

K5BMC

ELECTRONIC INTERLOCKING MANUAL

ENGINEER LEVEL

KYOSAN INDIA PVT LTD.

Troubleshooting Manual

for K5BMC Electronic Interlocking System

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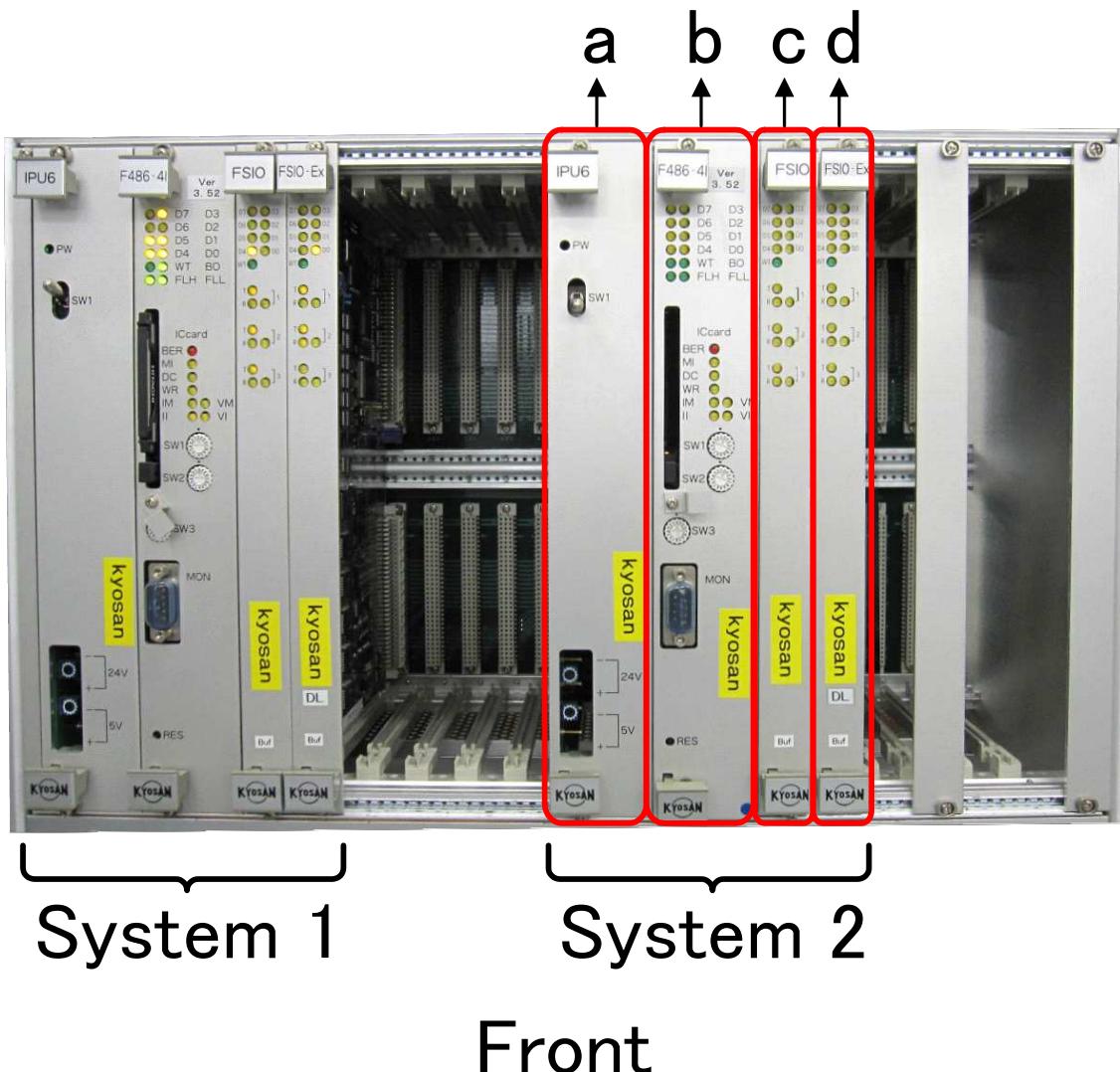
1 Introduction

- ◆ This manual provides general guidelines for troubleshooting and recovery of K5BMC Electronic Interlocking System.
- ◆ Personnel in charge of troubleshooting are requested to read thoroughly this manual to ensure the safety of people and operation of the equipment.

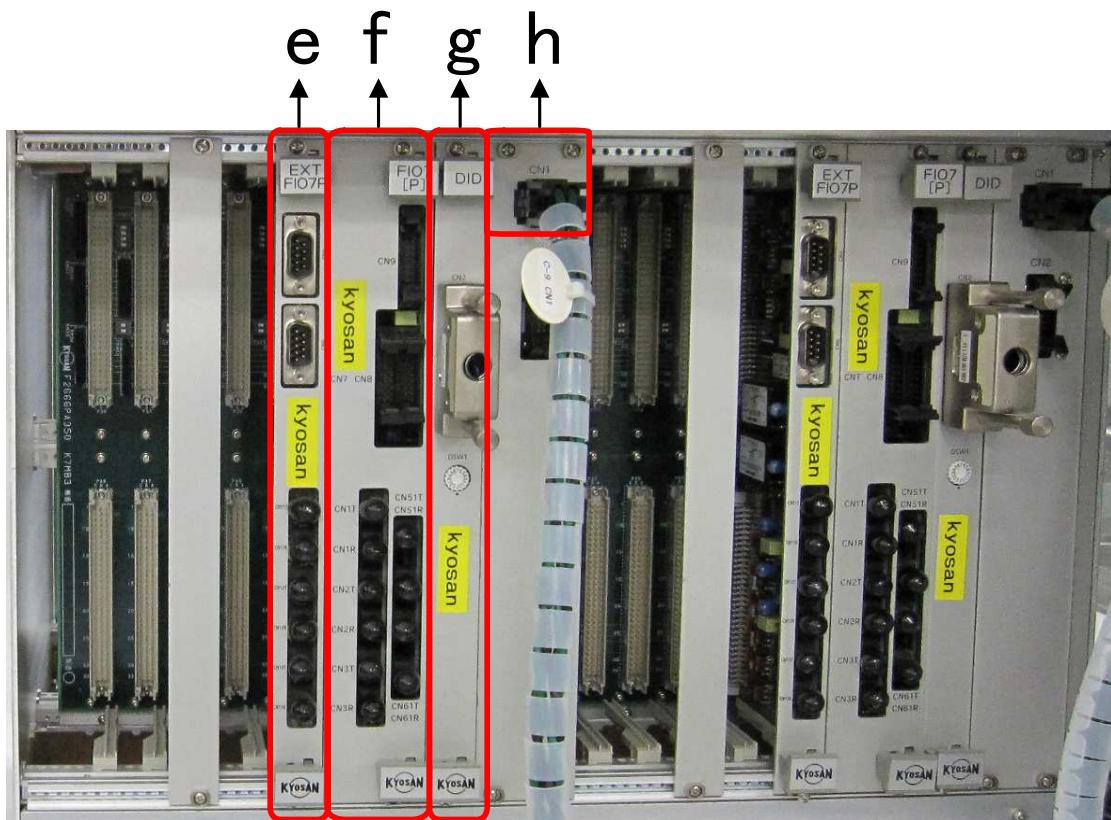
2 Sub-rack Configurations

This section describes the sub-rack configuration used for K5BMC EI system.

2.1 Logic Sub-rack



- a. IPU6C card
- b. F486-4I card
- c. FSIO card
- d. FSIO-Ex

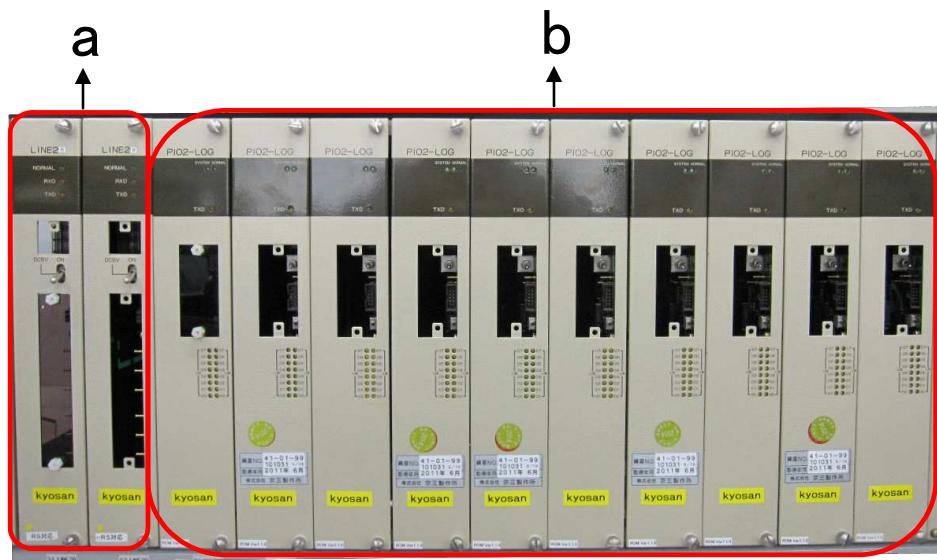


System 2 System 1

Rear

- e. EXTFIO7P card
 - f. FIO7-[P] card
 - g. DID card
 - h. IPU6C power input terminal

2.2 ET-PIO Sub-rack



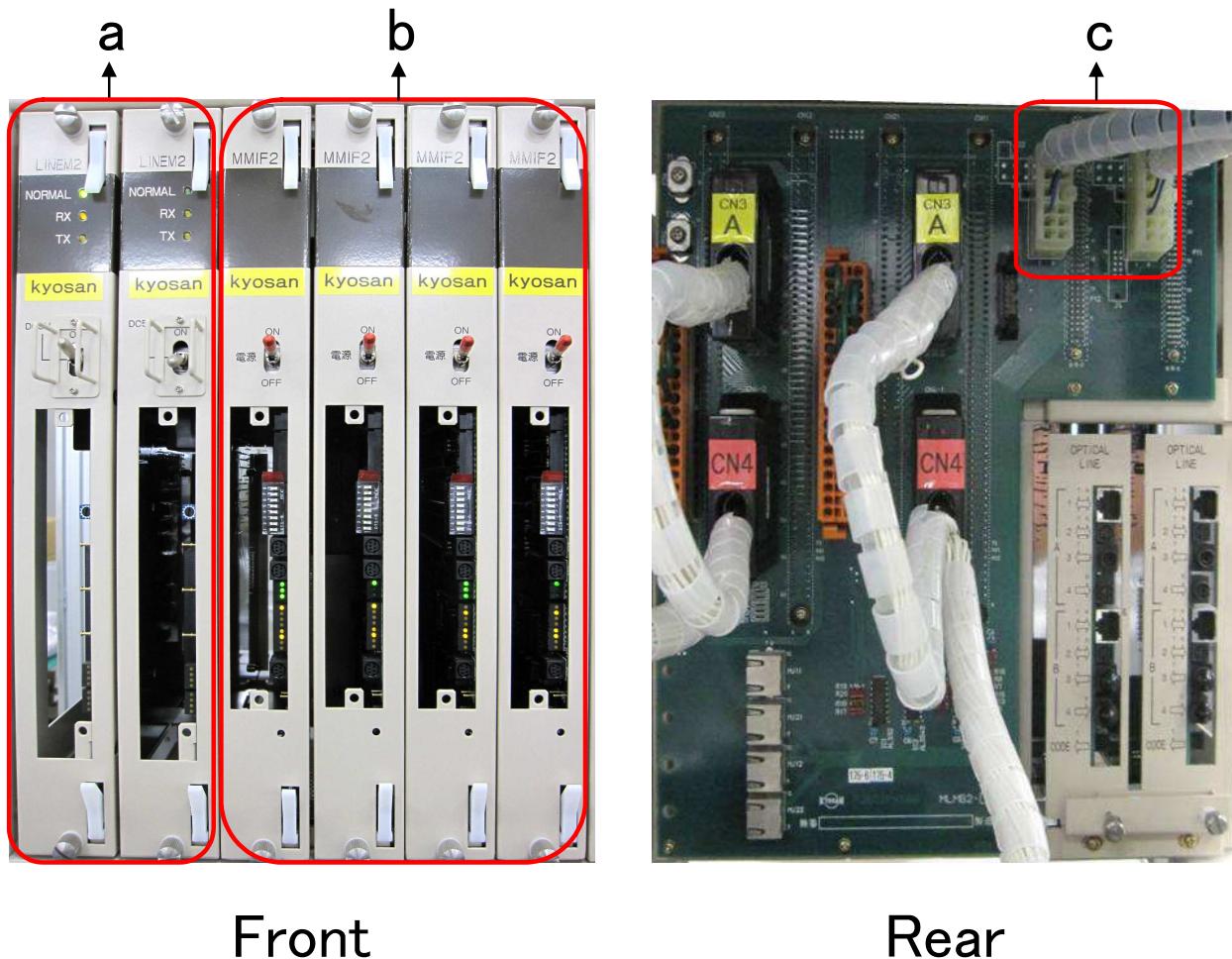
Front



Rear

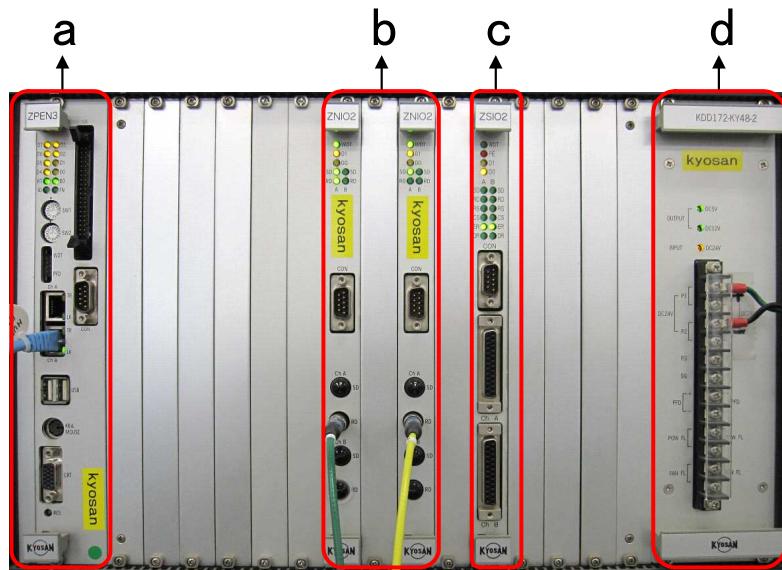
- a. LINE2B card
- b. PIO2-LOG card
- c. LINE2B power input terminal
- d. Optical Line Input

2.3 ET-MMIF Sub-rack



- a. LINEM2 card
- b. MMIF2 card
- c. LINEM2 power input terminal

2.4 Journal Module



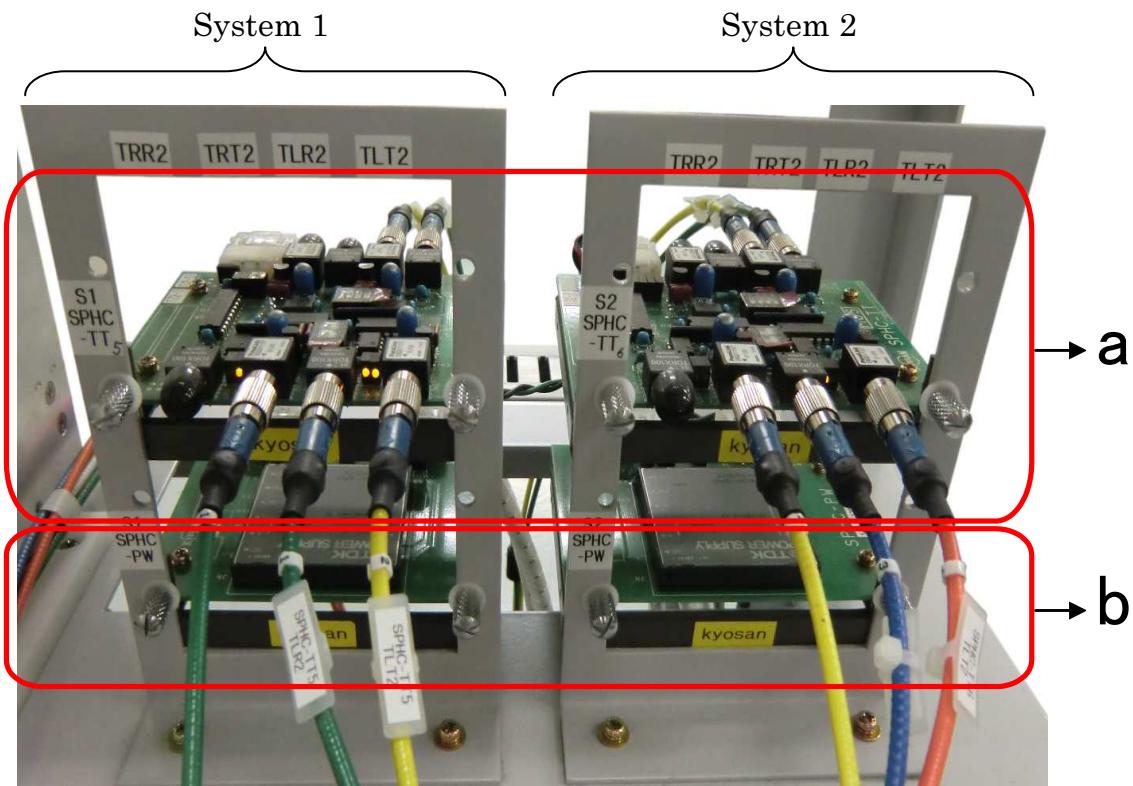
Front



Rear

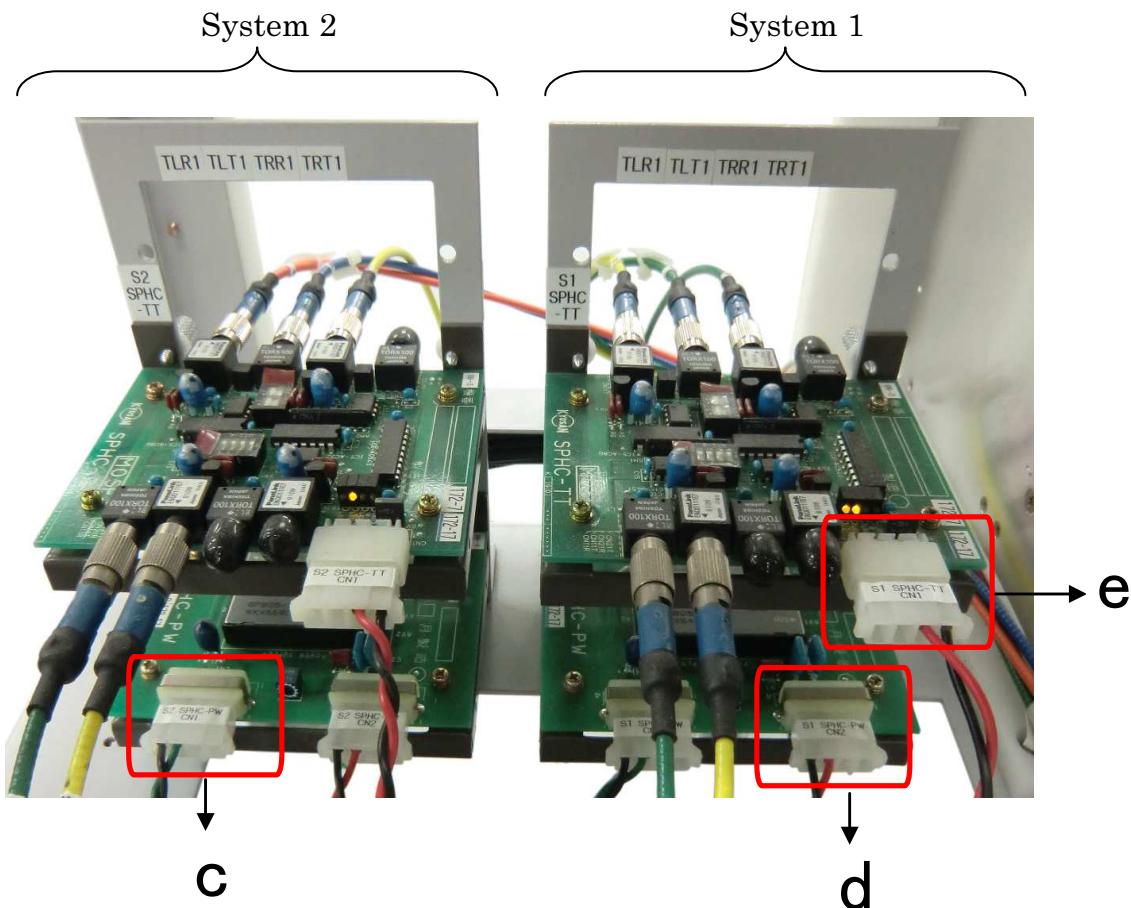
- ZPEN3 card
- ZNIO2-S1 and ZNIO2-S2 card
- ZSIO2 card
- KDD172-KY48-2 card

2.5 SPHC-TT/PW



Front

- a. SPHC-TT card
- b. SPHC-PW card

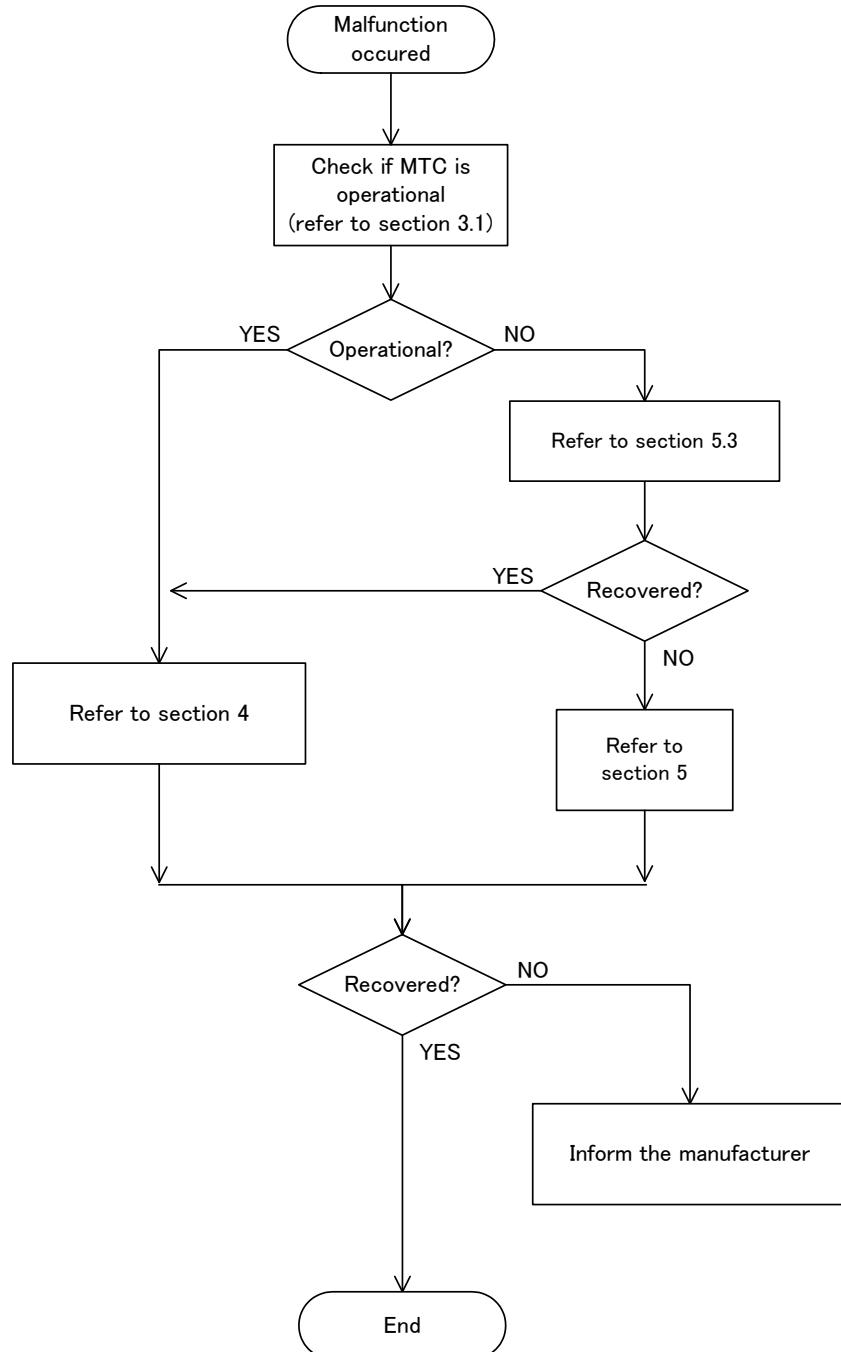


Back

- c. SPHC-PW power input terminal
- d. SPHC-PW power output terminal
- e. SPHC-TT power input terminal

3 Troubleshooting

If malfunction occurs, try the following steps to resolve the problem.

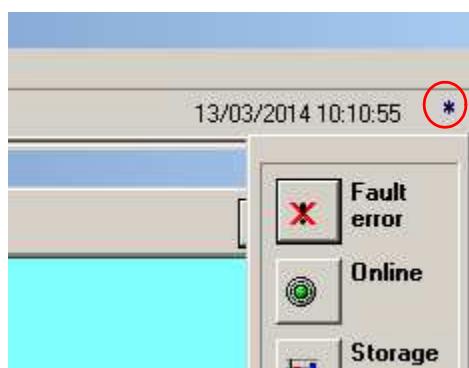
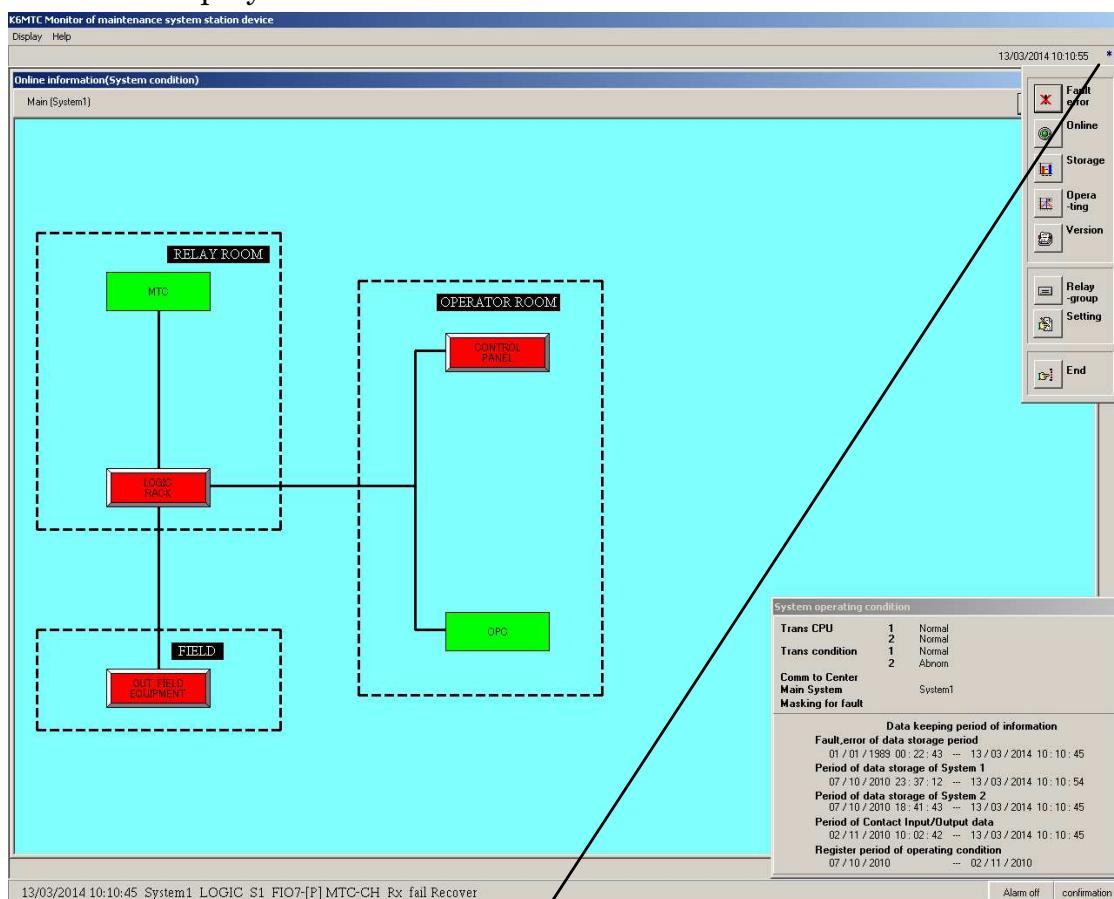


3.1 MTC Display Status

An example of Maintenance Console (MTC) display is shown below.

An asterisk “*” at the upper right of the window indicates the MTC display status.

Check if MTC is operational by determining the status of the asterisk indication or the MTC display itself as shown below.



Blinking = Normal transmission with the interlocking device at least on a subsystem

ON/OFF = no transmission with the interlocking device

No Display on MTC = out of order

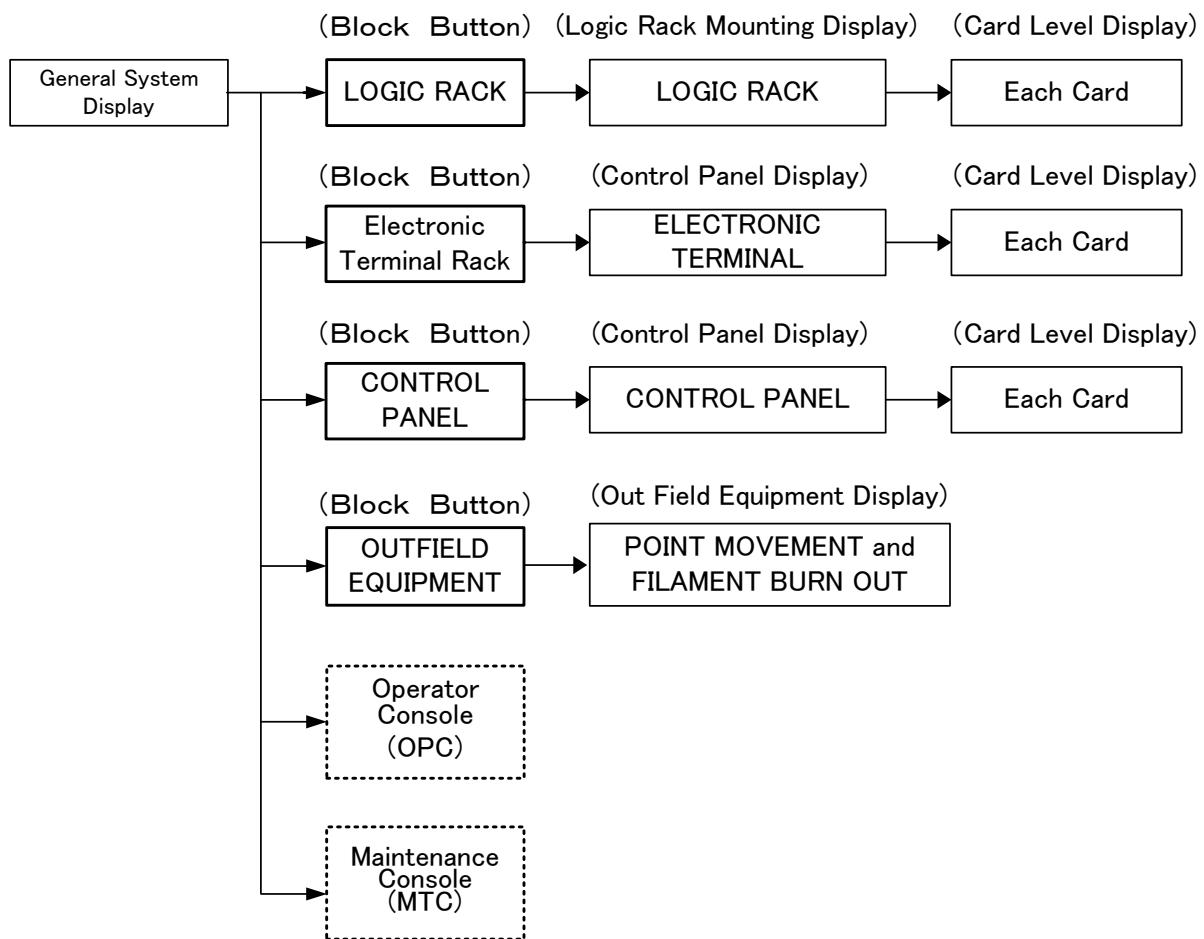
4 Troubleshooting from MTC

This section describes the display indication of Maintenance Console (MTC). The malfunction that occurred can be traced from the display indication of MTC up to card level display.

While looking at the status of the malfunctioned rack, unit or part of the unit from the MTC display, follow the instructions given in the following sections to resolve the problem.

4.1 Display Transition Diagram

An example of display transition diagram for an interlocking station is shown below. The display transition may vary depending on the system configuration of a station.



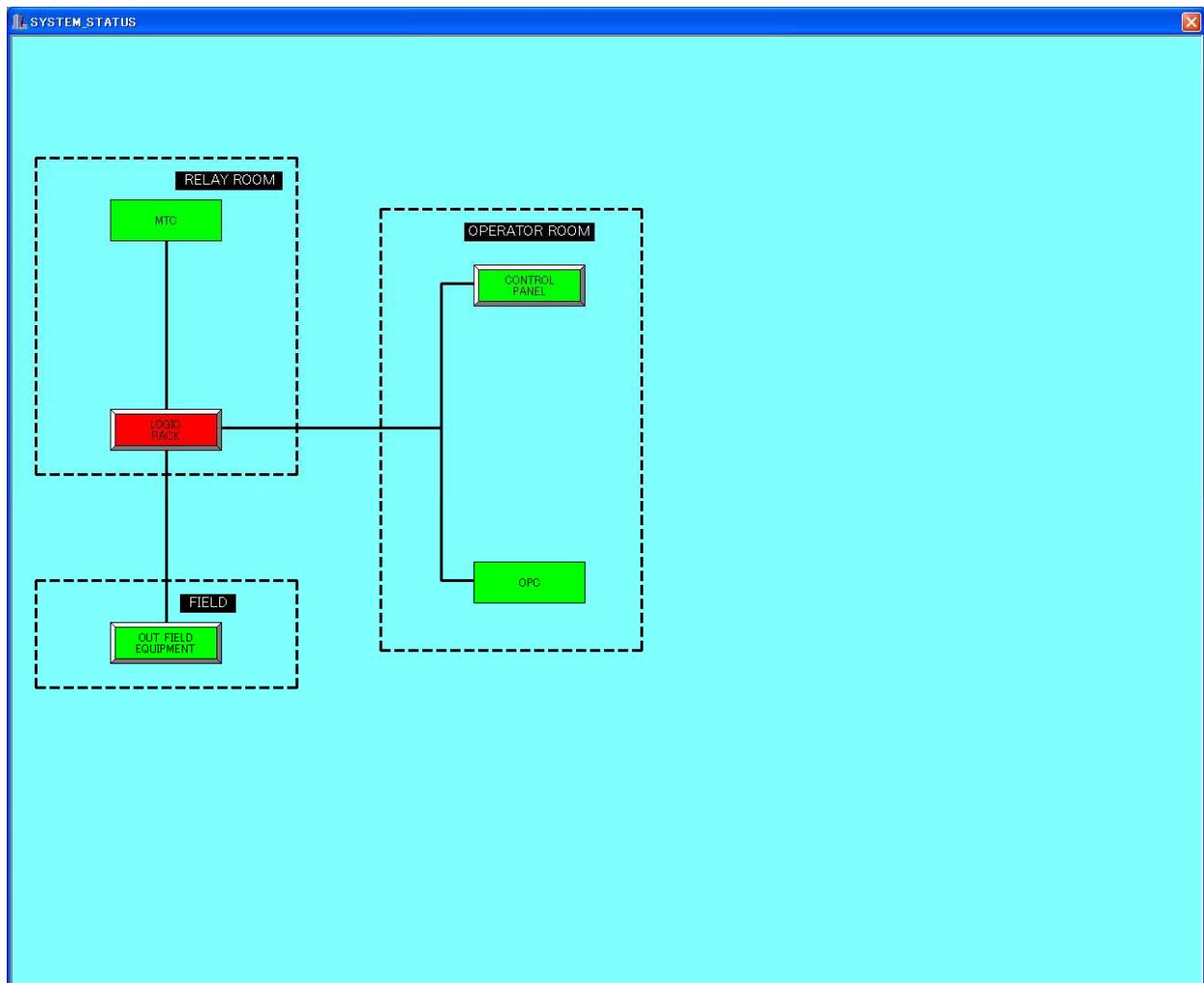
 Dotted-line shows only status indication and not Button.

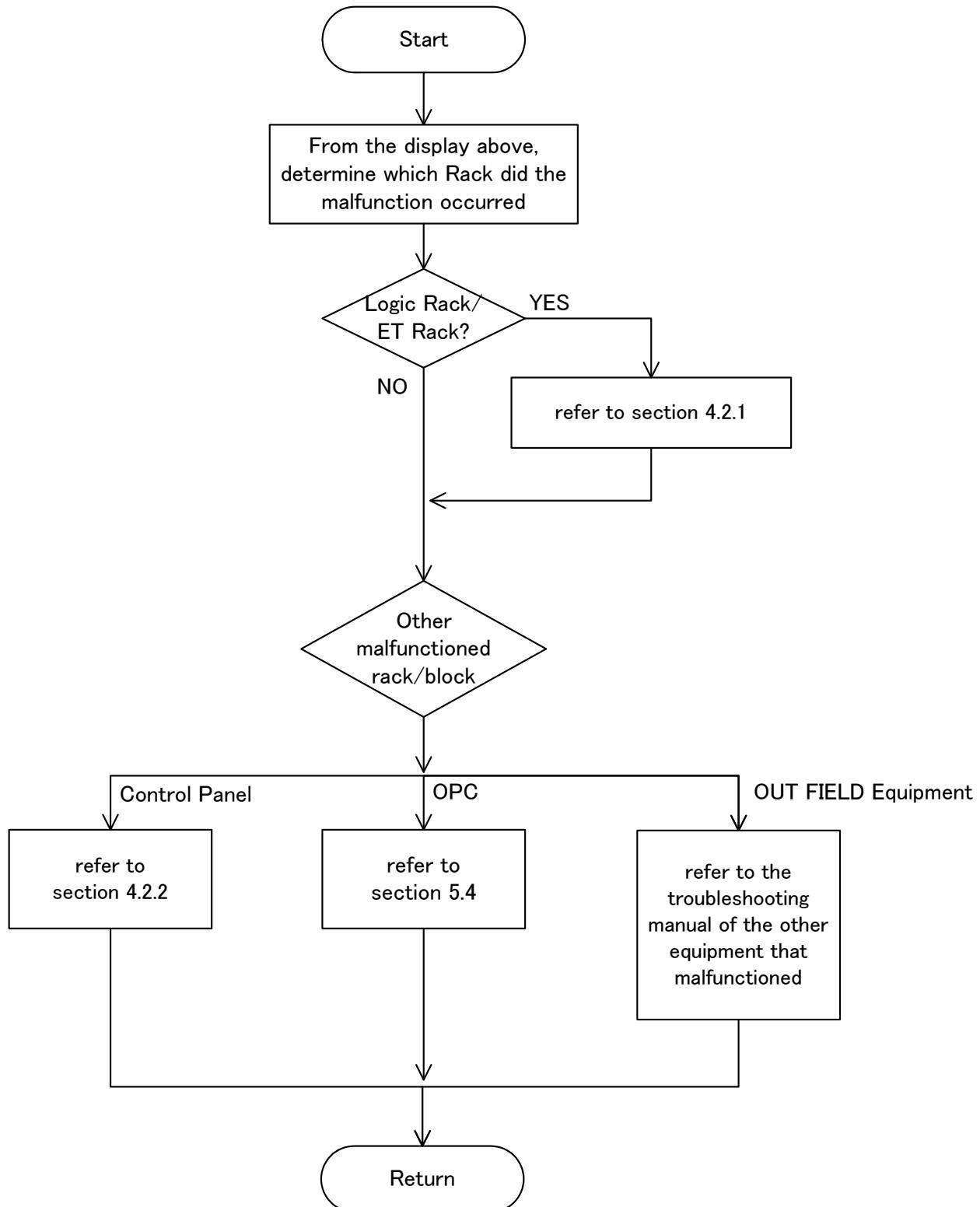
4.2 General System Display

An example of General System Display of MTC is shown below.

The display may vary depending on the system configuration of a station.

Unless specified, system status is to be indicated in green when normal and in red when out of order.

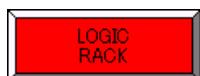




4.2.1 Logic Rack and ET RACK Mounting Display

An example of LOGIC RACK Mounting Display of MTC is shown below.

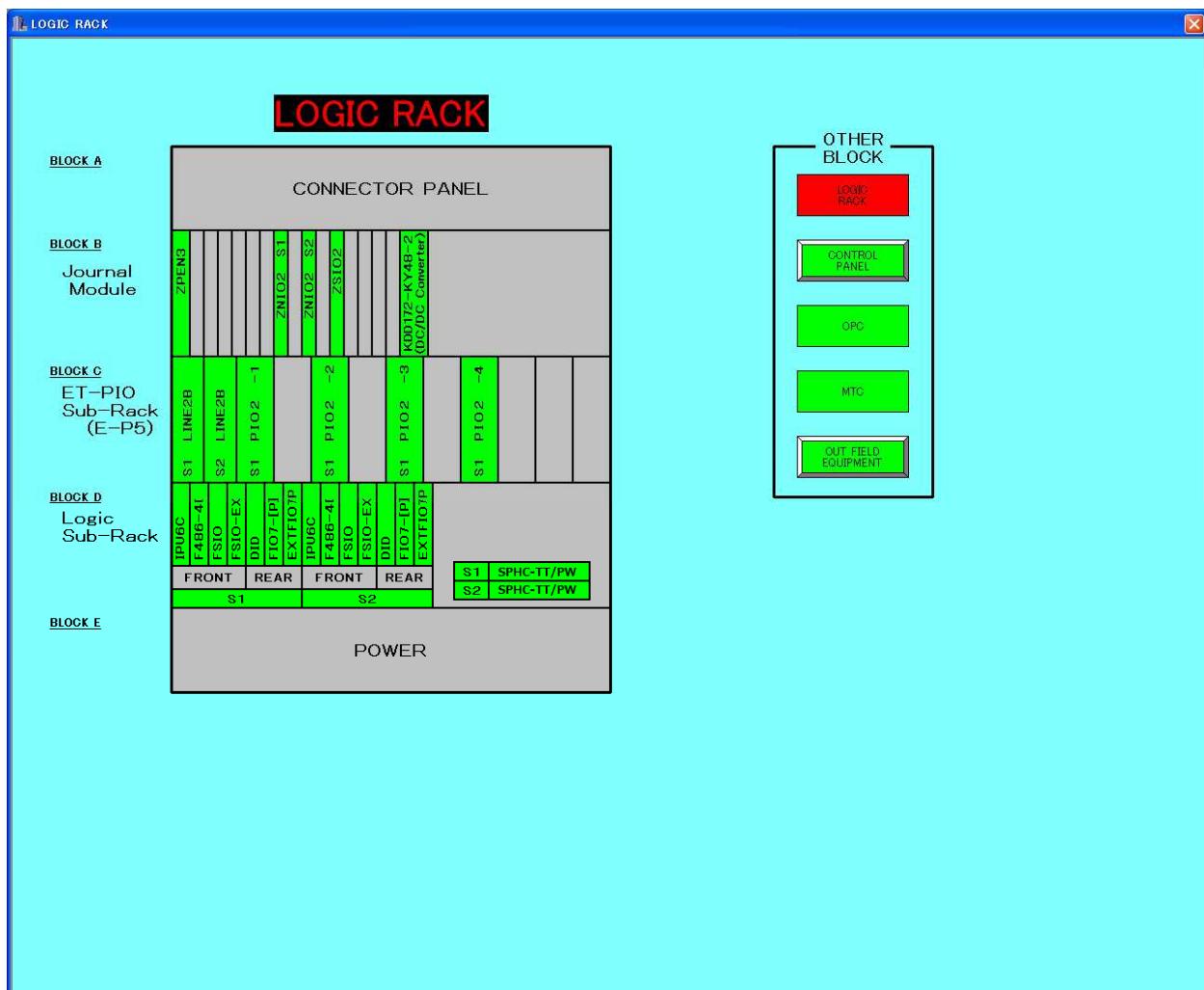
The display may vary depending on the system configuration of a station.

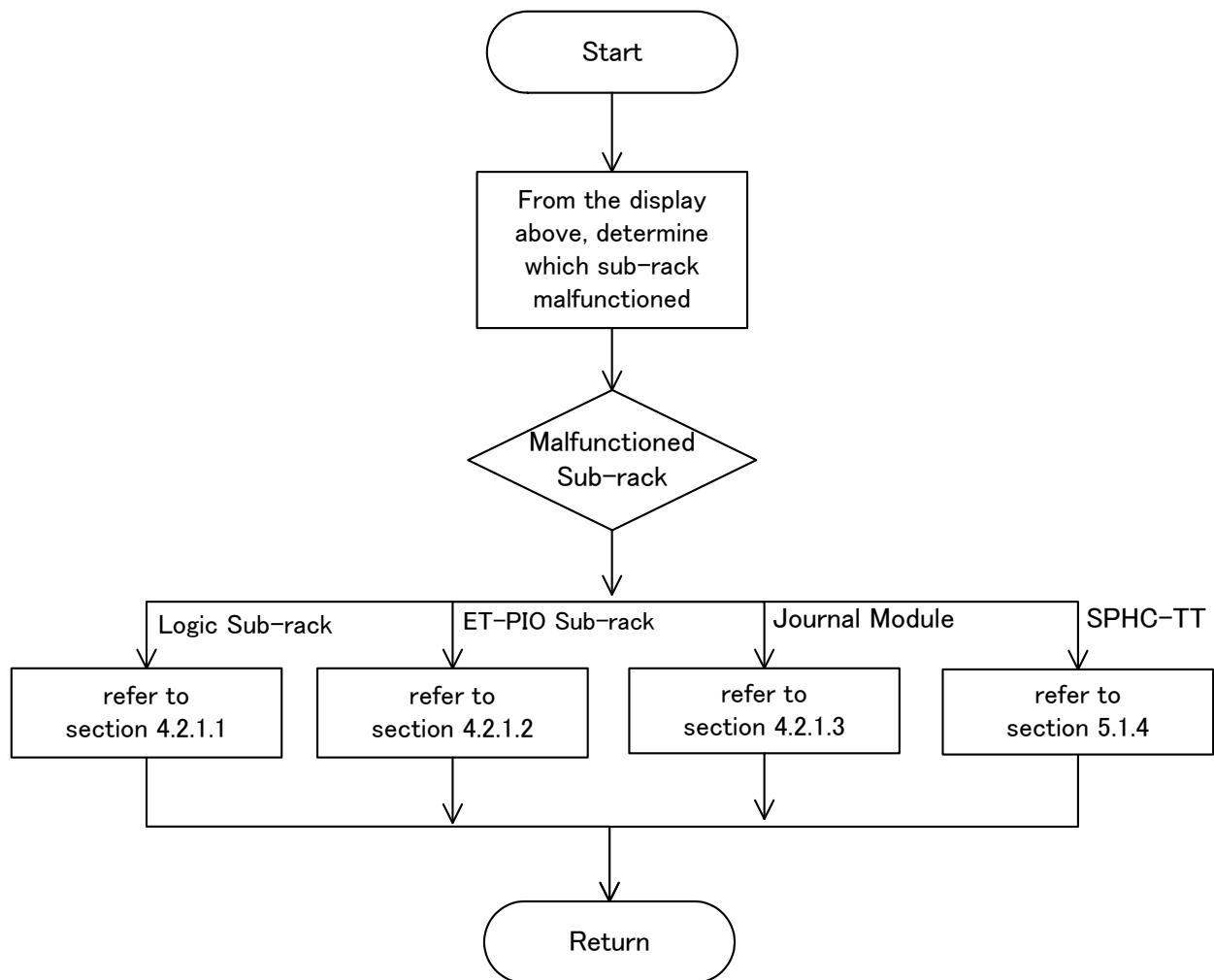


By pressing LOGIC RACK button on the General System Display (section 3.2), the screen shifts to LOGIC RACK Mounting Display as shown below.

The same process also applies for ET RACK.

Each card status is to be indicated in green when normal and in red when out of order.

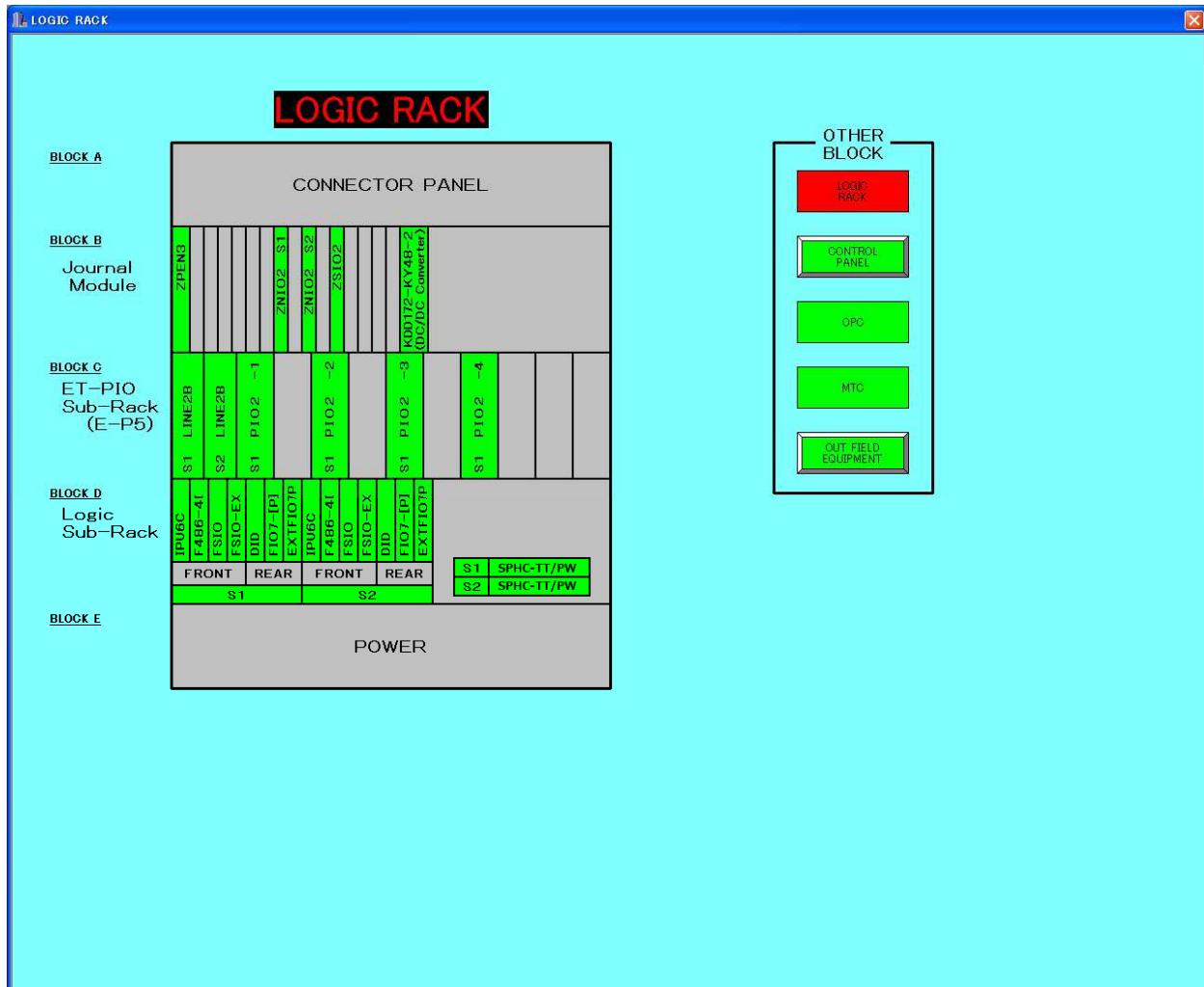


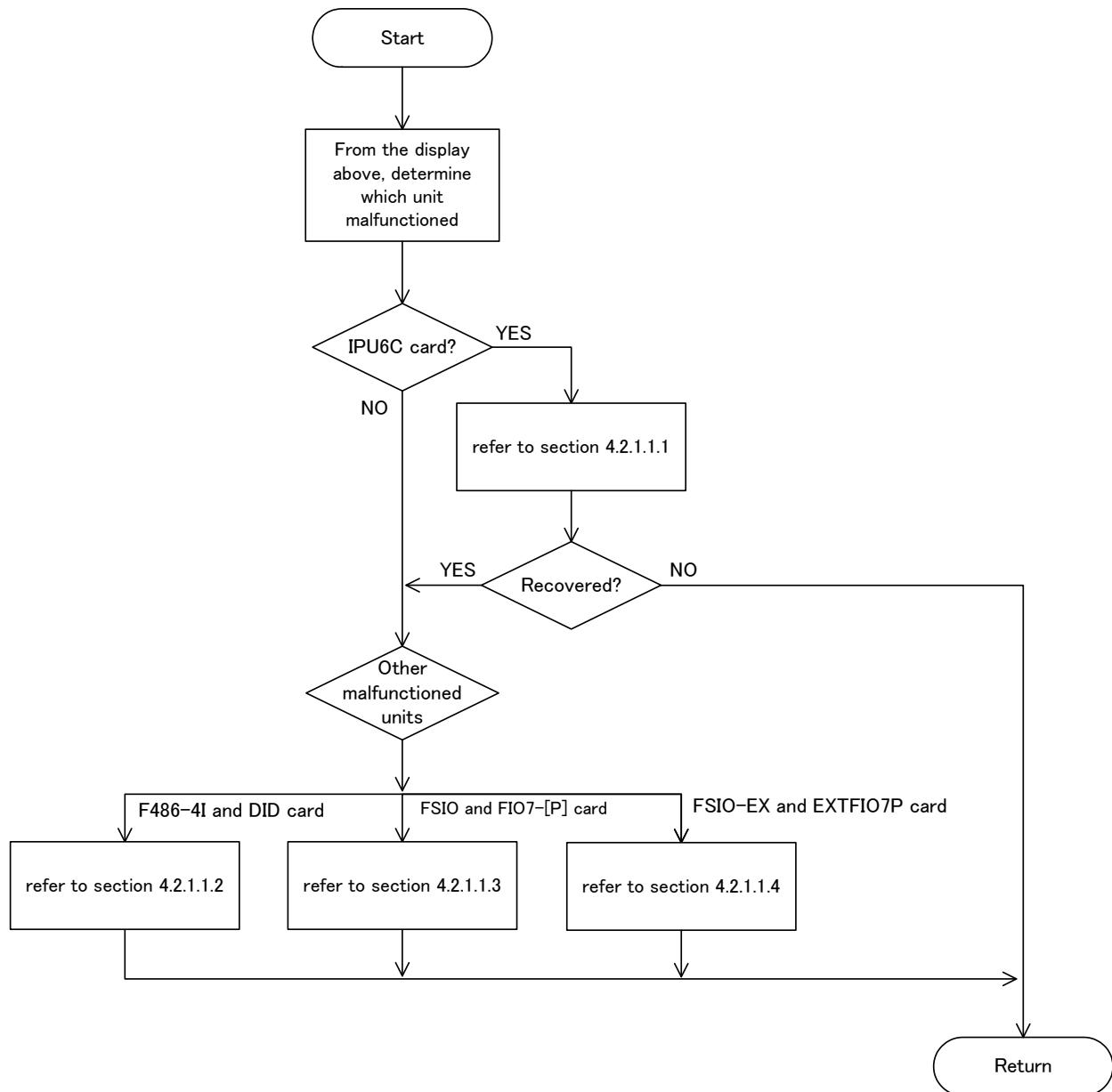


4.2.1.1 Logic Sub-rack

When any card portion in Logic Sub-rack is clicked in the LOGIC RACK mounting display as shown below, its card level will be displayed as shown in the following sections.

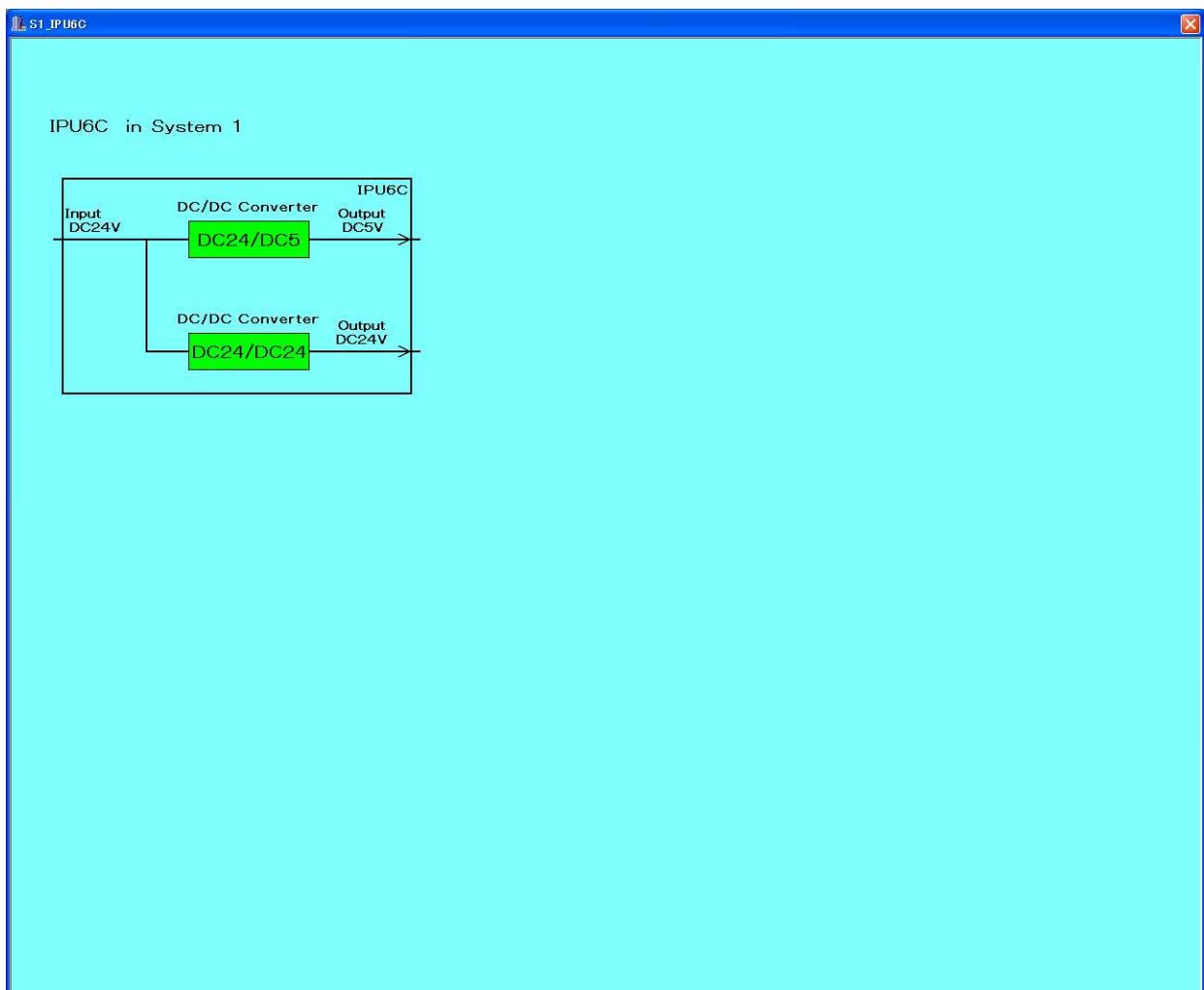
Each Card Level Display can be indicated in each system (system 1 and system 2).

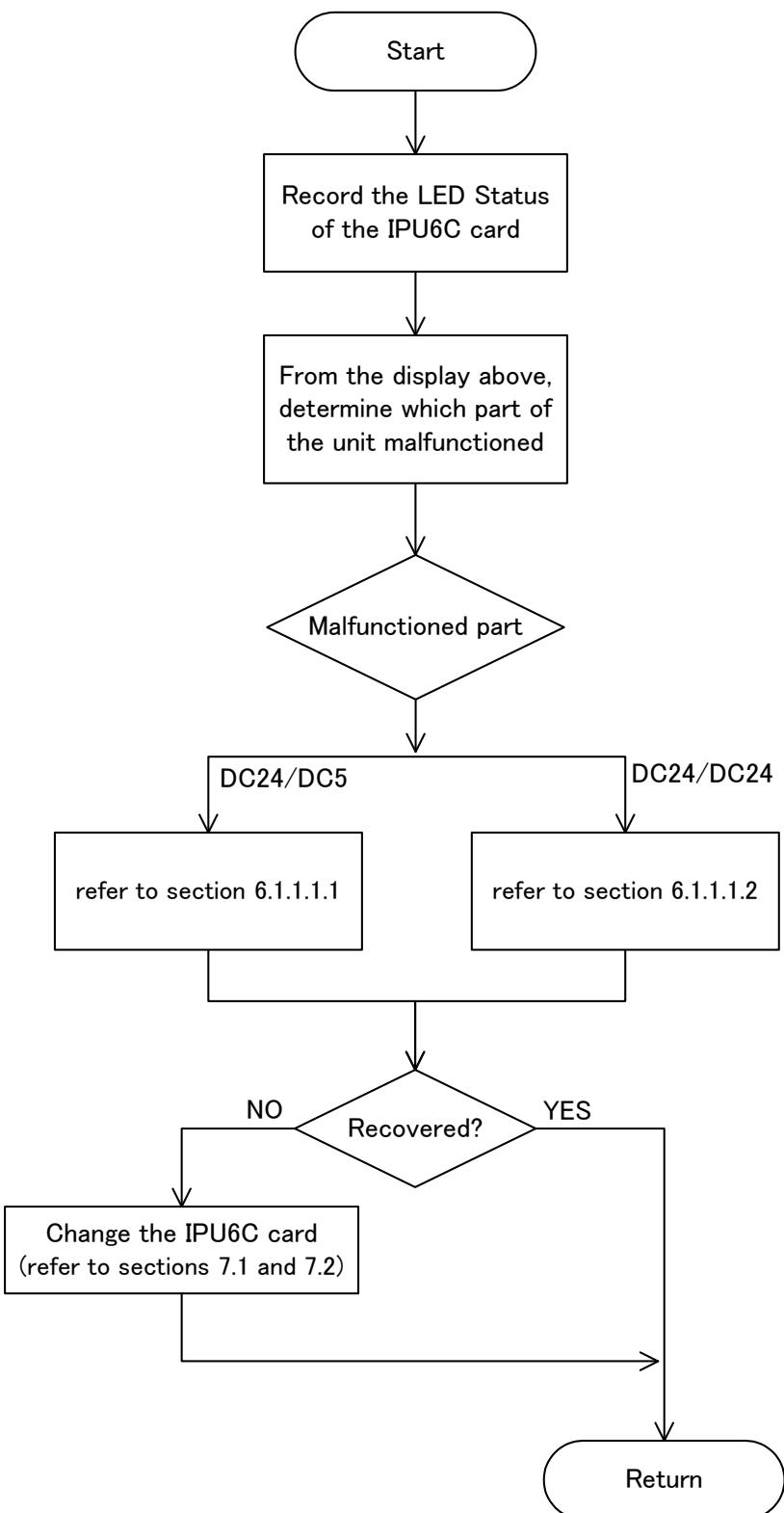




4.2.1.1.1 IPU6C Screen

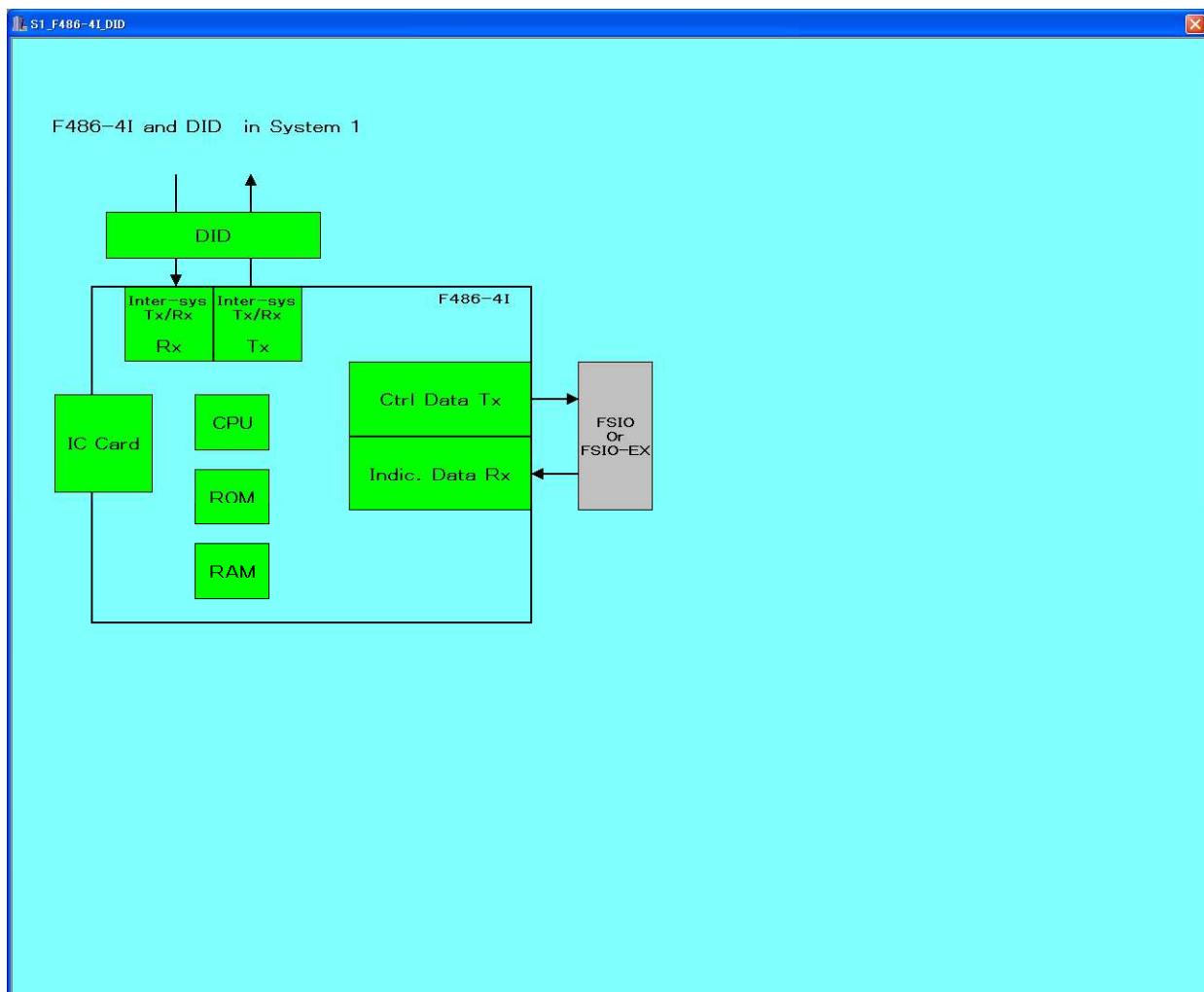
The status of each part is indicated in green when normal and in red when out of order.

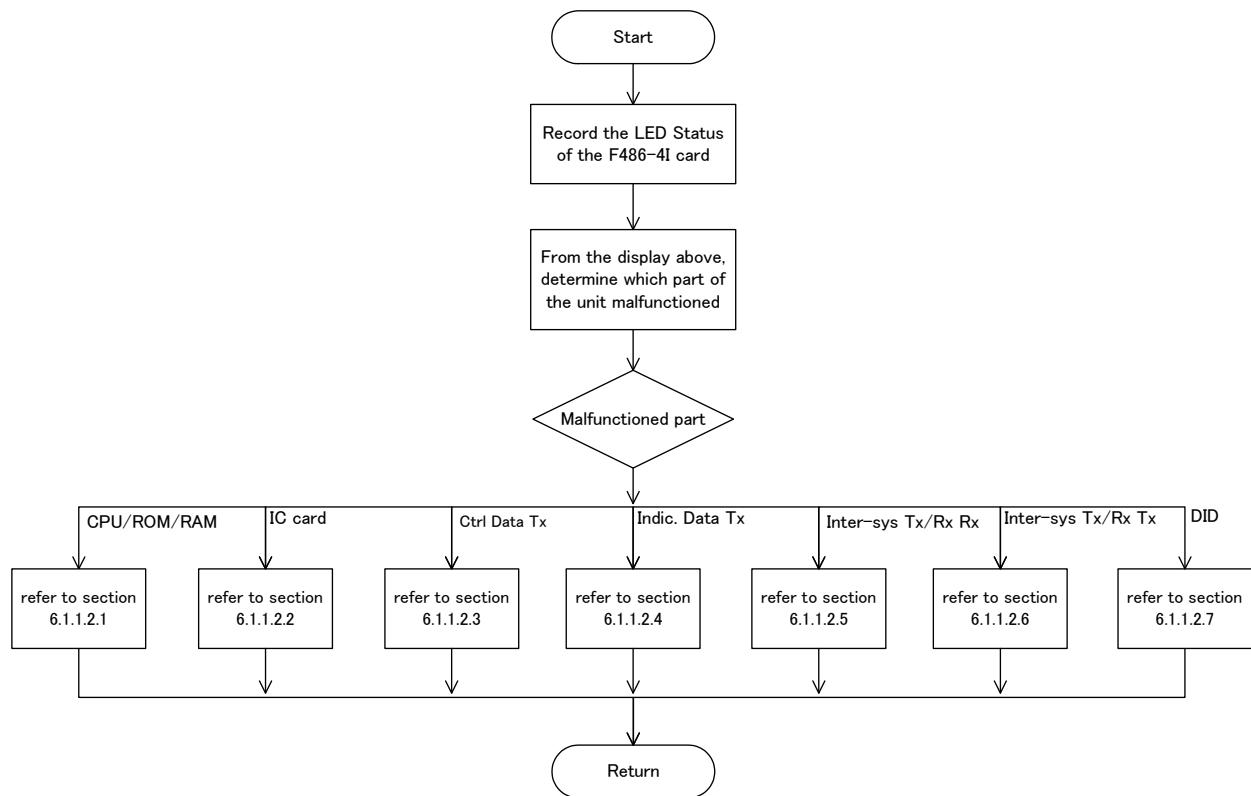




4.2.1.1.2 F486-4I and DID Screen

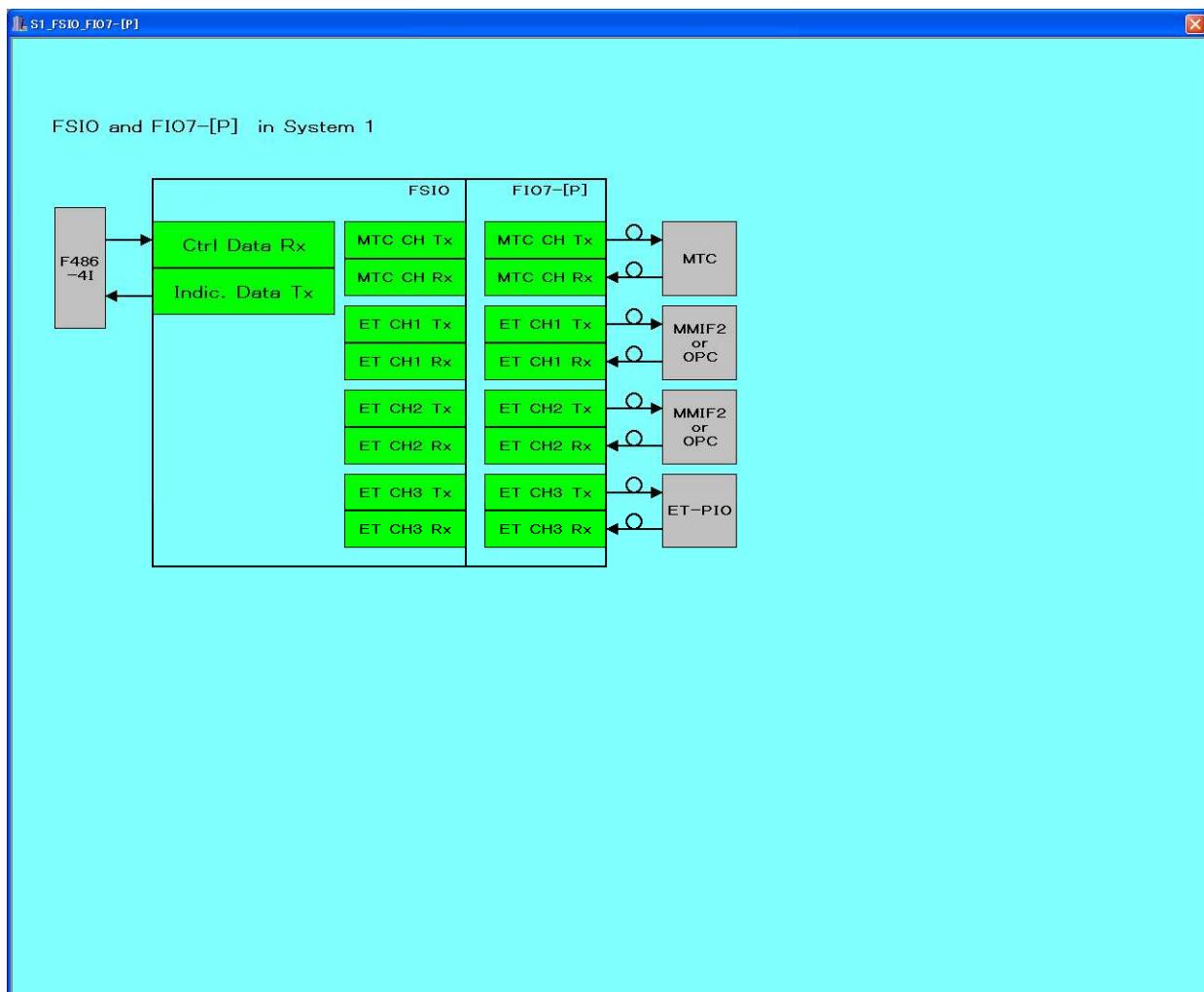
The status of each part is indicated in green when normal and in red when out of order.

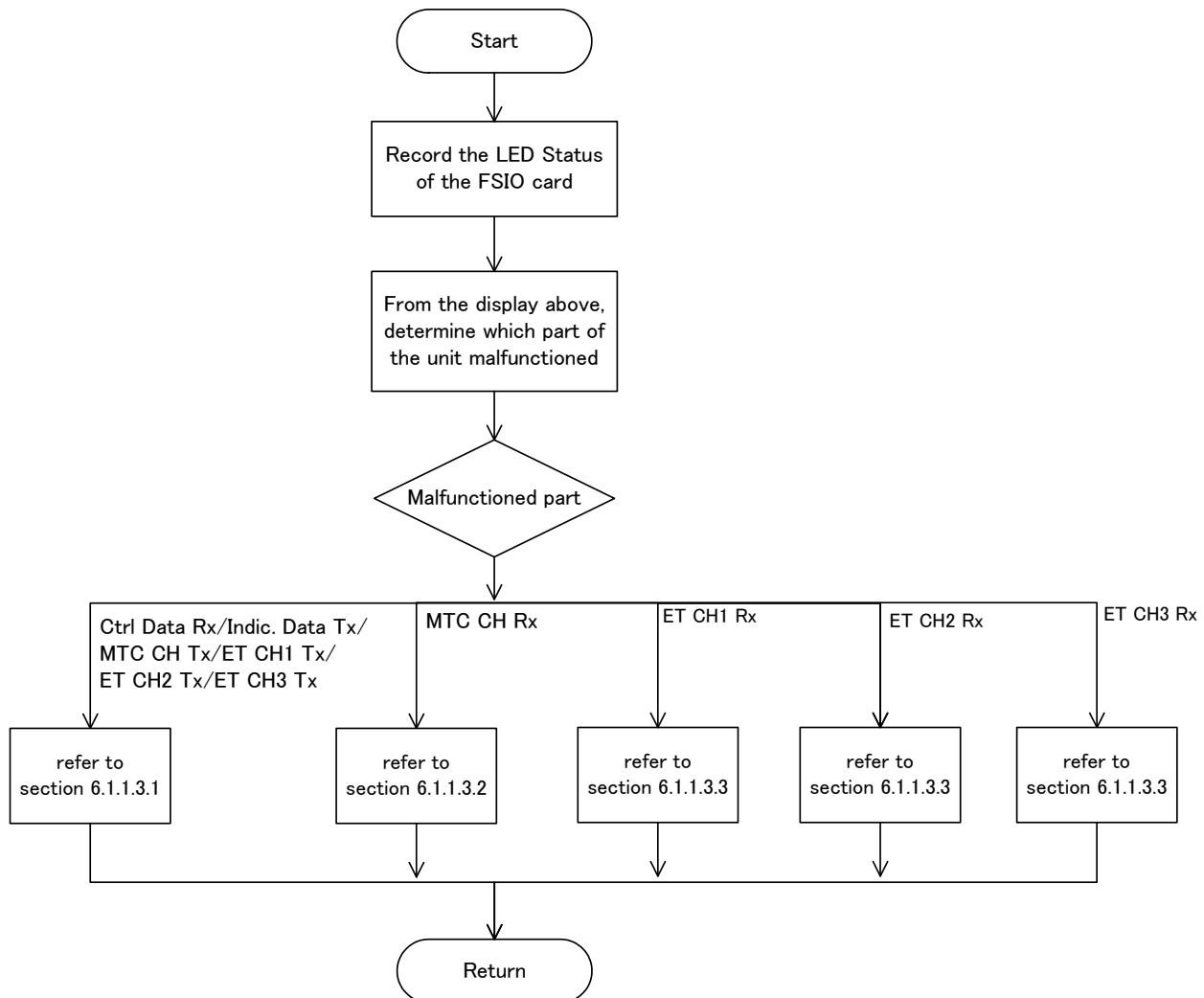




4.2.1.1.3 FSIO and FIO7-[P] Screen

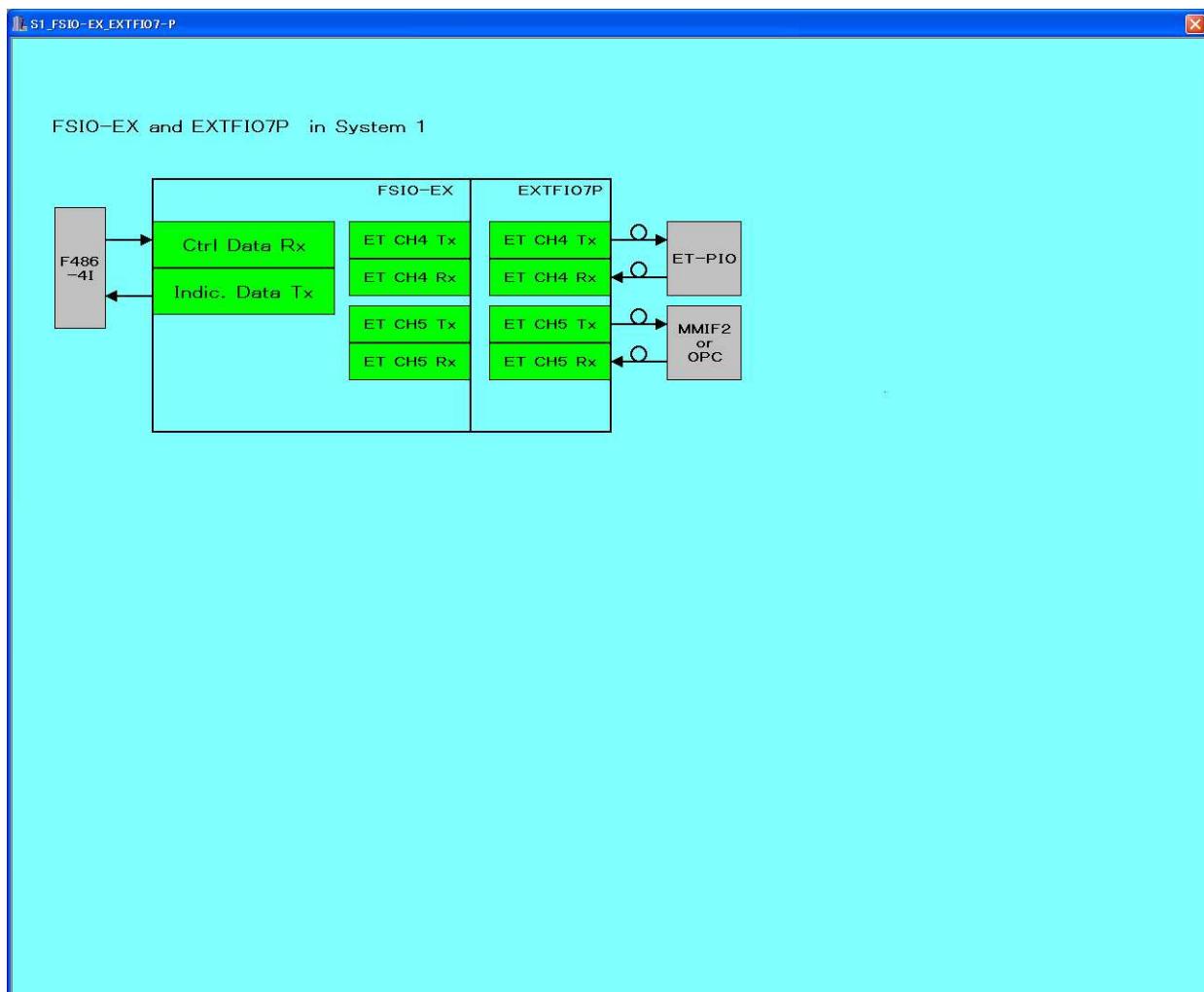
The status of each part is indicated in green when normal and in red when out of order.

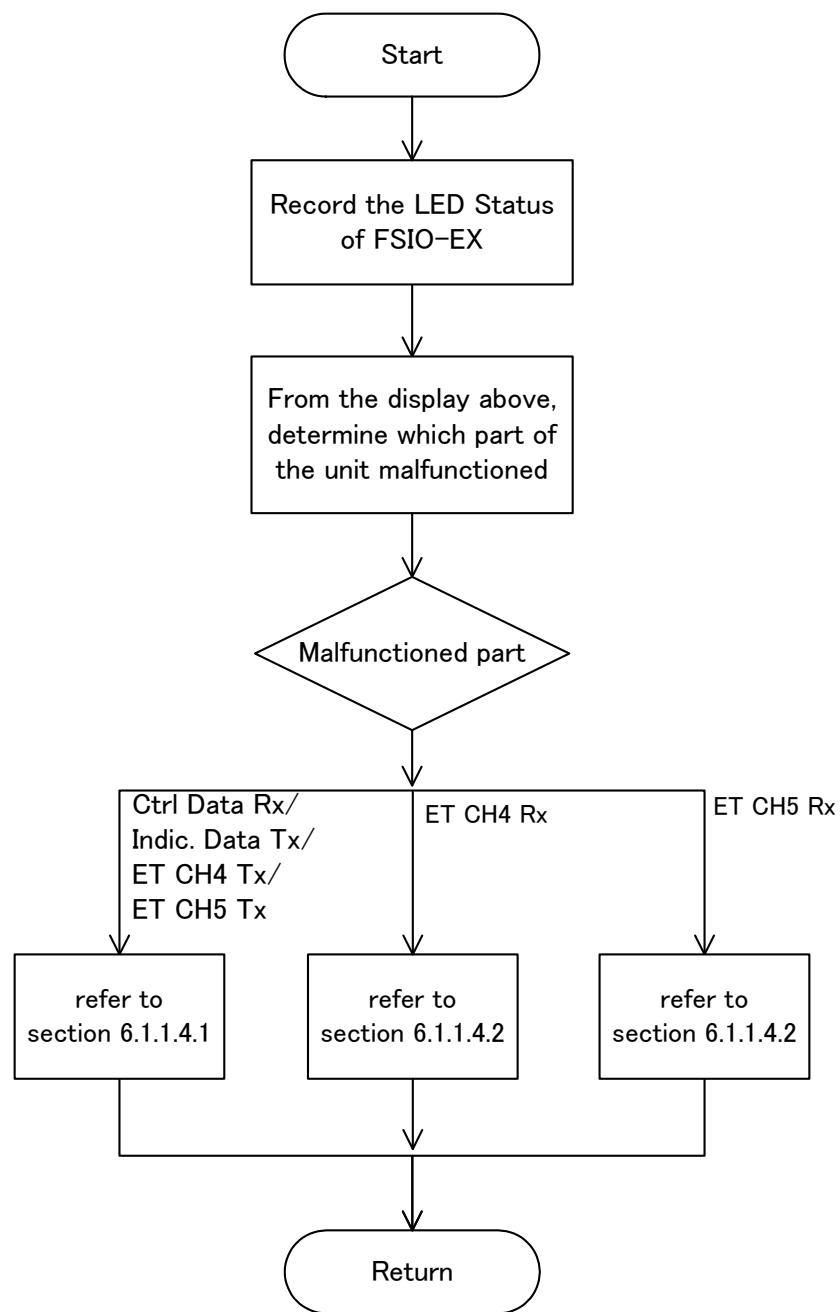




4.2.1.1.4 FSIO-EX and EXTFI07P Screen

The status of each part is indicated in green when normal and in red when out of order.

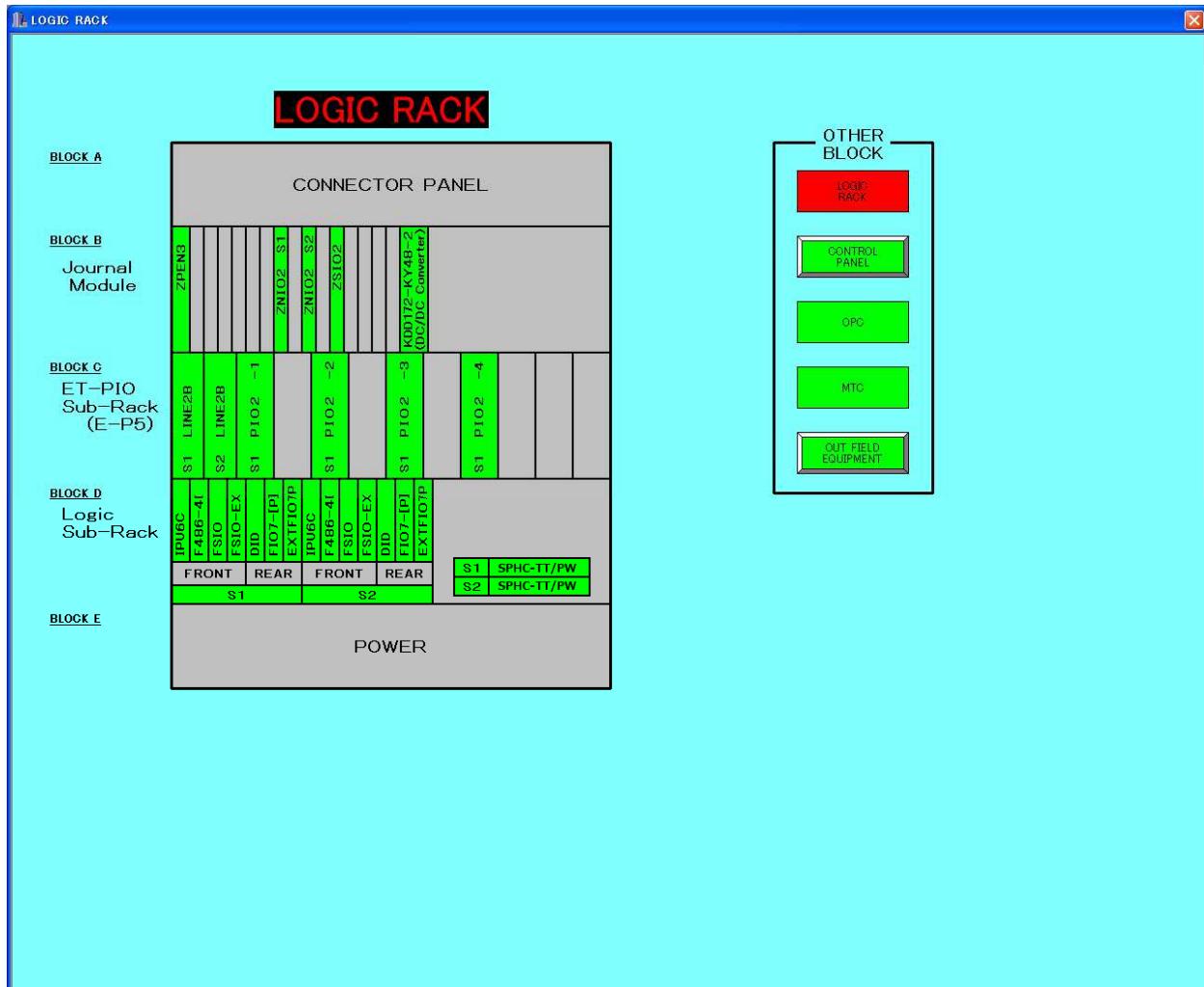


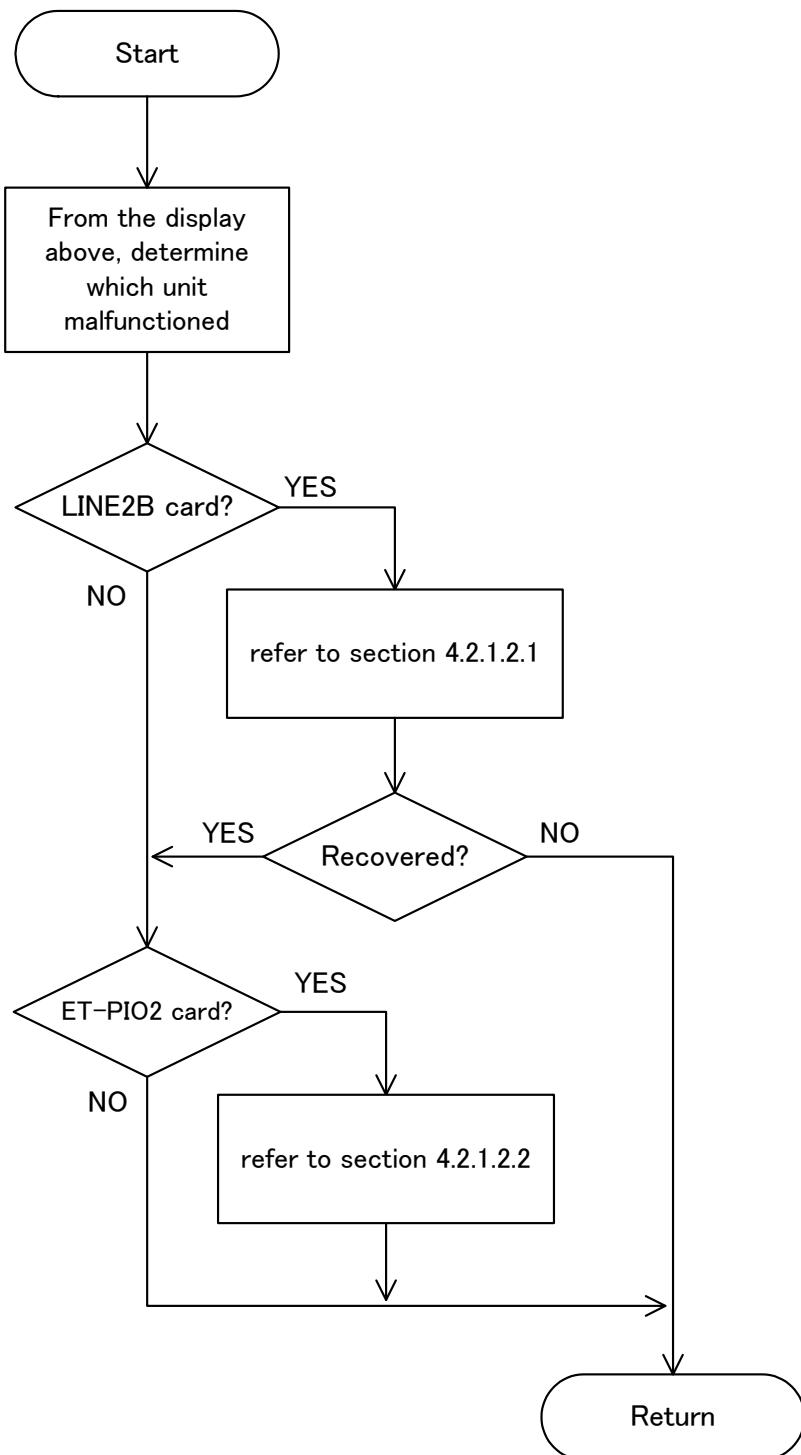


4.2.1.2 ET-PIO Sub-rack

When any card portion in ET-PIO Sub-rack is clicked in the LOGIC RACK mounting display as shown below, its card level will be displayed as shown in the following sections.

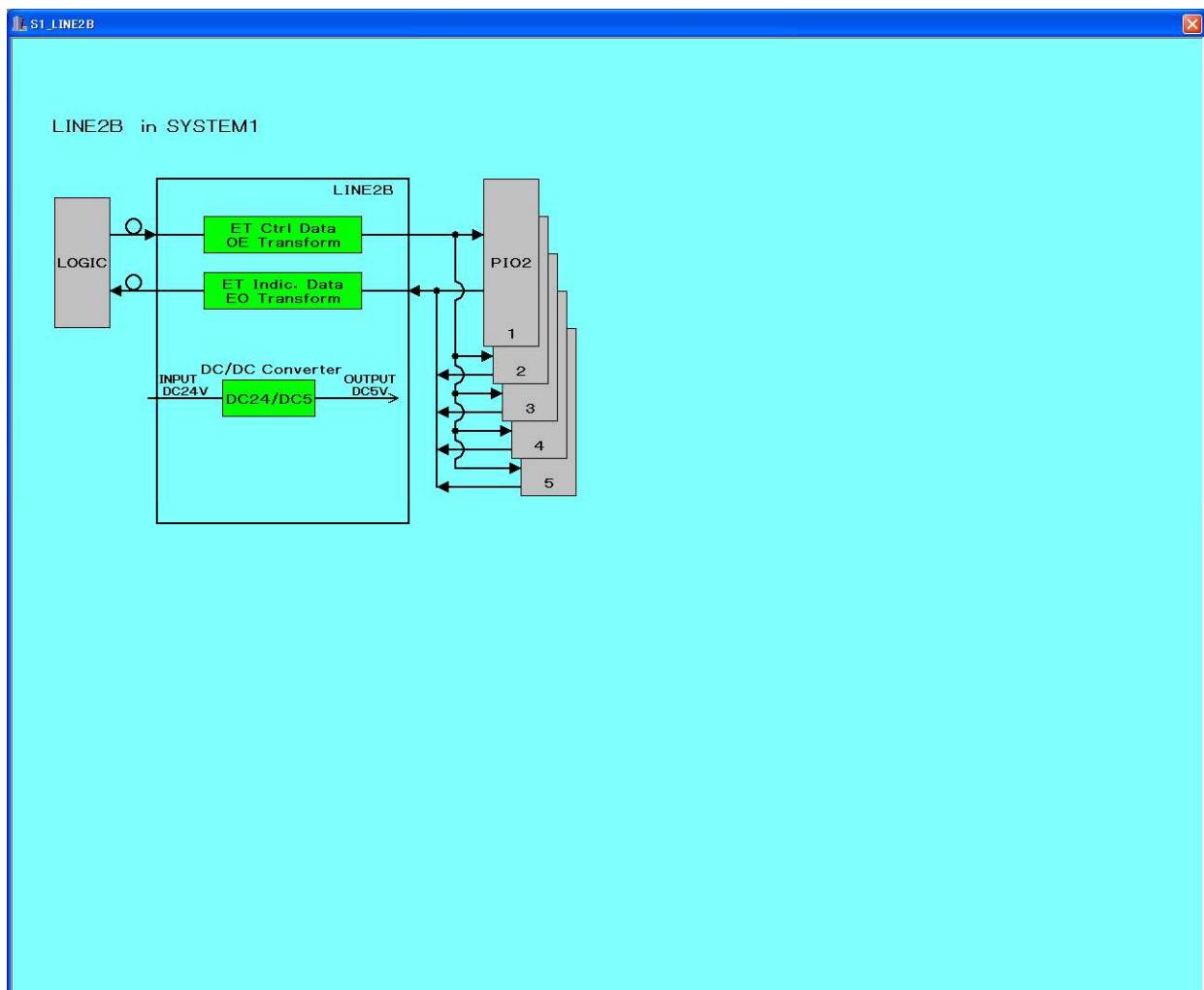
Each Card Level Display can be indicated according to mounted cards of each system.

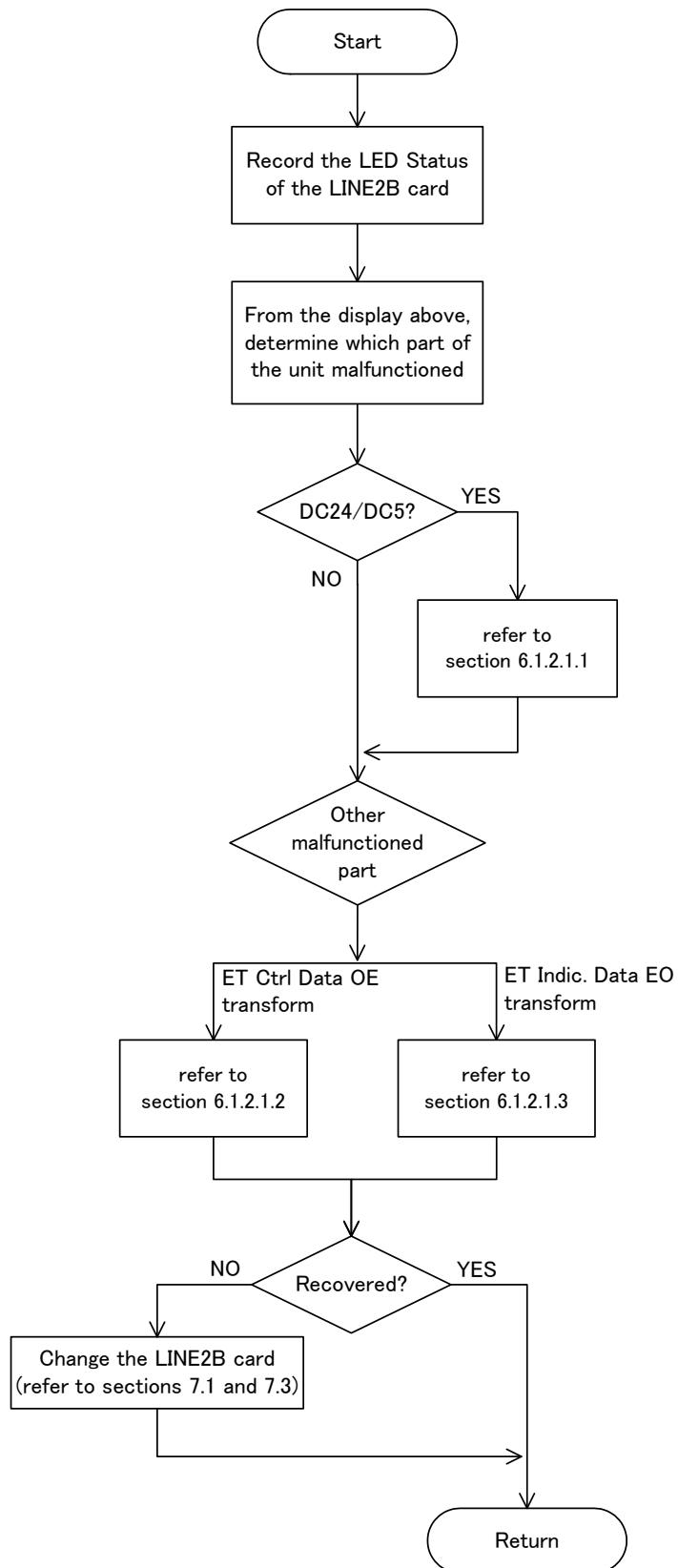




4.2.1.2.1 LINE2B Screen

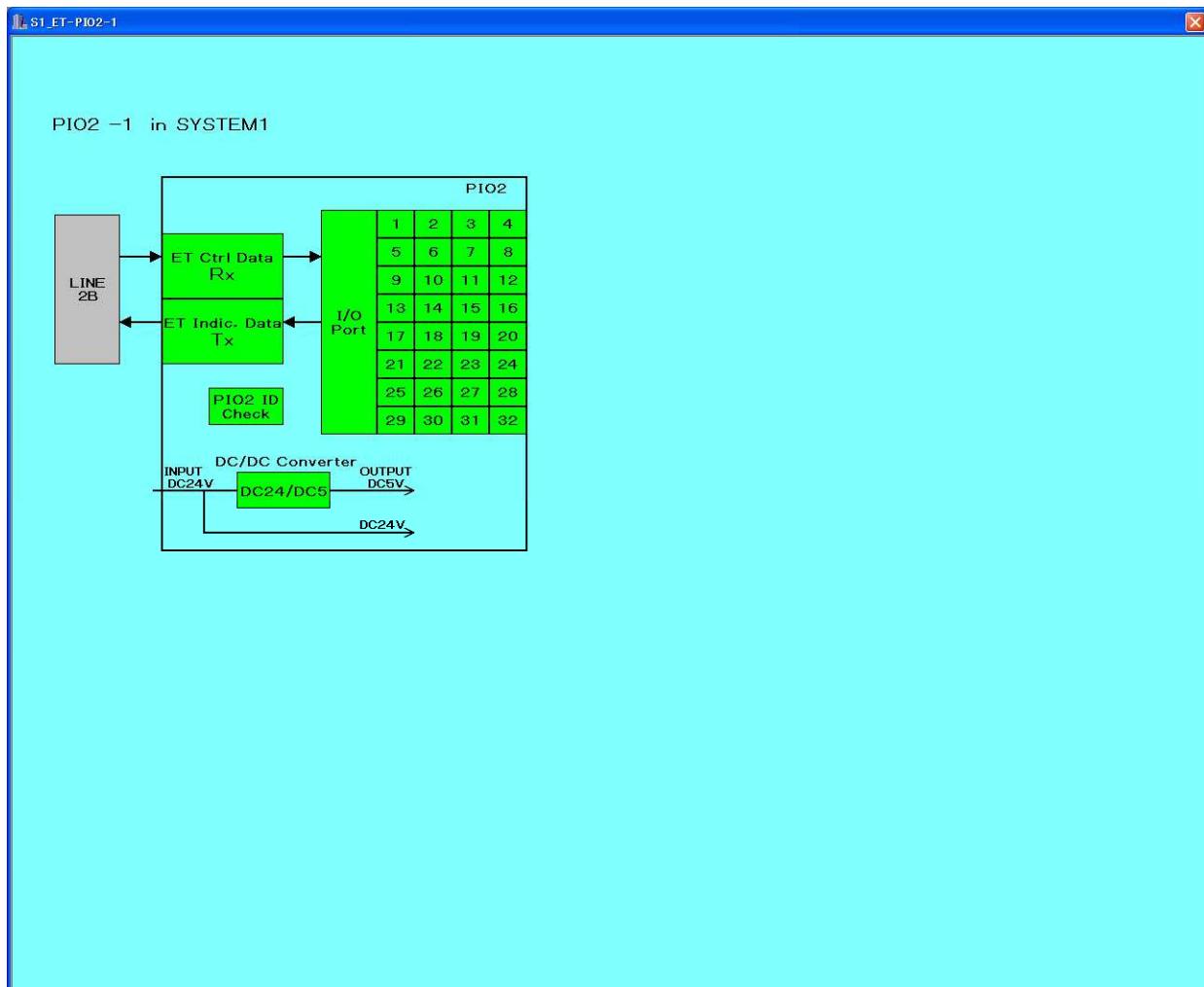
The status of each part is indicated in green when normal and in red when out of order.



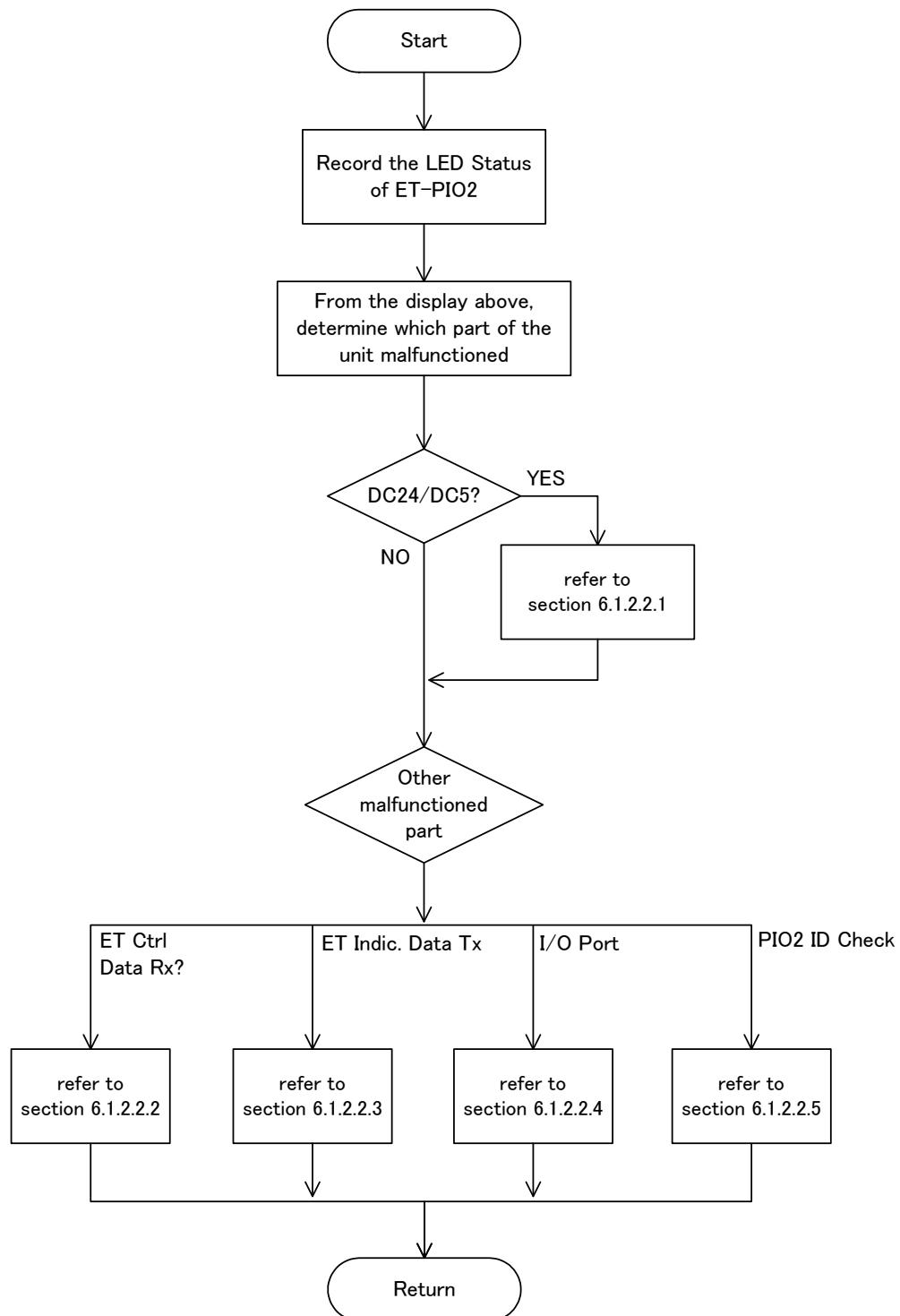


4.2.1.2.2 ET-PIO2 Screen

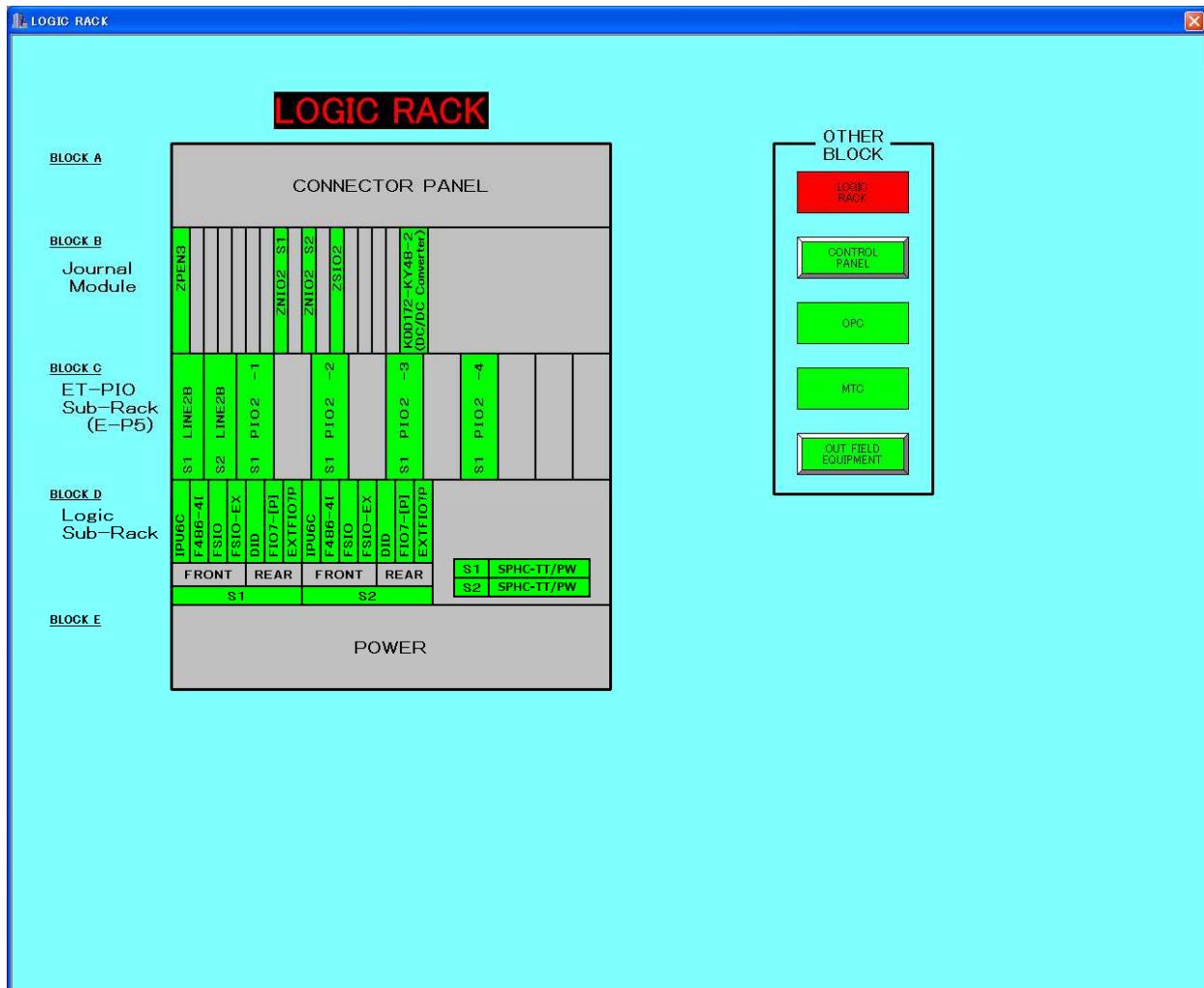
The status of each part is indicated in green when normal and in red when out of order.

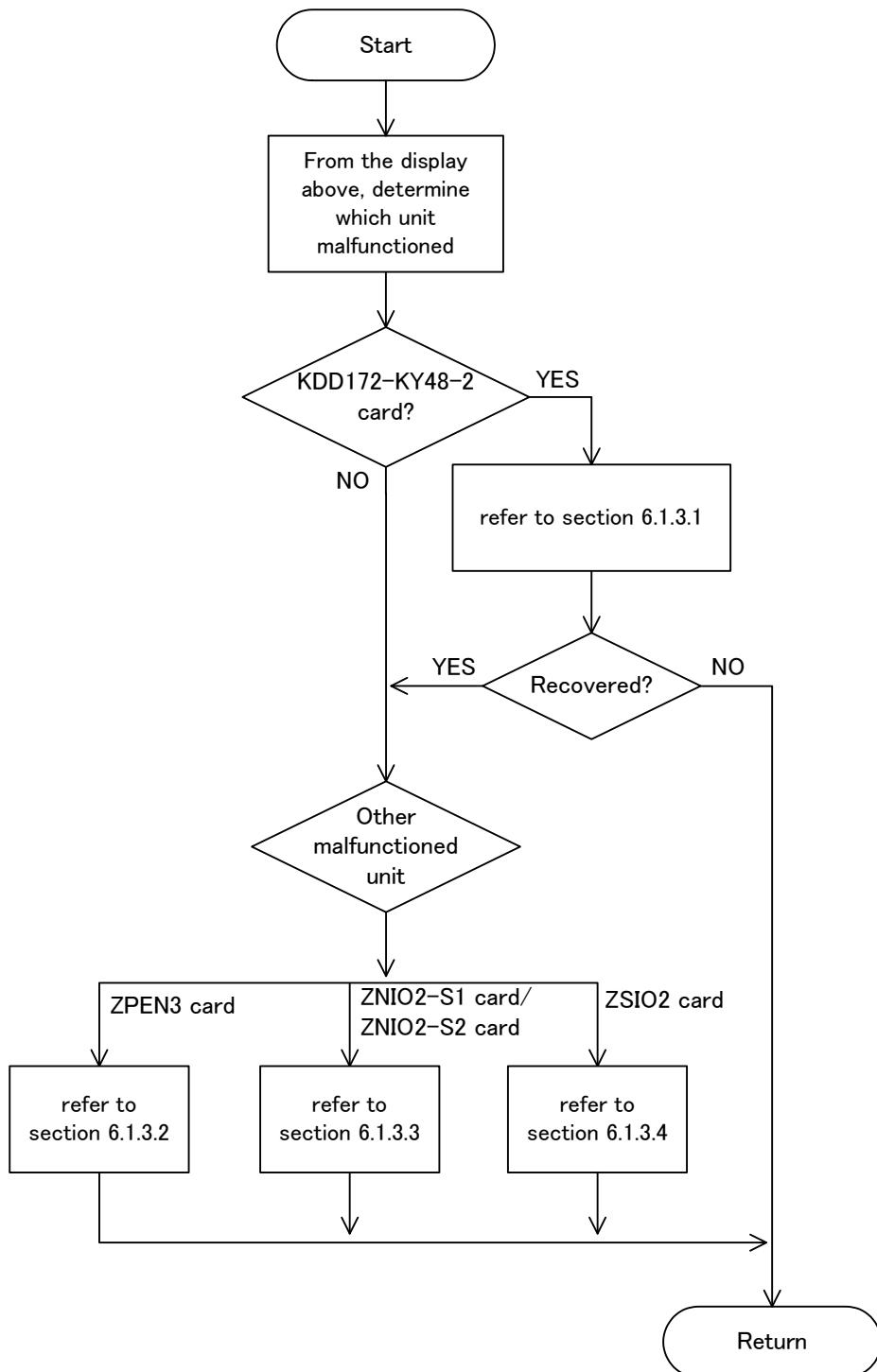


The result of status of Circuit No. of ET-PIO2 I/O is displayed collectively in fours (for example, 1 2 3 4, 5 6 7 8, etc.).



4.2.1.3 Journal Module





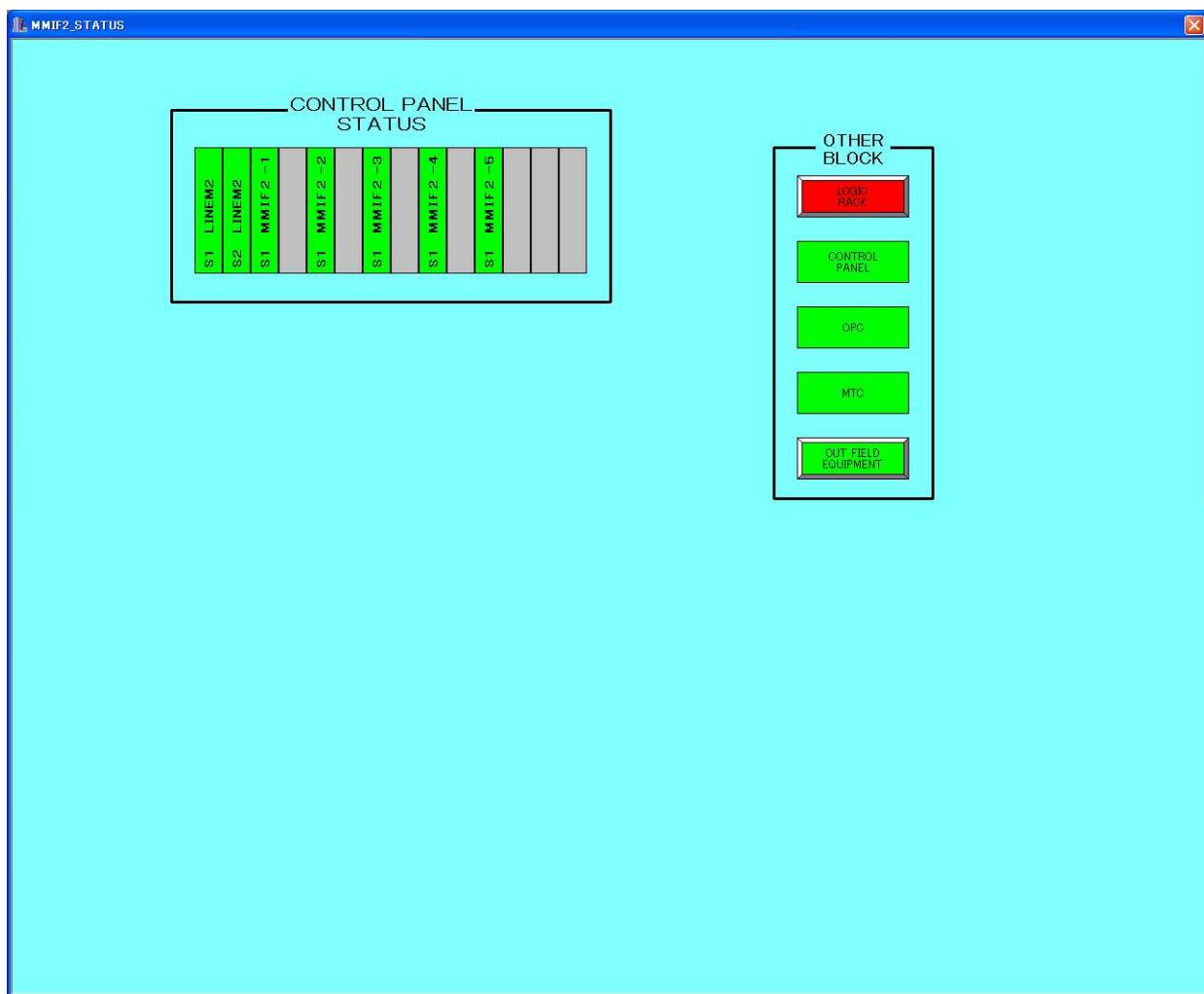
4.2.2 Control Panel (CCIP) Display

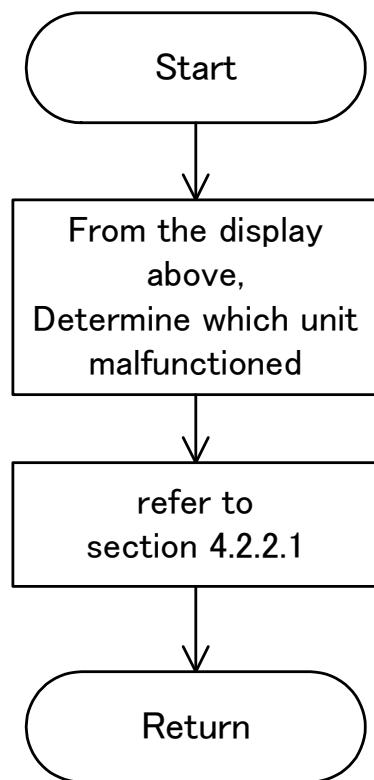
An example of CONTROL PANEL STATUS Display of MTC is shown below.



By pressing CONTROL PANEL button on the General System Display (section 3.2), the screen shifts to CONTROL PANEL STATUS Display as shown below.

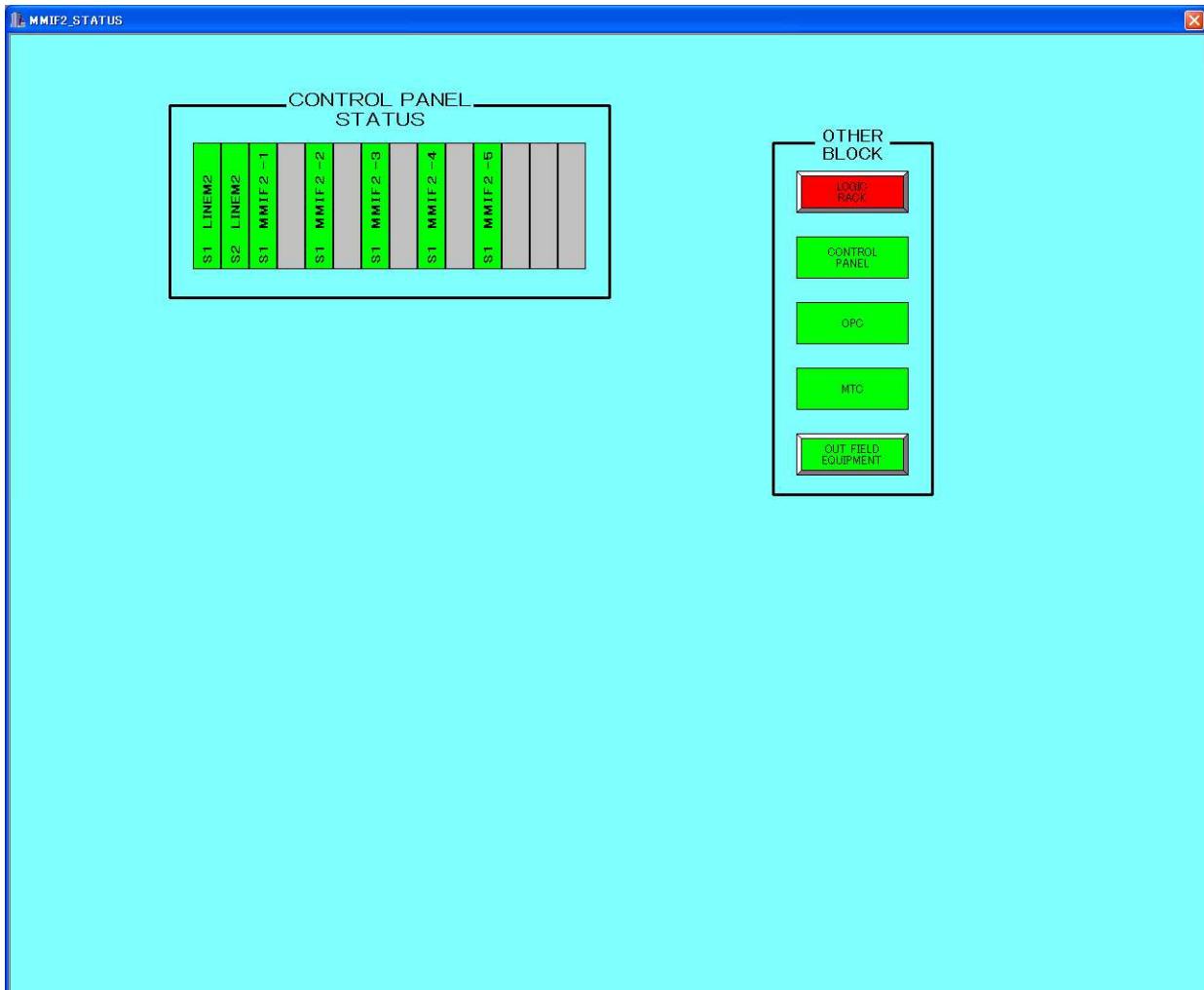
Each Card Status is to be indicated in green when normal and in red when out of order.

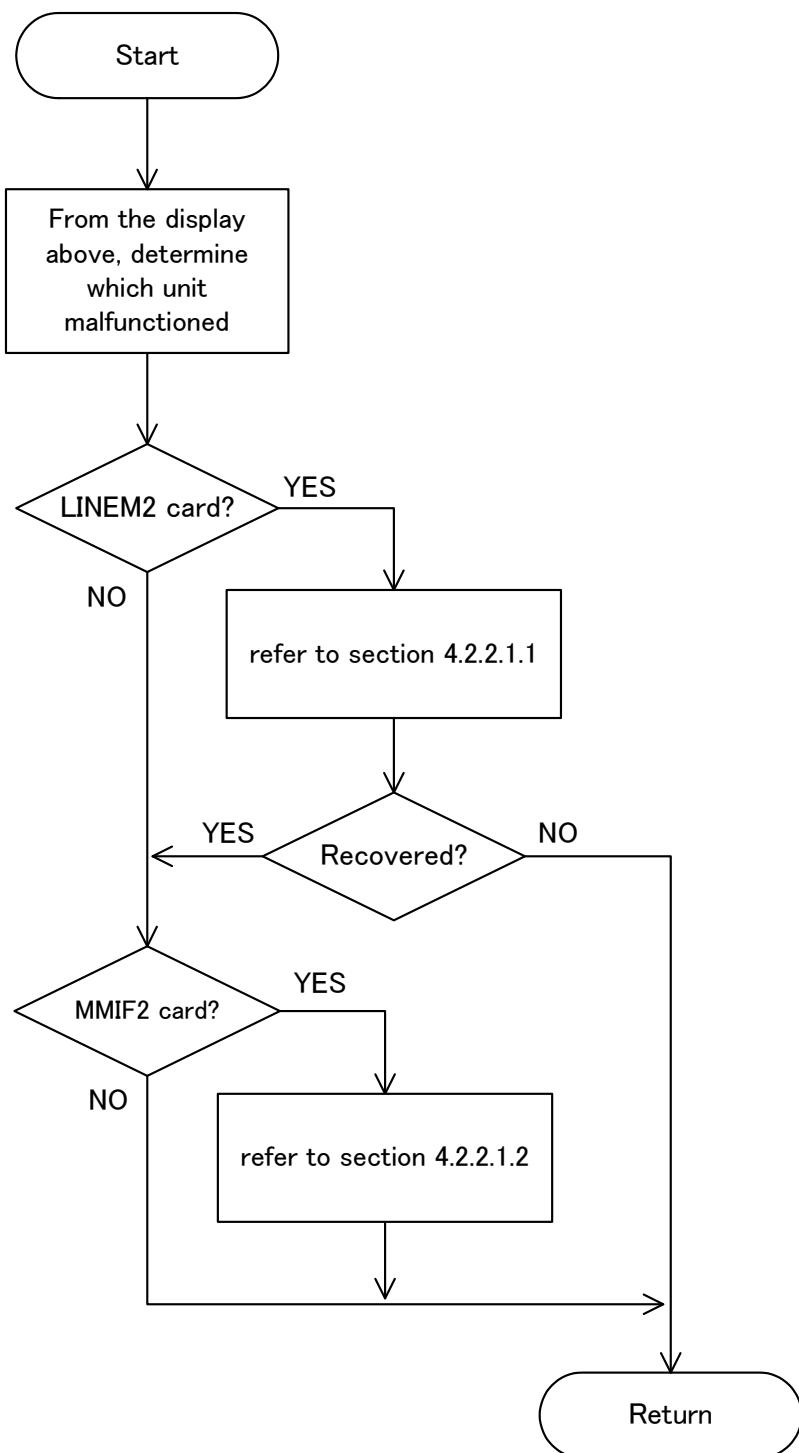




4.2.2.1 ET-MMIF Sub-rack

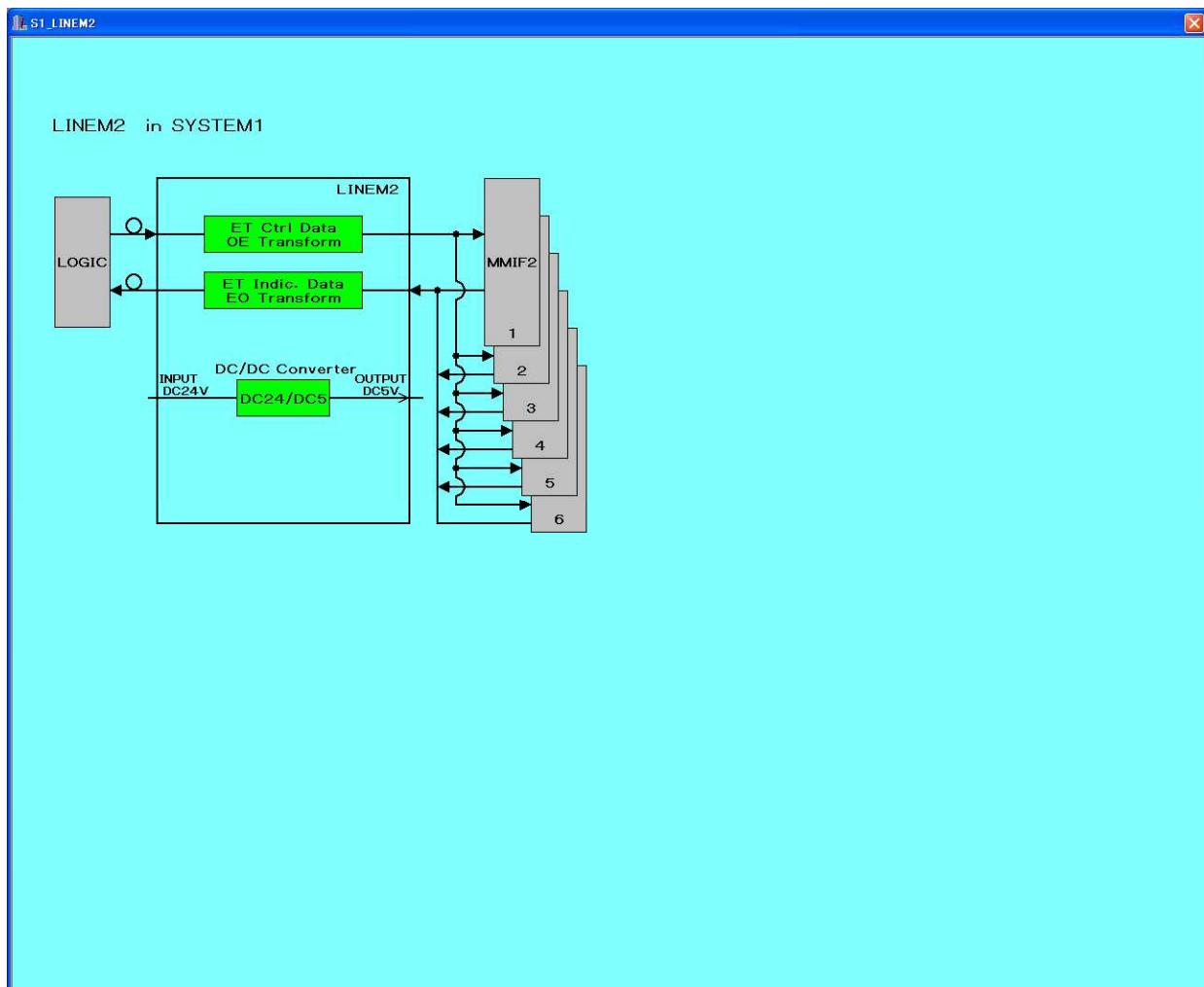
Each Card Level Display can be indicated according to mounted cards of each system.

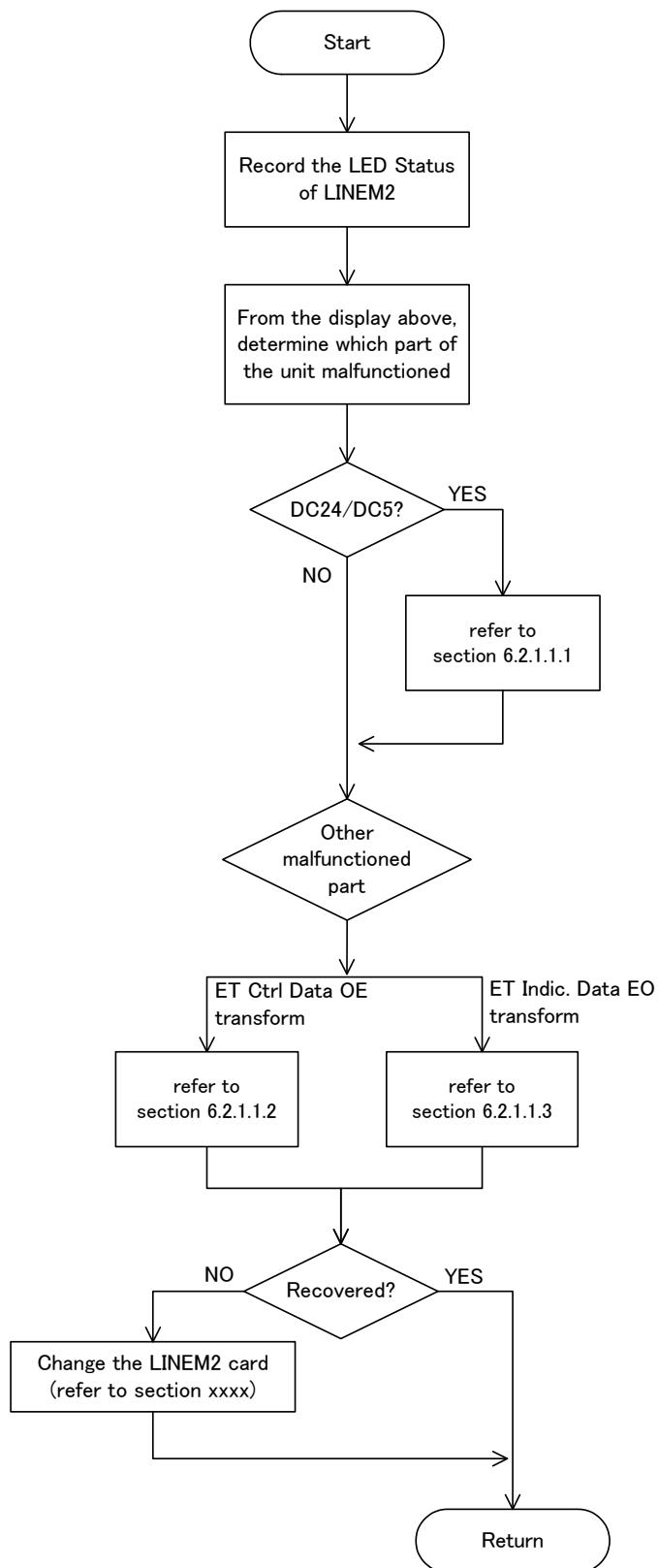




4.2.2.1.1 LINEM2 Screen

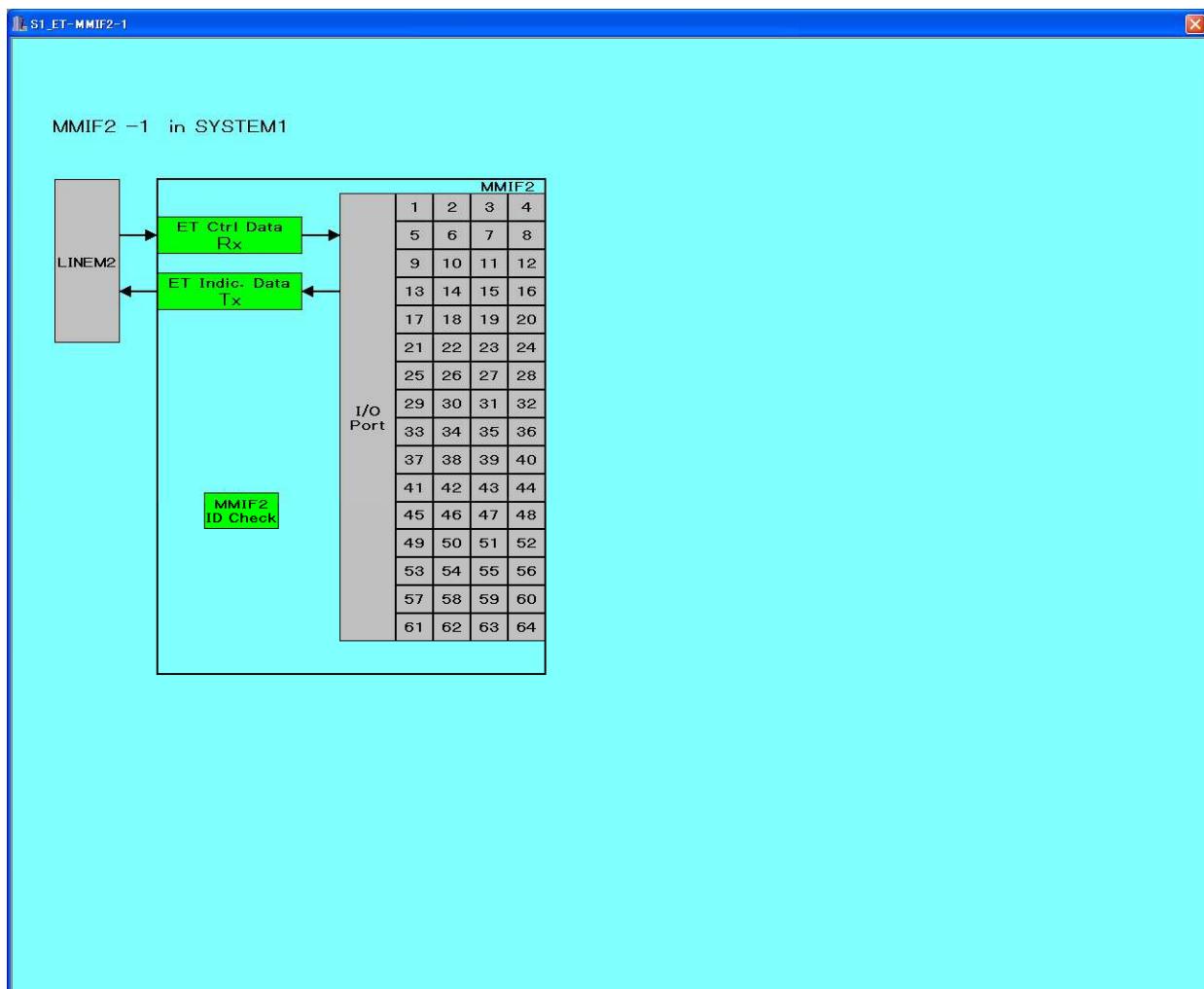
The status of each part is indicated in green when normal and in red when out of order.



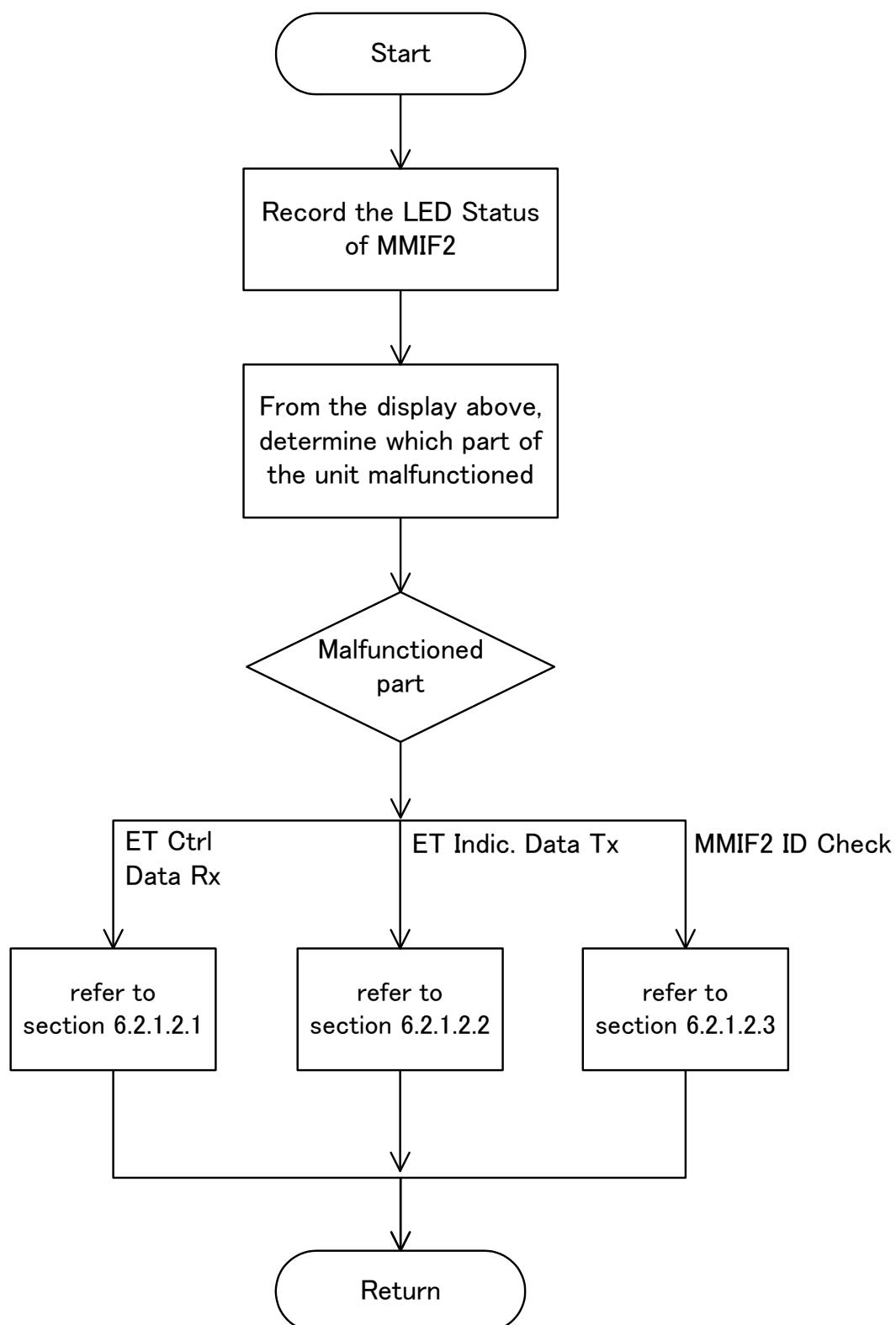


4.2.2.1.2 MMIF2 Screen

The status of each part is indicated in green when normal and in red when out of order.



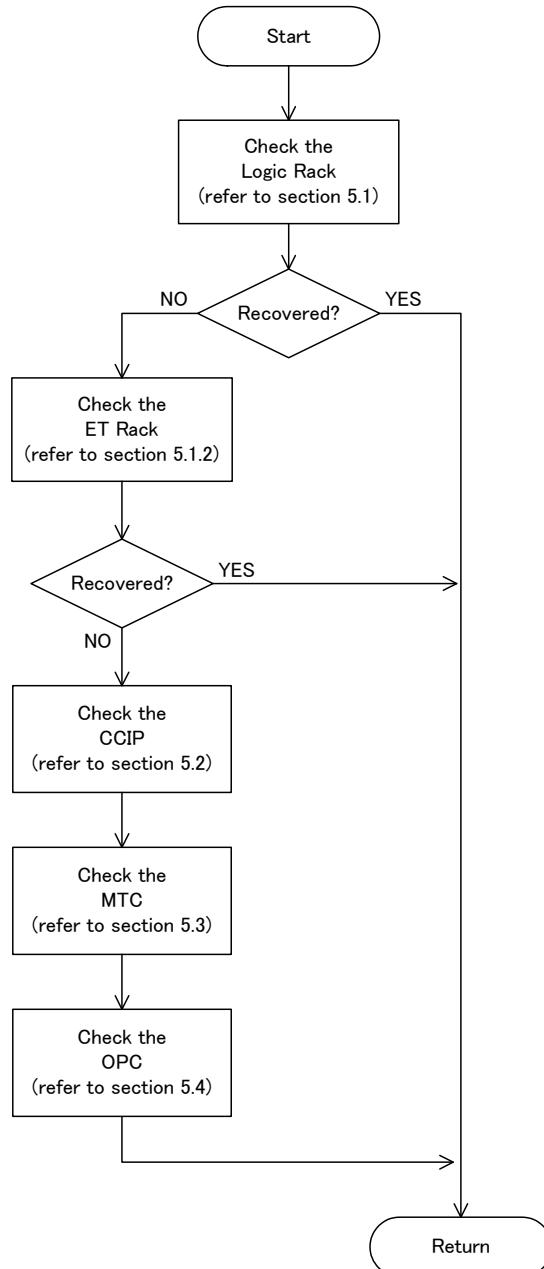
In this screen, the indication of I/O port and the right side from No.1 to 64 shall be totally colored gray, since there is no indication condition.



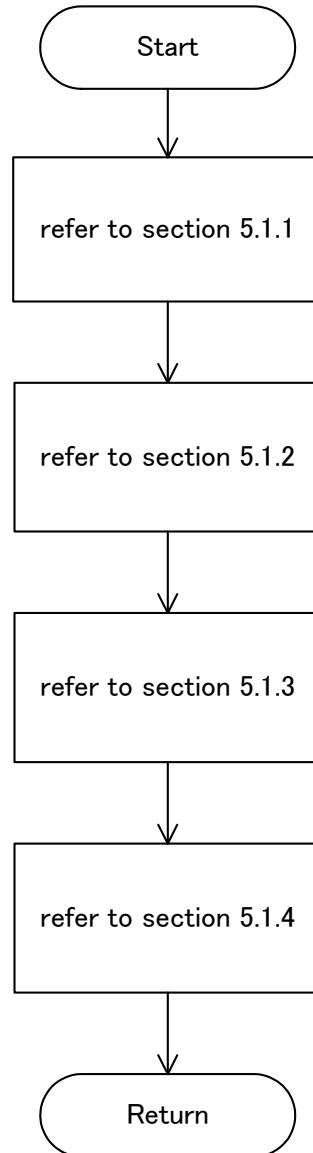
5 Troubleshooting by checking the LED Indications of each unit

This section describes the LED indications of each unit in K5BMC EI system. The LED indications of each unit specified in this section can be used to determine which unit malfunctioned.

Follow the instructions given in the following sections to resolve the problem.



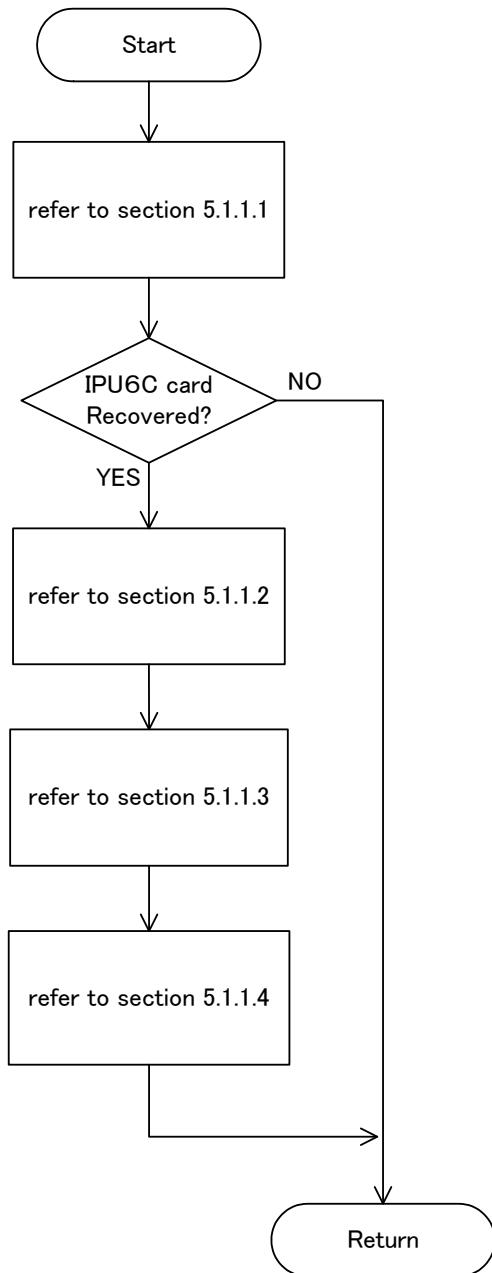
5.1 Logic Rack



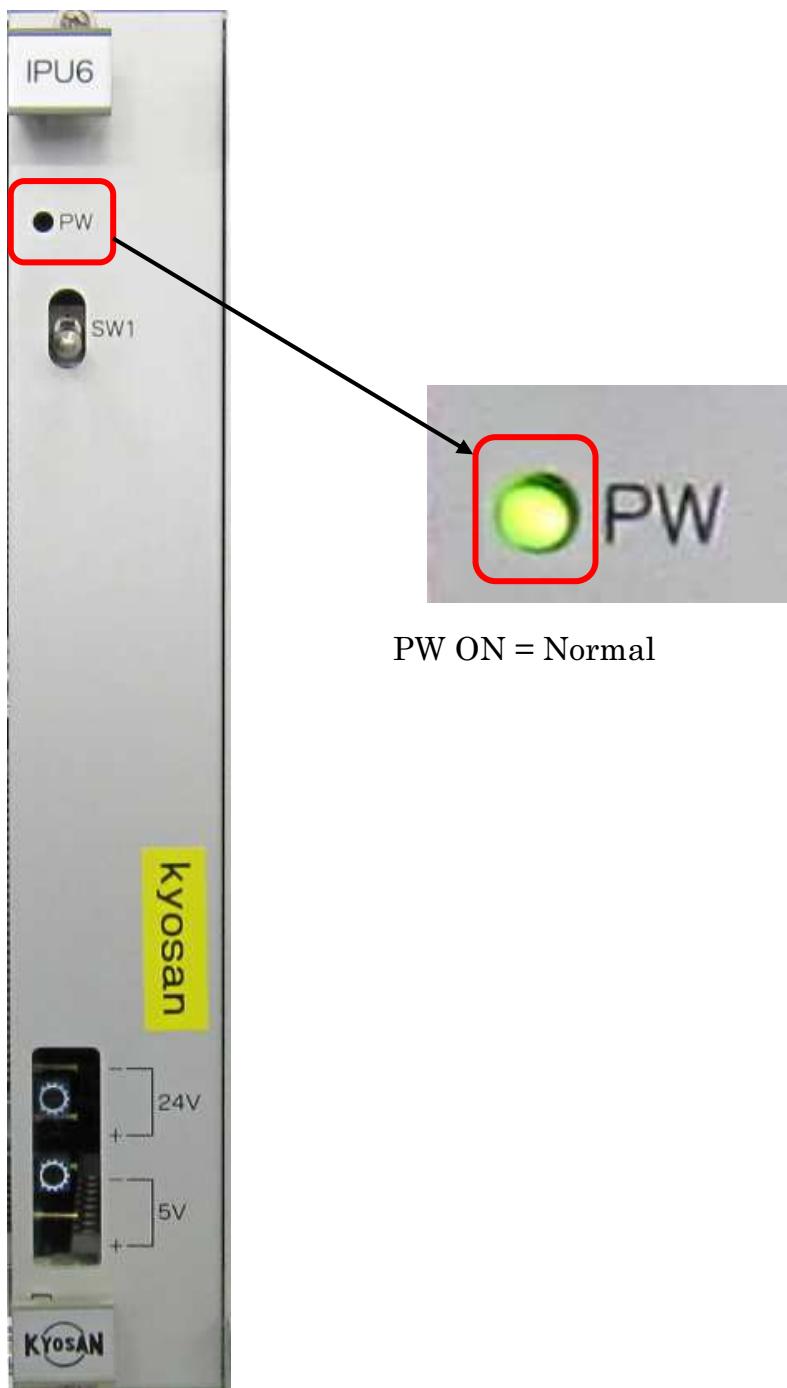
5.1.1 Logic Sub-rack

The LED indications of each unit of Logic Sub-rack are shown below.

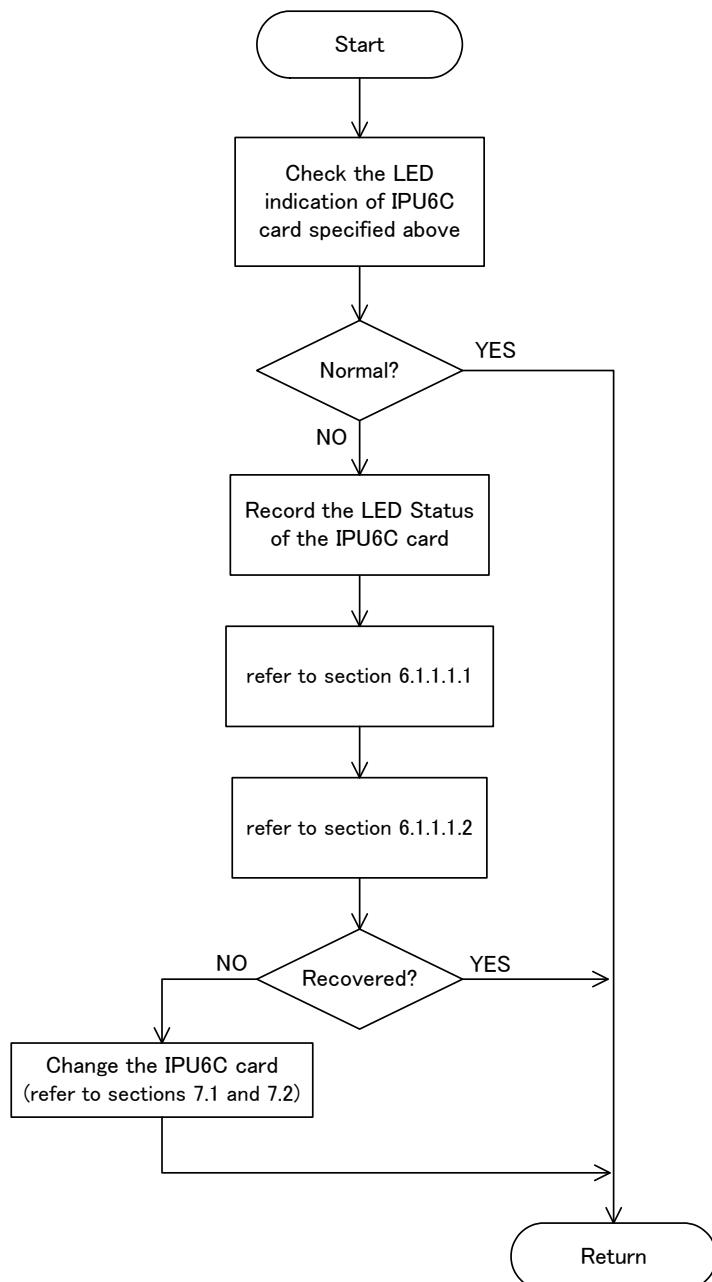
Check the LED indications of each unit of each system to determine which unit malfunctioned.



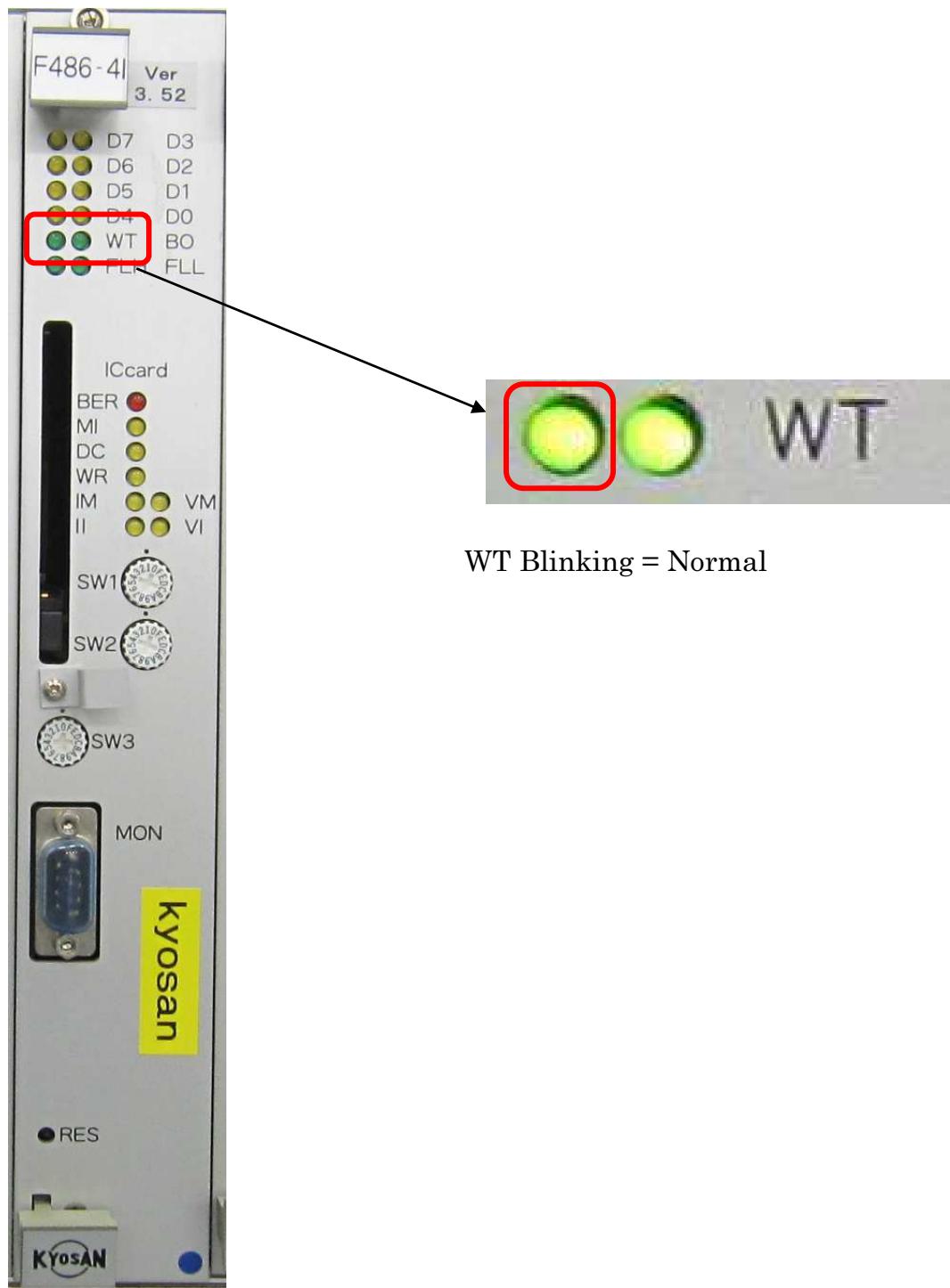
5.1.1.1 IPU6C Card

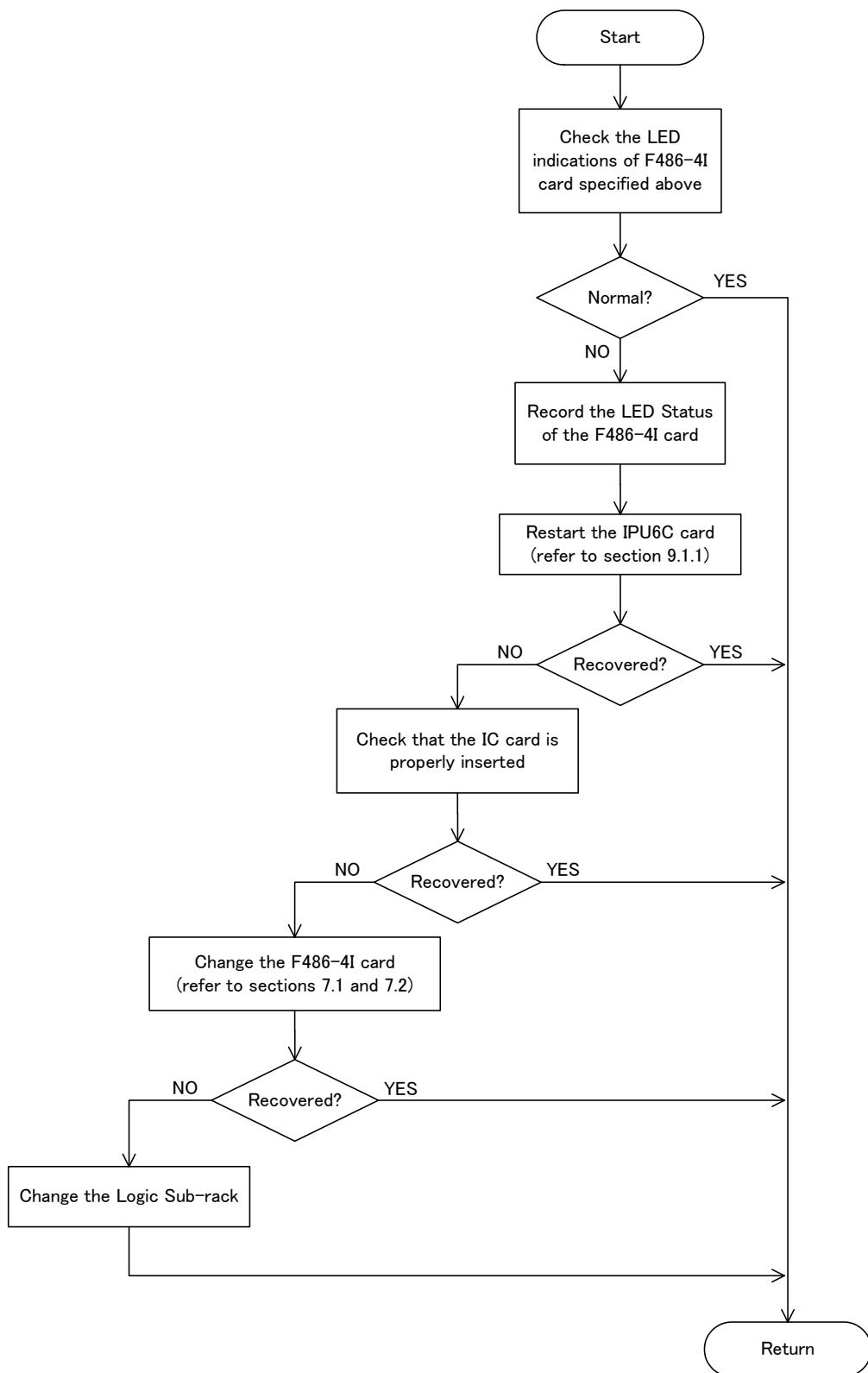


PW ON = Normal

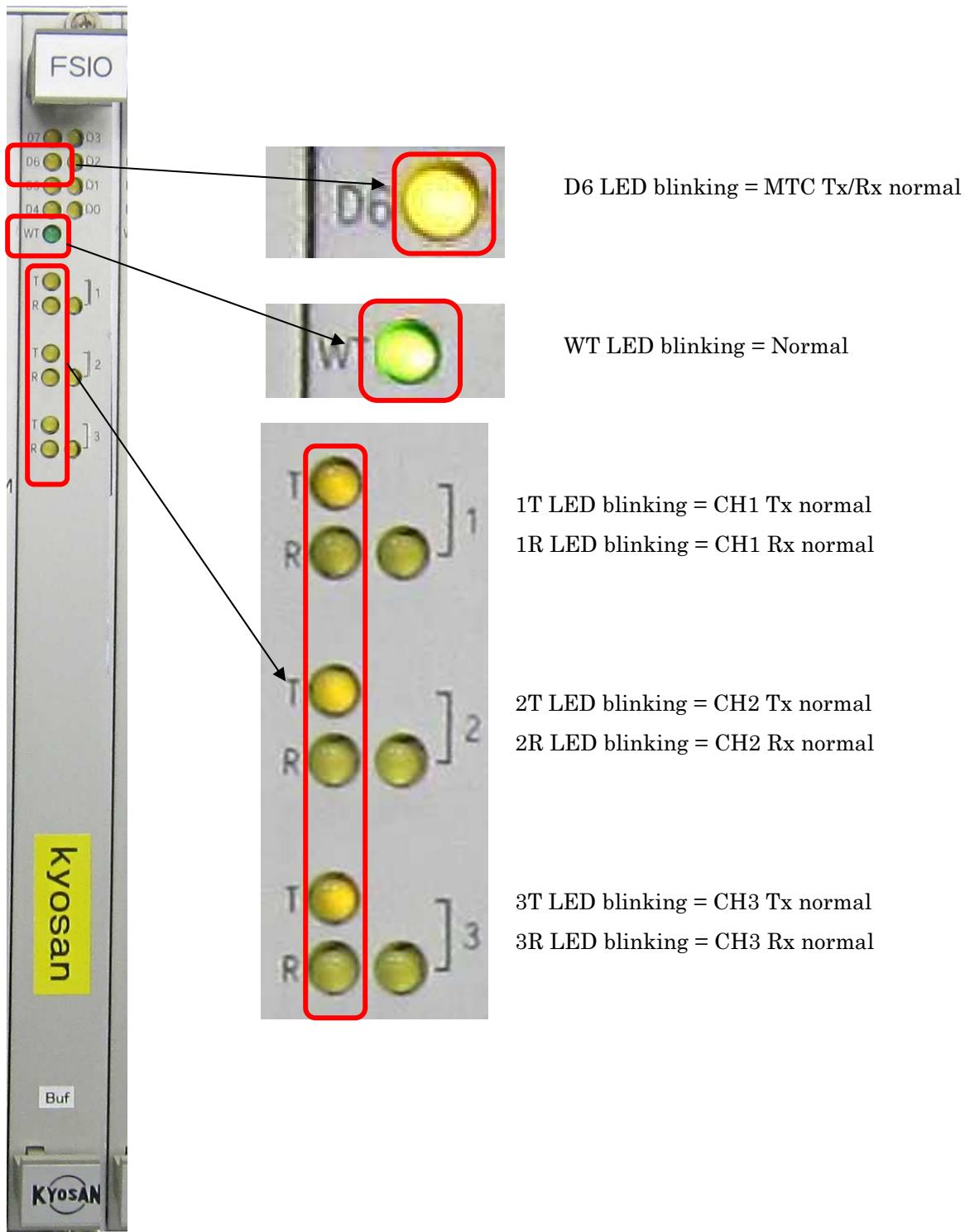


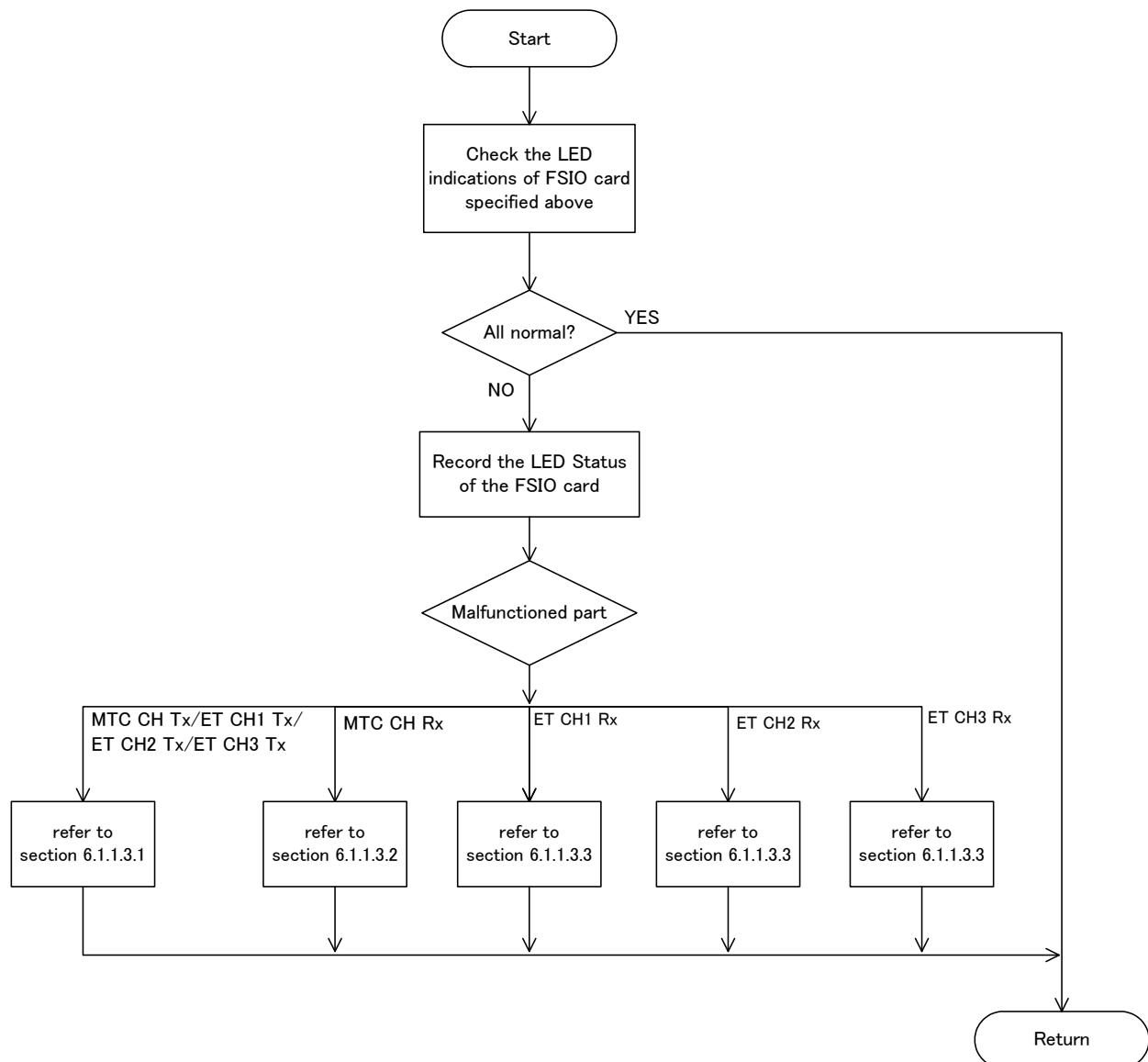
5.1.1.2 F486-4I Card



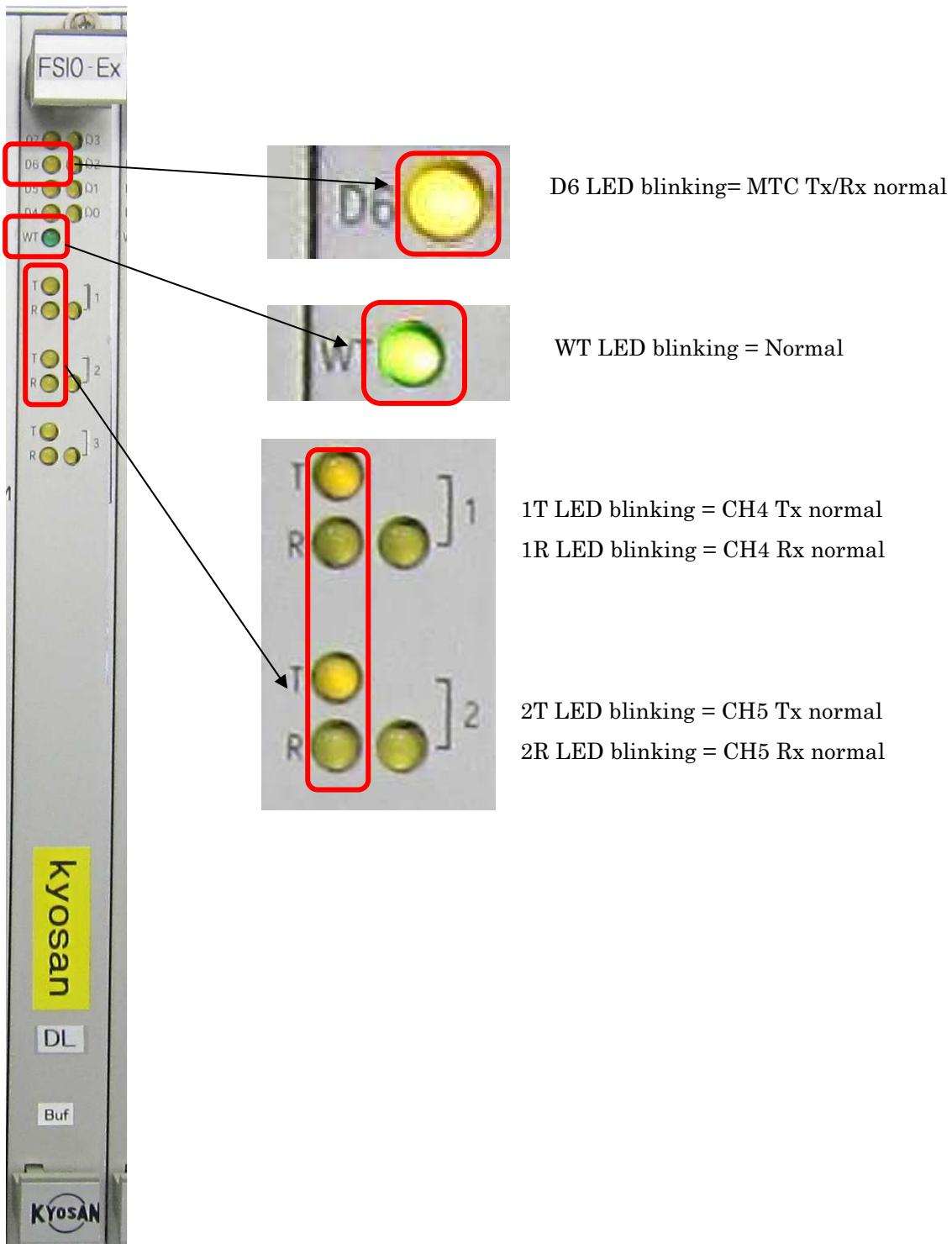


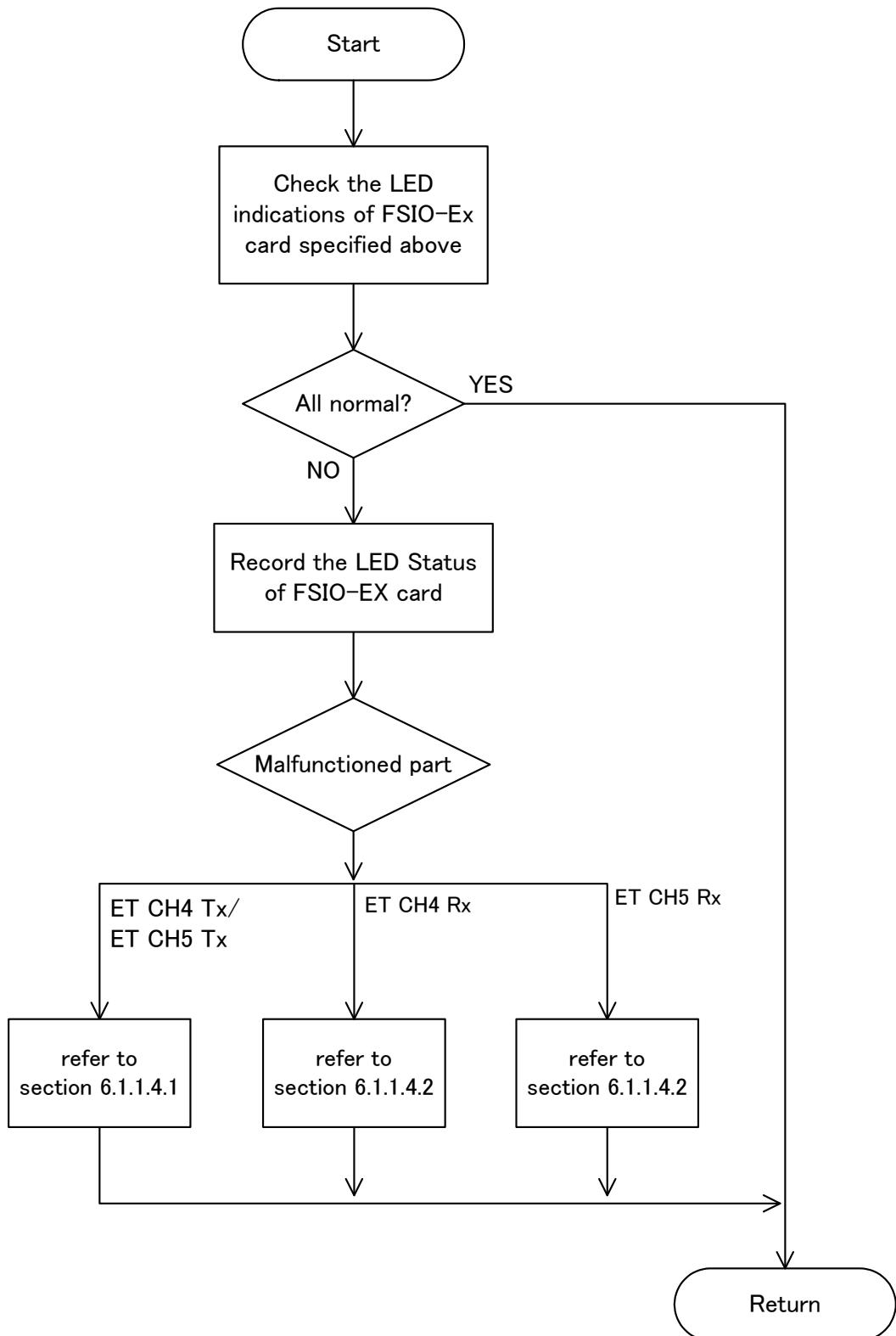
5.1.1.3 FSIO Card





5.1.1.4 FSIO-EX Card

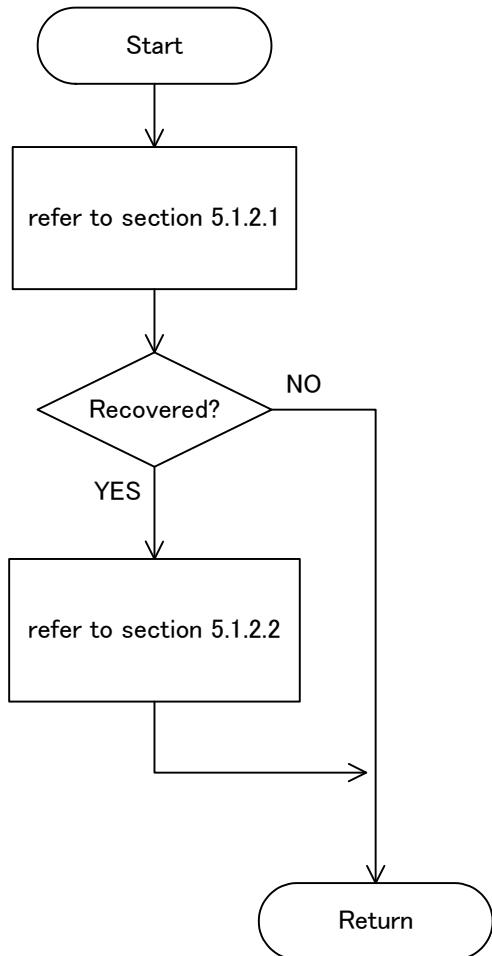




5.1.2 ET-PIO Sub-rack

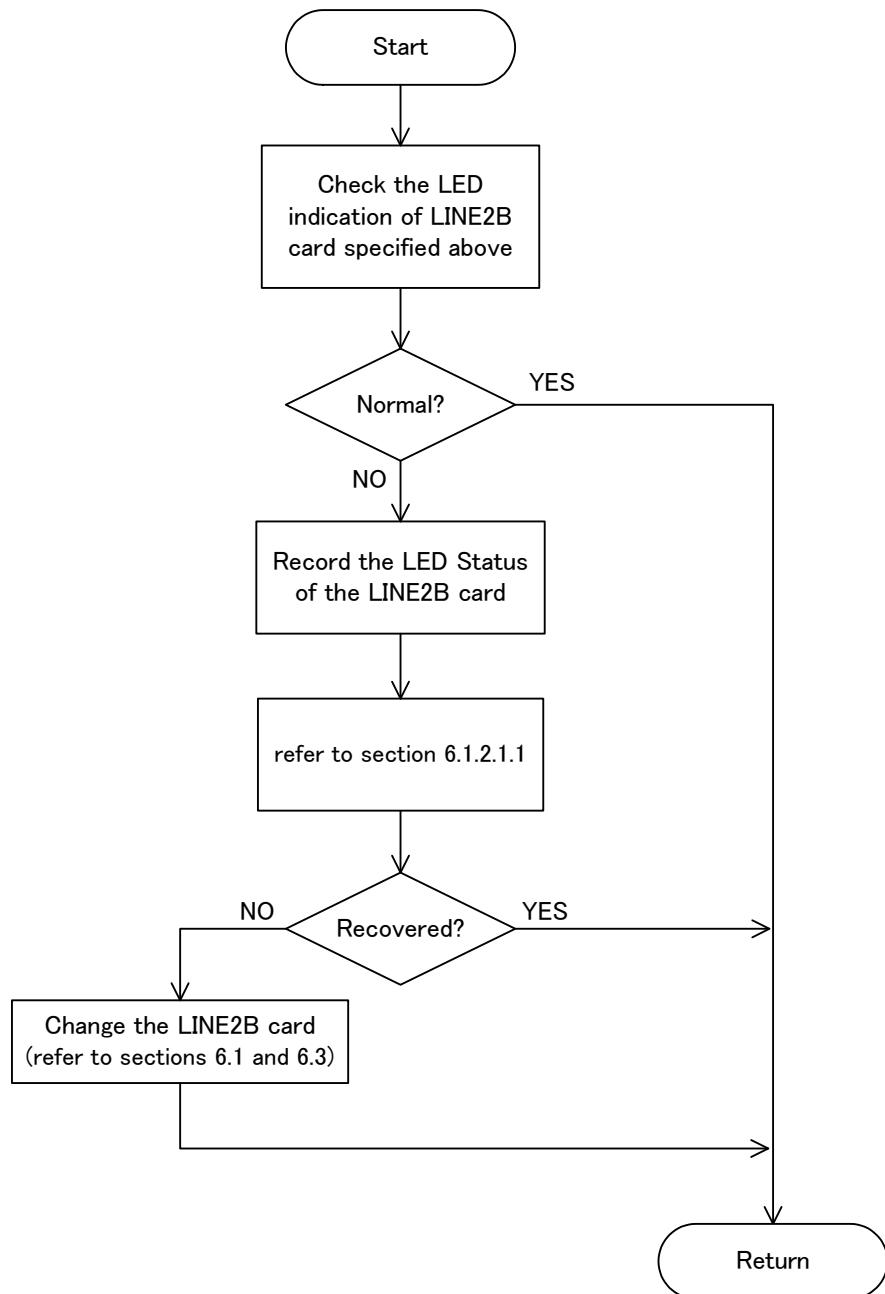
The LED indications of each unit of ET-PIO Sub-rack are shown below.

Check the LED indications of each unit of each system to determine which unit malfunctioned.



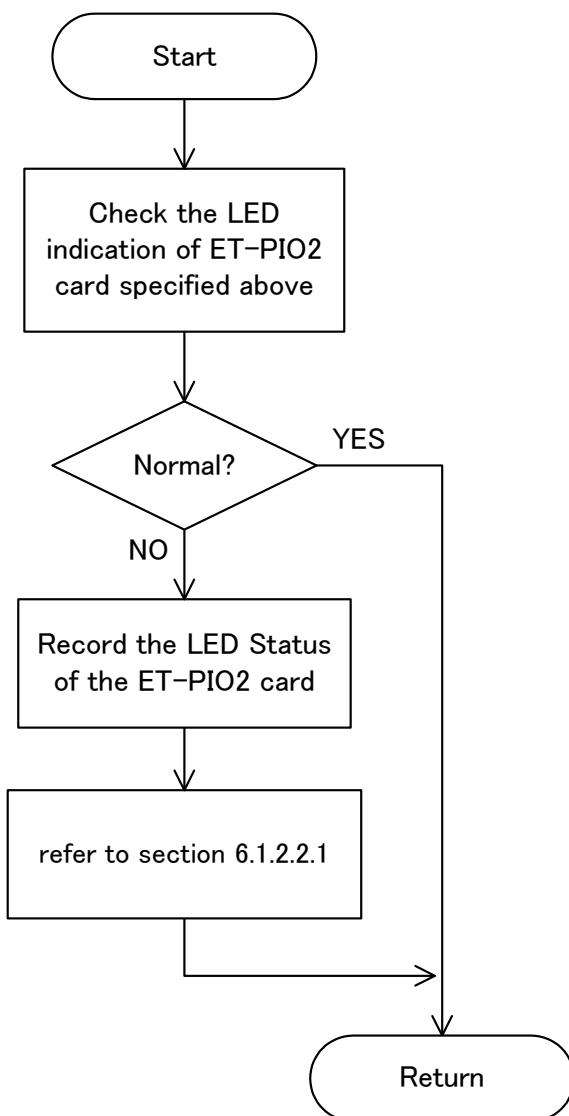
5.1.2.1 LINE2B Card





5.1.2.2 ET-PIO2 Card

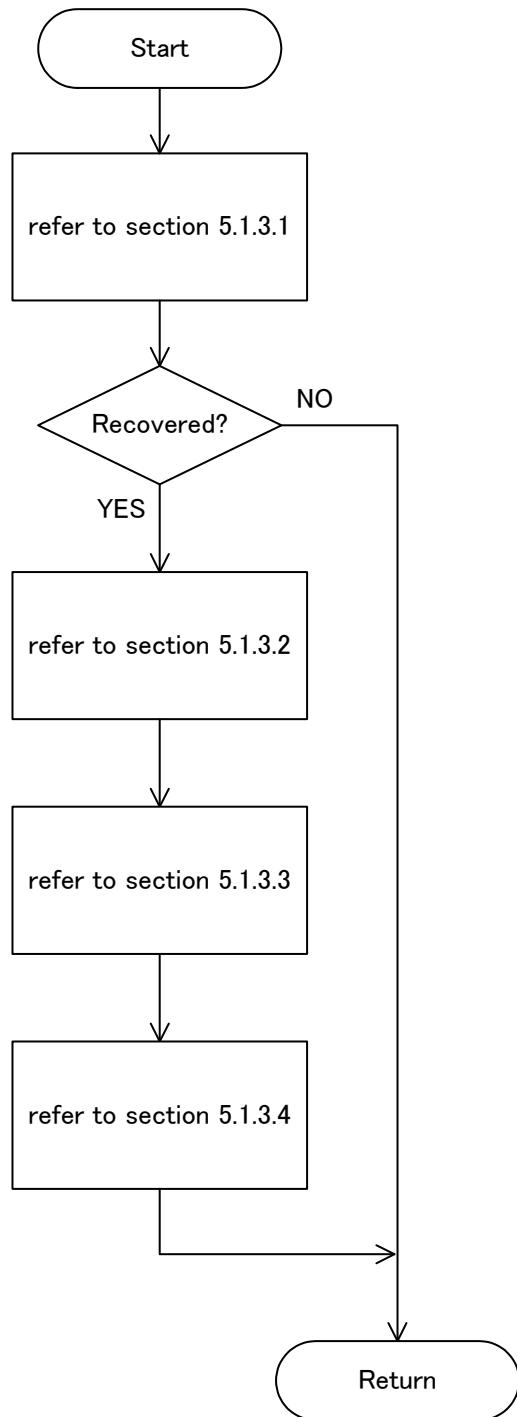




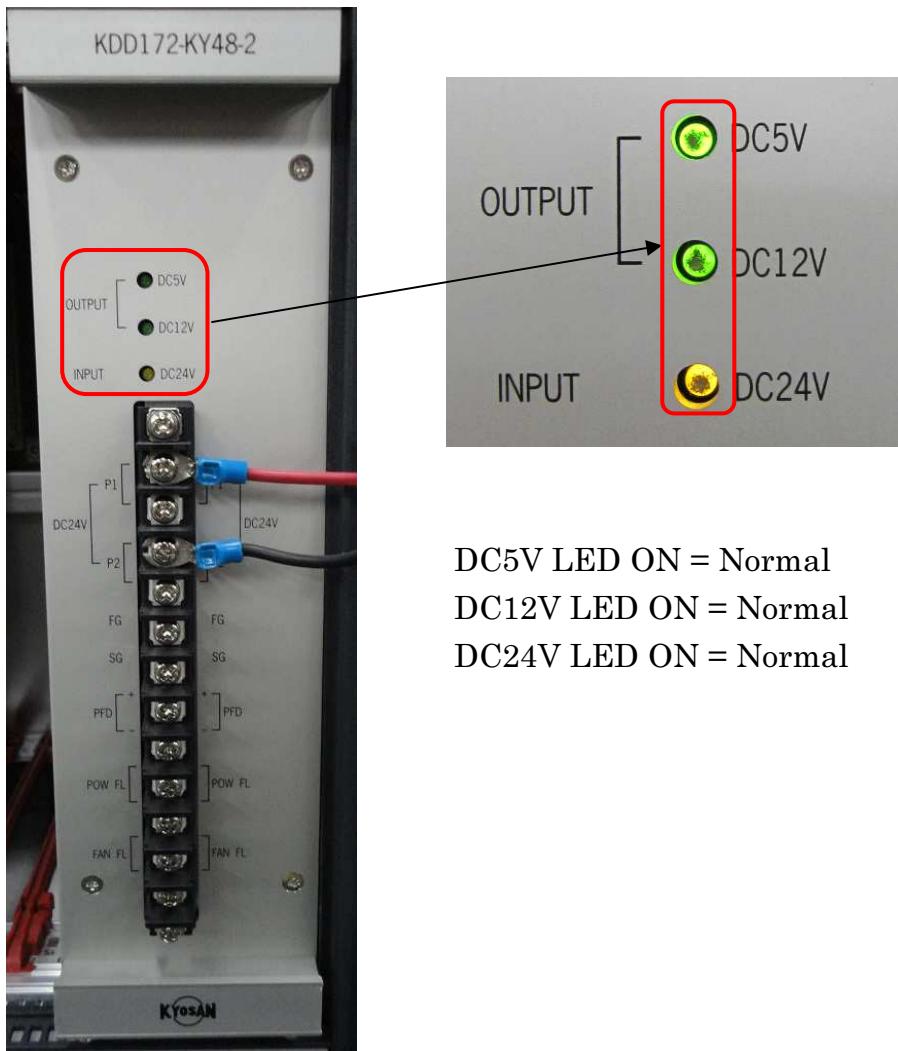
5.1.3 Journal Module

The LED indications of each unit of Journal Module are shown below.

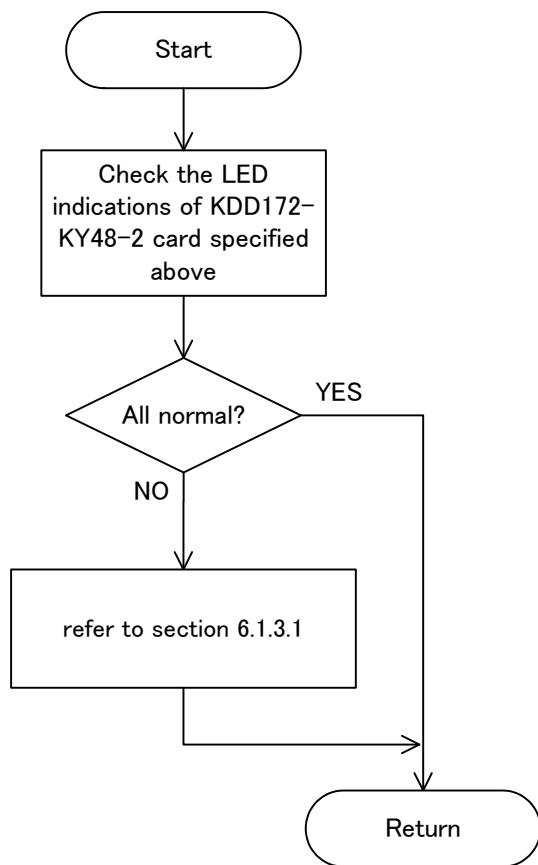
Check the LED indications of each unit of each system to determine which unit malfunctioned.



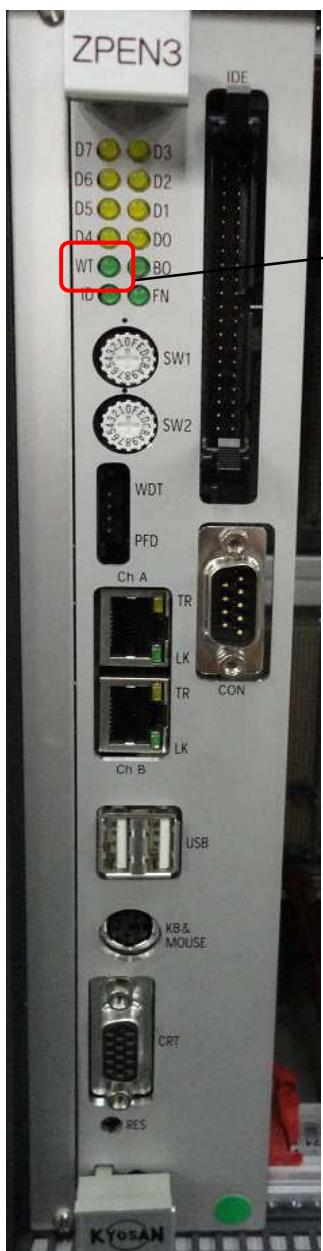
5.1.3.1 KDD172-KY48-2 Card



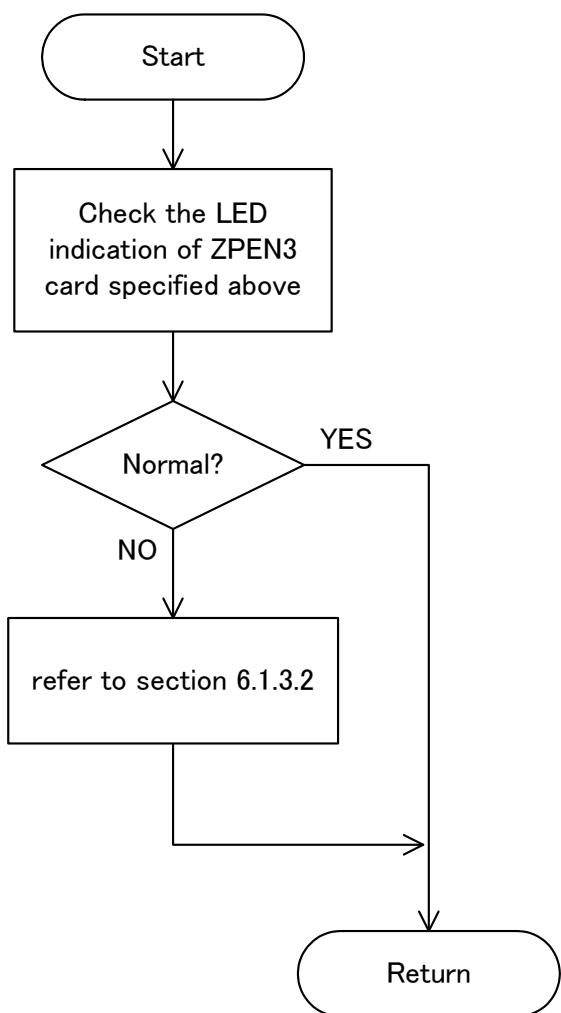
DC5V LED ON = Normal
DC12V LED ON = Normal
DC24V LED ON = Normal



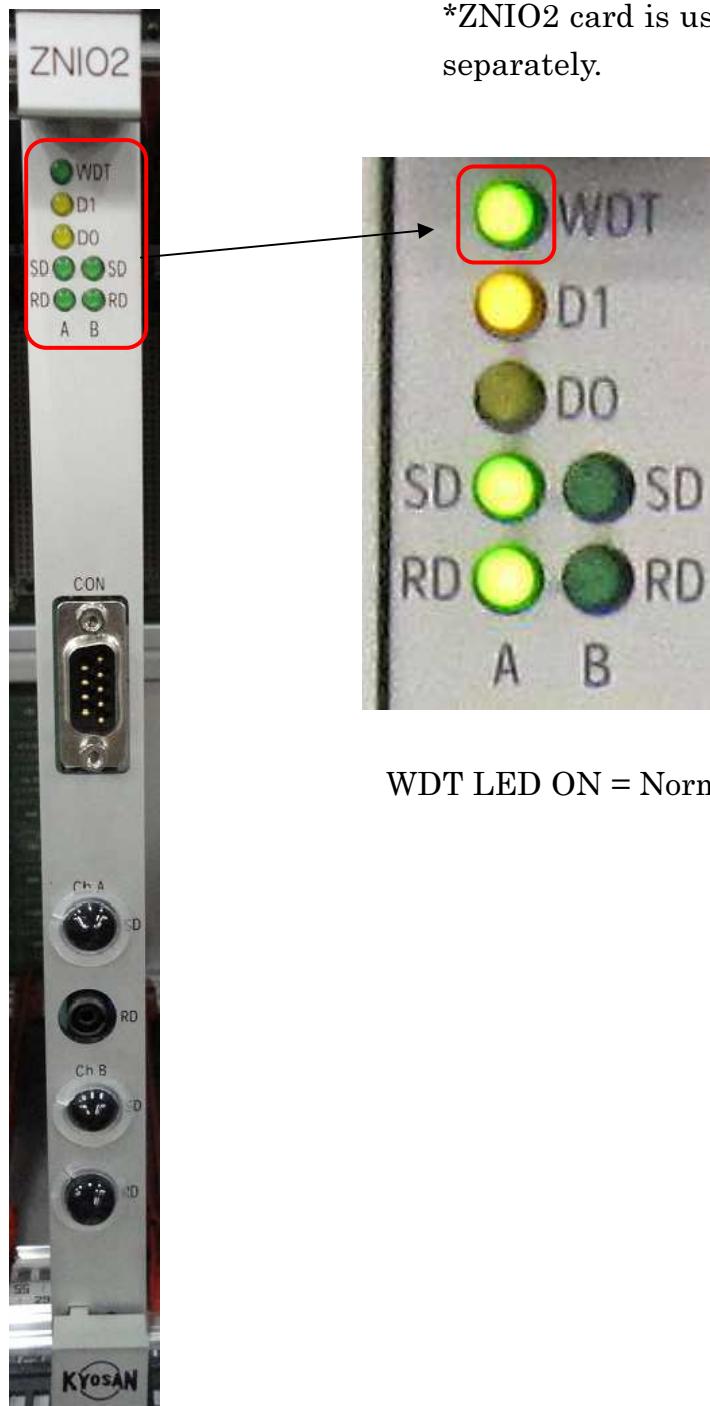
5.1.3.2 ZPEN3 Card



WT LED ON = Normal

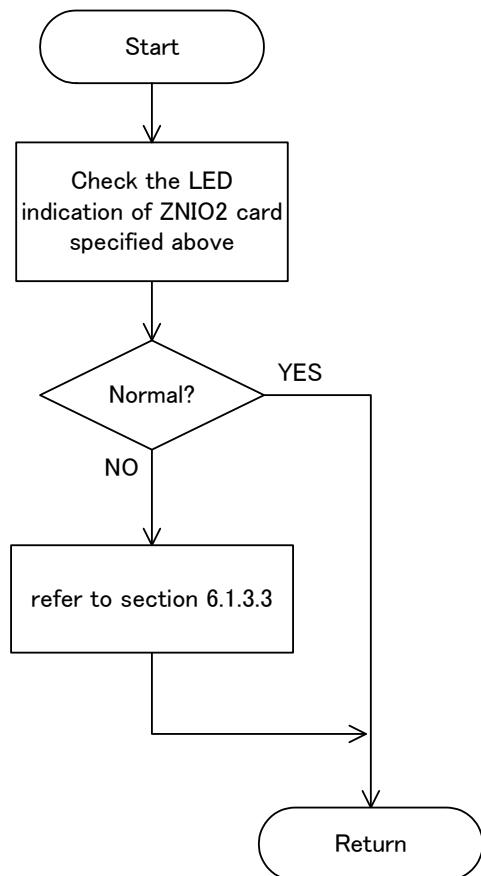


5.1.3.3 ZNIO2 Card

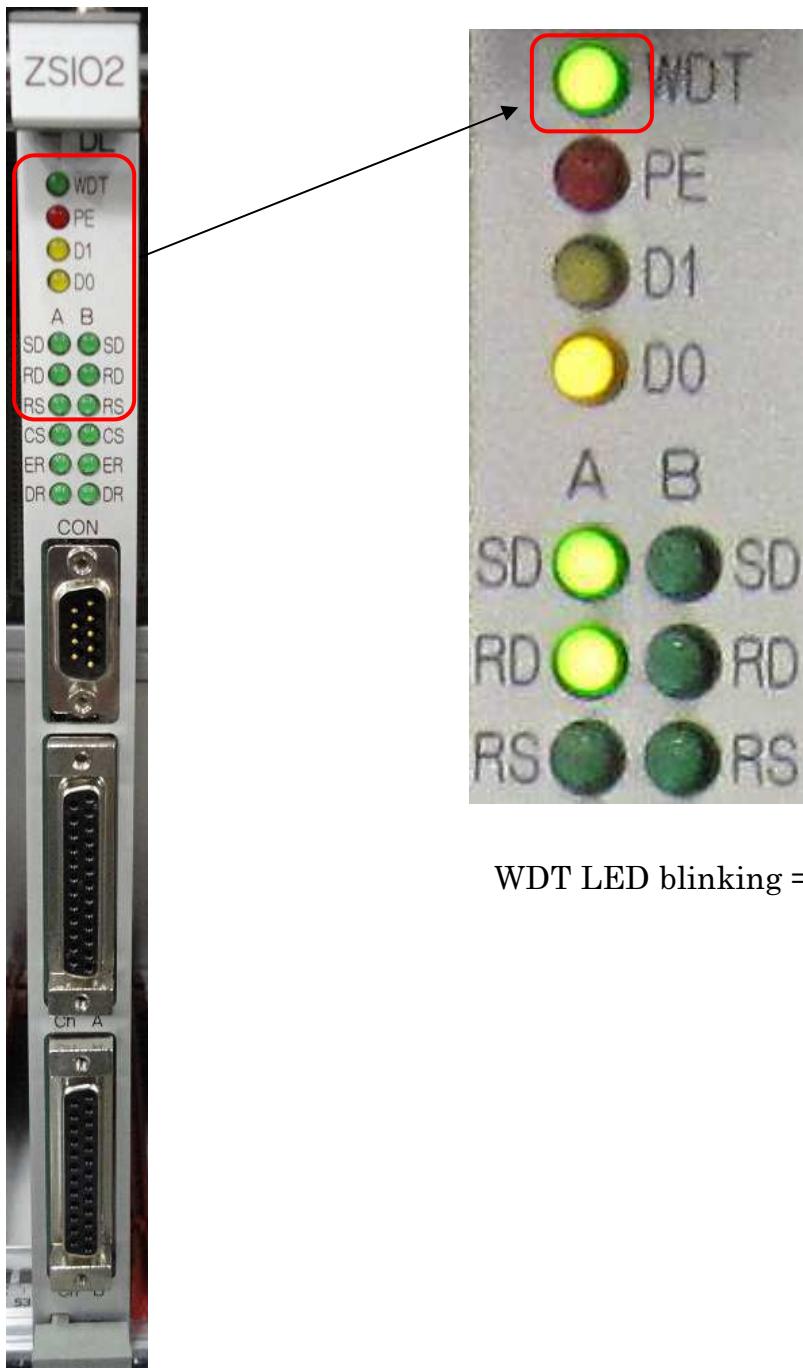


*ZNIO2 card is used for Logic System 1 and 2 separately.

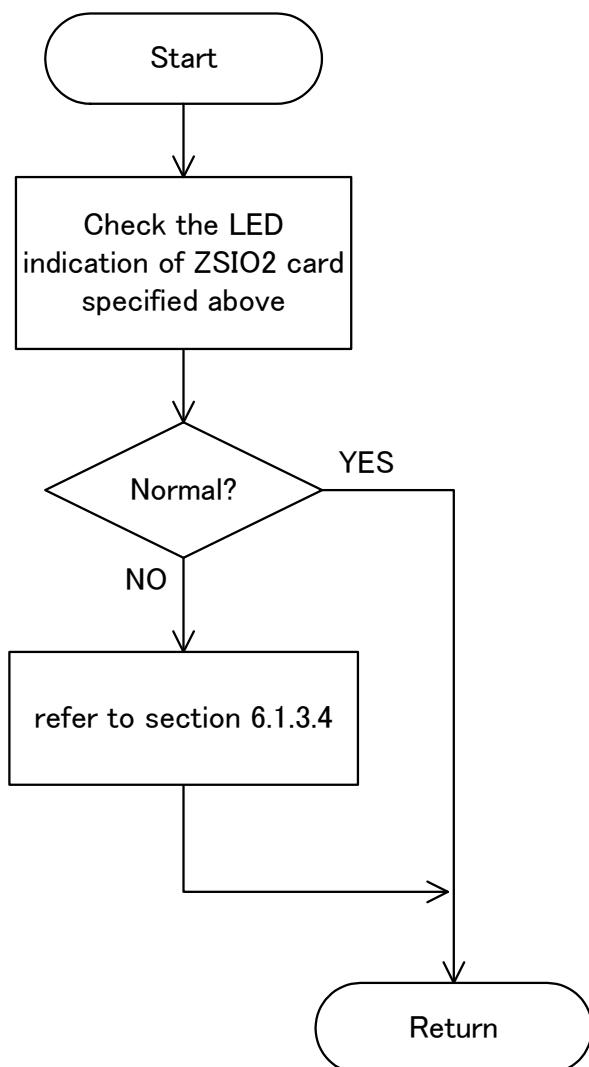
WDT LED ON = Normal



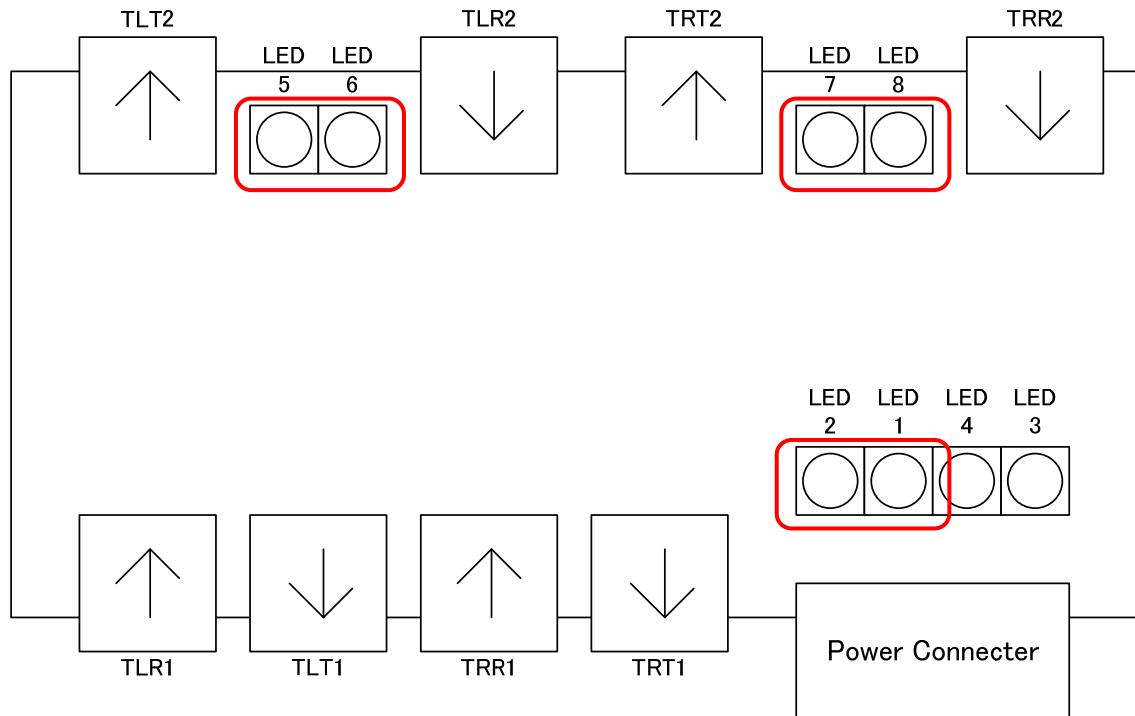
5.1.3.4 ZSIO2 Card



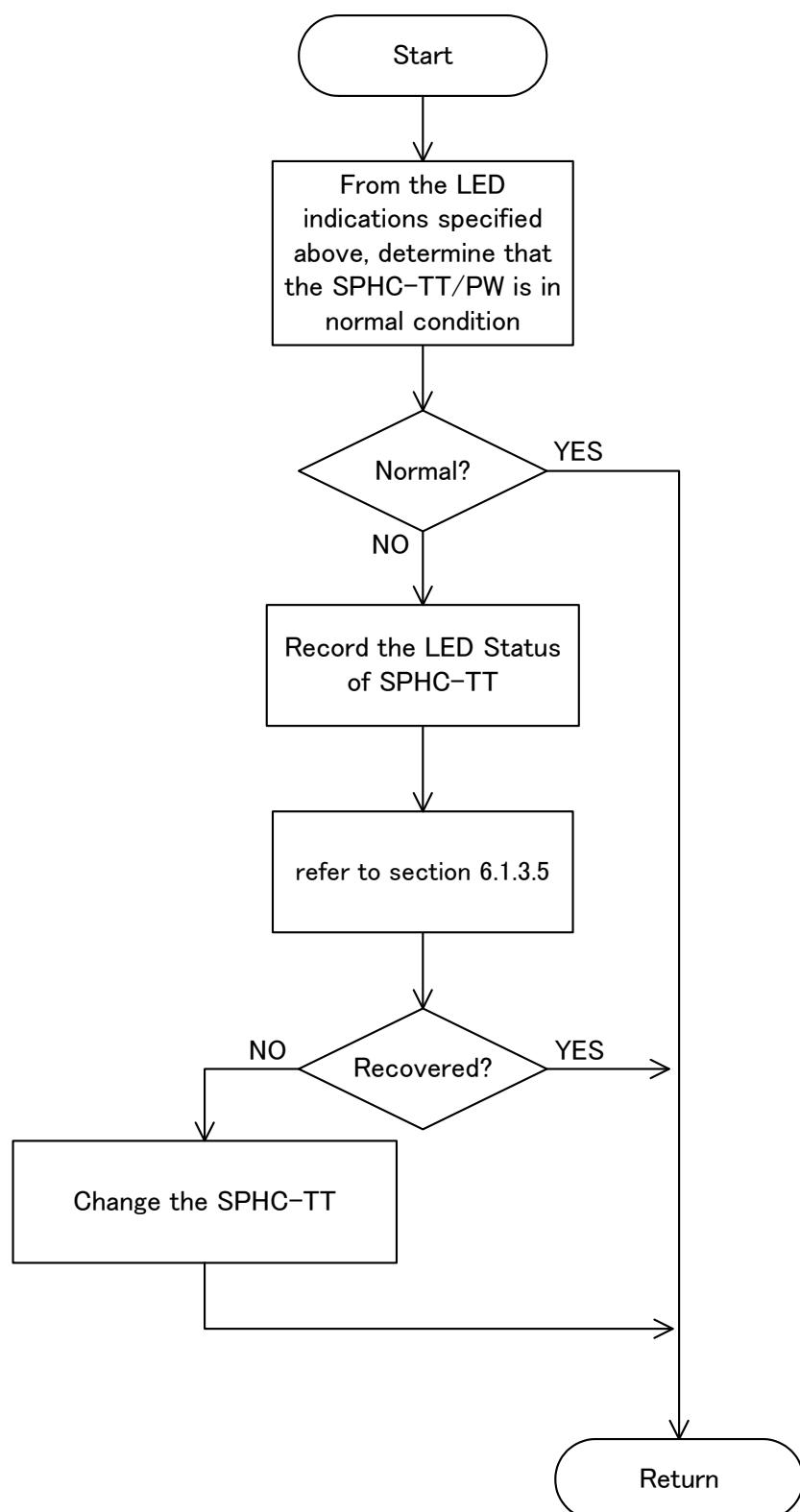
WDT LED blinking = Normal



5.1.4 SPHC-TT



LED1	Blink when data receiving (TLR1 Optical Line)
LED2	Blink when data sending (TLT1 Optical Line)
LED3	Not used (TRR1Optical Line)
LED4	Not used (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)

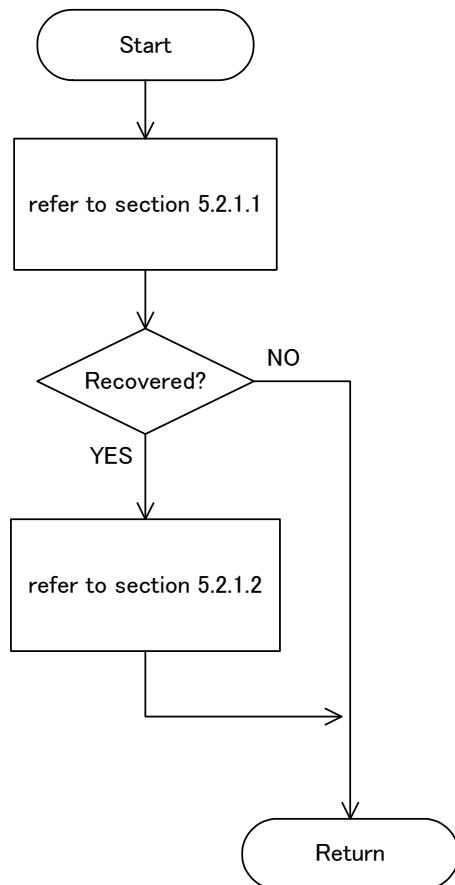


5.2 CCIP (Control Panel)

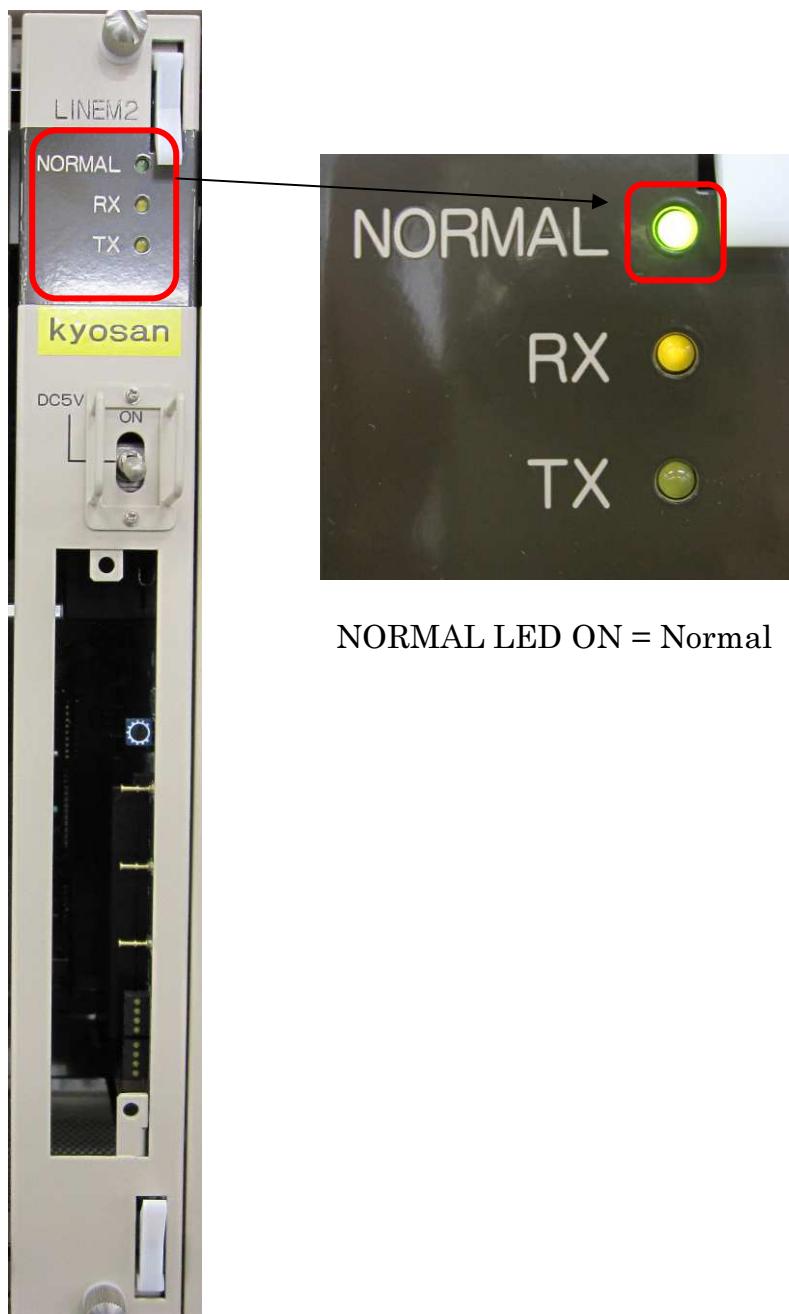
5.2.1 ET-MMIF Sub-rack

The LED indications of each unit of ET-MMIF Sub-rack are shown below.

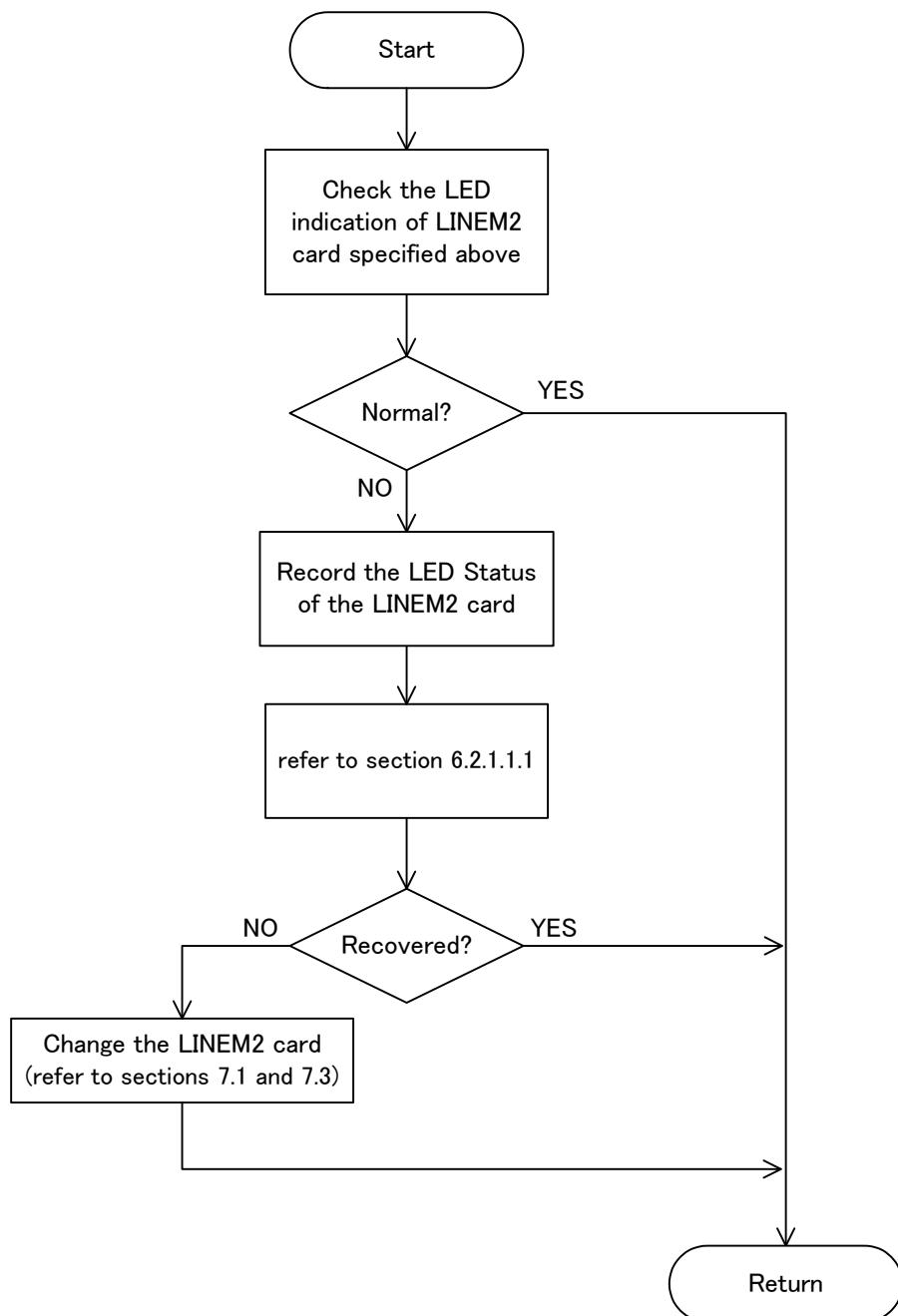
Check the LED indications of each unit of each system to determine which unit malfunctioned.



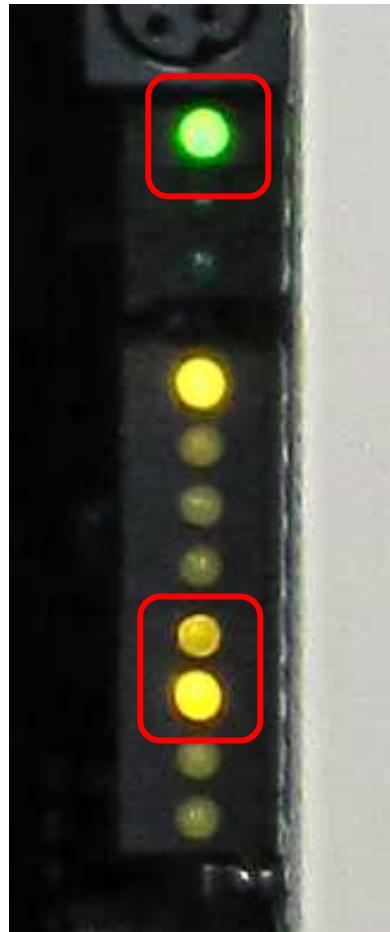
5.2.1.1 LINEM2 Card

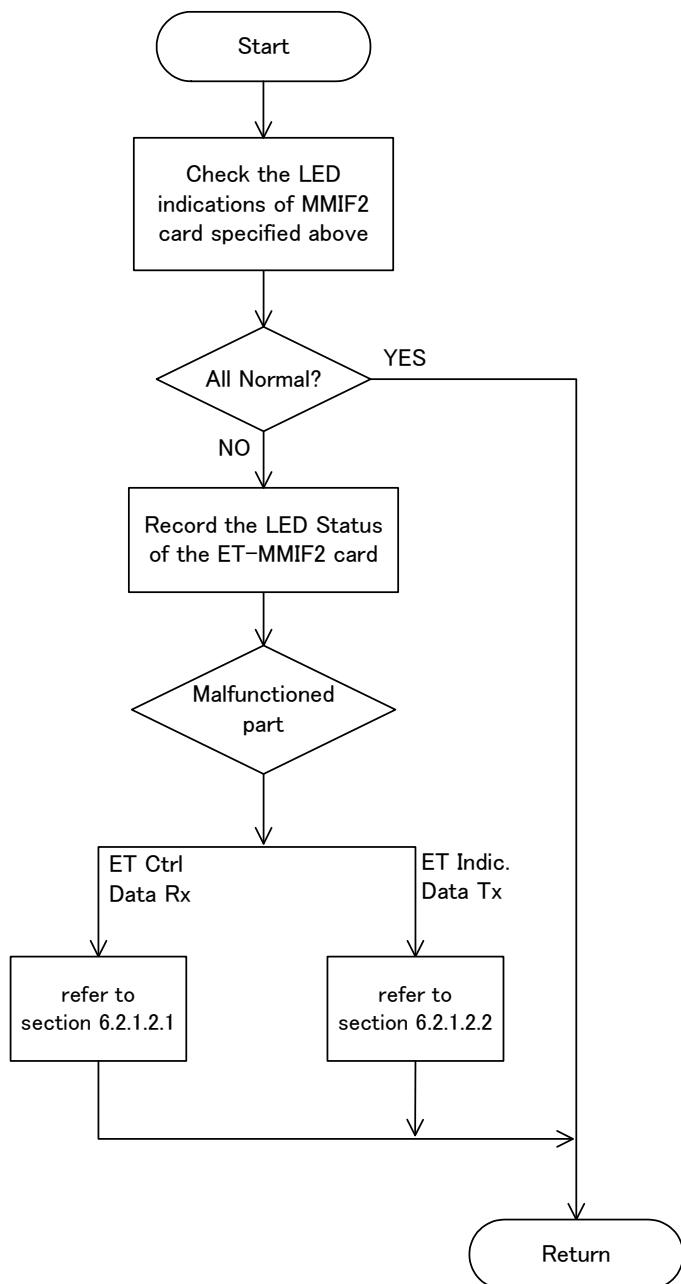


NORMAL LED ON = Normal



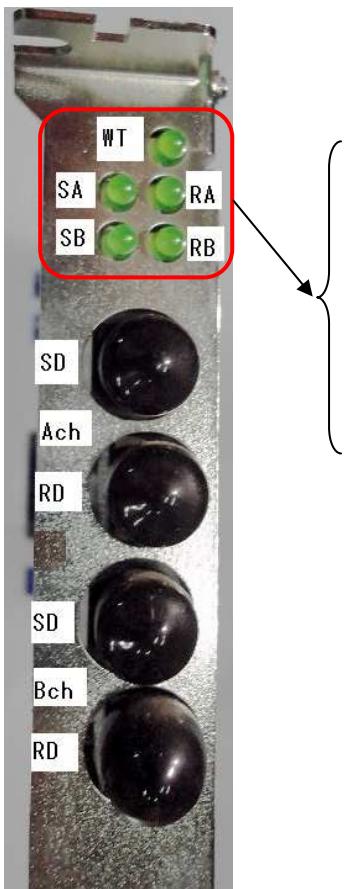
5.2.1.2 MMIF2 Card



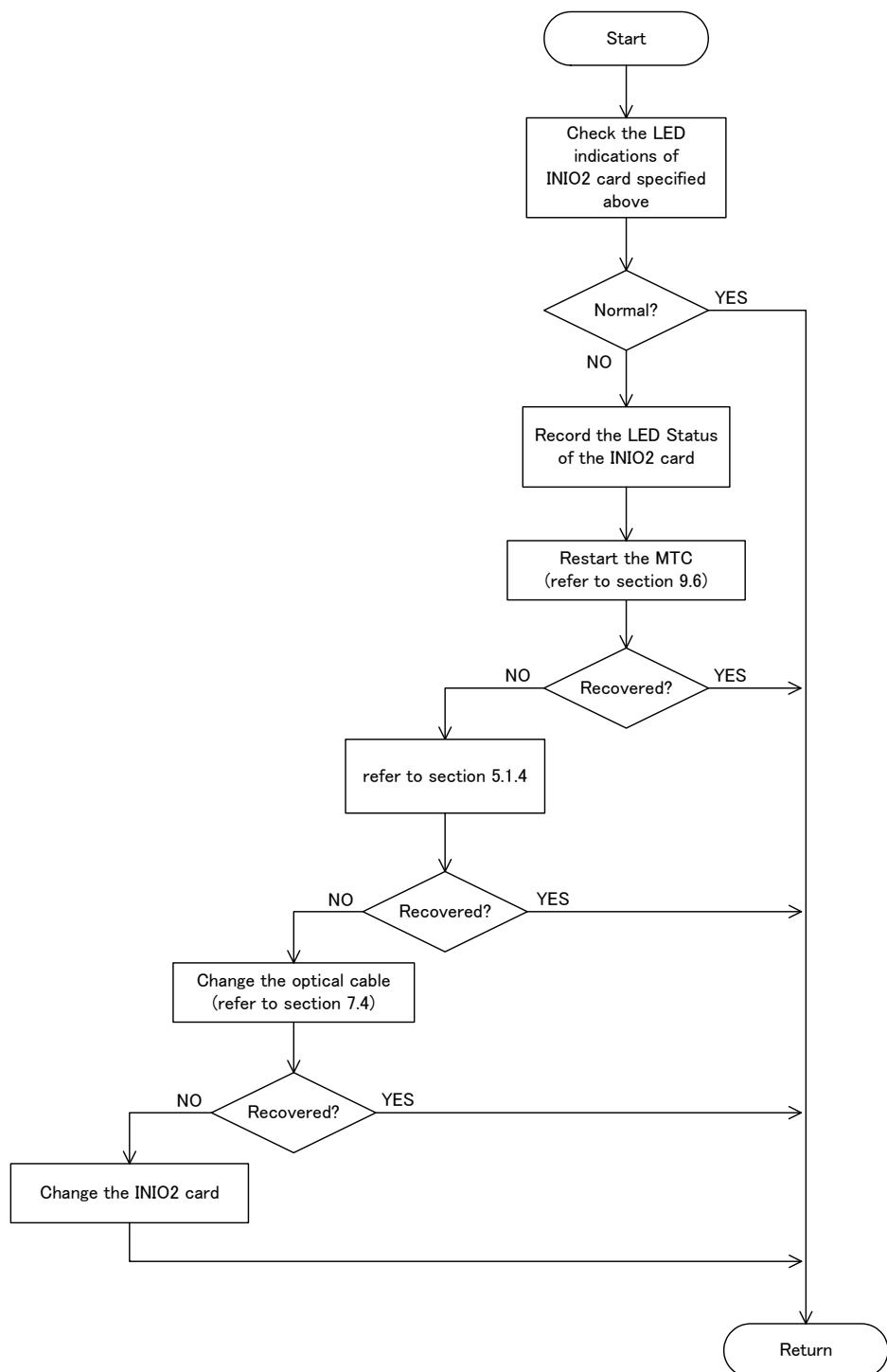


5.3 MTC (Maintenance Console)

5.3.1 INIO2 Card

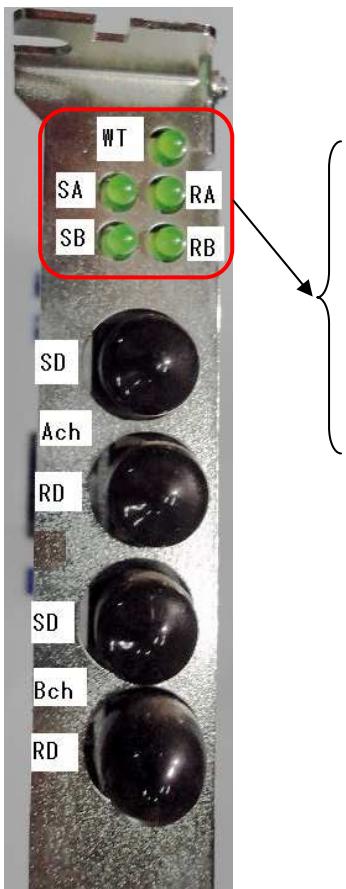


Item	Function
WT	Lighted when CPU in module is normal
SA	Lighted when transmission data exist in A channel
RA	Lighted when reception data exist in A channel
SB	Lighted when transmission data exist in B channel
RB	Lighted when reception data exist in B channel

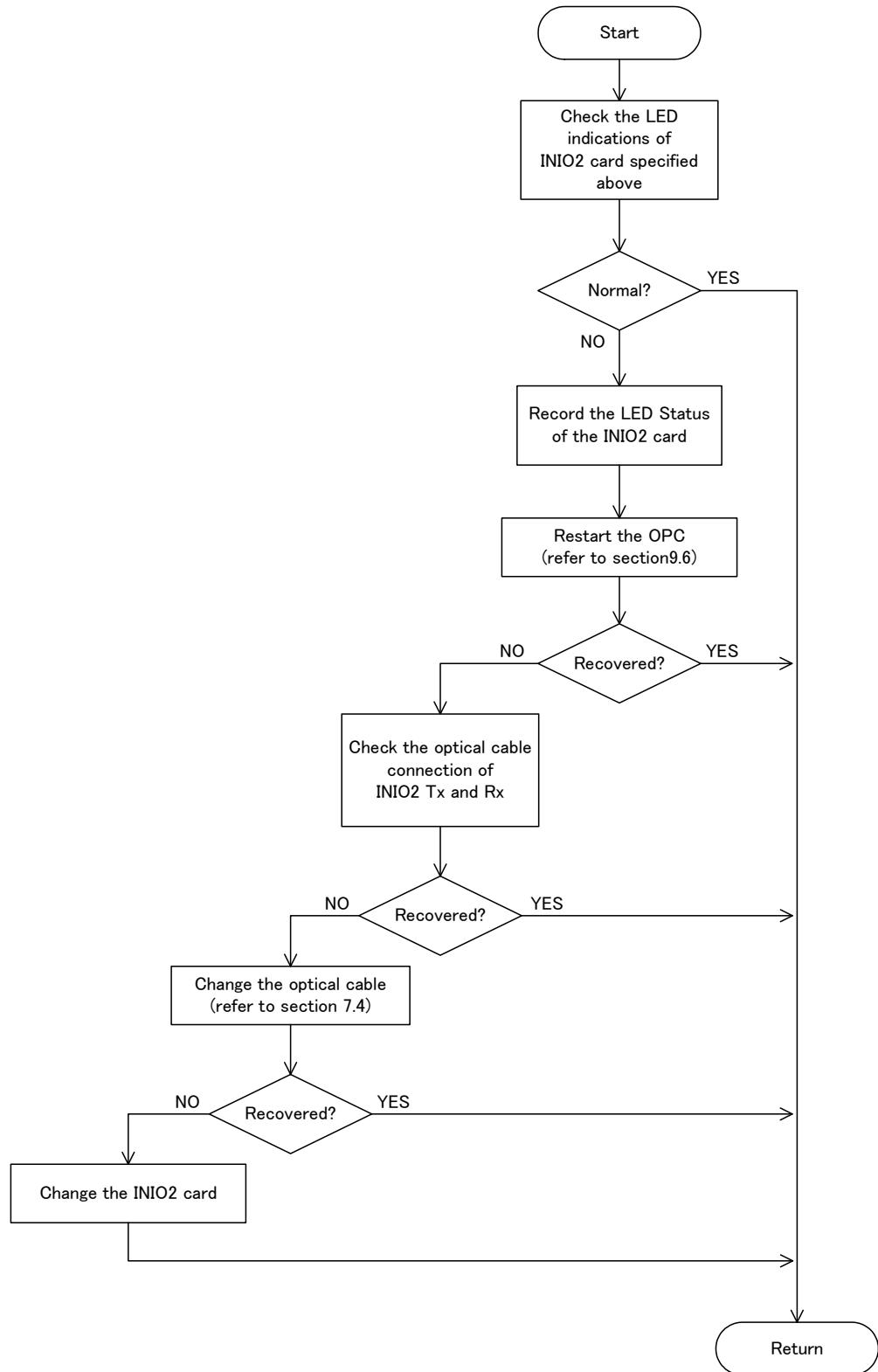


5.4 OPC (Operator Console)

5.4.1 INIO2 Card



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



6 Recovery Procedures

This section contains a series of flowcharts and figures that describe the procedures and possible solutions to recover from malfunction that occurred.

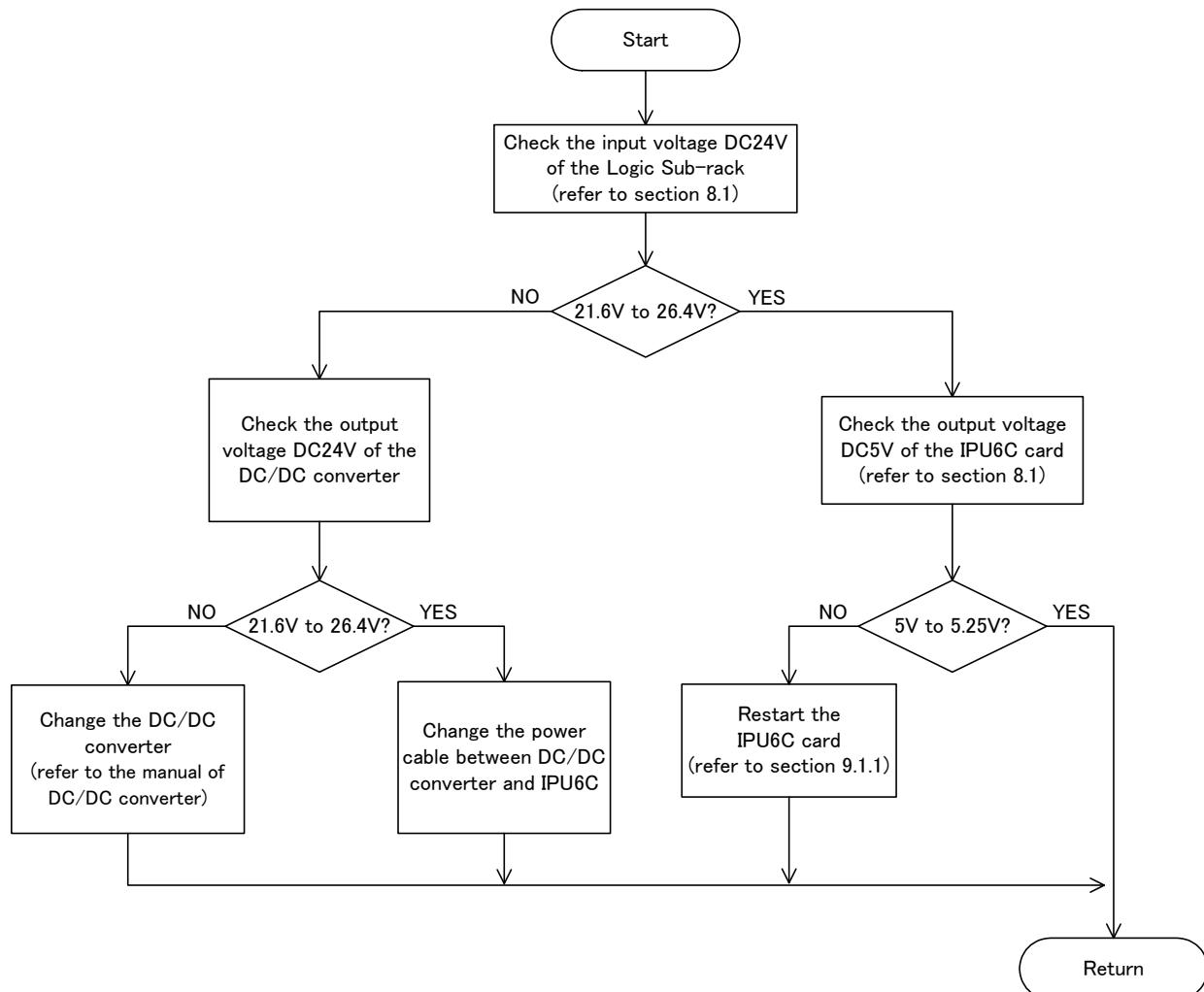
Unit replacement might be required to recover from malfunction. However, if spare parts are not available for replacement, skip and try to proceed to the next step to resolve the problem.

6.1 Logic Rack

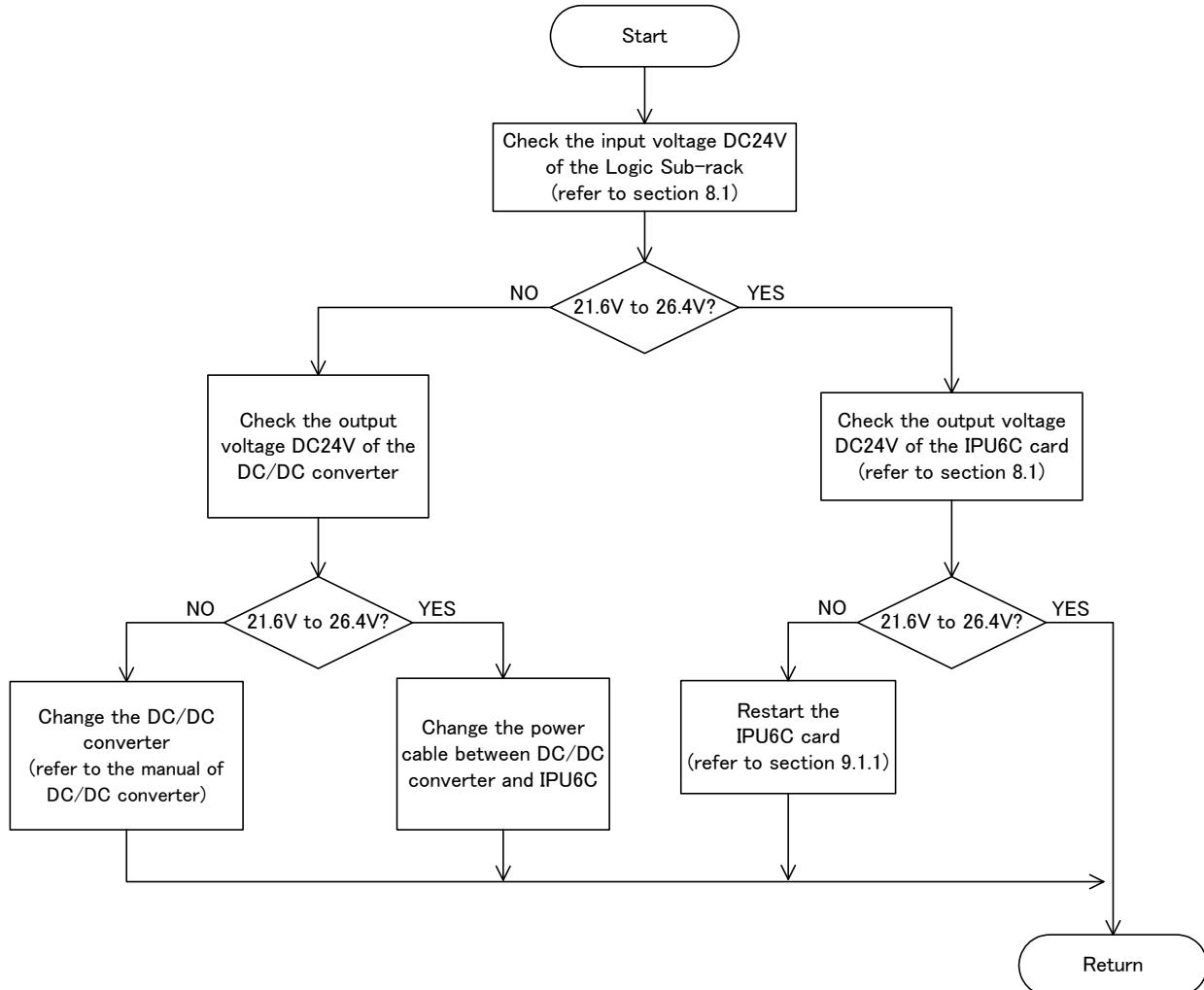
6.1.1 Logic Sub-rack

6.1.1.1 IPU6C

6.1.1.1.1 DC24/DC5

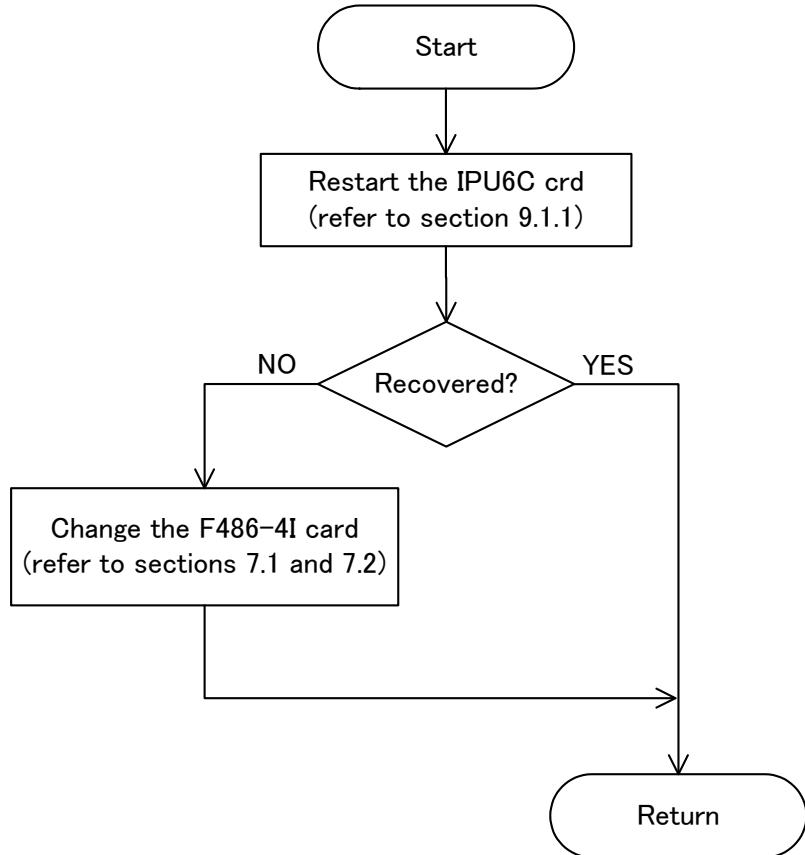


6.1.1.1.2 DC24/DC24

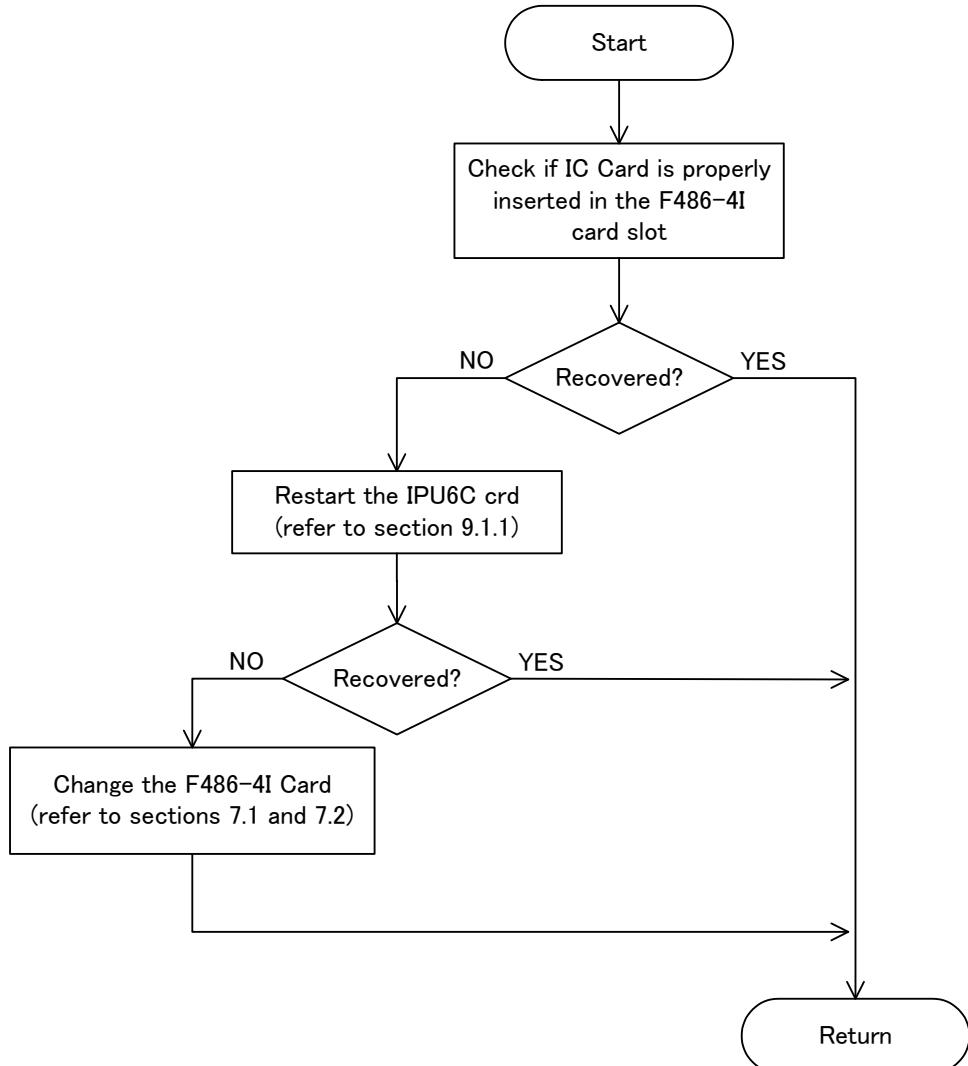


6.1.1.2 F486-4I and DID

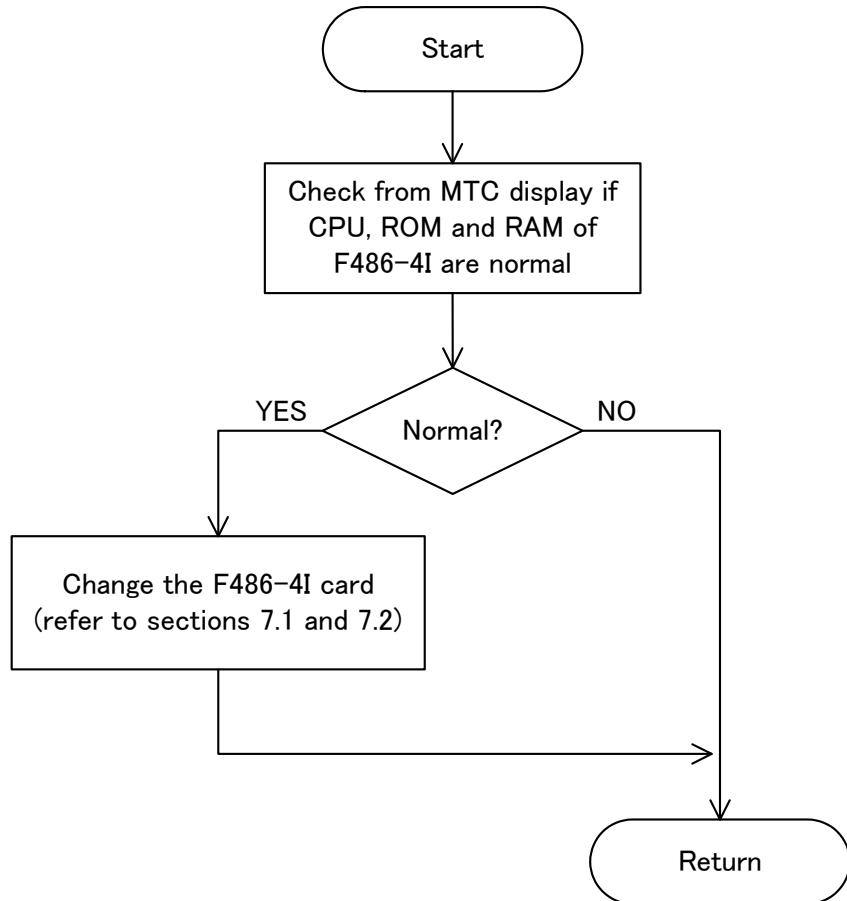
6.1.1.2.1 CPU, ROM, RAM



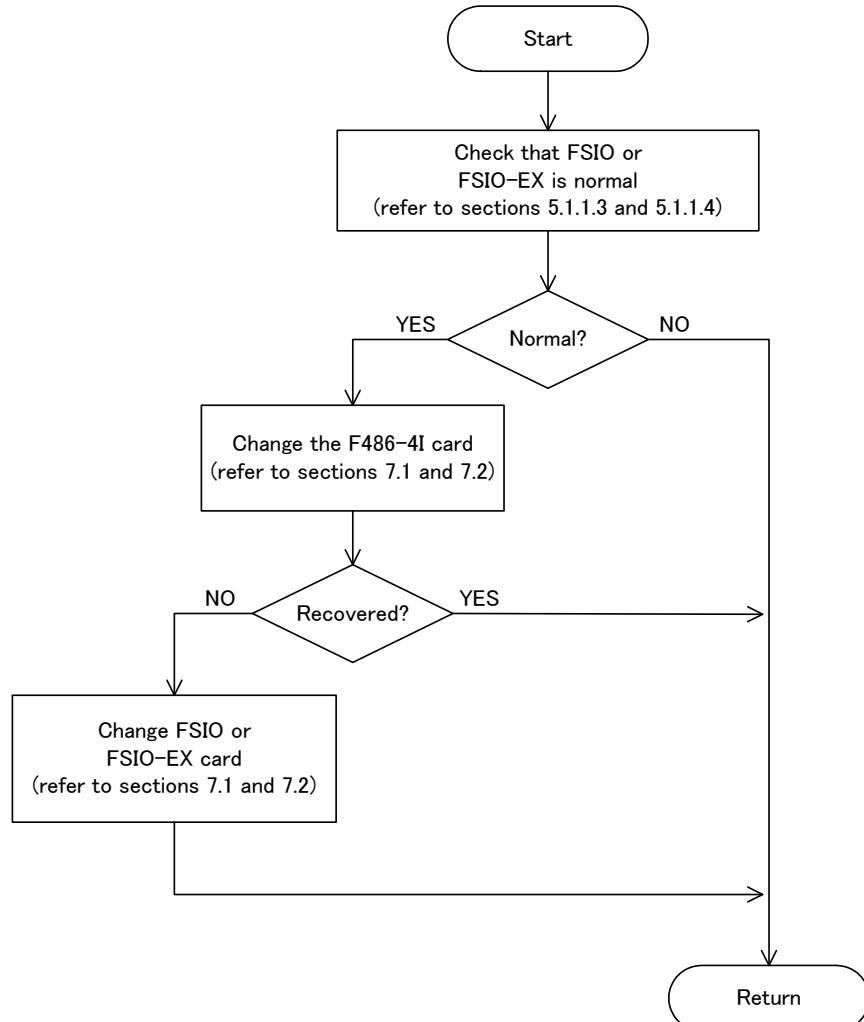
6.1.1.2.2 IC CARD



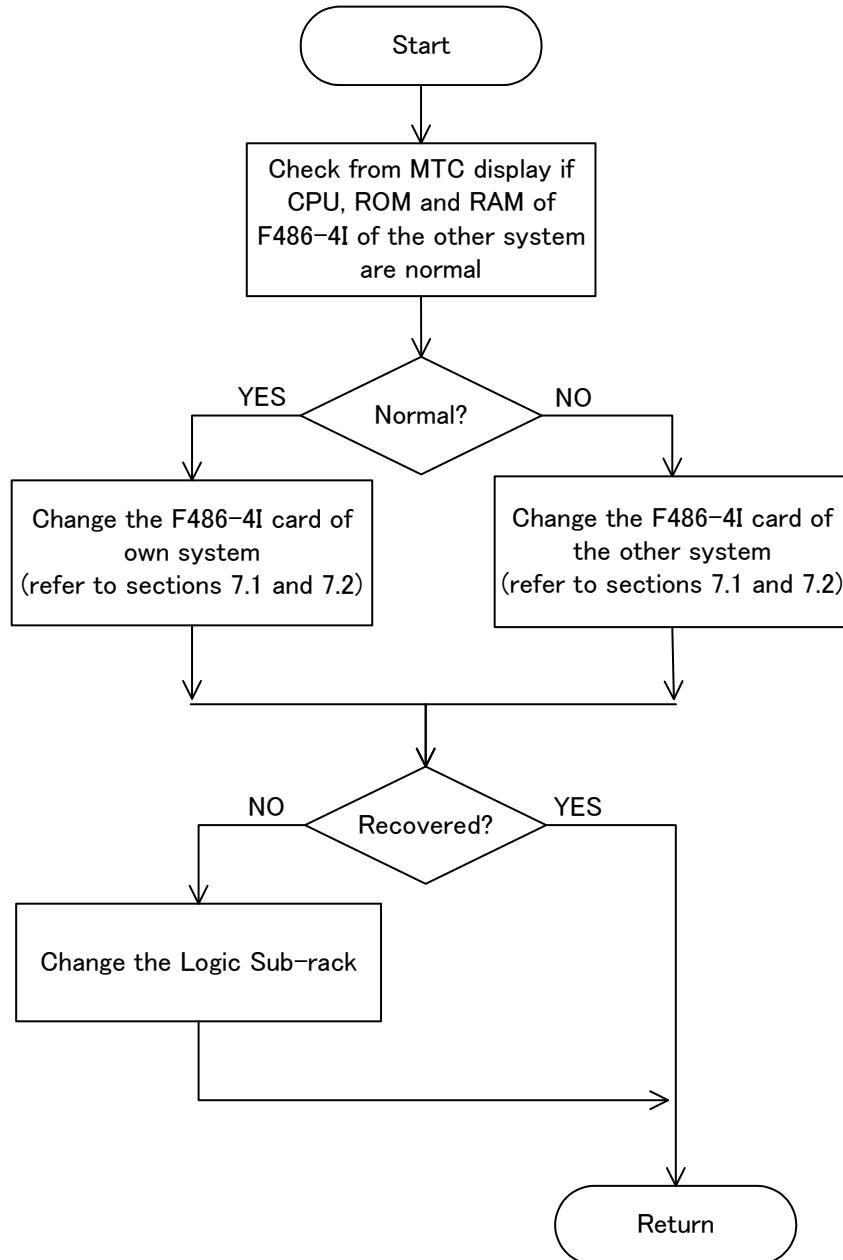
6.1.1.2.3 Ctrl Data Tx



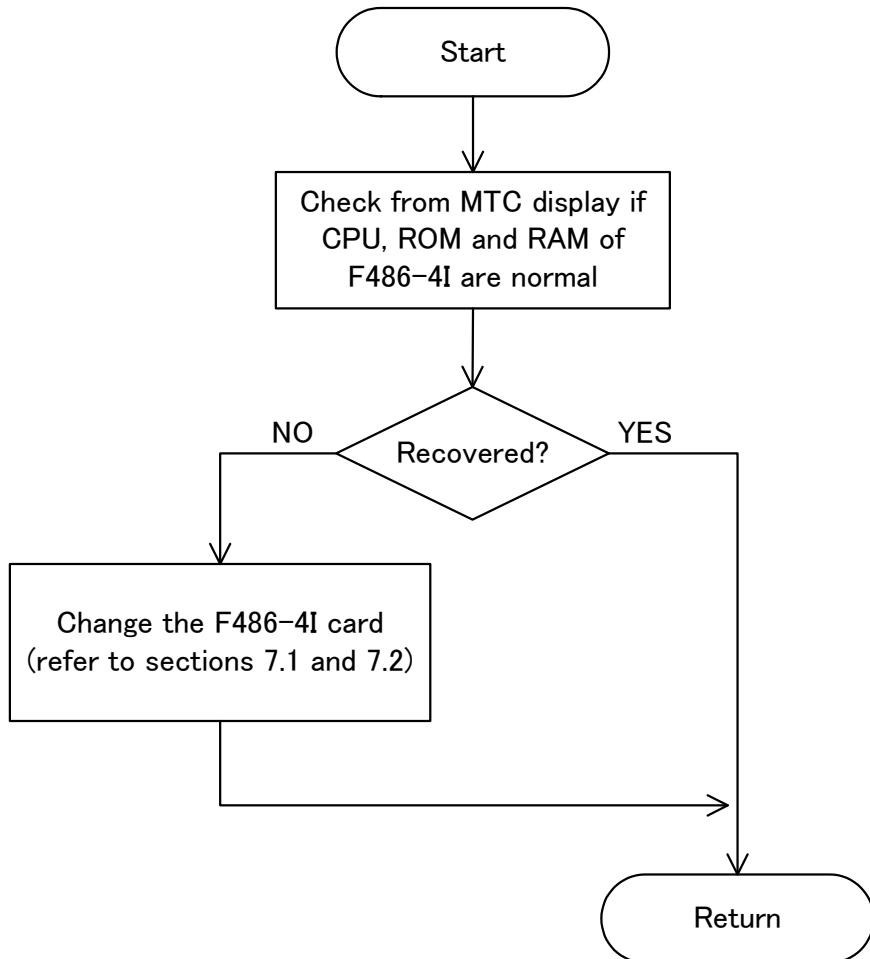
6.1.1.2.4 Indic. Data Tx



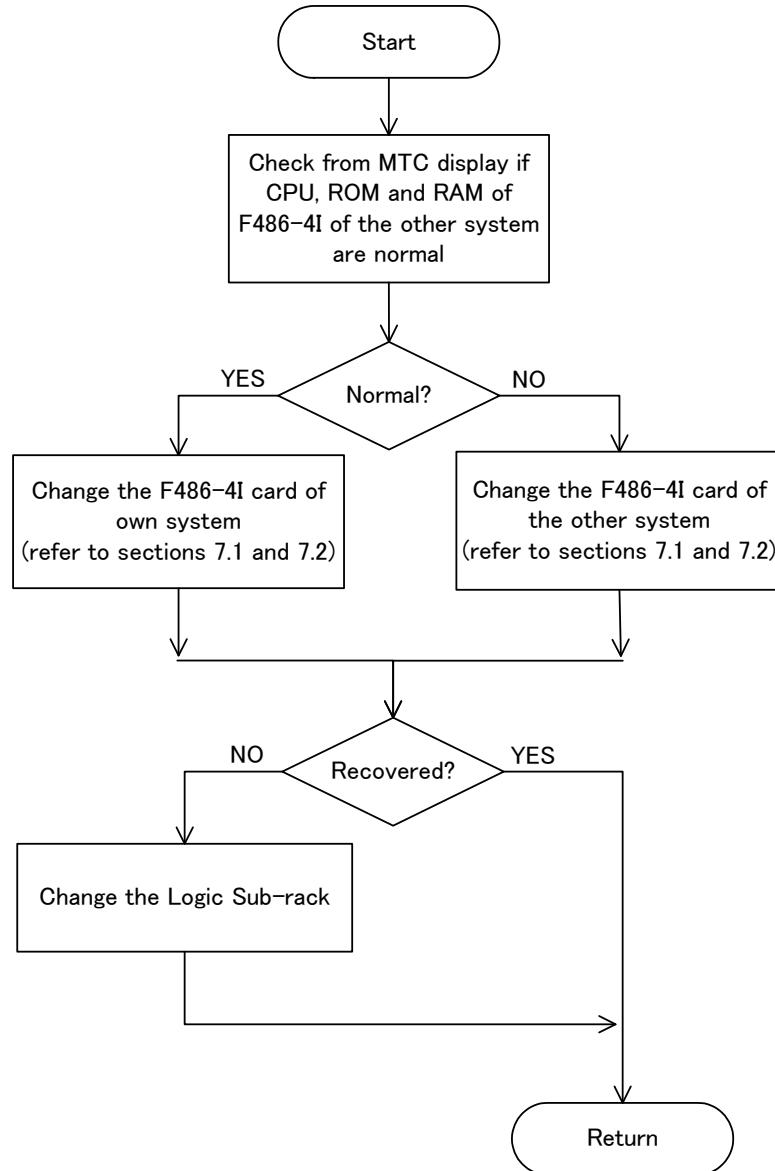
6.1.1.2.5 Inter-sys Tx/Rx Rx



6.1.1.2.6 Inter-sys Tx/Rx Tx

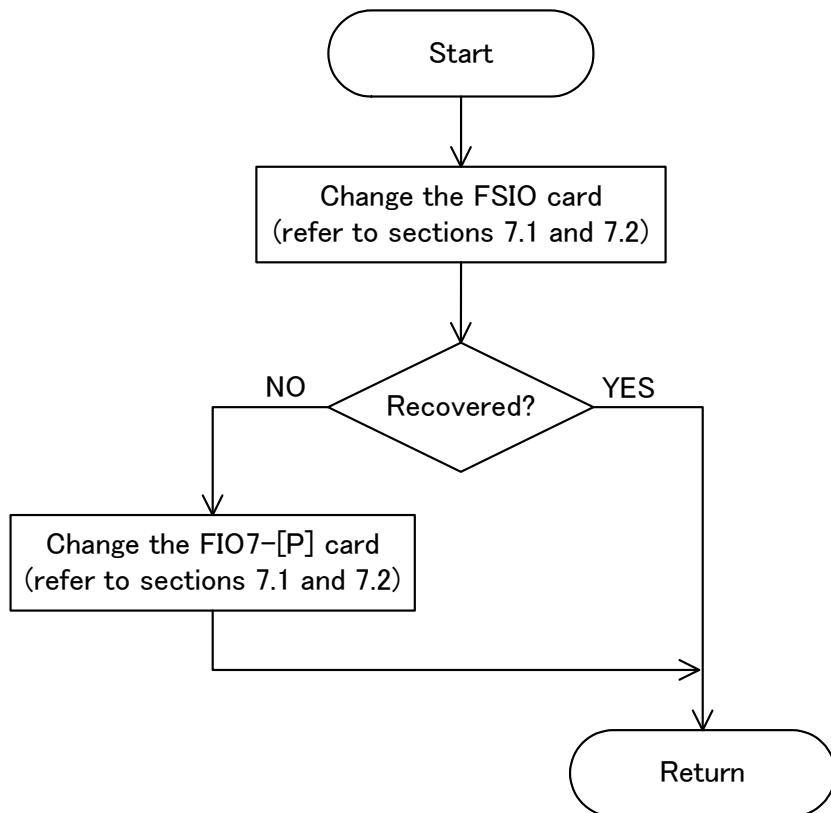


6.1.1.2.7 DID

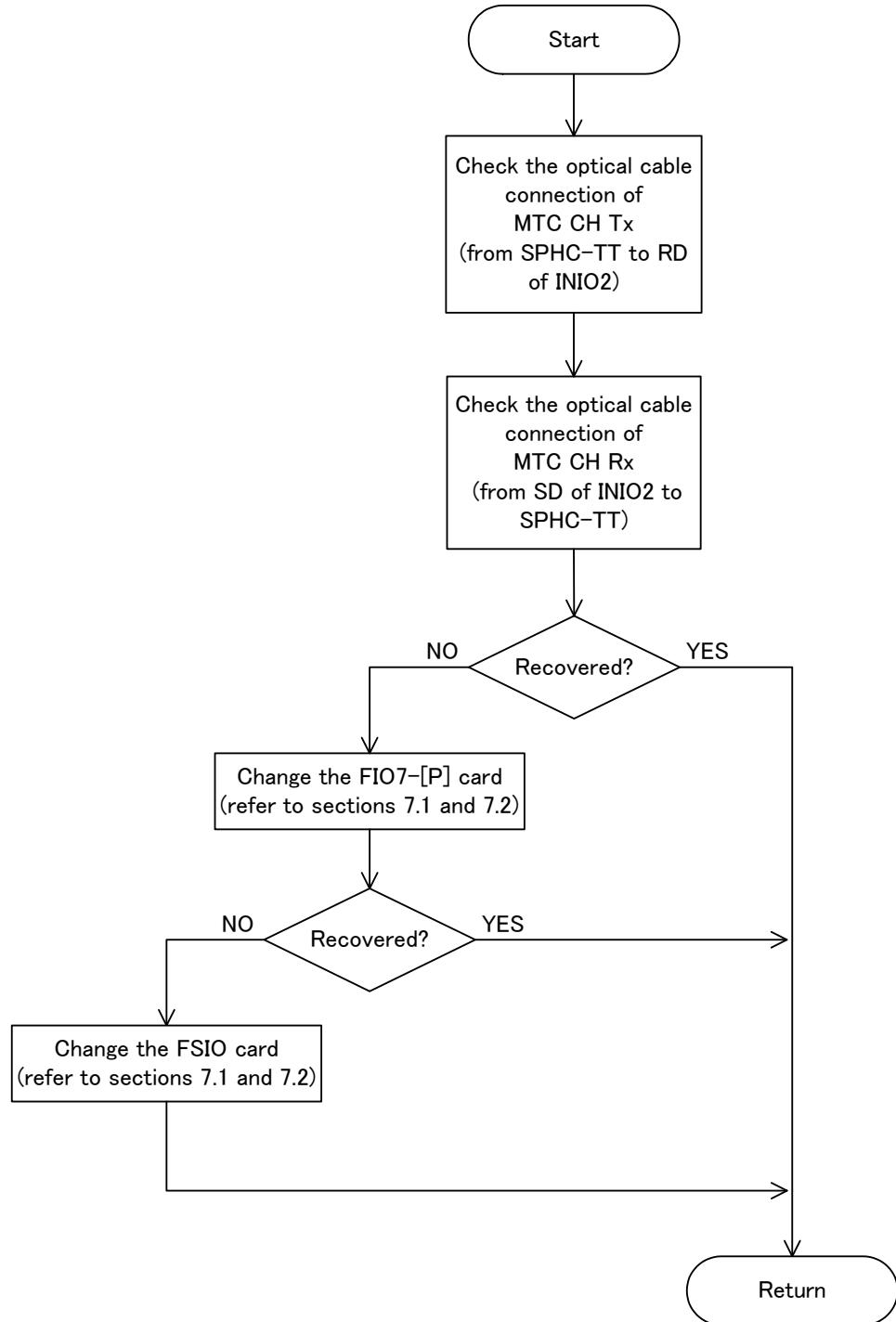


6.1.1.3 FSIO and FIO7-[P]

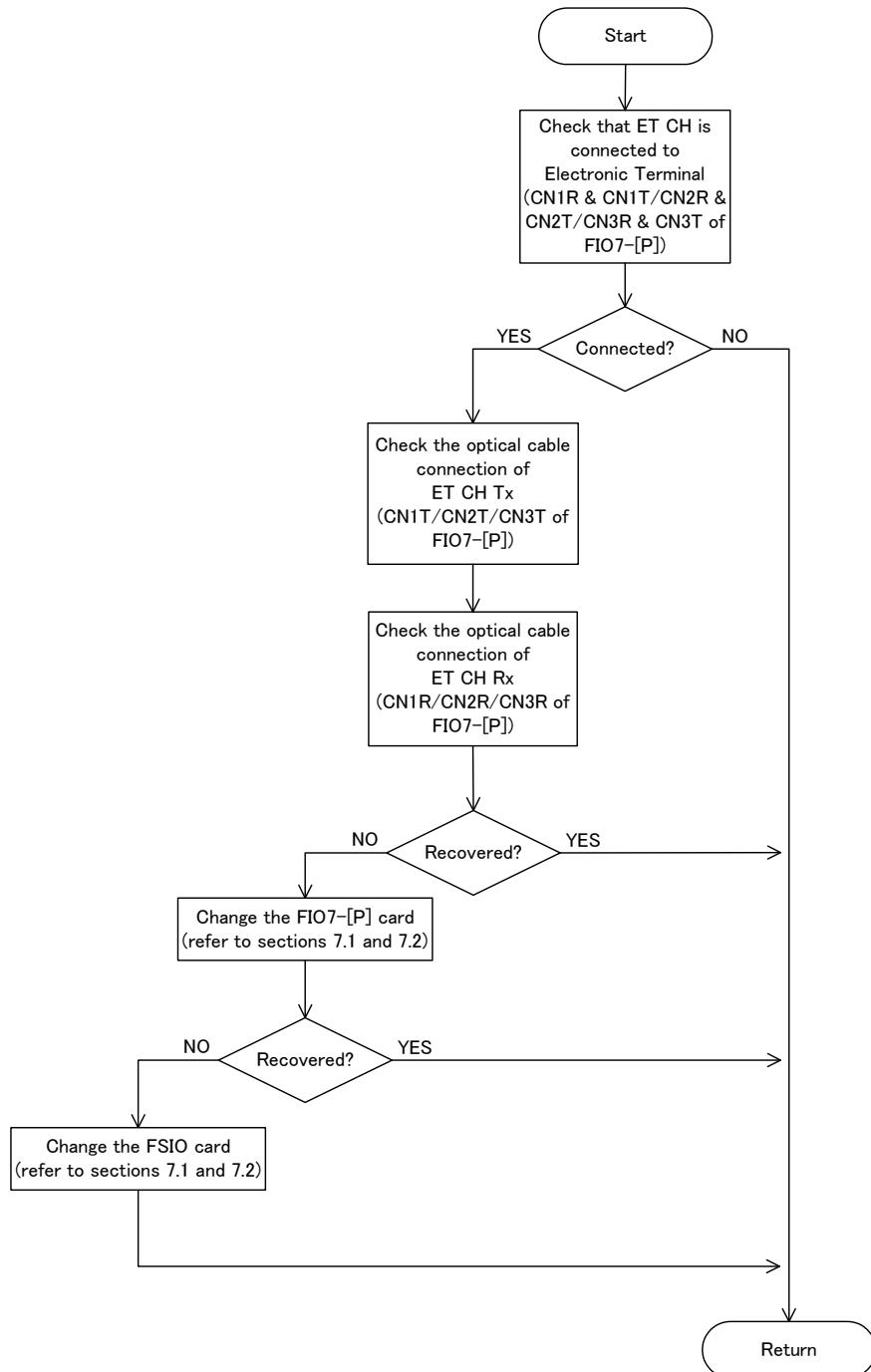
6.1.1.3.1 Ctrl Data Rx, Indic. Data Tx, MTC CH Tx, ET CH1 Tx, ET CH2 Tx, ET CH3 Tx



6.1.1.3.2 MTC CH Rx

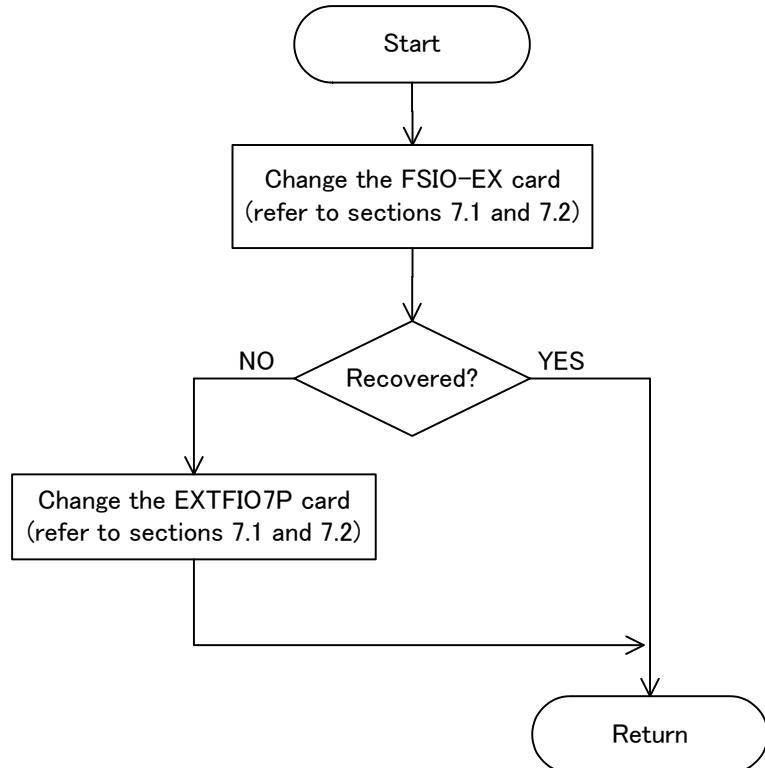


6.1.1.3.3 ET CH1/CH2/CH3 Rx

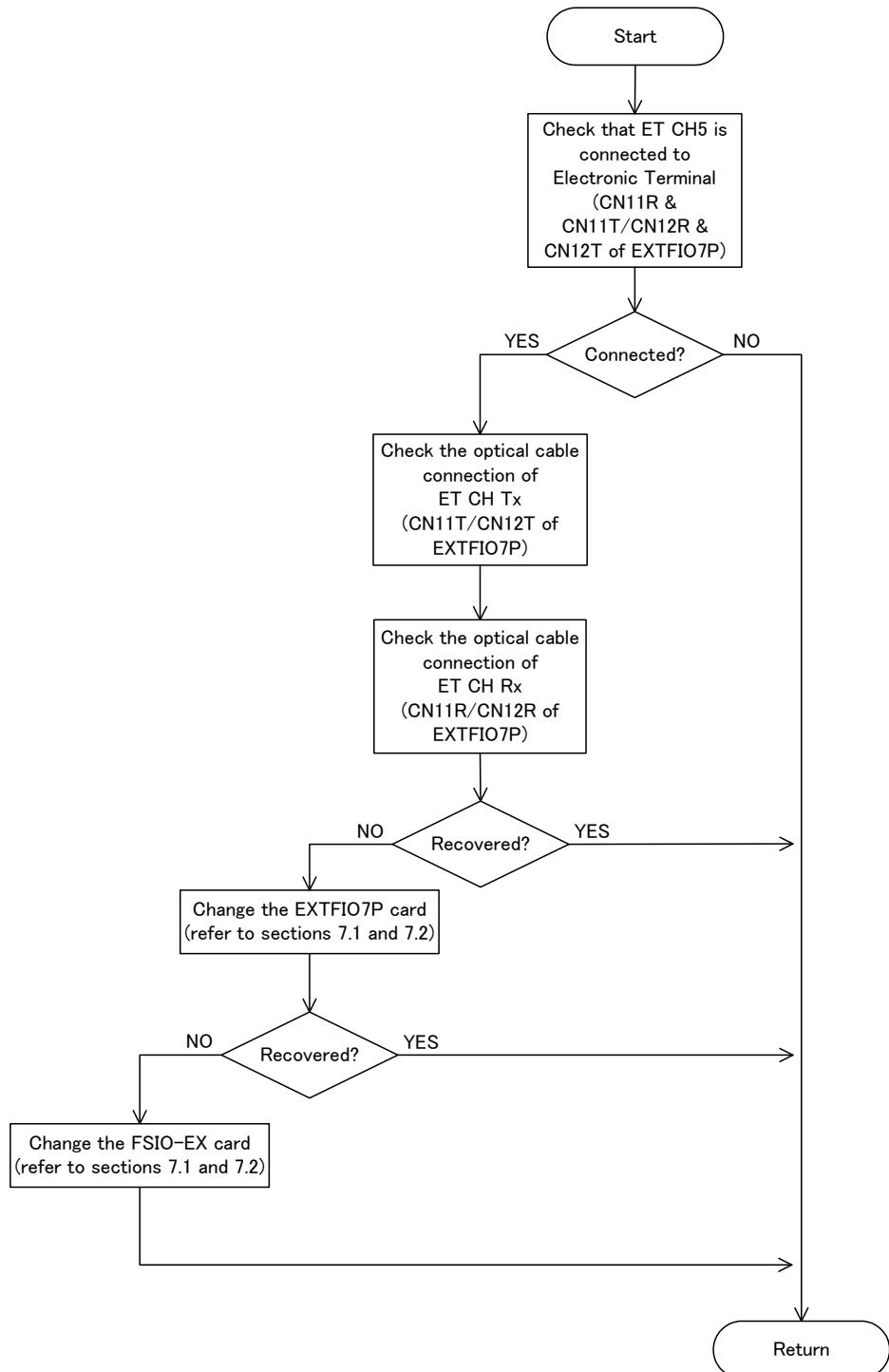


6.1.1.4 FSIO-EX and EXTFIO7P

6.1.1.4.1 Ctrl Data Rx, Indic. Data Tx, ET CH4 Tx, ET CH5 Tx



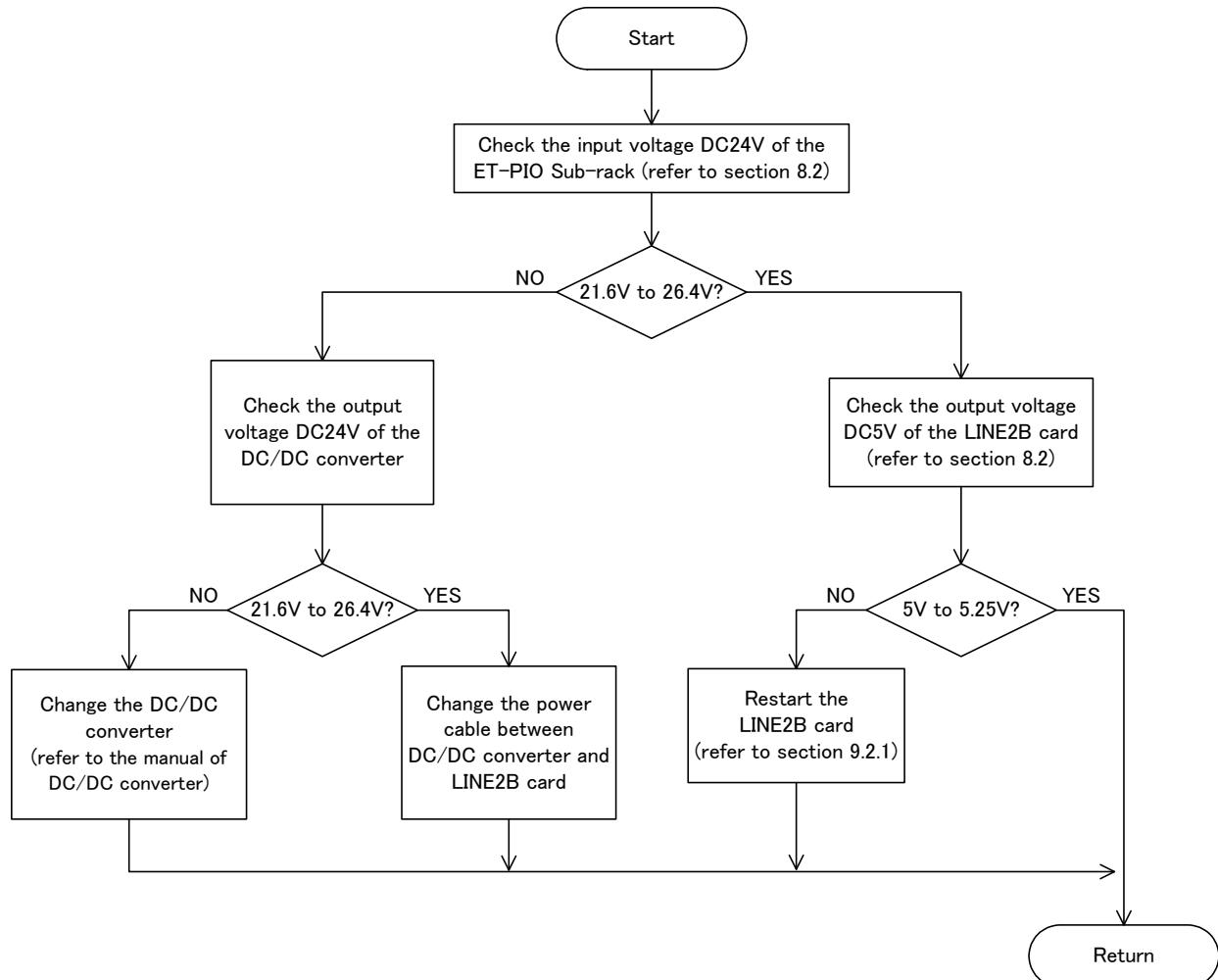
6.1.1.4.2 ET CH4/CH5 Rx



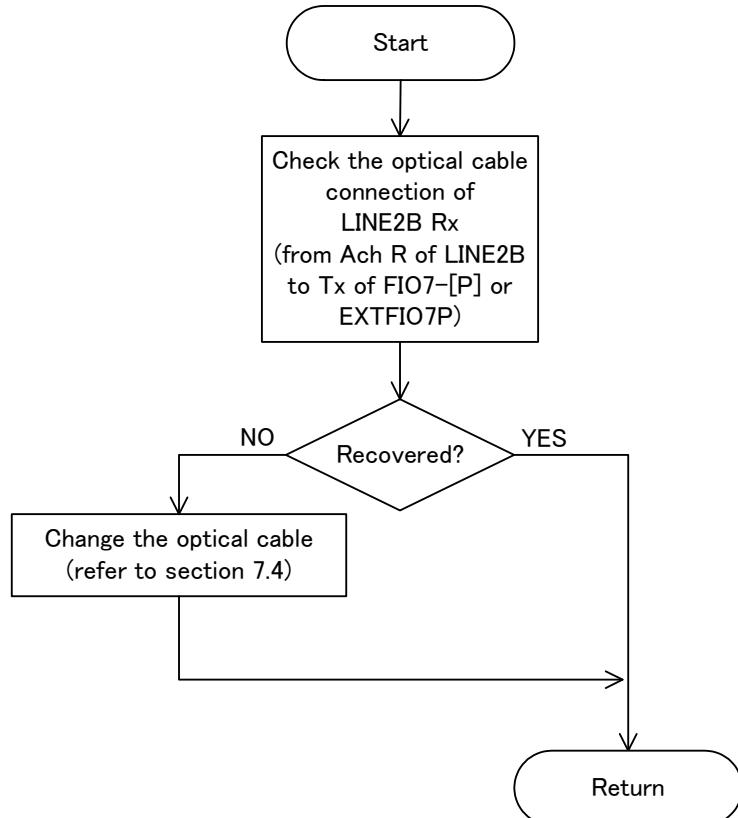
6.1.2 ET-PIO Sub-rack

6.1.2.1 LINE2B

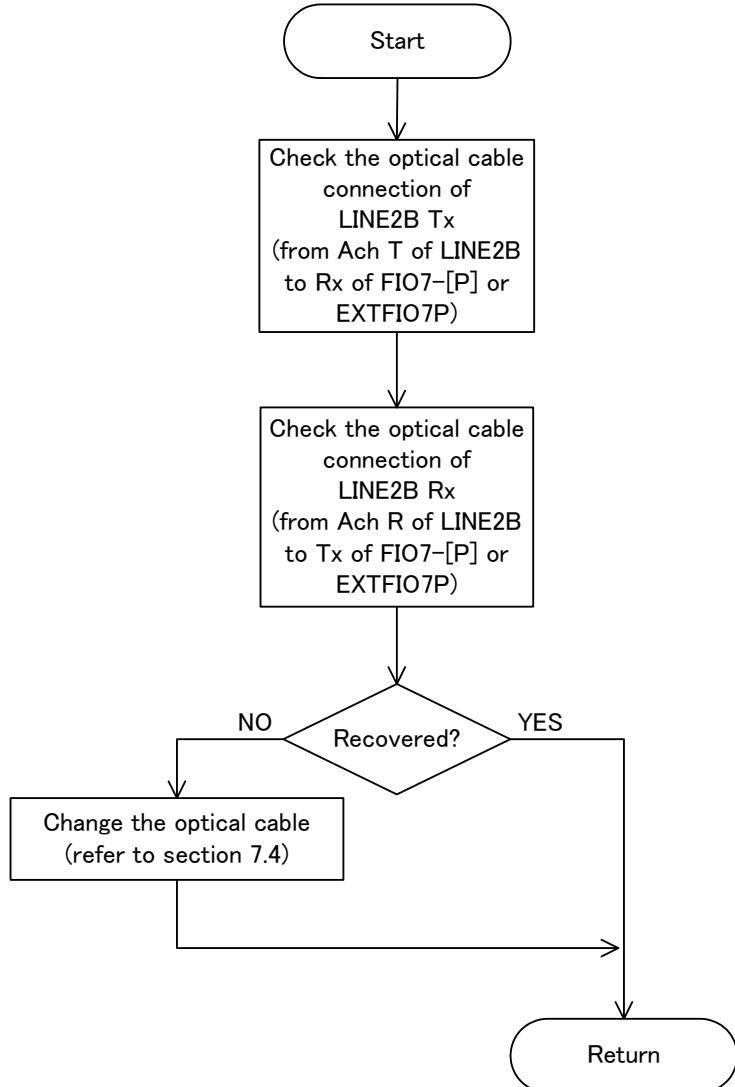
6.1.2.1.1 DC24/DC5



6.1.2.1.2 ET Ctrl Data OE conversion

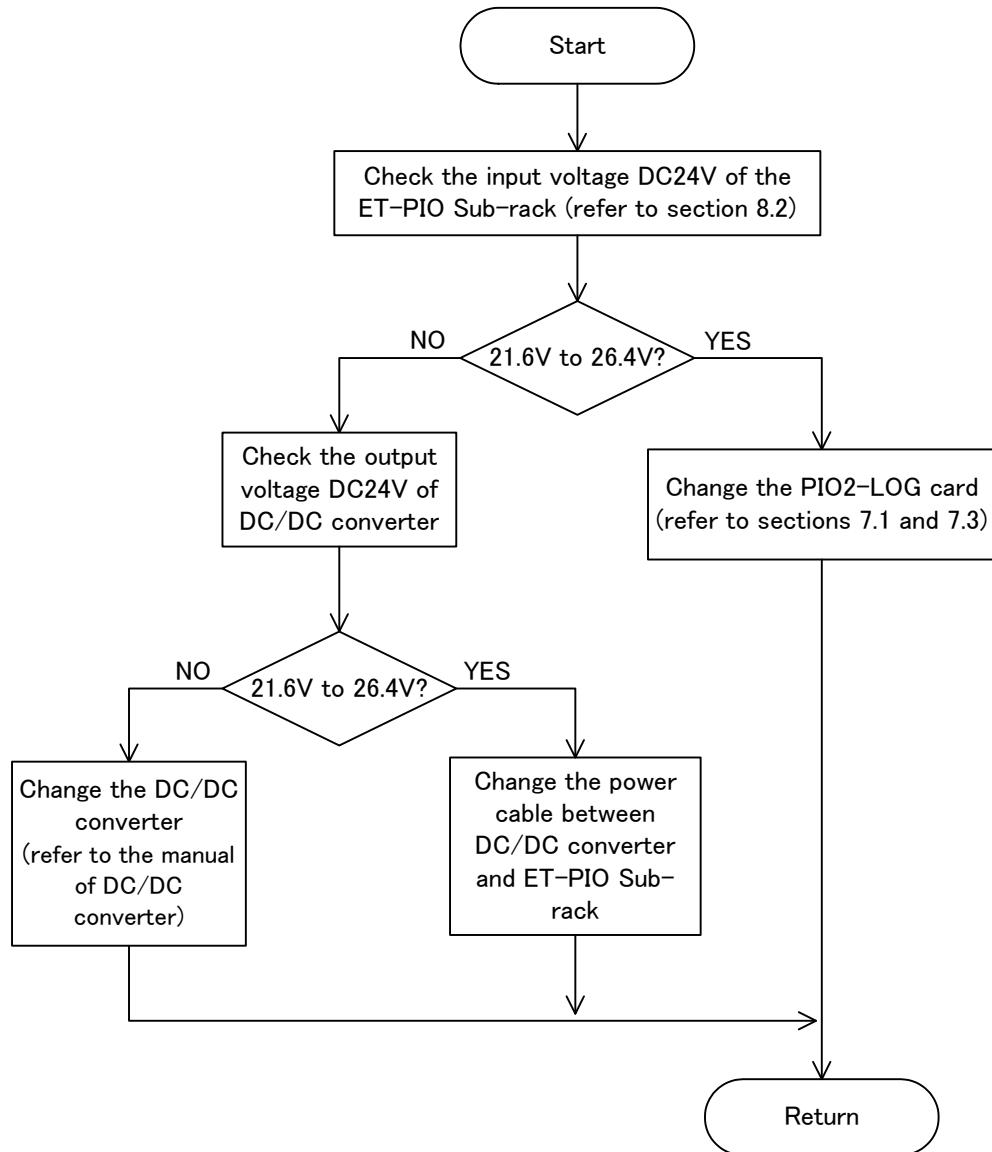


6.1.2.1.3 ET Indic. Data EO conversion

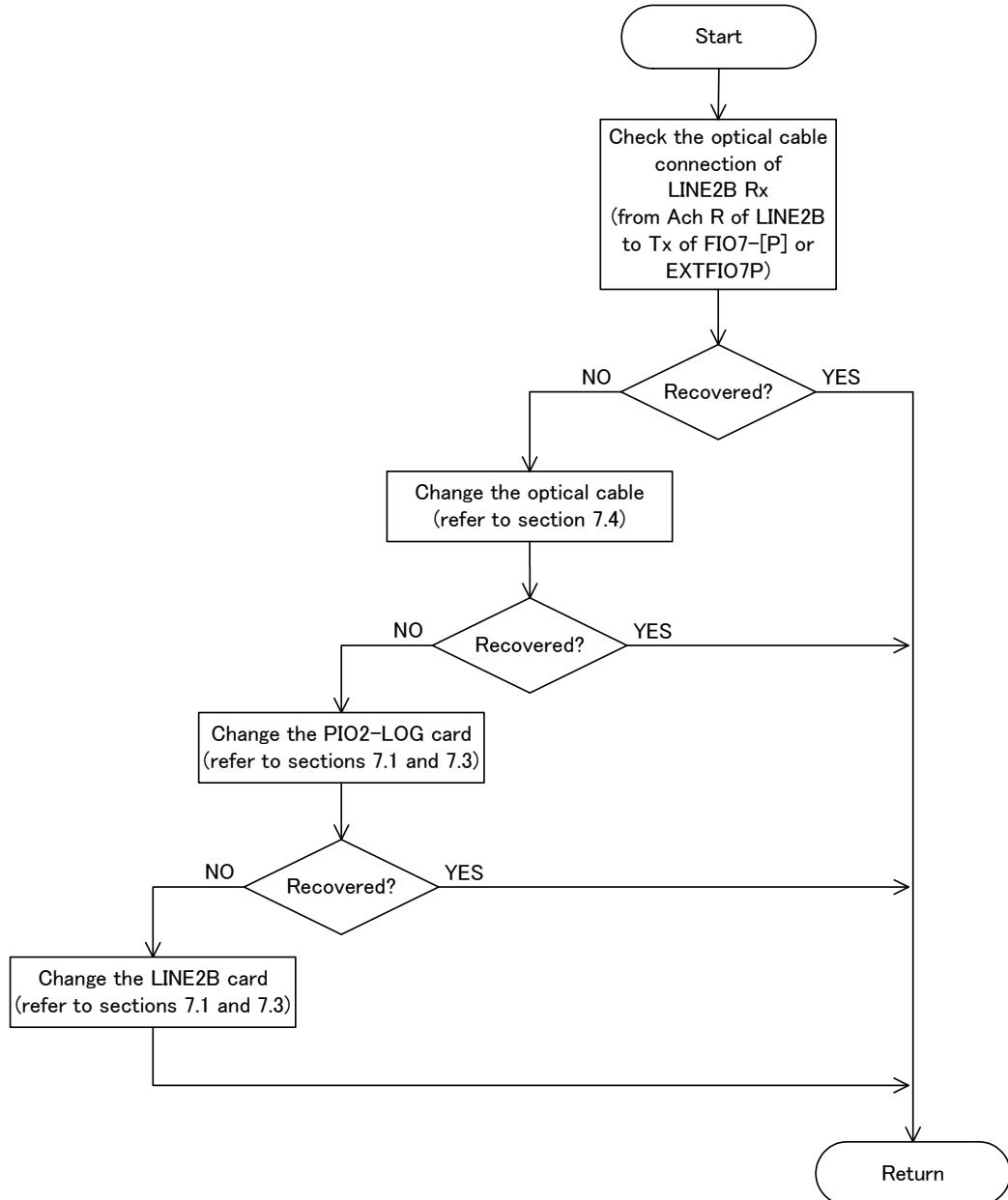


6.1.2.2 ET-PIO2

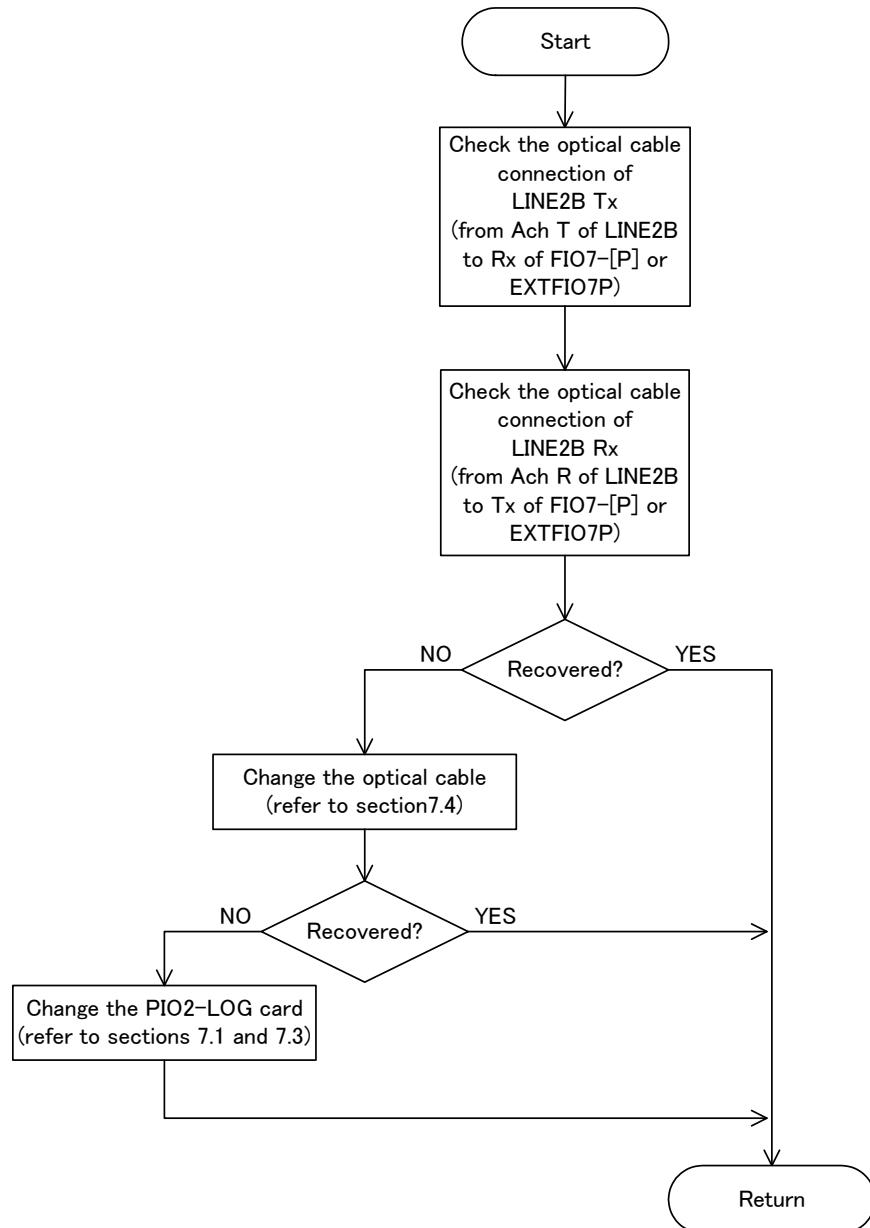
6.1.2.2.1 DC24/DC5



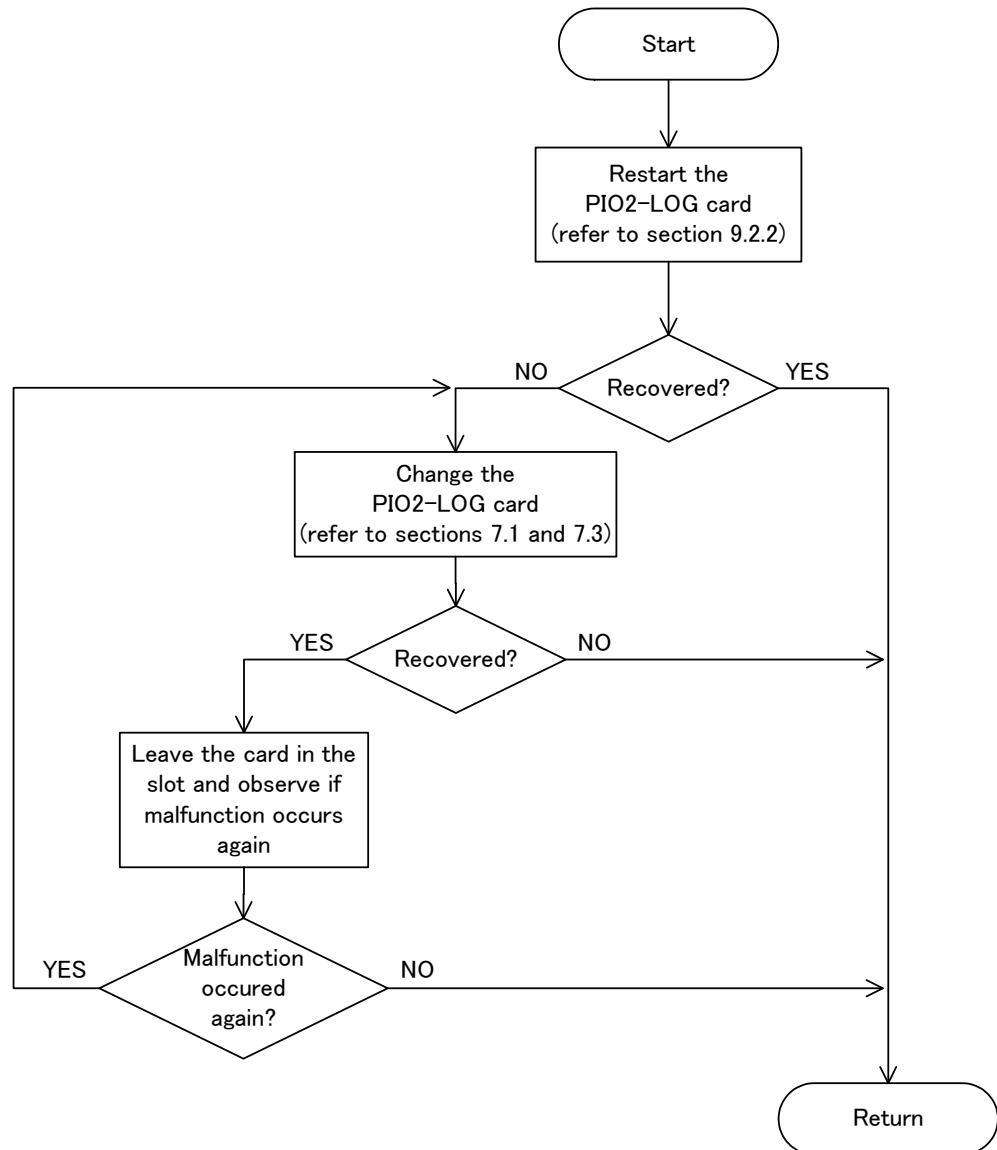
6.1.2.2.2 ET Ctrl Data Rx



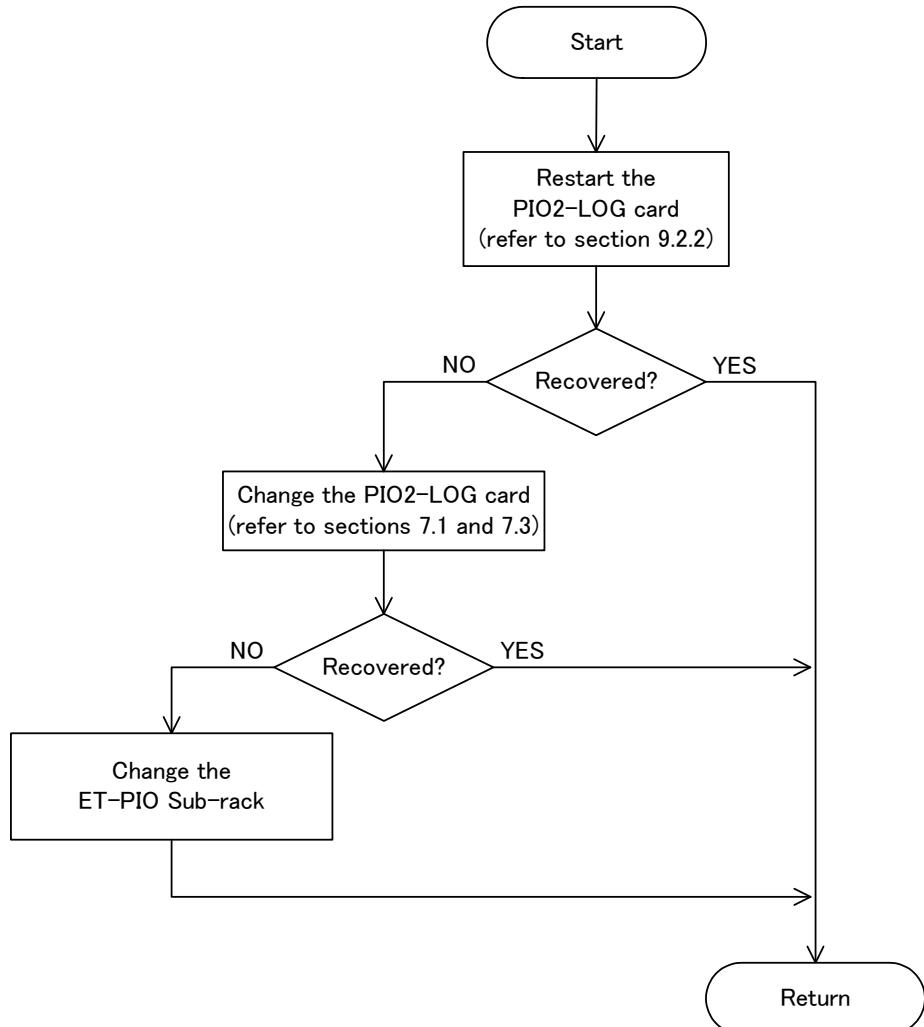
6.1.2.2.3 ET Indic. Data Rx



6.1.2.2.4 I/O Port

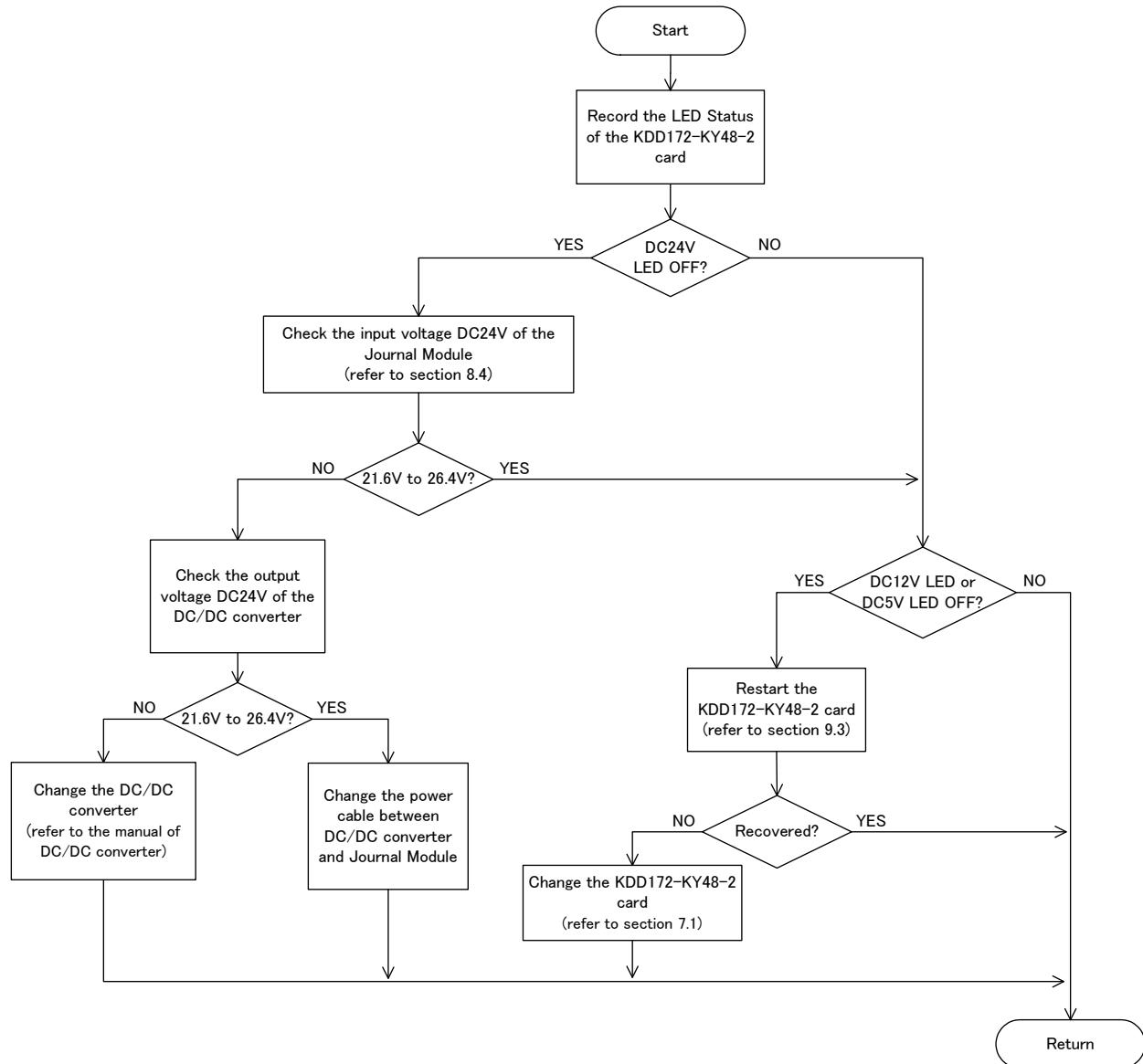


6.1.2.2.5 PIO2 ID Check

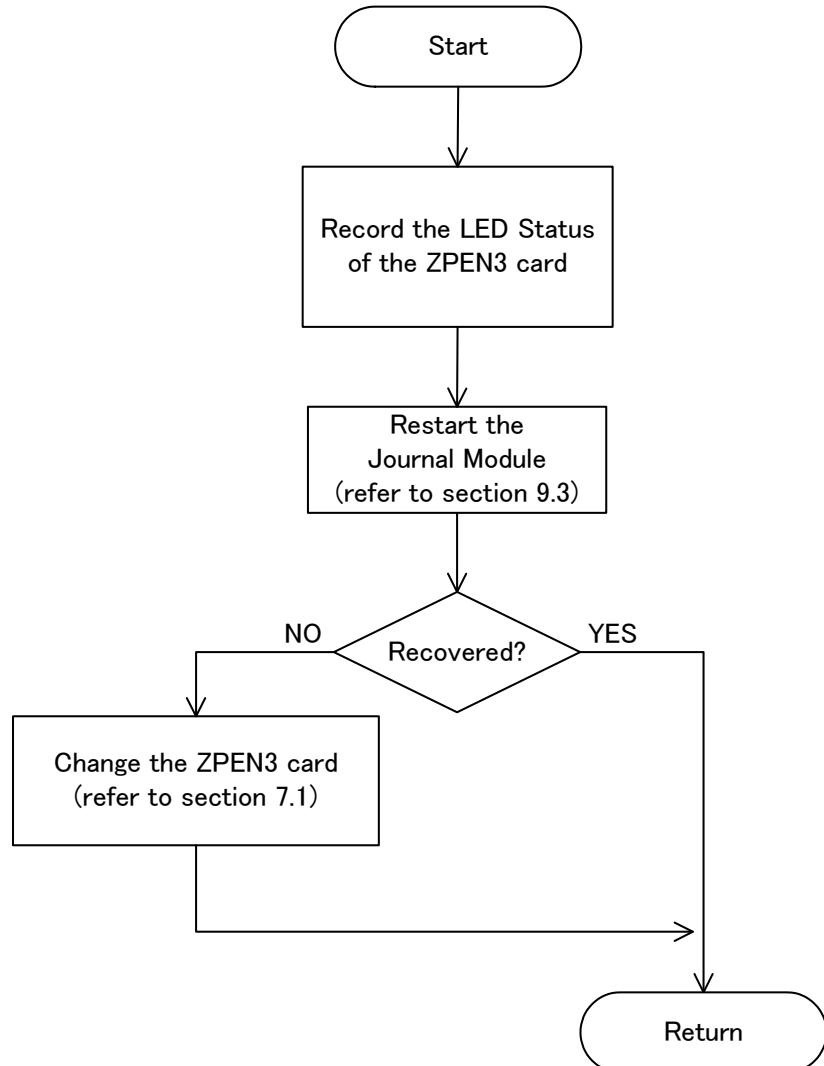


6.1.3 Journal Module

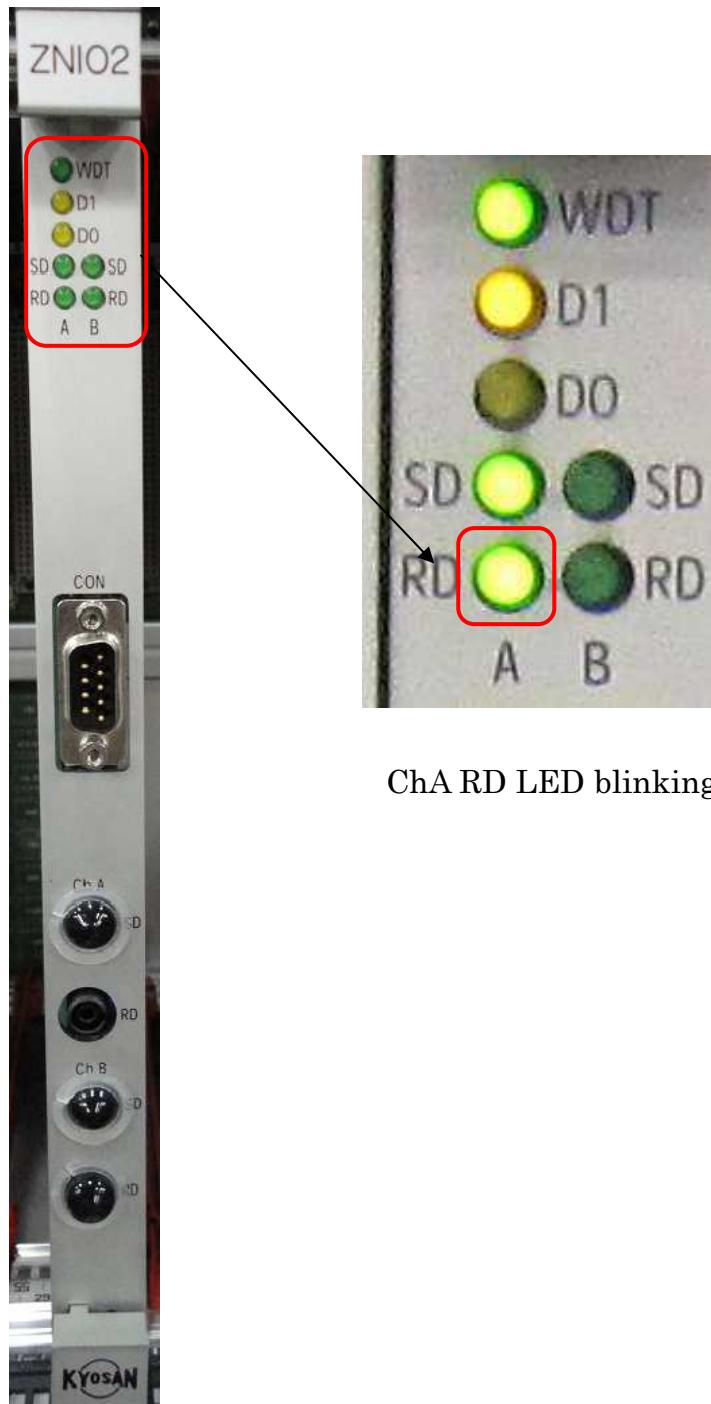
6.1.3.1 KDD172-KY48-2



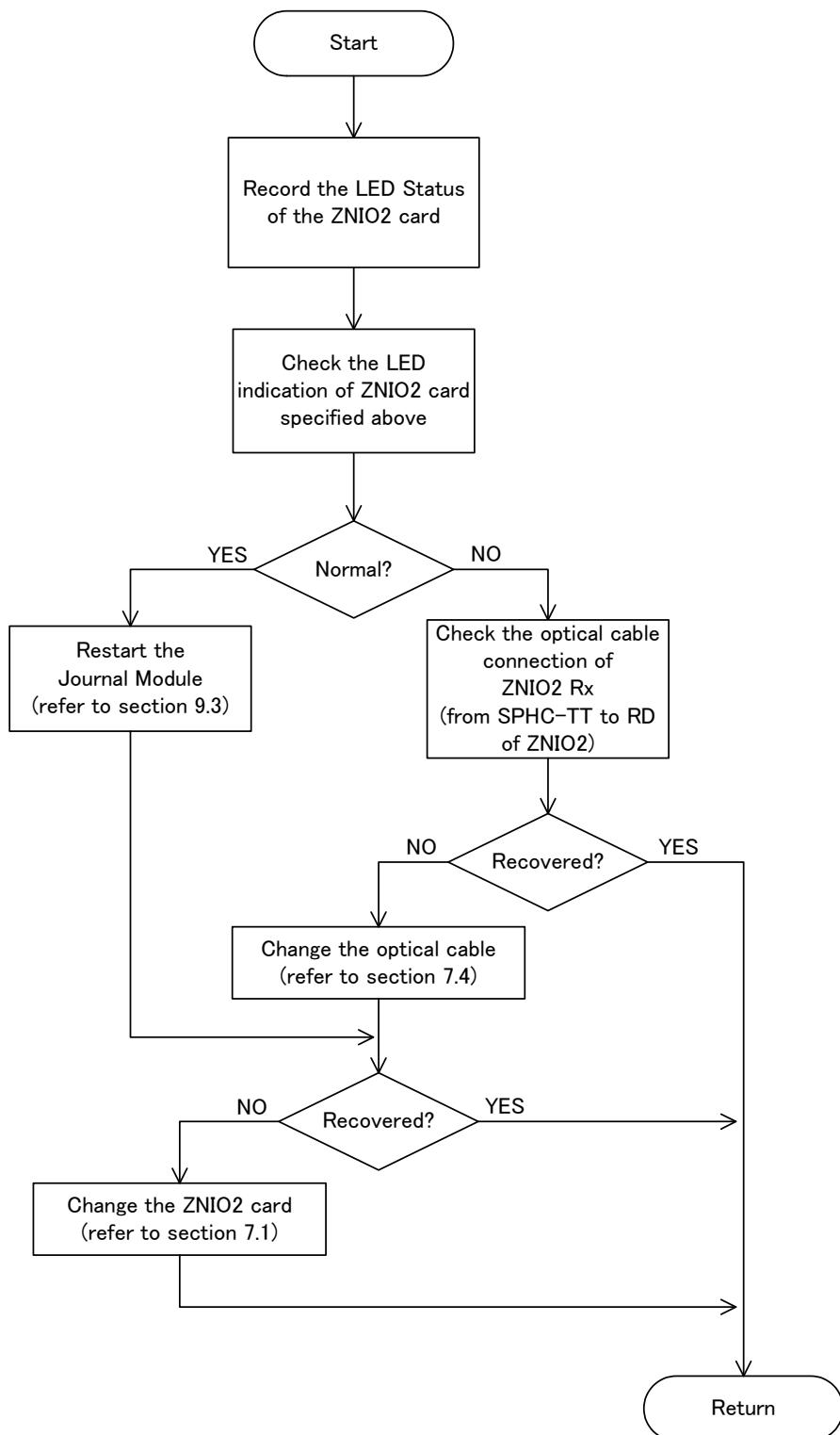
6.1.3.2 ZPEN3



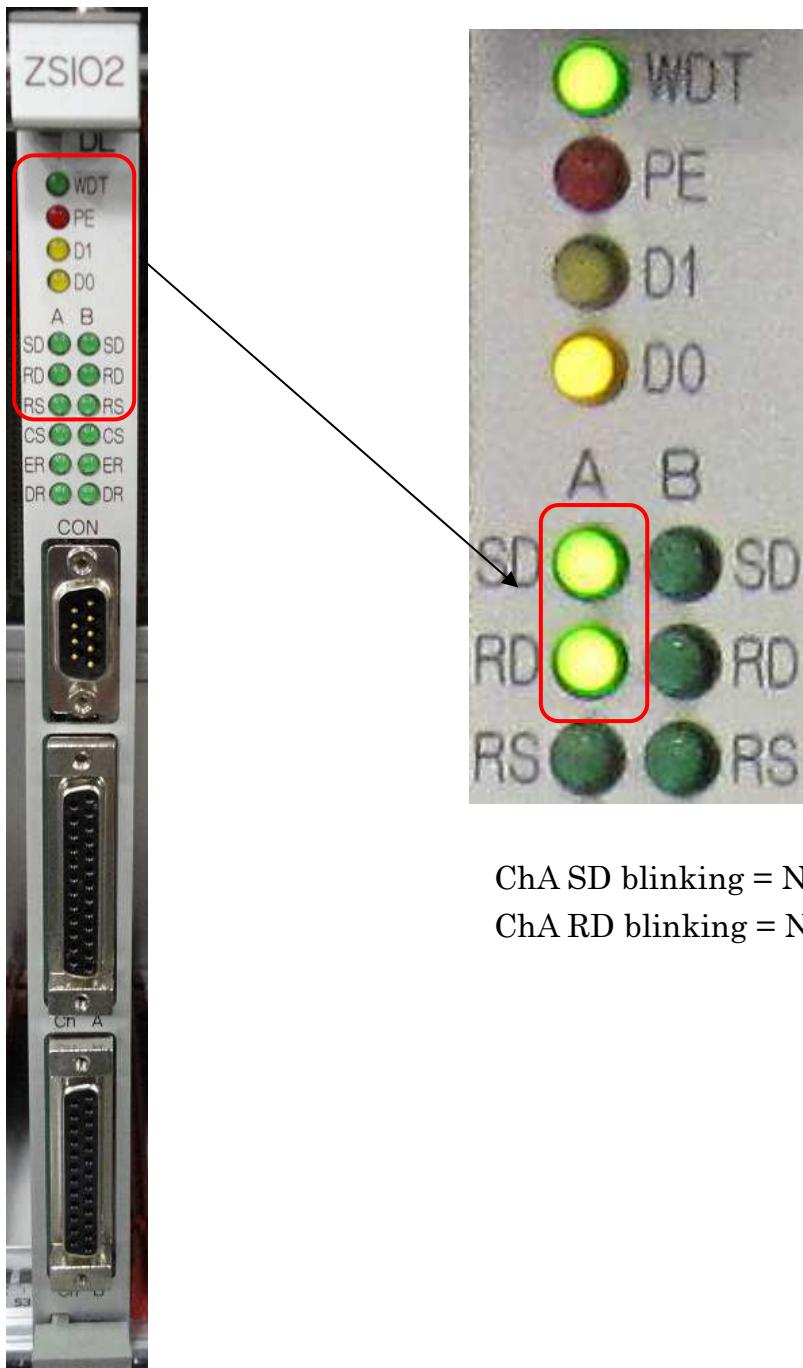
6.1.3.3 ZNIO2



ChA RD LED blinking = Normal

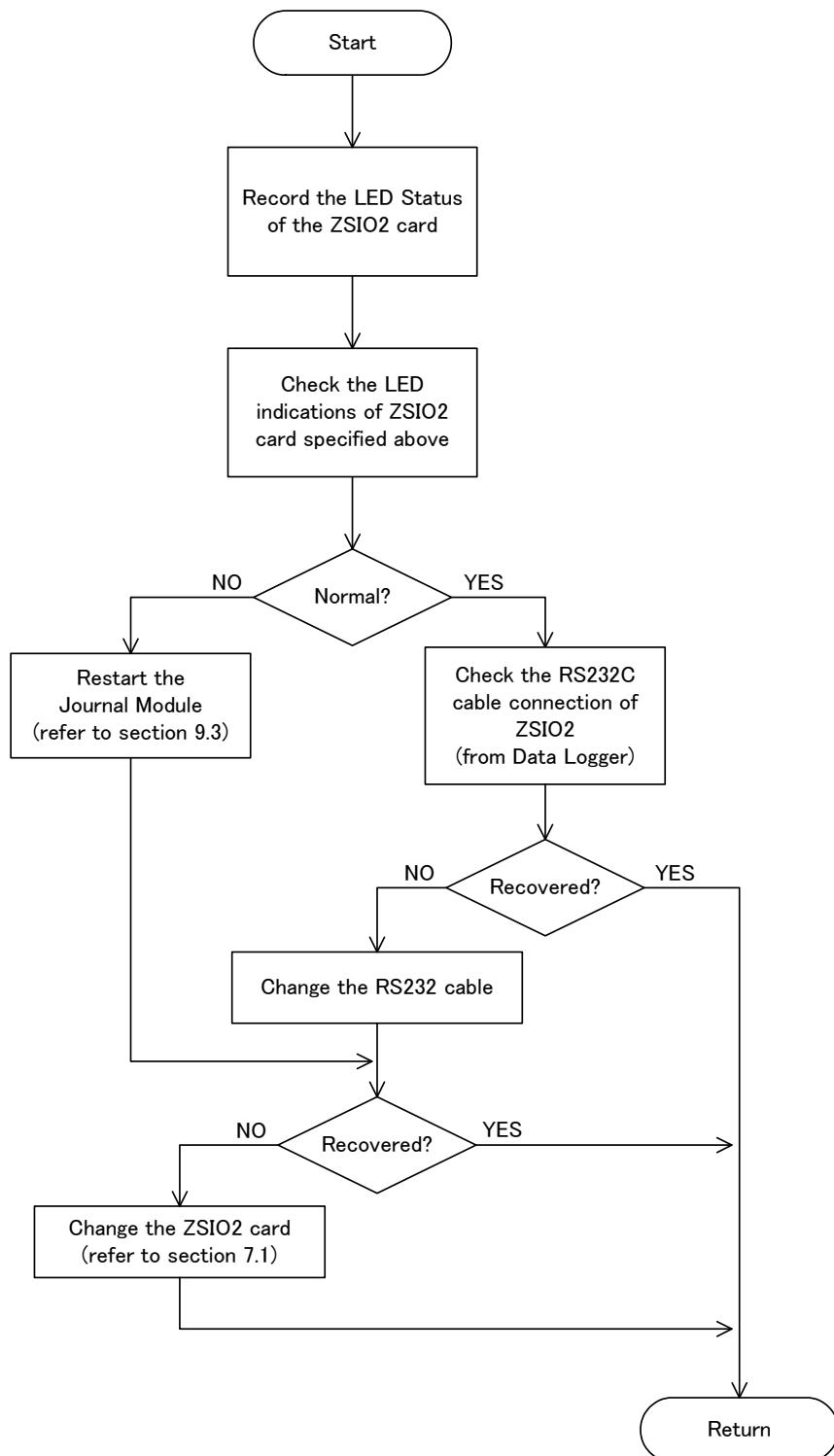


6.1.3.4 ZSIO2

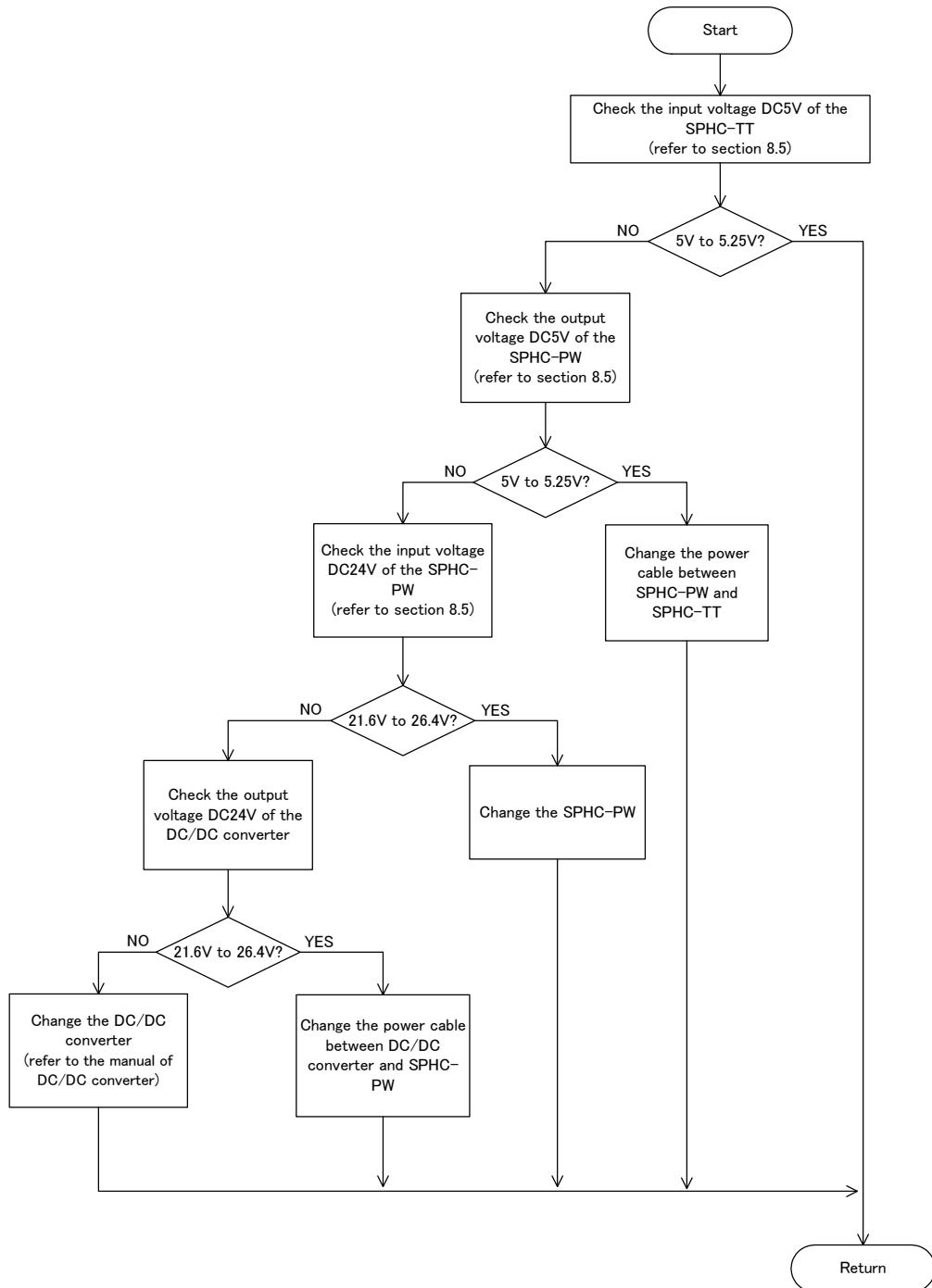


ChA SD blinking = Normal

ChA RD blinking = Normal



6.1.3.5 SPHC-TT

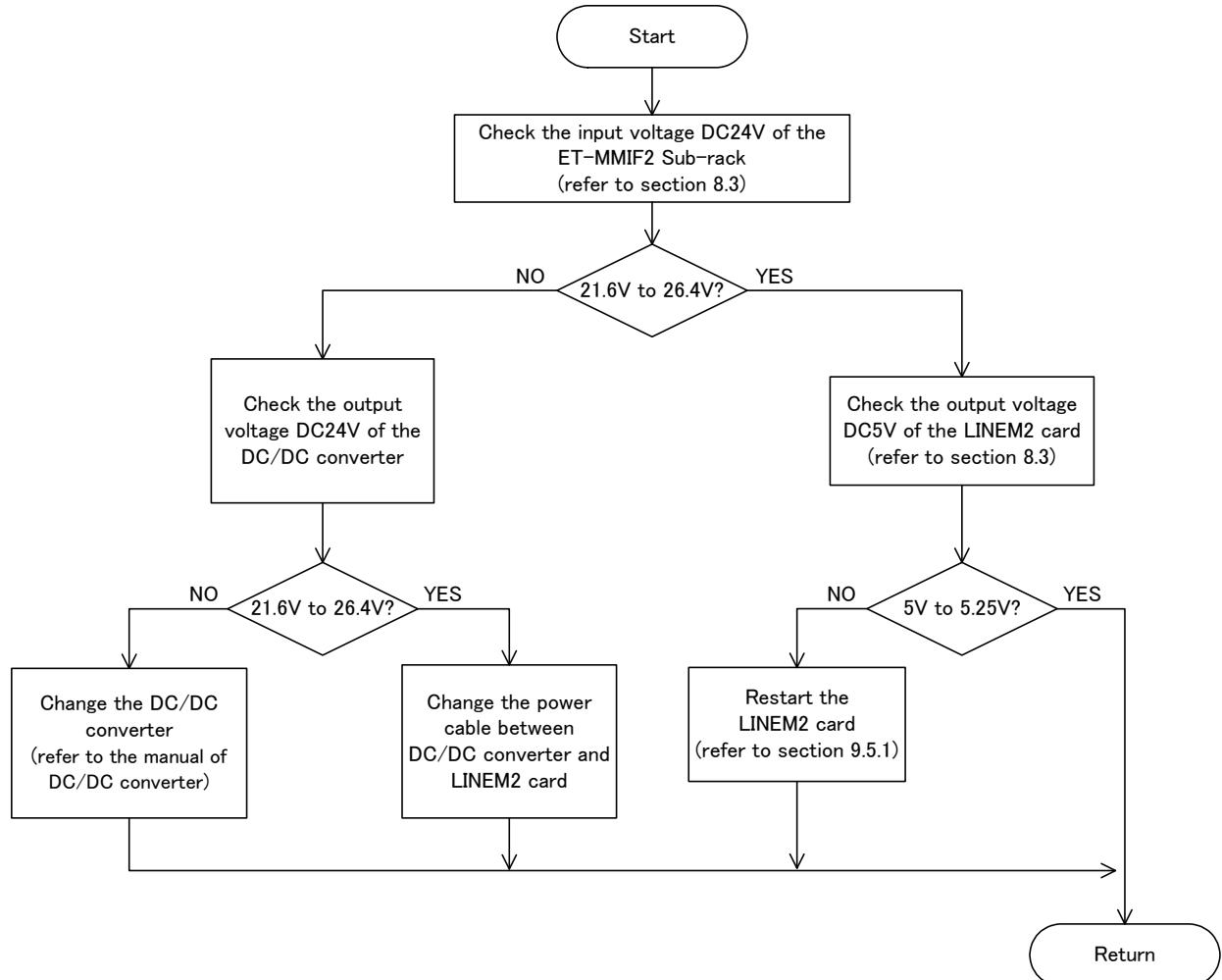


6.2 CCIP (Control Panel)

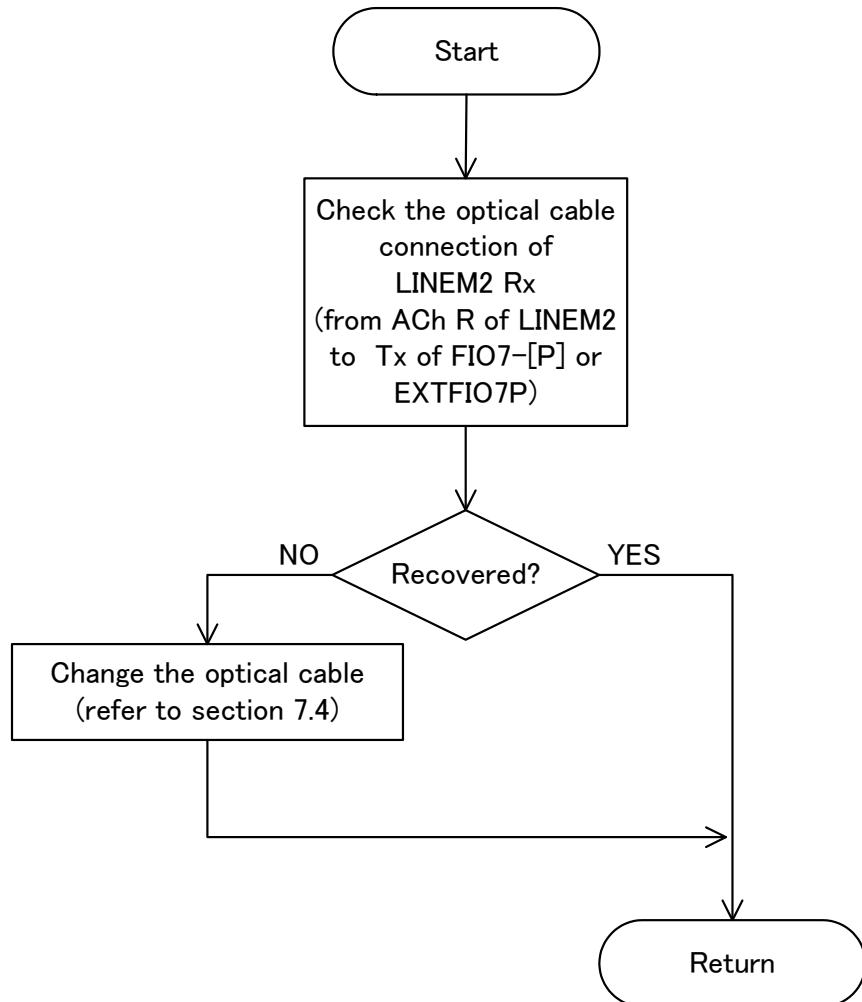
6.2.1 ET-MMIF Sub-rack

6.2.1.1 LINEM2

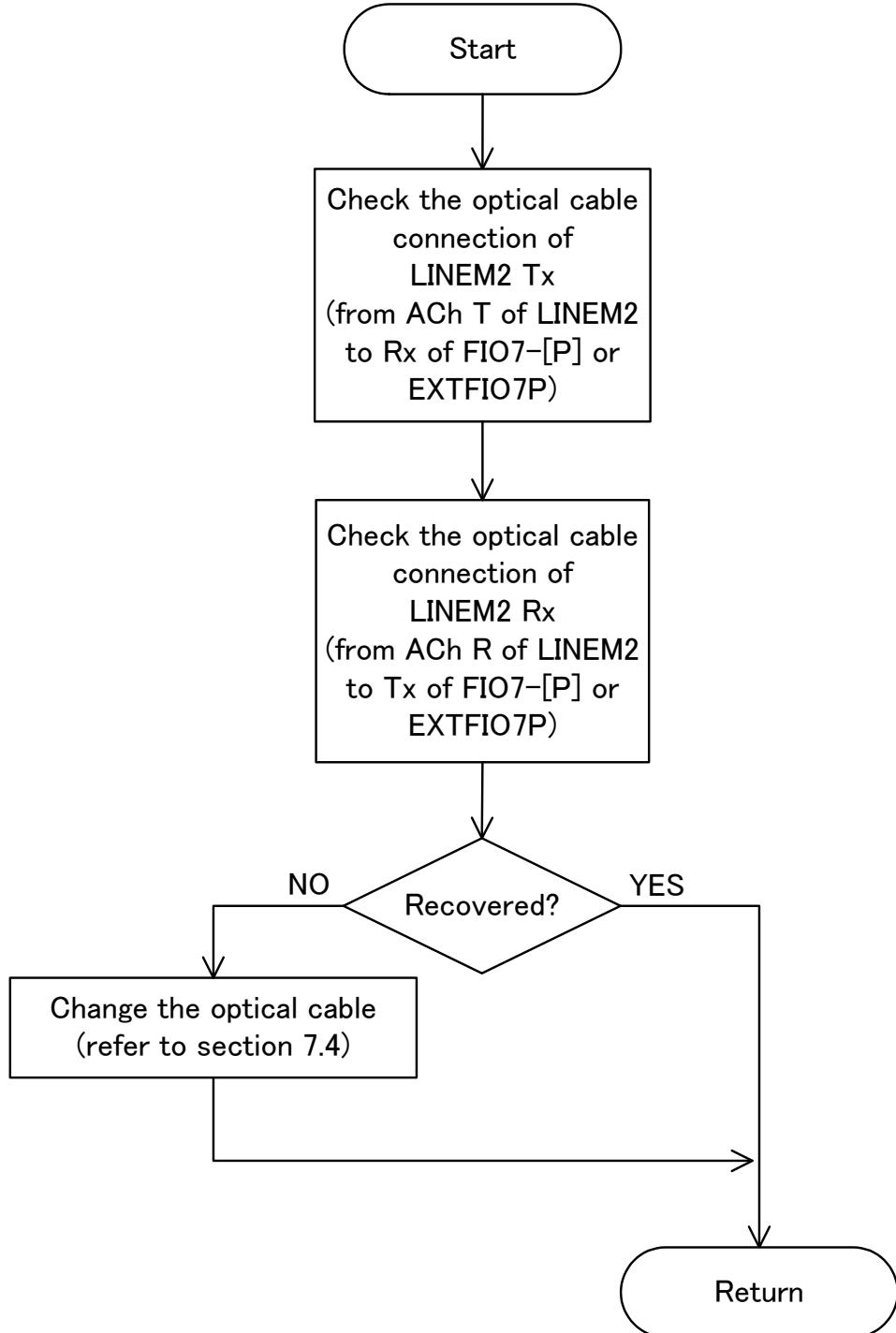
6.2.1.1.1 DC24/DC5



6.2.1.1.2 ET Ctrl Data OE conversion

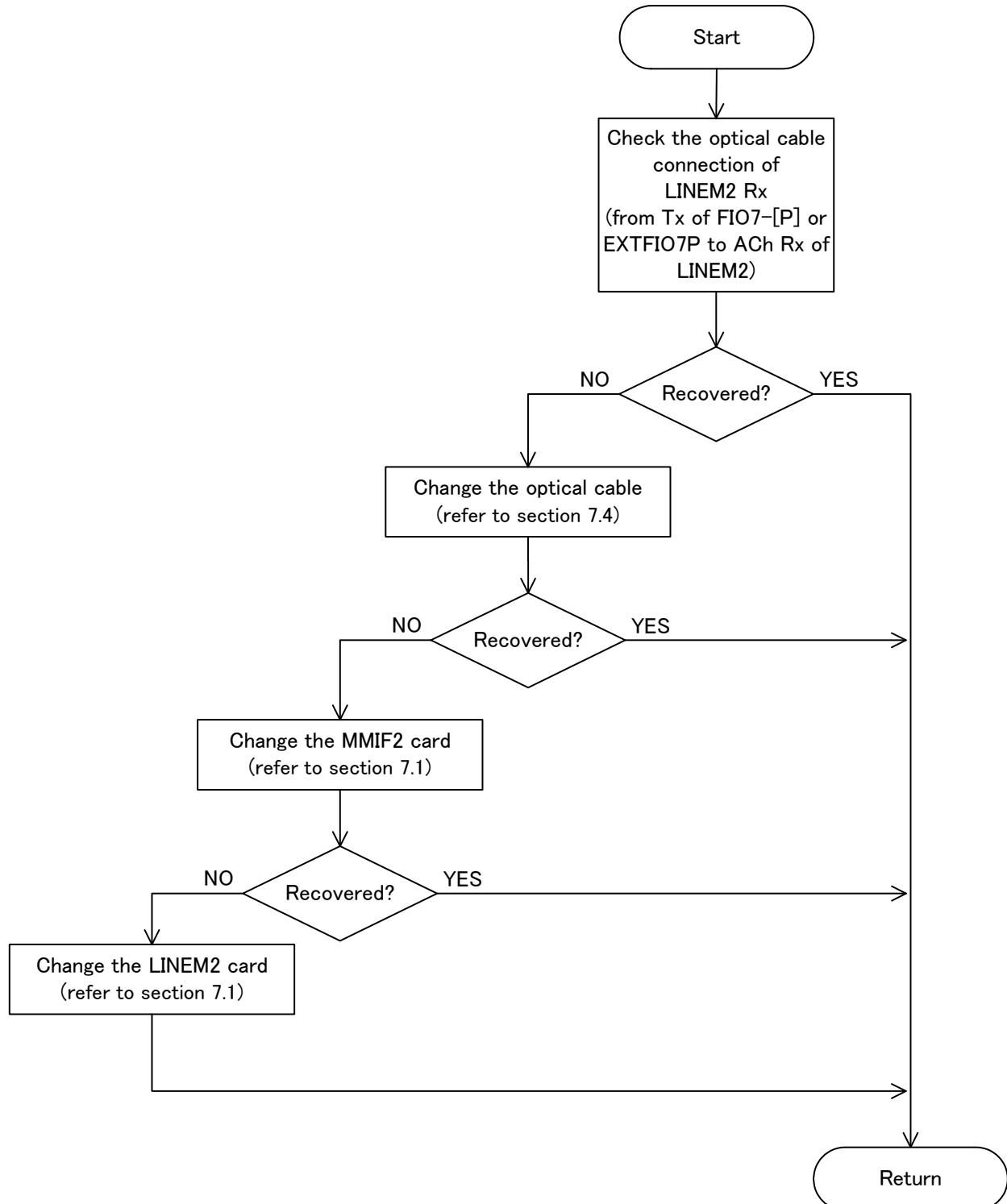


6.2.1.1.3 ET Indic. Data EO conversion

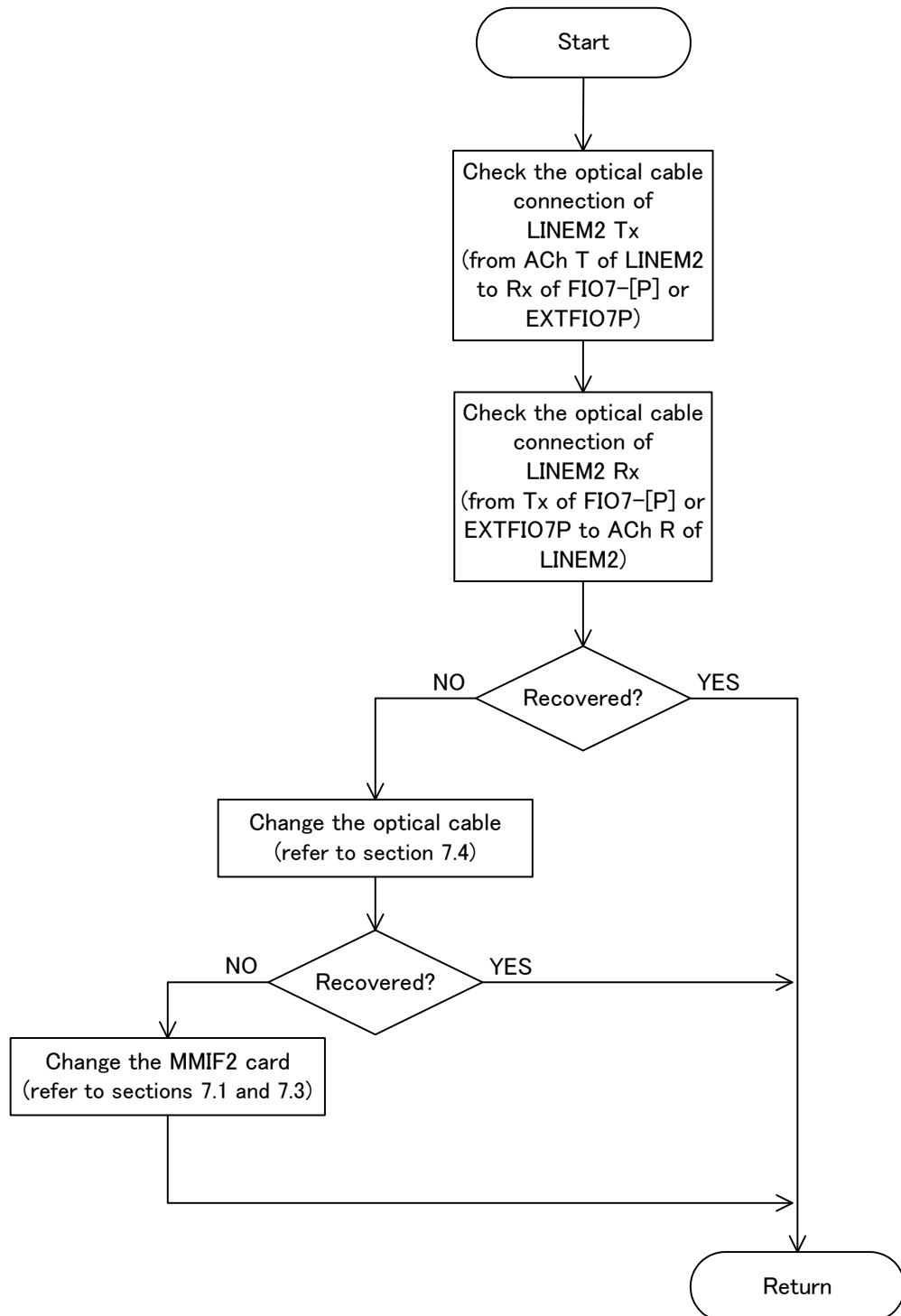


6.2.1.2 MMIF2

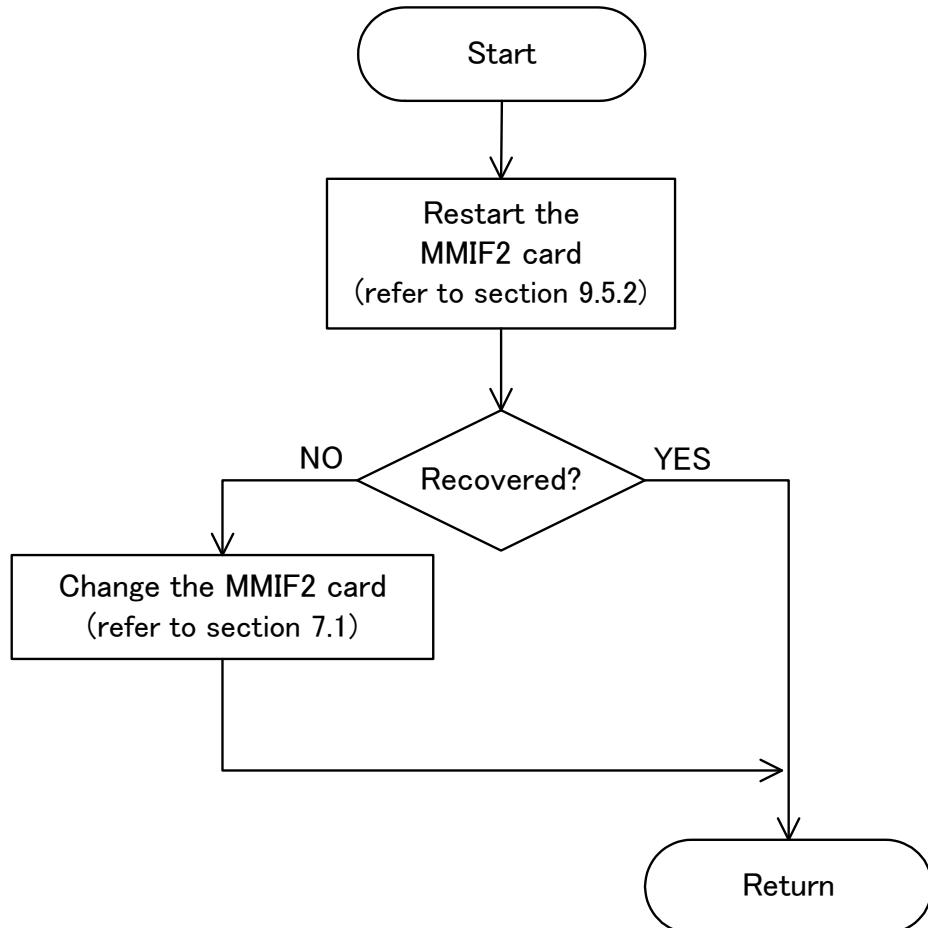
6.2.1.2.1 ET Ctrl Data Rx



6.2.1.2.2 ET Indic. Data Rx



6.2.1.2.3 MMIF ID Check



7 Handling Methods

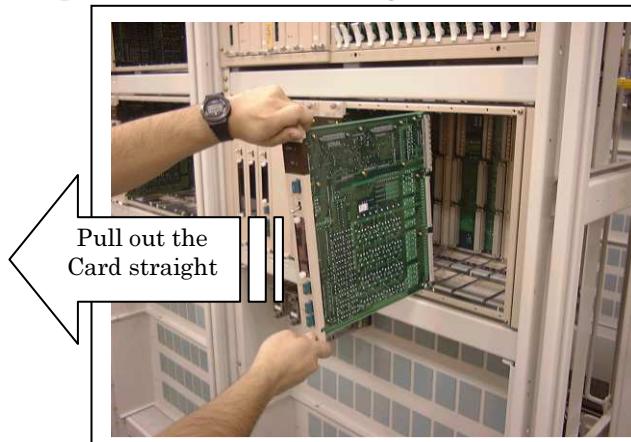
7.1 Card and IC Card replacing method

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.

7.1.1 Card Replacing Method

(a) Removing the card

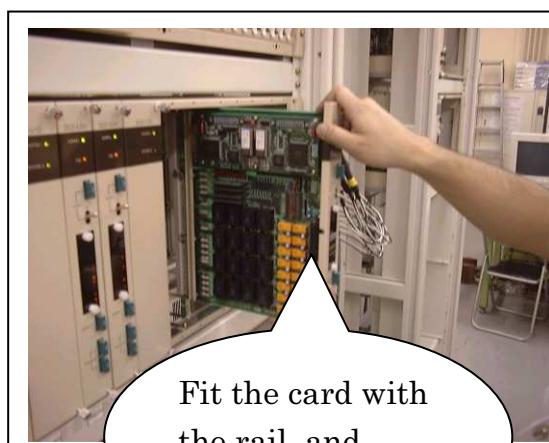
Turn OFF the power switch of each card. Remove card fixing screws. Next, pull out the card straight.



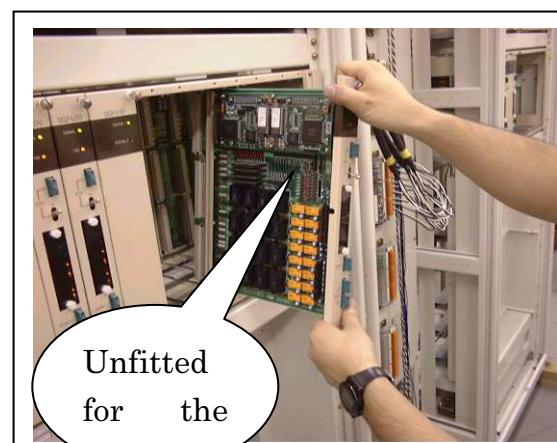
(b) Inserting the card

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.

Correct example



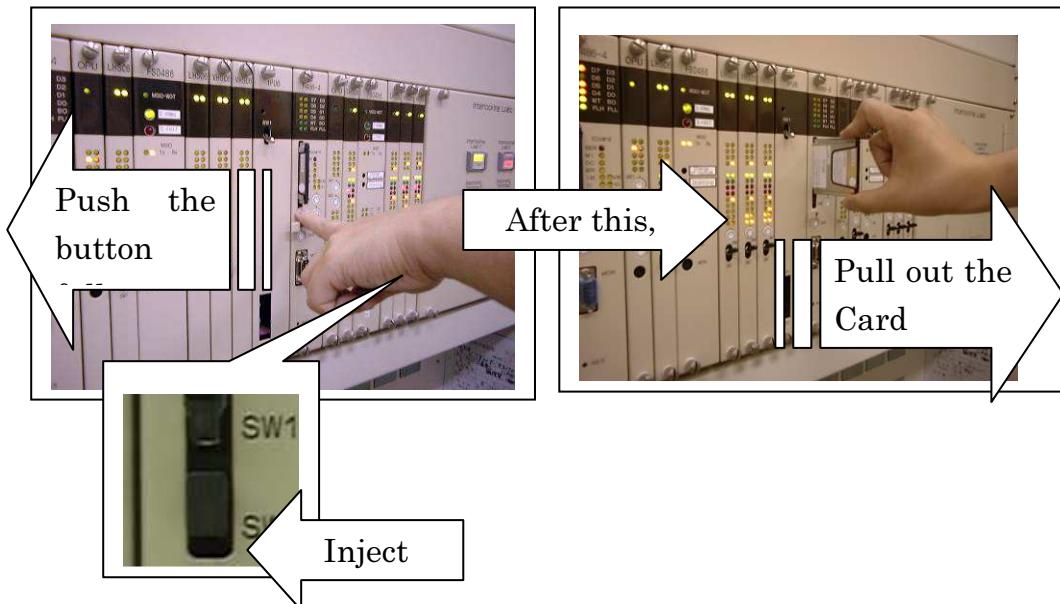
Incorrect example



7.1.2 IC Card Replacing Method

(a) Removing IC Card

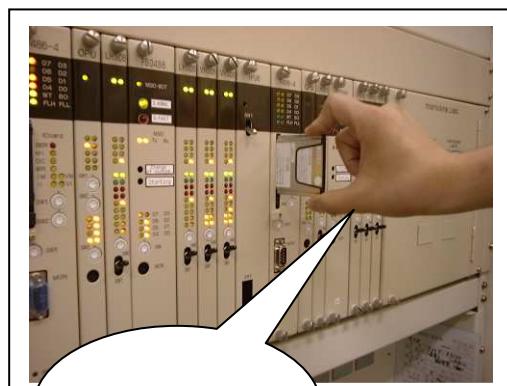
Turn OFF the power switch of IPU6C card. After removing inject button guard, push the inject button fully up to the innermost and then the IC Card comes out slightly. Next, hold the top and bottom of the IC Card firmly and pull out the Card straight.



(b) 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.

Correct example



Incorrect example



7.2 Logic Sub-rack handling precautions

 WARNING	
 	<p>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.</p> <p>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.</p>
 CAUTION	<p>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.</p> <p>Do not replace an IC etc. on a card board of the Logic Module or disassemble a stack of cards, using screwdriver.</p> <p>Handling precautions of optical fiber cords or cables</p> <ul style="list-style-type: none"> - 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. <p>Carefully protect an IC card from static electricity, and</p>

	<p>never touch contacts of the card during handling. Otherwise, the IC card might fail.</p> <p>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.</p> <p>If the setting of card switch (Dip-Switch) in the Logic Module is changed, interlocking functions stop. Do not touch the Dip Switch.</p>
 	<p>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.</p> <p>Be sure to house spare parts or replaced card in static electricity protective bags.</p> <p>Otherwise, they might break down due to static electricity. Do not operate with wet hands. Otherwise you might receive an electric shock.</p>
  	<p>Because the power card is hot, when replacing the card, grip the front panel with both hands. Otherwise, your hands might be scalded.</p> <p>Be sure to house replaced cards in static electricity protective bags.</p> <p>Otherwise, they might break down due to static electricity.</p> <p>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.</p>

7.3 Electronic Terminal Sub-rack handling precautions

 WARNING	
 	<p>Do not turn OFF the power switch without performing prescribed preparations, otherwise Electronic Interlocking functions might stop.</p> <p>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.</p>
 CAUTION	<p>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.</p> <p>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.</p> <p>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.</p> <p>Do not remove ROM in the MMIF2 card without performing prescribed preparations. Otherwise, the card might fail. In addition, interlocking functions might be lost.</p>

 	<p>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.</p> <p>Be sure to house spare parts or replaced card in static electricity protective bags.</p> <p>Otherwise, a card might break down due to static electricity.</p> <p>Do not work with wet hands, otherwise you might receive an electric shock.</p>
 	<p>When replacing a card board, be careful not to touch wires, boards, etc. inside the rack. Otherwise, you might receive an electric shock.</p>
  	<p>Because the power card is hot, when replacing the card, grip the front panel with both hands. Otherwise, your hands might be scalded.</p> <p>Be sure to collect replaced cards in static electricity protective bags.</p> <p>Otherwise, they might break down due to static electricity.</p> <p>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.</p>

7.4 Fiber Optic Handling precautions

Optical fiber handling precautions are described below.

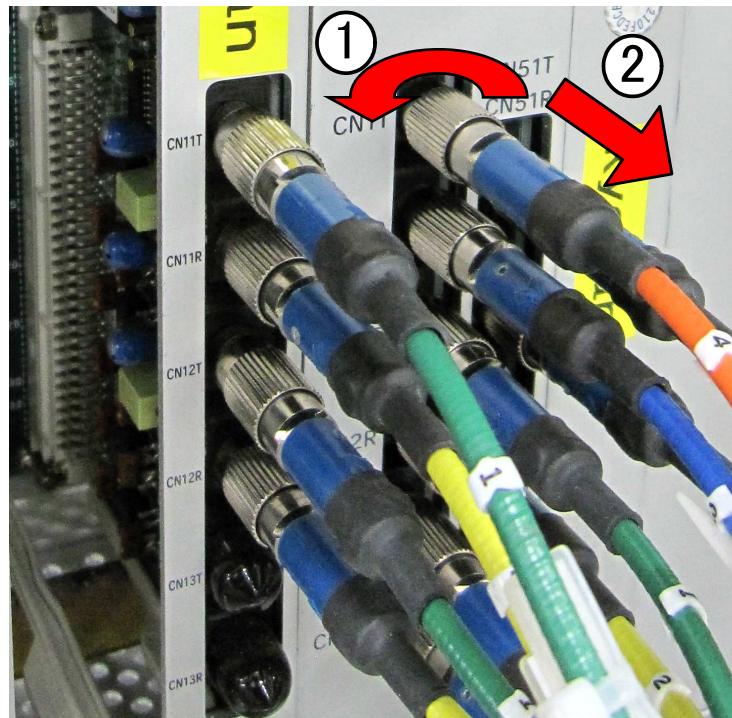
Cabling precautions

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

 WARNING	
 	<p>Do not bend an optical fiber with a radius of less than rated value. Otherwise, the optical fiber might break down.</p> <p>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.</p> <p>Do not apply a load to an optical fiber cord or cable. Otherwise, the fiber may break down.</p>

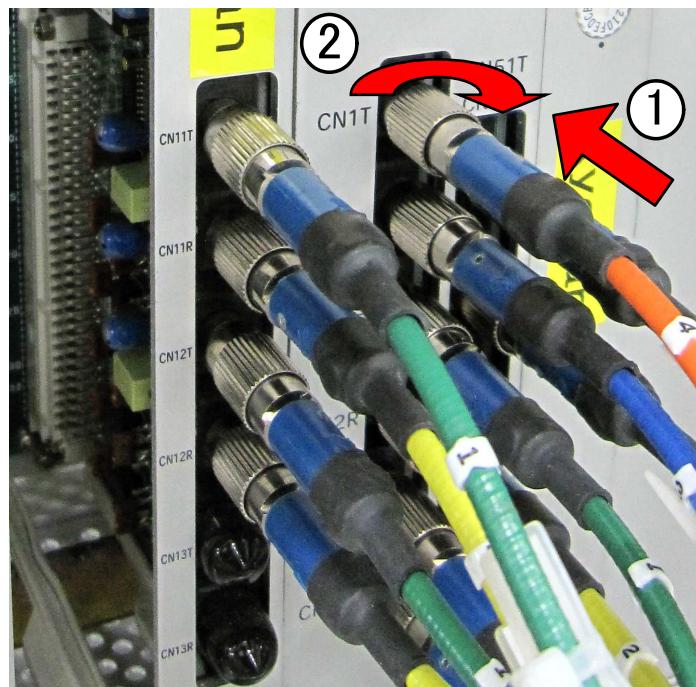
CAUTION	
	<p>Do not disassemble the optical fiber cable. Otherwise, the optical fiber connector or cable may be destroyed.</p>
	<p>Do not touch the tip of an optical connector.</p>
	<p>Do not stick a PVC tape etc. on the tip. Otherwise, a loss of the optical fiber might become large during operation, and the connector at the optical fiber unit might be defective.</p>
	<p>Do not place anything on an optical fiber during storage.</p>

Removing the Fiber Optic Cable from the terminal



1. Rotate the connector counterclockwise.
2. Gently remove the fiber optic cable from the terminal.

Inserting the Fiber Optic Cable into the Terminal



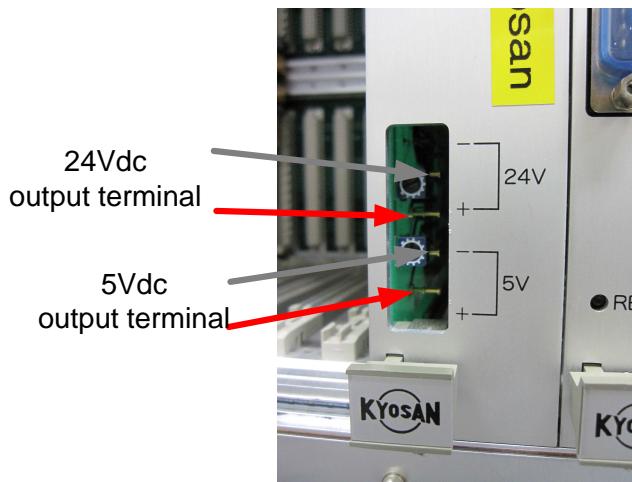
1. Gently insert the fiber optic cable into the terminal.
2. Turn the connector clockwise to secure the fiber optic cable.

8 Voltage Measurement Procedures

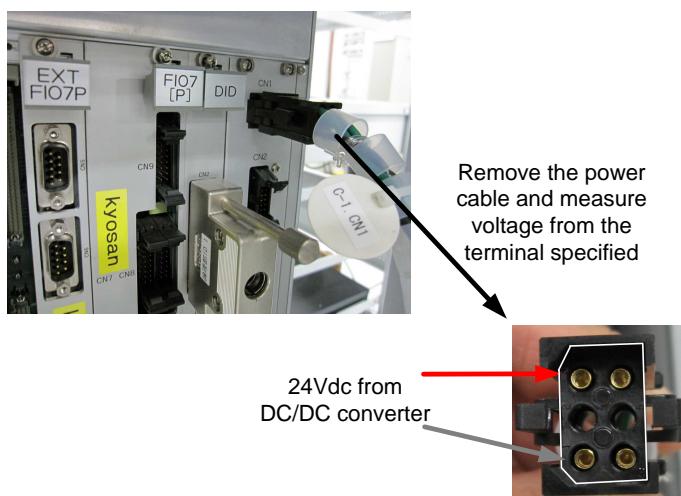
This section describes the power input/terminal of each sub-rack. Check the voltage level from the terminals described below. The red arrow specifies (+) terminal and gray arrow specifies (-) terminal.

8.1 Logic Sub-rack

8.1.1 IPU6C



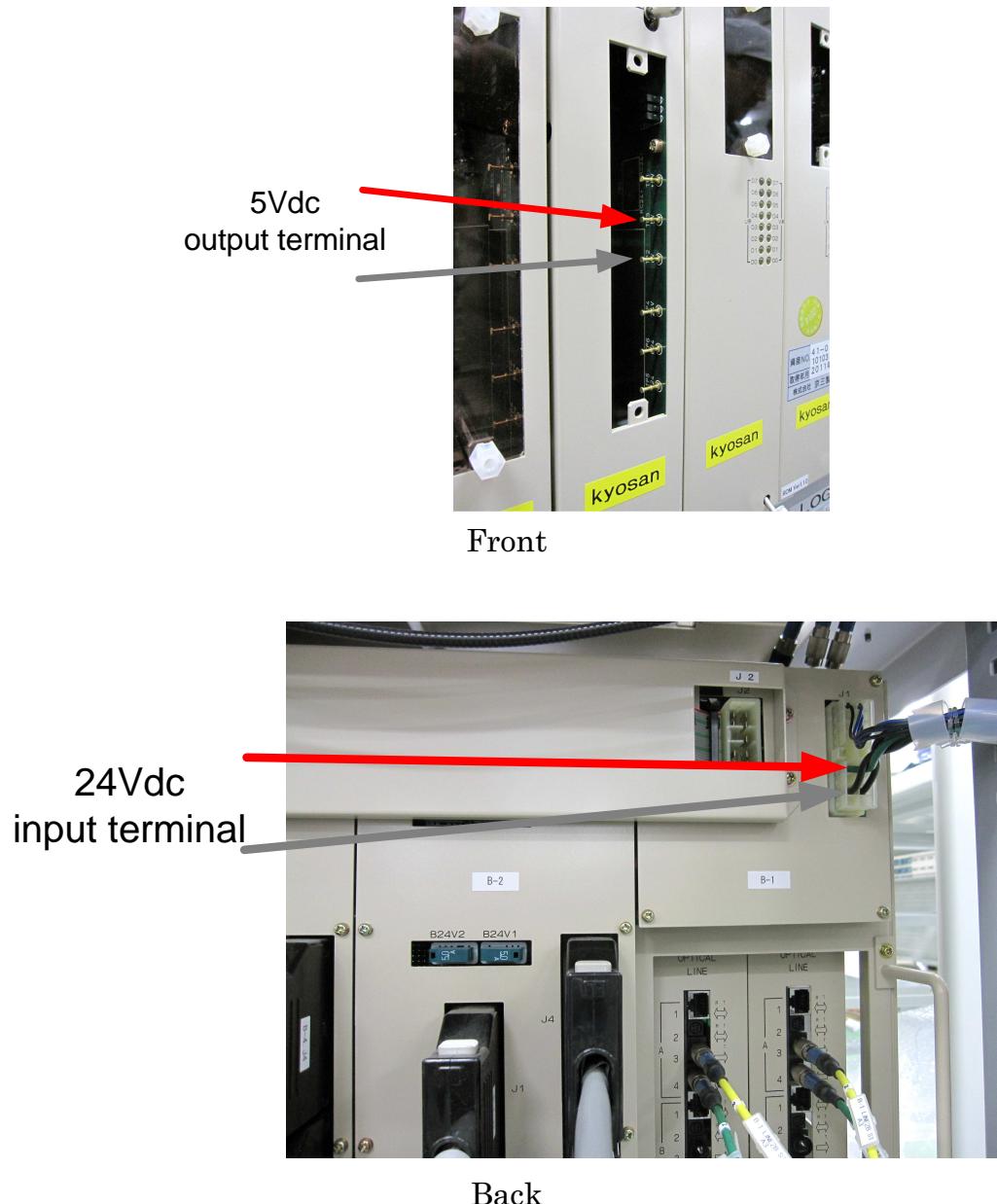
Front



Back

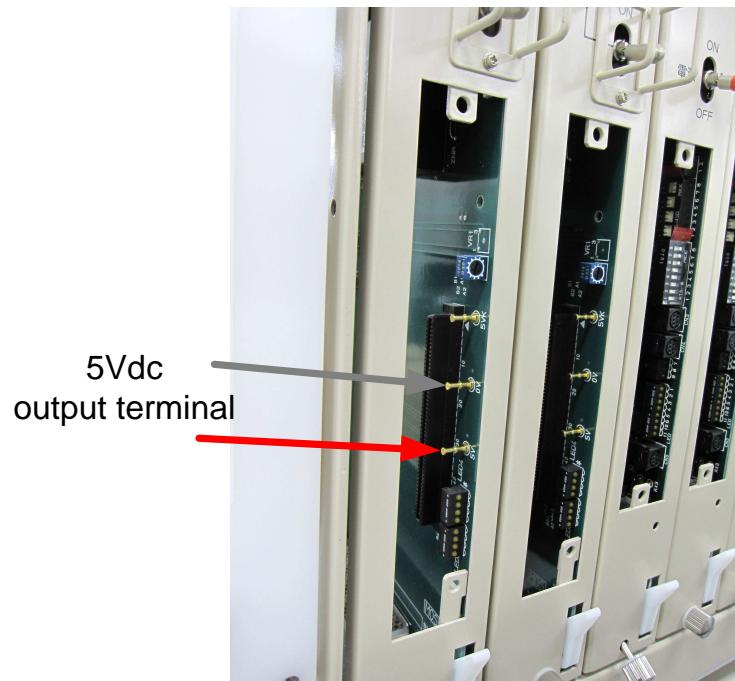
8.2 ET-PIO Sub-rack

8.2.1 LINE2B

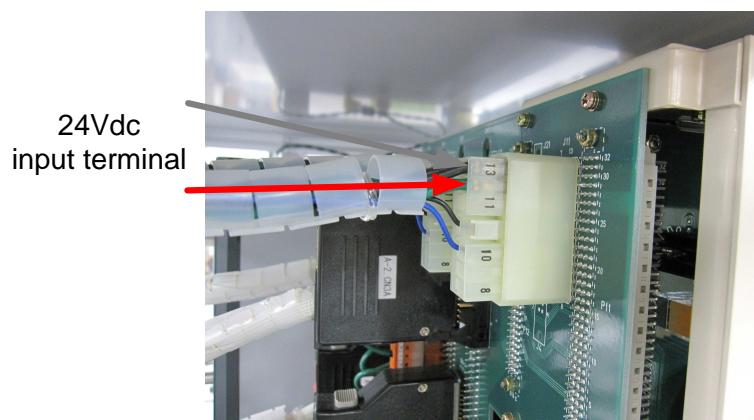


8.3 ET-MMIF Sub-rack

8.3.1 LINEM2



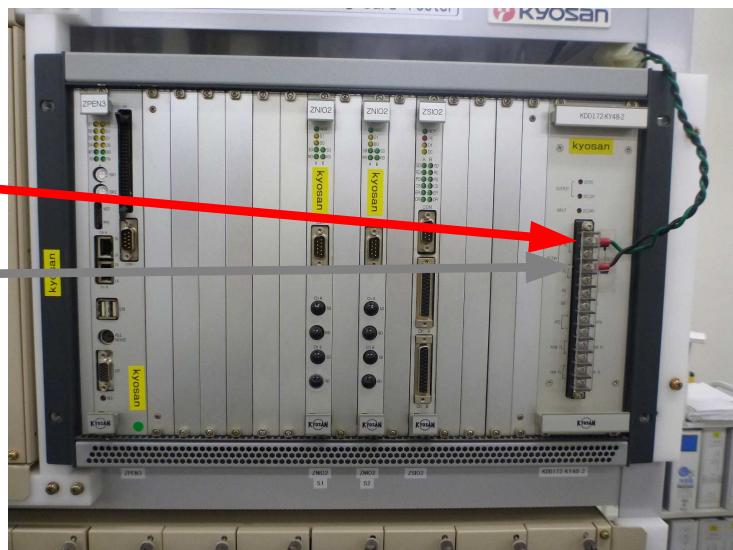
Front



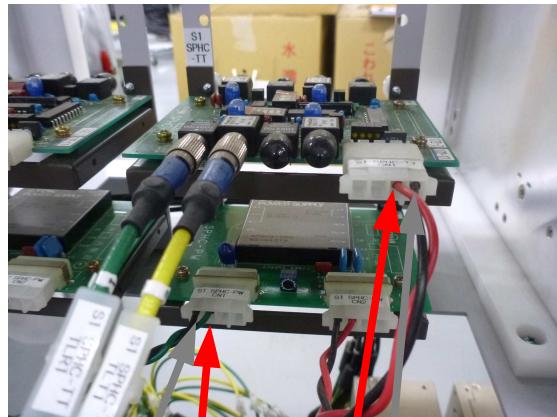
Back

8.4 Logic Module

Journal Module
24Vdc input
terminal



8.5 SPHC-TT/PW



SPHC-PW 24Vdc
input terminal SPHC-TT 5Vdc
input terminal

Back

9 Power Switches

This section describes the units with power switches used to turn on/off the unit itself or the whole sub-rack where the unit belongs in some cases.

9.1 Logic Sub-rack

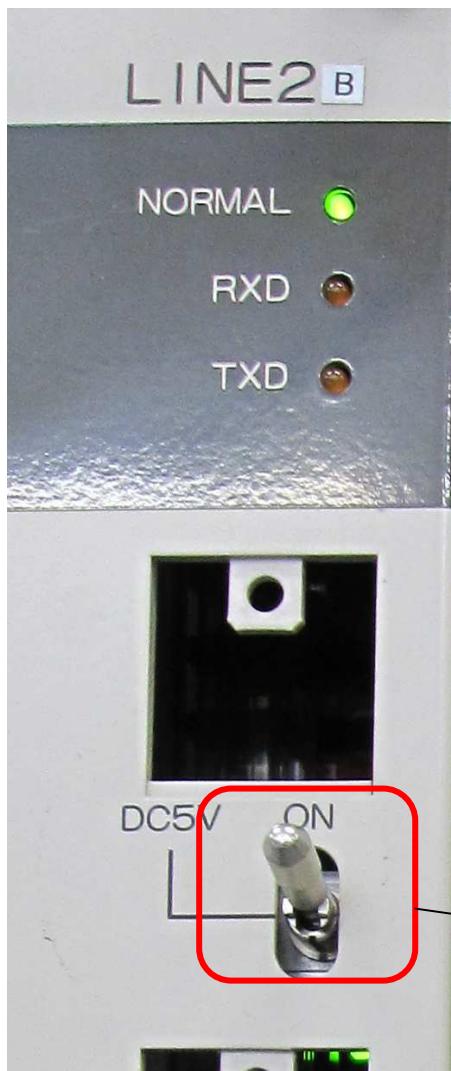
9.1.1 IPU6C



Turn the switch up to power ON and down to power OFF

9.2 ET-PIO Sub-rack

9.2.1 LINE2B



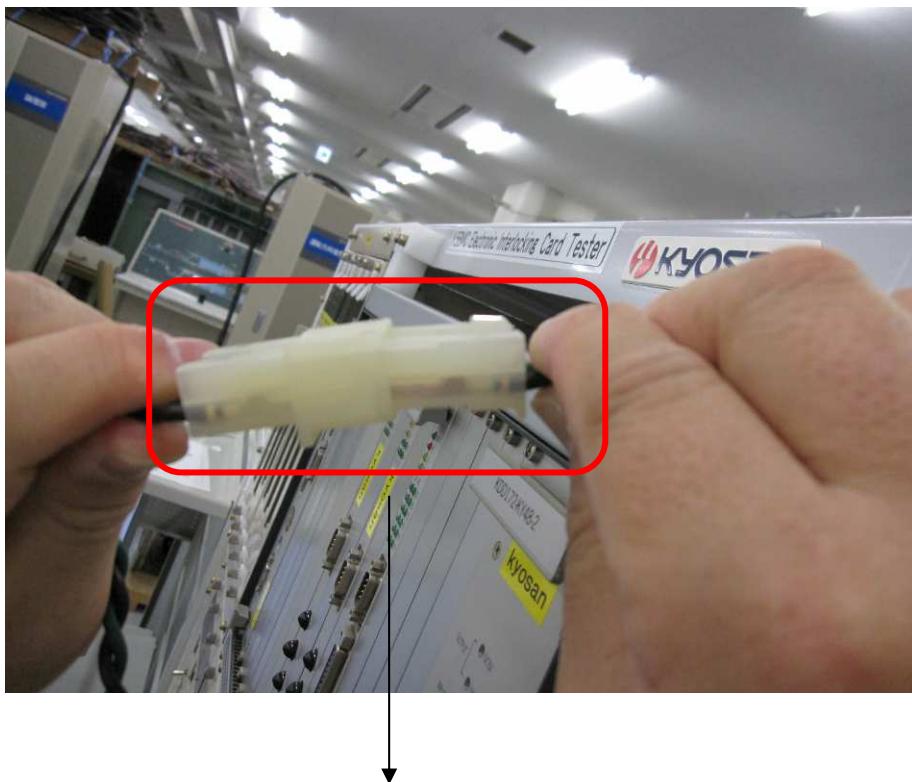
Turn the switch up to power ON and down to power OFF

9.2.2 PIO2-LOG



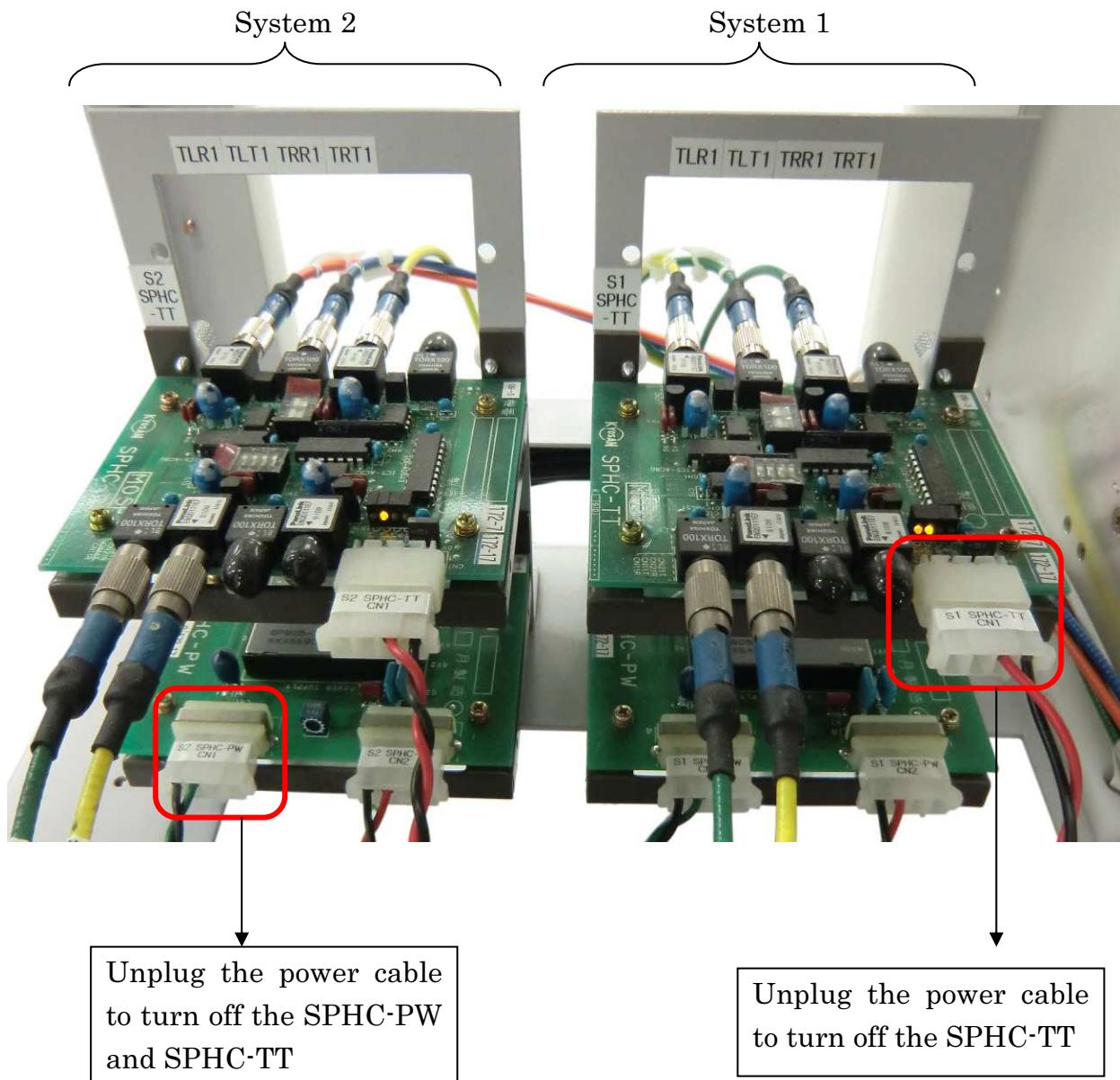
Turn the switch up to power ON and down to power OFF

9.3 Journal Module



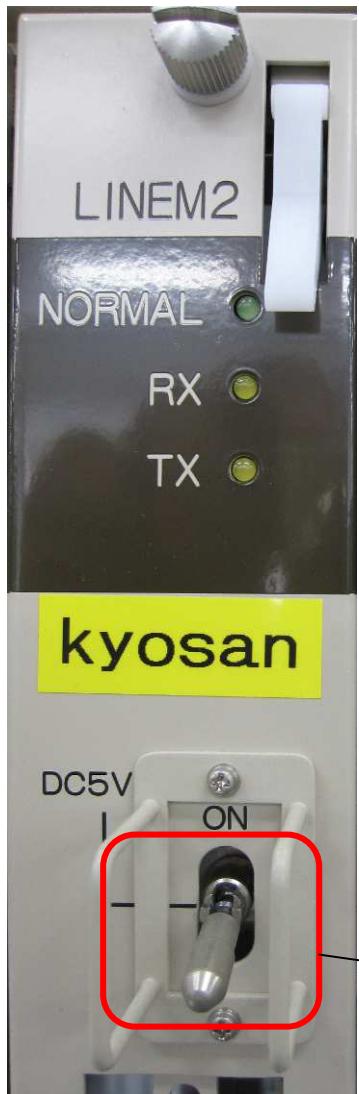
Pull the power cable
apart to turn off the
Journal Module.

9.4 SPHC-TT/PW



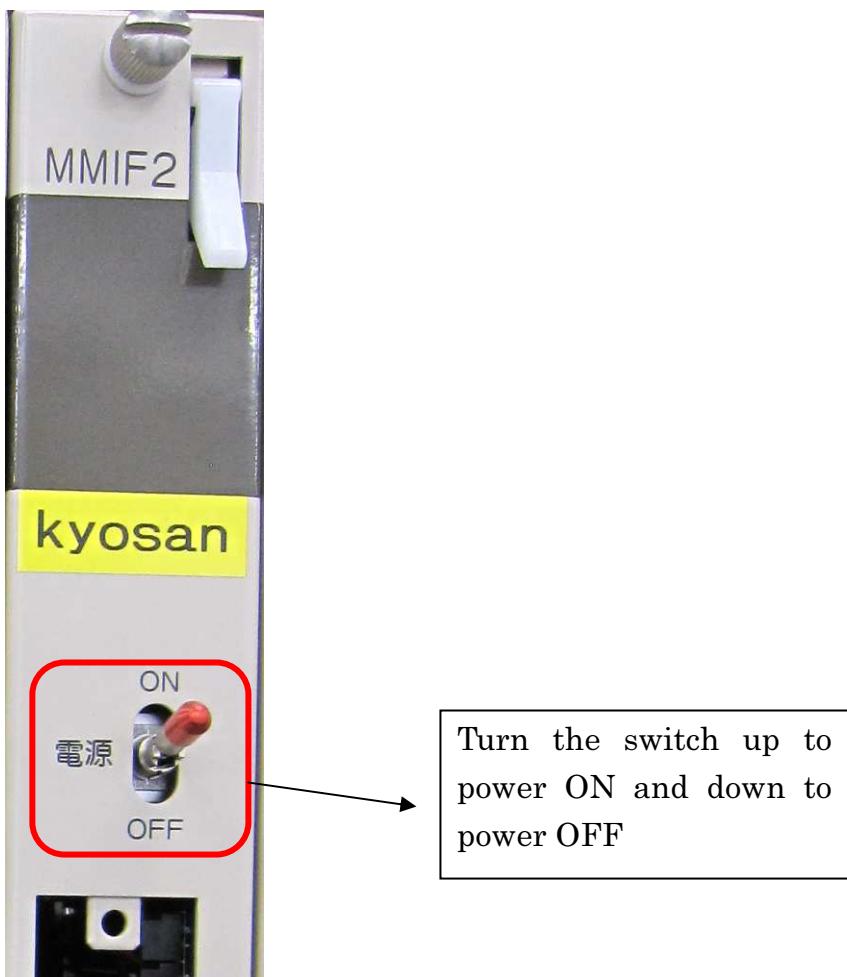
9.5 ET-MMIF Sub-rack

9.5.1 LINEM2



Turn the switch up to
power ON and down to
power OFF

9.5.2 MMIF2



9.6 MTC/OPC



Press the power button
when starting the
computer.
The computer can be
normally shut down from
the windows display.