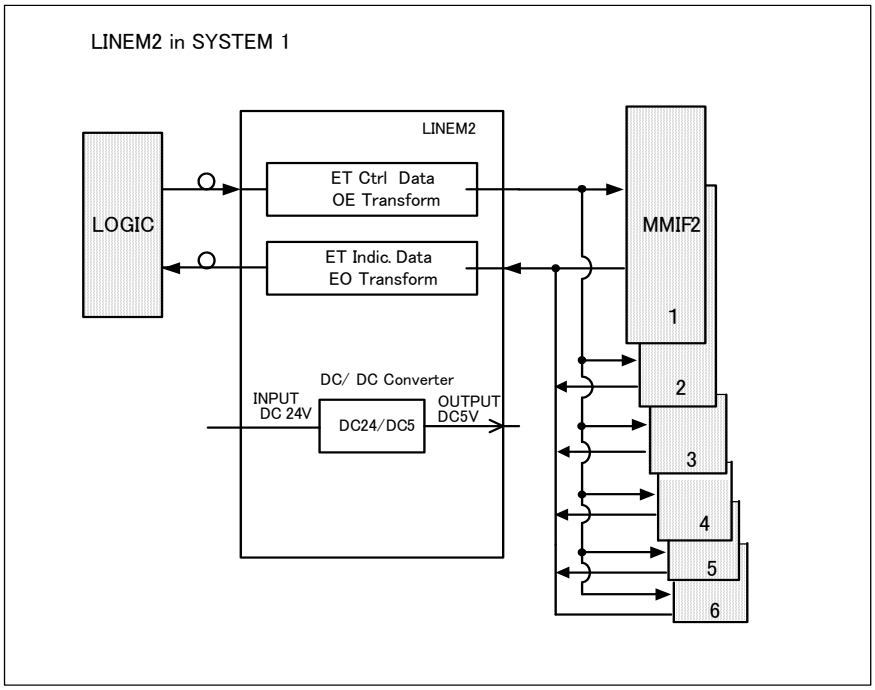


The result of status of Circuit No. of ET-PIO2 I/O is displayed collectively each four I/Os such as 1 2 3 4, 5 6 7 8, etc.

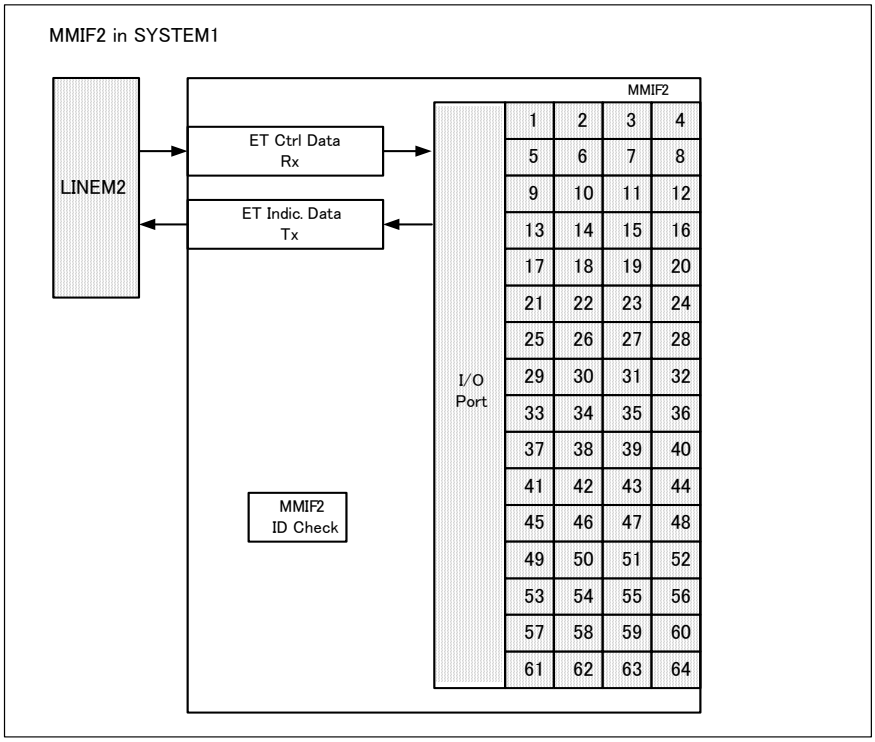
3.3.3 MMIF Block

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

1) LINEM2 Screen



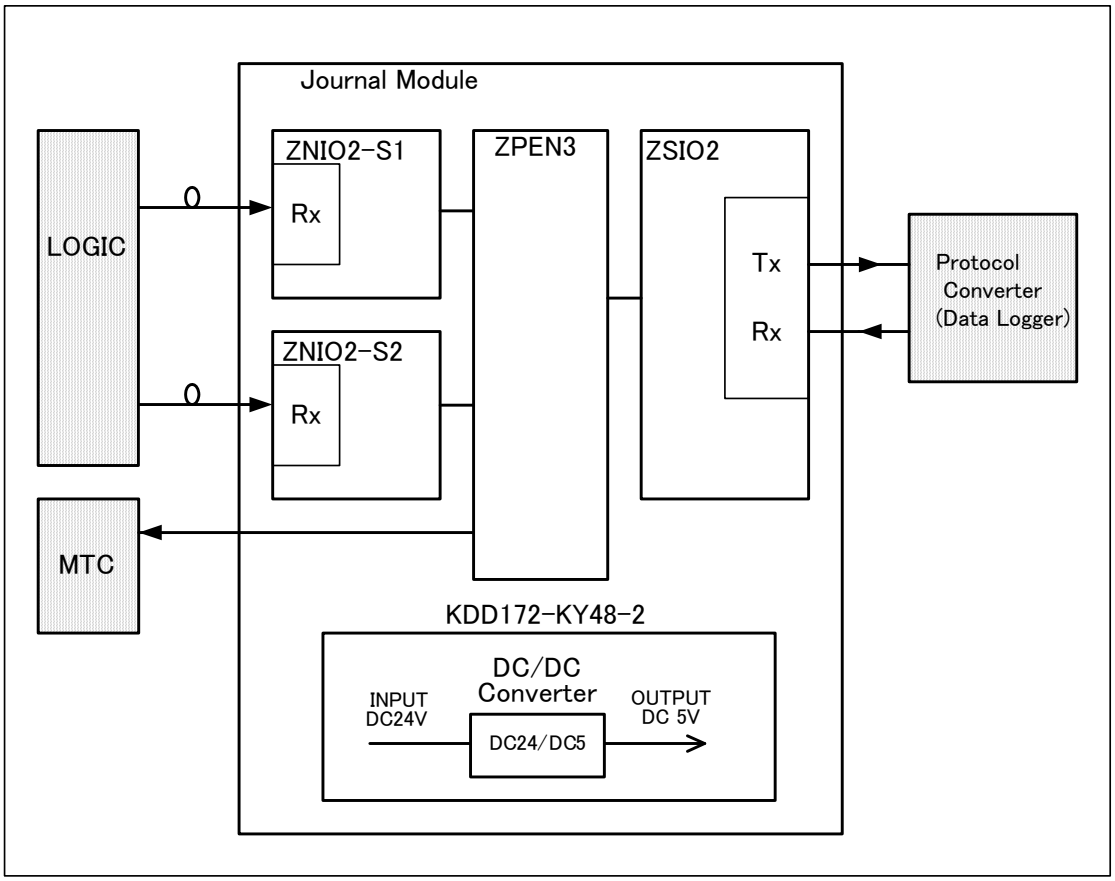
2) MMIF2 Screen



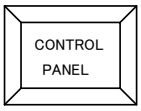
In this screen, the indication of I/O port and the right side from No.1 to 64 shall be totally colored gray, since there is no indication condition.

3.3.4 Journal Module

(1) Journal Module Screen

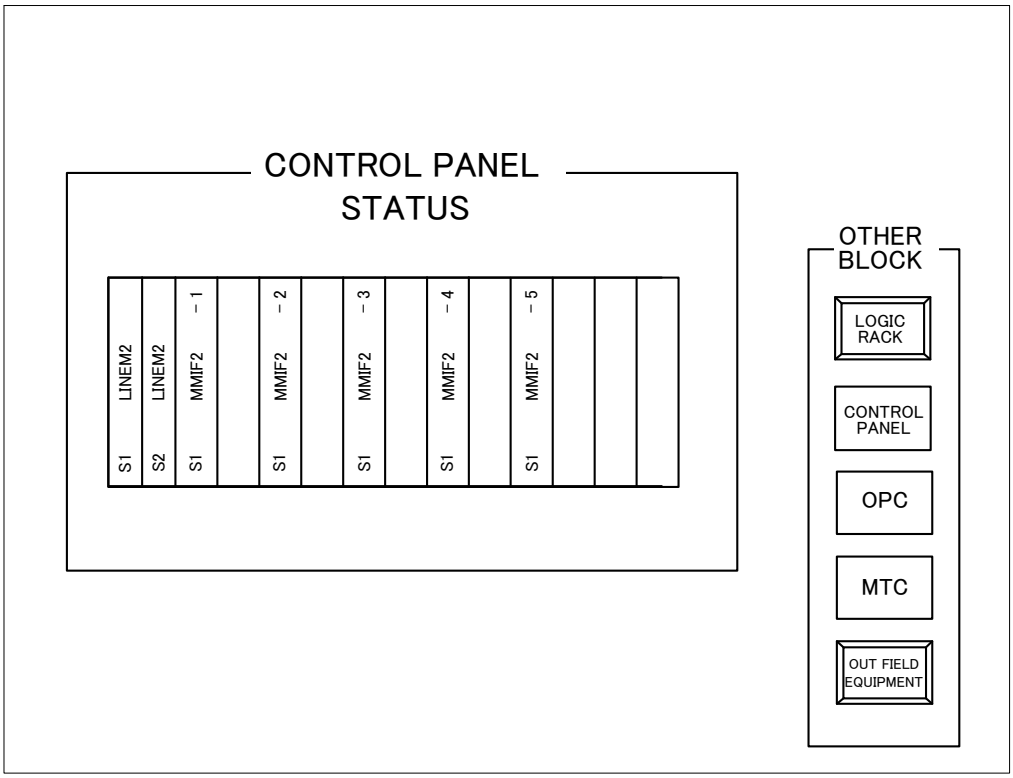


3.4 Control Panel Display

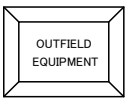


By pressing CONTROL PANEL button on the General Sytem Display, shifting to CONTROL PANEL Display below can be achieved.
Each card status is to be indicated in green for normal and in red for abnormal.

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"

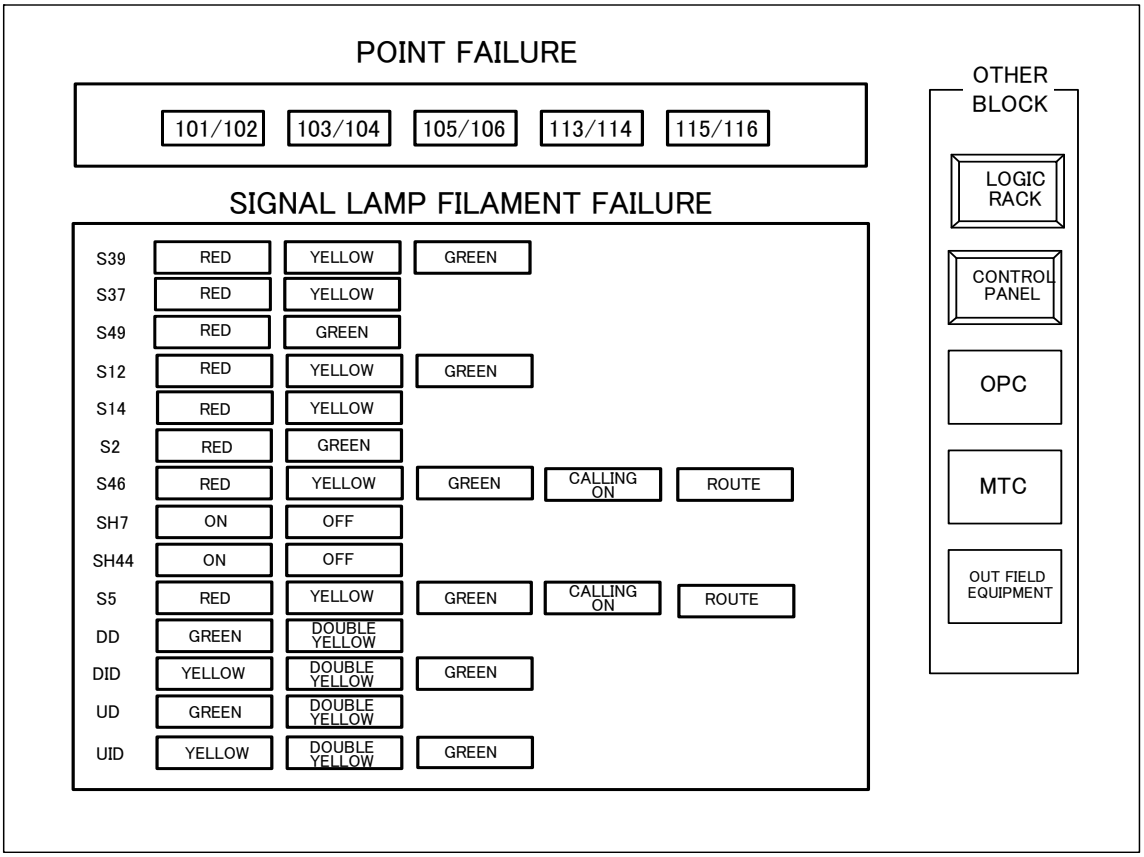


3.5 Out Field Equipment Display



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.

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.

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.

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.

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	**

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.

(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.