# K5BMC

# ELECTRONIC INTERLOCKING MANUAL

## AS PER PARA 10 OF RDSO SPECIFICATION

KYOSAN INDIA PVT LTD.

# Electronic Interlocking Equipment (Model K5BMC)

# Functional Requirement Specification

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

# Revision Table

| Revision No. | Date | Content | Edited by |
|---|---|---|---|
| 1 | 25/06/09 | First edition | Y. Kanno |
| 2 | 20/11/09 | Temperature range in Table 1 in Clause 1.1 has been modified. | Y. Kanno |
| | | Insulation resistance in Table 4-1 in Clause 4.3 has been modified. | |
| | | Columns of Description in Table 5-1 in Clause 5.1 have been modified. | |

# Table of Content

# 1. Scope of Application

This specification describes Electronic Interlocking Equipment (TYPE K5BMC)

## 1.1 Environmental conditions

Environmental conditions are shown in Table 1.

Table 1

| Environmental condition for operation | | Equipment room | Indoor or in casing (electronic terminal) |
|---|---|---|---|
| Ambient temperature (degrees C) | | -10~70(no-condensation) (0~35 for OA equipment) | -10~70(no-condensation) |
| Relative humidity (%) | | Less than 95 at 40 degree C (no-condensation) (35~80 for OA equipment) | Less than 95 At 40 degree C (no-condensation) |
| DC power Supply | Voltage(V) (Note 1) | 24+20%, -10% | 24+20%, -10% |
| | Ripple(%) | Less than 5 | Less than 5 |
| AC power Supply | Voltage(V) | 110+10%,-10% (110 +10%,-10% for OA equipment) | 110+10%,-20% |
| | Frequency(Hz) | 50/60+1Hz,-Hz | 50/60+1Hz,-Hz |

Note 1: The maximum value of DC voltage for a control output at the electronic terminal will be 24V+30%.
Note 2: The power supplies mean those from the utility and others for controlling external circuits, except for power supplies used in a device for logic circuits.

## 2. Definition of Terms

Major terms used in this proposal specification mean as follows, as well as conforming to JIS E 3013 (Glossary of terms for railway signaling) and JIS X 0001~0022 (Glossary of terms used in information processing).

(1)Fail-safe CPU (FSC systems and electronic terminals)

A CPU system, to be used to process and execute an interlocking logic etc., is operated by collating results processed by two or more CPUs, and unless the results of both CPUs agree with each other, one CPU is regarded to have failed and made to stop processing, and outputting from the CPU in failure is stopped or fixed to the safe side.

The fail-safe CPU system is classified into a bus synchronization type (two CPUs are operated with the same program at the same timing, and data on the data bus are compared and checked), and a phase difference type (two CPUs are operated by the processing program and the check program alternately with a time difference between each other, and results of processing with both CPUs are compared and collated) according to the methods of collation.

(2) Fail-safe system Electronic Terminal

An Electronic Terminal of which functions are realized using fail-safe CPU.

(3) System cycle time

A cycle time for executing functions of a system dedicated to each station, to be determined for the system of each station according to the number of Electronic Terminals, etc. The system cycle time is an important constant to determine the performance of response to a control command from the Electronic Interlocking Equipment and should be as short as possible. However, with the Equipment, it is defined at 200 msec unless otherwise indicated.

(4) LDC (Logical Data Compiler)

A compiler dedicated for creating a string of data that can analyze and execute a logic process in the logic unit of the signaling system and an electronic terminal, by inputting interlocking conditions etc. for each station using an interlocking connection or a Boolean formula in algebra.

(5) Image relay

A relay for an interlocking connection on the software, created by LDC.

An interlocking logic function is actuated by the operation of an image relay.

(6) On-site equipment

The on-site equipment described in this proposal specification generally represent signals, switches, track circuits, various relays including ATS control relays, level crossing control relays, etc., apparatus controlled by the

Electronic Interlocking Equipment, and devices from which the Electronic Interlocking Equipment receives control status.

(7) Safe-side processing

In a fail-safe CPU configuration, if a fatal error is detected in the hardware or the software, processing and outputting of the CPU are stopped, or all outputs from the CPU are fixed to “0.”

The safe-side processing means that data to be output at this time are determined to be “0” on the safe side, beforehand.

For example, the output of a signal is indexed to show a stop signal with 0, and the output of a relay is allocated to drop away with 0.

## 3. Model of the Equipment and Types of Electronic Terminals

### 3.1 Model

The model of the Equipment and the types of Electronic Terminals are shown in Tables 3-1 and 3-2, respectively.

Table 3-1

| Equipment model | Description | Remarks |
|---|---|---|
| Model K5BMC | Signalling system logic unit based on phase difference complementary computation system(32-bit CPU) | |

Table 3-2

| Type of ET | Description | Remarks |
|---|---|---|
| Relay I/O control Terminal (ET-PIO) | For inputs to contacts of indoor relays, and outputs for controlling Indoor relays | Inputs 32 point/terminal Outputs 32 point/terminal· For indoor use only FS |
| ~~DC terminal (ET-DC)~~ | ~~For inputs to relay contacts and outputs for controlling relays~~ | ~~Used indoors and in the instrument box FS~~ |
| ~~Switch control Terminal (ET-PM)~~ | ~~For controlling switches of 1 to 4 Switches, and inputs for switch Indication conditions Provided with inputs of lock failure indication Conditions~~ | ~~A terminal can control a maximum of 8 Sets Used indoors and in the instrument box FS~~ |
| ~~Signal control Terminal (ET-SG)~~ | ~~For controlling signal with up to 4 aspects. For 5 aspects, two sets will be used. ・Provided with the function for detecting fusion of filament of Signal lamp~~ | ~~A terminal can control a maximum of 4 Sets Used indoors and in the instrument box FS~~ |
| ~~AC terminal (ET-AC)~~ | ~~For controlling up to two AC lamps~~ | ~~A terminal can control a maximum of 8 Sets. Used indoors and in the Instrument box FS~~ |
| General-purpose Input/Output terminal (MMIF) | For inputs of contacts for indoor levers, relays, etc., and for DC Controlling relays etc. | Inputs 32 point/terminal Outputs 64 point/terminal· For indoor use only |
| ~~Track circuit input terminal~~ | ~~Used to detect occupation of a train, instead of track relay~~ | ~~8 track circuits per terminal ・Used indoors and in the instrument box FS~~ |

| | | |
|---|---|---|
| ~~(ET-TR)~~ | | |

FS shown in the Remarks column mean Electronic Terminals using fail-safe CPU.

## 4. Functions

### 4.1 General functions

The Electronic Interlocking Equipment will provide the following functions by means of software built in each of the Interlocking Logic Unit, Electronic Terminal, Maintenance System, etc.

Except for the Maintenance System, each unit and terminal will be configured to improve the reliability of processing information using fail-safe CPU.

Each program, except for those in the maintenance system, will be operated in a single thread system, to improve the reliability of software.

If an error is detected in hardware, data, etc. as a result of self-checking, the Equipment will be operated to the safe side (fail-safe operation).

(1) Controlling cycles of executing functions

The functions of the Electronic Interlocking Equipment will be actuated by periodically executing the three major functions, i.e. transmitting data from the Interlocking Logic Unit to Electronic Terminals (control information, poling information), transmitting data from Electronic Terminals to the Interlocking Logic Unit

(indication information), and processing the interlocking logic, within a system cycle time.

(2) Control functions

The interlocking logic unit receives control conditions sent from the Control Panel or the CRT Operation Console, via an Electronic Terminal (a general-purpose input/output terminal), and control to set and reset a route.

At each Electronic Terminal, on-site equipment such as switches, signals, etc. are controlled. Each unit of the on-site equipment can also be controlled through relays provided in the relay bay, when required.

(3) Indication functions

The Interlocking Logic Unit receives information on the status of the on-site equipment such as switches, signals, and track circuits, and operation status of an Electronic Terminal, from each Electronic Terminal, and uses the information as conditions for controlling the interlocking logic etc. An input from each unit of the on-site equipment can be received through a relay provided in the Relay Bay, if required.

Data, control status, locking status, etc. entered are indicated on the Indication Control Panel through an Electronic Terminal (general-purpose input/output terminal), and are also displayed on the CRT in the CRT Operation Console.

(4) Interlocking logic processing functions

An interlocking logic is processed in the Interlocking Logic Unit, part of which can also be processed in an Electronic Terminal. A route is controlled to be set and reset according to information entered from each Electronic Terminal, regarding control status of the Control Panel etc., status of the on-site equipment, etc. and the conditions of the interlocking connection diagram entered beforehand, together with performing other necessary issues required as an interlocking system, including processing various locking and unlocking procedures such as approach locking, and route locking, and interlocking between systems etc.

## 4.2 Functions of each unit

### (1) Interlocking Logic Unit

A. Input from terminal circuit

・The unit receives data transmitted from each Electronic Terminal in response to poling performed periodically to the Electronic Terminal via the terminal circuit, and the unit checks its significance, and accepts effective data.

・・・ Indication information for terminal circuit

B. Processing interlocking logic

・The unit computes an interlocking logic using

information sent from each Electronic Terminal and the logic computation formula based on the conditions of the interlocking connection diagram previously entered, thereby realizes the interlocking functions dedicated to each station.

- Results calculated logically are converted to and controlled as image relay data.

C. Output from terminal circuit

- The data of the image relay data added with a check code is output periodically to each Electronic Terminal through the Terminal Circuit.
- A maximum of 4 Terminal Circuits will be provided, and each circuit will be configured with optical fibers.

… Control information for terminal circuit

D. System control

- The interlocking logic unit is operated as dual systems, i.e. a main system and a sub-system.
- The two systems will be configured in “hot standby” that is actuated in synchronism with a synchronous timer clock signal issued from the main system.
- Control data only from the main system will be transmitted on the Terminal Circuit.
- Even when the main system and sub-system are switched, the operation of the Electronic

Interlocking Equipment will be continuous when an effect to the outside is concerned, therefore the main system and the sub-system will be changed over without a short break of interlocking functions.

- When an abnormality occurs in the equipment of the main system, the failure detection function, self-diagnosis function, etc. will locate the failure on the hardware or software, and will automatically switch the system to the sub-system.

E. Processing errors

- If indication information cannot be received normally within a preset time from Electronic Terminals, indication information controlled inside the Interlocking Logic Unit is fixed to the “safe side.”
- If a fatal error in the hardware or software of the Interlocking Logic Unit is detected, the Logic Unit concerned with stop processing and outputting a control command.
- If any of the two dual systems stops processing, the other system is operated singly. When both systems fail, functions as an interlocking system are stopped, and all control outputs from the Interlocking Logic Unit will be stopped completely. At this time, all related equipment including the on-site equipment is fixed to the “safe side” by the Electronic Terminals.

F. Initial starting and restarting

・For starting the system by turning ON the power switch and restarting it after a stop of processing, a resetting start (the power switch is turned ON and OFF) will be actuated.

G. Interface of data to the Interlocking Logic Unit

(A) Interface with Electronic Terminal

Data is interfaced with each Electronic Terminal as follows, via the Terminal Circuit.

・Electronic Terminal in fail-safe system

・Among the Electronic Terminals shown in Table 3-2, those using fail-safe CPU will be operated using parallel operated Electronic Terminals in dual systems. The reliability of data transmitted through these Electronic Terminals will be higher than those of other Electronic Terminals.

・In the Terminal Circuit of a fail-safe Electronic Terminal, control data issued from the Interlocking Logic Unit of the main system are transmitted on the circuits in systems 1 and 2.

・At an Electronic Terminal in dual systems, each system alternately receives and process data transmitted on the circuits in systems 1 and 2. When control data is received in either system, it will be validated.

・Indication data will be output from each system

of the Electronic Terminal in the dual systems, to the circuits in system 1 or 2, respectively.

- The Interlocking Logic Unit receives indication data from both circuits in a cycle time. If a checked result is OK, logical OR is taken from indication data received by both systems, and an effective data will be confirmed.
- Electronic Terminal in non-fail-safe system
- The redundancy configuration of a general-purpose input/output terminal is composed of standby dual systems, and no fail-safe CPU will be used.
- On the transmission circuit connected to an Electronic Terminal in the non-fail-safe system, data issued from the Interlocking Logic Unit is received by the dual systems and processed. For the Interlocking Logic Unit, only the operating system (main system) outputs indication data. If data received by the Interlocking Logic Unit is erroneous, it is discarded. Unless data are received normally, data to be received from an Electronic Terminal is assumed that a safe-side data has been entered for the purpose of safety in the signaling system.

(B) Type of optical cable

The optical fiber shown in the attached table 2-1 will be used as optical cables.

An optical cable consisting of the GI fiber (GI50/125) can also be used, when so required because of a reason such as transmission distance.

H. Monitoring the Equipment and processing errors

Functions of monitoring the Equipment and processing errors can be added by setting and inputting conditions according to the connection diagram.

The functions provided as standard will be as follows.

(A) Monitoring status of track circuit

・By setting and inputting the conditions for detecting and processing incorrect actuation and drop-away of relays in the track circuit, the status of the track circuit will be monitored, routes concerned with an abnormality will be locked, and an alarm will be output for the error in the track circuit. In addition, the error will also be reflected to the interlocking conditions.

(B) Monitoring change of switch and correcting operation

・By setting and inputting conditions for detecting and remedying incorrect change of a switch, the control status of switches will be monitored and reoperated. In addition, correcting operation, unchangeable alarm output, etc. will be actuated when required.

(C) Detecting fusion of filament in signal lamp

- The fusion of a filament will be detected by checking current flowing in the signal light.
- The detection sensor will detect a fusion of single filament and both filaments at the signal control terminal in an Electronic Terminal, and will detect a fusion of both filaments at the AC Control Terminal. Data of detections will be summated in the signaling system, and the Maintenance System or the General-purpose Terminal (MMIF) will output an alarm to the Indication Control Panel.

I. Interface with the Maintenance System

- Interlocking conditions, operating status of each Electronic Terminal, etc. are transmitted through the optical fiber.
- A fatal failure in electronic interlocking will be entered through parallel circuits.

(2) Electronic Terminal

An Electronic Terminal will be connected to the Interlocking Logic Unit either directly via a signal cable or through a relay, if required, and will control the on-site equipment and receive information on the status of the on-site equipment.

Each Electronic Terminal constituting the Electronic Interlocking Equipment will be indexed with a unique

identification number.

A. Input

・Each Electronic Terminal will periodically receive a control information output data sent from the Interlocking Logic Unit, through the terminal circuit, and will check its validity and accept effective data.
… Control information for Terminal Circuit

・Status inputs from on-site equipment etc. will be received periodically according to contact conditions etc., and stabilized status will be detected and the data concerned will be used for processing.

B. Processing terminal logic

・Each Electronic Terminal will receive a control information input sent from the Interlocking Logic Unit, and will actuate the functions of each terminal according to information received from on-site equipment etc. and the conditions previously entered. DC terminals etc. can actuate necessary functions like the Interlocking Logic Unit, by inputting the conditions for connection logic.

・Results of processing at a Terminal Logic Unit will be formatted specifically and stored, and will be used to control the on-site equipment as the status information data of the on-site equipment.

C. Output

・Each Electronic Terminal will control various on-

site equipment units based on data in the Interlocking Logic Unit.

・The terminal will respond to poling periodically sent from the Interlocking Logic Unit, will process necessary matter at the terminal, will add a check code to the data of processed results, and will transmit the data with the code to the Interlocking Logic Unit.

… Indication information for terminal circuit

D. Controlling the system ・An Electronic Terminal using a fail-safe CPU shown in Table 3-2 will be operated as parallel dual systems with self-diagnosis function and on-site equipment diagnosis function. Even if one system fails, the other system can operate singly to maintain the continuity of system functions.

・A General-purpose Input/Output Terminal (MMIF) using no fail-safe CPU will be operated as standby dual systems with self-diagnosis function and equipment error processing function.

・When the operating system (main system) fails, the system is switched to the standby system to assure the continuity of system functions.

・An Electronic Terminal in either system will continuously monitor both circuits, and when both circuits are normal, the terminal will transmit and

receive information with each other through both circuits, and will transmit indication information to the receiving circuit.

E. Processing upon error

- If control information from the Interlocking Logic Unit cannot be received normally for a preset time, all control outputs from a control terminal to outside are fixed to the “safe side.”
- The operation of both systems of an Electronic Terminal is monitored by the hardware and the software, and once an error is detected, the system concerned will be stopped to operate.
- If one system of dual systems stops processing during operation, single operation takes place. If both systems fail, the functions of the Electronic Terminal related will be stopped. At this time, all equipment concerned including the on-site equipment will be controlled to be fixed to the “safe side.”
- When a Terminal Circuit fails (system 1 circuit or system 2 circuit), information is transmitted and received solely on the normal circuit. The circuit in failure will be checked periodically for recovery, and once the circuit recovers, the operation will automatically be shifted to normal status.

F. Initial starting and restarting

・An Electronic Terminal can automatically start when the power switch is turned ON or when it is controlled to restart from a system stop. At this time, conditions of control data sent from the Interlocking Logic Unit will be compared to those of the data at the Electronic Terminal, and if they do not agree with each other, no control output will be sent to the on-site equipment side until they agree.

G. Functions of each Electronic Terminal

The functions of each electronic terminal are shown below.

(A) Relay Input/Output Control Terminal (ET-PIO)

・The terminal will receive control information from the Interlocking Logic Unit and control relays etc. inside the equipment room. In addition, the terminal will receive the conditions of contacts of relays, etc. in the equipment room, and will send the status to the signaling system logic unit.

・When logic conditions have been assigned by a connection diagram, the terminal will operate logically according to the conditions.

・Once an error occurs, relays will be controlled to drop away, and input contacts will break.

The system in which an error has been detected will be stopped to generate an output.

~~(B) DC Control Terminal (ET-DC)~~

~~・Receiving control information from the interlocking logic, the terminal will control conditions of ATS wayside coils, level crossings, etc. installed at the site and the equipment room. Also receiving the contact conditions of relays etc. installed at the site, the terminal will transmit the status to the Interlocking Logic Unit.~~

~~・The terminal is functionally the same as ET-PIO, however the terminal will be operable characteristically to equipment both at the site and in the equipment room.~~

~~・When logic conditions are assigned by a connection diagram, the terminal will operate logically according to the conditions.~~

~~・Once an error occurs, relays will be controlled to drop away, and input contacts will break. The system in which an error has been detected will be stopped to generate an output.~~

~~(C) Switch control terminal (ET-PM)~~

~~・Receiving switch control information from the Interlocking Logic Unit, the terminal will~~

~~control and lock the switch. In addition, the terminal will receive an opening direction of the switch, and will transmit the status to the Interlocking Logic Unit.~~

~~・When a locking error detector is equipped, the terminal will receive the status of an output of the detector, and transmit it to the Interlocking Logic Unit.~~

~~・In the control conditions of the switch control relay, the control circuit will be open normally as well as when an error occurs, except for controlled status, and furthermore the circuit of the control relay of the switch is shorted to prevent stray current from entering the switch.~~

~~・The status of unknown opening direction (blank) will be monitored by the signaling system, therefore the terminal will not work for this purpose.~~

~~・Upon an error, NR/RR control output will be stopped, and the switch will be locked. NR=RR=1 will not be permitted. The system from which an error has been detected will be stopped to generate an output.~~

~~(D) Signal Control Terminal (ET-SG)~~

~~・Receiving signal control information from the Interlocking Logic Unit, the terminal will~~

~~control the signal to light.~~

~~・Detecting filament fusion (all filaments and single filament fusion) of signal light of the signal controlled, the terminal will transmit the status to the Interlocking Logic Unit.~~

~~・Upon an error, the signal will be stopped to indicate an aspect or will be distinguished. The system from which an error has been detected will be stopped to generate an output.~~

~~(E) AC Control Terminal (ET-AC)~~

~~・Receiving lighting tool control information from the Interlocking Logic Unit, the terminal will control shunting signal, shunting sign, track number indicator, etc. to light.~~

~~・The terminal can also detect a fusion of all filaments of signal light, when required, and can transmit the status to the Interlocking Logic Unit. The LED type signal light (repeater of starting signal etc.) can be disconnected from detecting filament fusion.~~

~~・Upon an error, the signal light will be stopped to show an aspect or distinguished.~~
~~The system from which an error has been detected will be stopped to generate an output.~~

(F) General-purpose Input/Output Terminal (MMIF)

・Receiving information on indication lamp etc.

from the Interlocking Logic Unit, the terminal will light an indication lamp of the Indication Control Panel etc. and will actuate the buzzer. In addition, the terminal will receive the contact conditions of levers and push-buttons on the Indication Control Panel etc., and will transmit the status to the interlocking logic unit.

- When logic conditions are assigned by a connection diagram, the terminal will operate logically according to the conditions.
- Upon an error, the indication lamp will go out, and input contacts will be made open. (The signal concerned will be stopped to show aspects.)

The system from which an error has been detected will be stopped to generate an output.

~~(G) Track Input Terminal (ET-TR)~~

~~- Detecting an actuation and drop-away of relays in the track circuit, the terminal will transmit the status to the Interlocking Logic Unit.~~
~~- The standard actuation and drop-away time delays of relays in the track circuit will be 2 seconds and 0.2 seconds, respectively for detecting assuredly, and can be adjusted when required.~~

(3) Maintenance System

The functions of the maintenance system are aimed

at maintaining the Equipment, and will be configured so that no adverse effects will be given to the functions of the Interlocking Equipment even if a failure etc. occurs in the Maintenance System.

A. Functions for storing and indicating data of operation records

- The system will receive control data sent from the Interlocking Logic Unit to Electronic Terminals and indication data sent from the Electronic Terminals to the logic unit in the Maintenance System, will select control and indication data received, and will indicate selected data on the CRT screen.
- Information on variations of received control and indication data will be stored within a preset amount, after adding data of time the information occurred to the information on variations. The data can be stored in a sub-memory device such as floppy disk etc.
- Data stored in the sub-memory device can be displayed on the CRT screen, or printed in a data list. When displaying a screen or outputting a list, necessary data will be selected and sorted according to assigned time, data item, etc., and necessary data can be output efficiently.

B. A failure related to an important system of the Electronic Interlocking Equipment will be input directly parallel.

C. Data transfer function

- Data stored in the Maintenance System can be forwarded to “Remote Monitor” provided in a signal communication section etc., using the communication line.
- The remote monitor will be provided when required.

## 4.3 Electrical performance

(1) Insulation resistance and withstand voltage

Insulation resistance and withstand voltage are shown in Table 4-1.

Table 4-1

| ITEM | PERFORMANCE |
|---|---|
| Insulation resistance | 10 M ohm or more when measured with DC 500V megger between input terminals of power supply and cabinet |
| Withstand voltage | AC 1,500V or more (RMS, for 1 minute) between input terminals of power supply and cabinet |

Note: Except OA devices such as personal computers

(2) Electrical performance of Interlocking Logic Unit

The electrical performance of the Interlocking Logic Unit is shown in Table 4-2.

The same specifications will be applied also to the route control unit and the I/F Control Unit.

Table 4-2

| ITEM | | PERFORMANCE |
|---|---|---|
| Requirement of operating power supply | | DC5V±5%, DC24V±10% |
| Power consumption | | Dual system (Backup dual system operation, hot standby) |
| Control system | | Dual system program control system using fail-safe CPU of complementary computation |
| Type | | 32-bit parallel |
| Operation frequency | | 40MHz |
| Operating rate | | 1 μs or less (Add command) |
| Memory capacity | ROM | 1M bytes |
| | RAM | 2M bytes |
| Error detection | | Complementary computation system, Watchdog timer, CRC check |
| Interface to terminal circuit | Transmission system | Bit serial, start-stop synchronization |
| | No. of I/O | Transmission and receiving (in common) 4ch |
| | Electric condition | A transmission media of optical cable |
| | Transmission rate | 31.2kbps |
| | Transmission route | Optical cord or cable with opt-electric conversion device |
| IC card | Card capacity | 1M bytes (When IC card is operated without ROM) |

(3) Electrical performance of Electronic Terminal

The electrical performance of an Electronic Terminal is shown in Table 4-3.

Table 4-3 Part 1

| ITEM | | | PERFORMANCE |
|---|---|---|---|
| Common items | Terminal circuit | Transmission system | Bit serial, start-stop synchronization |
| | | No. of inputs and outputs | Transmission/receiving 2 channels |
| | | Electrical condition | A transmission medium of optical cable |
| | | Transmission rate | 31.2Kbps |
| | | Transmission route | Optical cord or cable with opt-electric conversion device |
| | Power requirement for logic operation | | DC5V±5% |
| | Redundancy | | Parallel dual system |
| | Control system | | Dual system program control using fail-safe CPU of phase difference type, for each system |
| | | Track input | Dual system program control using fail-safe CPU of bus synchronization, for each system |
| | Type | | 8-bit parallel |
| | | Track input | 16-bit parallel |
| | Operation frequency | | 11.9808MHz |
| | | Track input | 8MHz |

| | | |
|---|---|---|
| | Operating rate | 2 μs or less (Add command) |
| | Track input | 1 μs or less (Add command) |
| | ROM memory capacity | 32k bytes |
| | Track input | 128k bytes |
| | RAM memory capacity | 4k bytes |
| | Track input | 64k bytes |
| | Error detection | Phase difference collation and CRC check |
| | Track input | Bus collation, watchdog, CRC check |
| | Maximum applicable voltage of power supply for controlling equipment | Maximum DC 28.8V<br>Maximum AC 110V<br>…Signal lamp control |
| | Track input | Maximum DC 31.2V …WR control |
| Repeater | No. of repeating terminals | Standard 4 terminal/repeater (TR, PIO, MMIF will be calculated separately) |

Table 4-4 Part 2

| ITEM | | PERFORMANCE |
|---|---|---|
| Relay input/ output control ET-PIO | Relay control current and No. of I/O contacts | Input 32 points, 24V, 16mA/single system<br>Output 32 points, 24V, 120mA or less/circuit<br>3.84A or less/terminal |
| | Power consumption | About 65W (with an input/output load of 70%) |
| ~~DC control ET-DC~~ | ~~Relay control current and No. of I/O contacts~~ | ~~Input 16 points, 24V, 32mA/single system~~<br>~~Output 16 points, 24V, 480mA or less/circuit~~<br>~~3.84A or less/terminal~~ |
| | ~~Power consumption~~ | ~~About 41W (with an input/output load of 70%)~~ |

| | | |
|---|---|---|
| ~~Switch control ET-PM~~ | ~~No. of switches controlled~~ | ~~A maximum of 8 sets of switches of 1~4 switch can be controlled~~ |
| | ~~Short circuit performance of control condition~~ | ~~3Ω or less, maximum current 2A or less. Except resistance component due to control cable~~ |
| | ~~Power consumption~~ | ~~About 53W (with an input/output load of 70%)~~ |
| ~~Signal control ET-SG~~ | ~~No. of signals controlled~~ | ~~A maximum of 4 sets of signals with up to 4 aspects can be controlled. A signal with 5 aspects is counted as 2 sets.AC 30Vrms, 1.5A/set (G type bulb). One filament fusion detection. 1A ± 50 mA or less~~ |
| | ~~Power consumption~~ | ~~About 28W (with load of 70%)~~ |
| ~~AC control ET-AC~~ | ~~No. of lights controlled~~ | ~~A maximum of 8 sets of lights with 2 lamps per set can be controlled. For 3 or 4 lamp type, 2 sets are used. AC 110Vrms, 3A max (I type bulb)~~ |
| | ~~Power consumption~~ | ~~About 28W (with load of 70%)~~ |
| Control panel input/output MMIF | DC control output current and No. of control points | Input 32 points, 24V, 10mA/single system. Output 64 points, 24V, 30mA or less/circuit 640mA or less/common, 2A or less/unit |
| | Power consumption | About 10W (with an input/output load of 70%) |
| ~~Track input ET-TR~~ | ~~No. of track circuits detected~~ | ~~8 track circuits (50/60Hz, 25/30Hz, 83.3/100Hz)~~ |
| | ~~Rating~~ | ~~Local voltage 110V (80 ~ 85V of rating or more) Track voltage 1.0V (60 ~ 65% of rating or more) Frequency 50/60Hz, with a phase difference of 80° · Operating time: 2.0 ~ 2.4 sec · Resetting time: 0.2 ~ 0.3 sec~~ |
| | ~~Power consumption~~ | ~~About 15W (with an input load of 70%)~~ |

(4) Electrical performance of CRT Operator Console

The electrical performance of CRT Operator Console is shown in Table 4-5.

Table 4-5

| ITEM | | | PERFORMANCE |
|---|---|---|---|
| Requirement for operating power supply | | | AC100V±10% |
| Logic unit | Redundancy | | Single |
| | Control System | | Program Control System |
| | Type | | 32-bit |
| | Memory capacity | | 640k bytes |
| | Sub-memory | Floppy disk | 3.5-inch × 2 or 3.5-1 × 1 |
| | | Hard disk | HDD 100M |
| | Input Equipment | | Keyboard |
| CRT | Screen size | | 21 inches |
| | Resolution | | 640 × 400 dots or more |

(5) Electrical performance of Maintenance System

The electrical performance of the Maintenance System is shown in Table 4-6.

Table 4-6

| ITEM | | | PERFORMANCE |
|---|---|---|---|
| Requirement for operating power supply | | | AC100V±10% |
| Logic unit | Redundancy | | Single |
| | Control System | | Program Control System |
| | Type | | 32-bit |
| | Memory capacity | | 640k bytes |
| | Sub-memory | Floppy disk | 3.5-inch × 2 or 3.5-1 × 1 |
| | | Hard disk | HDD 100M |
| | Input Equipment | | Keyboard |
| CRT | Screen size | | 14 inches |
| | Resolution | | 640 × 400 dots or more |
| Printer | Type | | Dot matrix |
| | Interface | | 8-bit parallel |
| | Printing speed | | 122 character/sec or more |
| | No. of digits | | 80 digits or more |

# 5. Configuration and Block Diagram

## 5.1 Equipment configuration

The configuration of the equipment is shown in Table 5-1.

Table 5-1

| NAME | Q'TY | DESCRIPTION |
|---|---|---|
| Electronic Interlocking (Logic Unit) | 1 | |
| Power Supply Unit | | |
| Interlocking Logic Unit | | |
| | | |
| Various Electronic Terminals(ET) | | |
| Electronic interlocking (ET) | As demanded | Including Electronic Terminals that will be housed in on-site instrument box. |
| Power Supply Block | | |
| Repeater | | |
| Various ET | | |
| Various signal relays | | |
| Control Panel | 1 | |
| Power Supply Block | | |
| Repeater | | |
| I/O Terminals of Control Panel | | |
| Levers, push-buttons, etc. | | |
| Various signal relays | | |
| Maintenance Monitor | 1 | |
| Power Supply | 1 lot | |

# 6. Construction, Shapes and Dimensions

## 6.1 Racks

(1) The Interlocking Logic Bay, Electronic Terminal Bay and Relay Bay will be structured with steel members, so that maintenance inspections and replacing units etc. can be easily performed.

(2) Indication Lamps using LED etc. will be provided at locations where operation status, failure, etc. must be indicated. Measurement Panels with terminals will be installed where measuring voltage etc. is required.

(3) Nameplates showing bay name, manufacturer, year, month and day of manufacture, etc. will be installed at locations specified by the customer.

## 6.2 Control Panel

(1) This unit will be structured with steel members and easily maintained and inspected; doors will be installed on the front and rear sides, and a signal lock can be installed on the rear door.

(2) The table will be composed of steel sheets and wooden members processed and lined with melamine panels, and structured rigidly.

(3) The panel surface will show an approximate track shape with illustrated levers, push-buttons, switches, etc., the names of which will also be described. The push-buttons and switches illustrated will be made self-

illuminating using LED etc., when required. The levers illustrated will be provided with locks when required (a structure such that a lever can be controlled with a key, or the cover of a lever can be opened and closed using a key), and will be provided with a latch or will be embedded in the panel.
In the rear surface of the panel, a track layout will be described in black, together with the description of names of push-buttons, etc.

(4) A nameplate showing panel name, manufacturer, year, and month of manufacture, etc. will be installed at a location specified by the customer.

6.3 Units

(1) Each unit will consist of a plug-in system in which the plug can be easily inserted and removed, but when mounted, the plug will be securely retained.

(2) Indication Lamps using LED etc. for showing operation status will be provided at locations where indicating operation status, fault position, etc. is required. Measurement Terminals and Panels will also be installed wherever required.

(3) Each unit will be indicated with unit name, manufacturer, year, month and day of manufacture, etc.

(4) Each unit will be treated with solder resist, and silk printed on the surface of mounting devices.

6.4 Wiring and terminals

(1) Printed wires will be incorporated in a unit, as standard.

(2) For inter-bay wiring, the cable or optical cord shown in the attached table 2 will be installed.

(3) For connecting an external device, a multi-connector or optical connector will be used for each unit. In the connector, pins will be installed on the bay, and the socket will be connected to the cable.

(4) Component parts for connecting unit connectors, inter-bay cable connectors, etc. will be plated with gold, in general. However, switches, connectors, etc. for relays and in auxiliary circuits will be plated with silver, or treated equivalently or better.

(5) Connecting pins of 6 mm or more in diameter will be used for power terminals, among other terminals to external devices.

(6) Relays will be of a spark extinction type.

7. Appearance and Coating

(1) Racks will be painted and baked with a paint of Munsell 5Y 8.5/1, semi-brilliant.

(2) The Control Panel will be painted and baked with a paint of Munsell 2.5G 6/2, semi-brilliant.

(3) The outer surface of the Control Panel will be painted and baked with a paint of Munsell 7.5BG 4/2, semi-brilliant. The inner surface of the Control Panel will

be painted and baked with a silver paint.

8. Materials

(1) The major materials are shown in Table 8.

(2) Semiconductors and major moldings will be used after being aged satisfactorily.

Table 8

| ITEM | MATERIALS |
|---|---|
| Bay | JIS G 3101 (Rolled steel for general structure)<br>JIS G 3141 (Cold rolled carbon steel sheets and strip)<br>JIS H 4000 (Aluminum and aluminum alloy sheets And plates, strip and coiled sheets)<br>JIS H 4100 (Aluminum and aluminum alloy extruded shapes) |
| Semiconductor (Transistor) (Diode)(IC) | Those registered in EIAJ for telecommunication industry, or equivalent |
| Resistance and capacitor | Those specified in JIS or equivalent |
| Intra-bay wiring | Those specified in the JIS or equivalent, and optical cord |
| Inter-bay wiring | PVC office cable [0.5 $mm^2$ (20/0.18) 50 cores] and cables shown in the attached tables 2-1~ 2-5.Optical cord with electro-optical converter |

| | | |
|---|---|---|
| Insulation materials | | |
| | Plug jack | JIS K 6915 (Phenolic molding compounds)<br>JIS K 6719 (Polycarbonate moulding materials)<br>or equivalent |
| | Terminal board | JIS K 6915 (Phenolic molding compounds) or equivalent |
| | Printed circuit board | JIS C 6484 (Copper-clad laminates for printed wiring boards-glass fabric base, epoxy resin) or equivalent |
| Transform and coil | | Iron core will be made of the material specified in JIS C 2552 (Non-oriented magnetic steel sheet and strip) or equivalent, and coil will be manufactured from the material specified in JIS C 3202 (Enameled winding wires) or equivalent and vacuum impregnated with the material specified in JIS C 2353 (Coil impregnating varnishes for electrical insulation) or equivalent. |
| Circuit breaker | | Will conform to JIS C 8370 (Molded case circuit breakers), circuit breaker for protecting semiconductor circuit, or equivalent. |

# 9. Test Methods

## 9.1 Test site

The standard conditions of test site will conform to Class 3 of JIS Z 8703 (Standard atmospheric conditions for testing) for both temperature and humidity.

## 9.2 Test methods

Test methods will be as shown in Table 9.

Table 9

| TEST ITEM | TEST METHODS | CHECK ITEMS |
|---|---|---|
| Appearance inspection | Shape, dimensions, paint status, etc. will be checked. | Will satisfy the specifications. |
| Electrical performance inspection | Power will be supplied to each unit, and electrical performance will be measured using instruments etc. | 9 The electrical performance specified in 4 will be satisfied. |
| General Function inspection | Each bay will be connected and tested using simulator etc. | The functions specified in 4 will be satisfied. |
| Interlocking function inspection | Will conform to JIS E 3004 (Inspection of relay interlocking machines). | |
| | | |

| | | | |
|---|---|---|---|
| Voltage regulation test | | | |
| | Voltage Increase | Voltages of power supplies will be increased by 10% for AC, and 5% or 10% for DC. | The normal performance specified in 4 will be retained. |
| | Voltage Decrease | Voltages of power supplies will be decreased by 10% for AC, and 5% or 10% for DC. | |

| | | |
|---|---|---|
| Temperature change test<br>In equipment room<br>High temperature<br><br><br><br><br><br><br><br>Low temperature<br>Cabinet<br>High temperature<br>Low temperature | Ambient temperature will be maintained at +35℃, and after allowing test sample to stand in this environment continuously for 2 hours, performance will be tested.<br>Ditto but +10℃<br><br>Ditto but +60℃<br>Ditto but + 0℃ | The normal performance specified in 4 will be retained. However, this test will be carried out as a type test. |
| Surge immunity | Lightning surge test will be carried out according to IEC801-5, level 3 (2 KV or less). | 34 After the test, the normal performance will be retained. However, this test will be carried out as a type test. |
| Electromagnetic environment immunity test (EMC test) | Irradiated high frequency electromagnetic field test will be performed according to IEC801-3, level 3 (10V/m). | |

9.3 Aging

(1) Aging time

When a product is completed to be manufactured, equipment for simulating the related on-site equipment will be connected, and the product will be aged for 500 hours under the standard operation status.

(2) Aging conditions

If the related on-site equipment cannot be connected physically to the product, simulator will be used. Aging will be performed at a manufacturing works or on-site installation location.

10. Package, Marking, etc.

10.1 Package

As per Class 2 of JIS (Package of electrical appliances and materials)

10.2 Marking

(1) Bay

Bay name, manufacturer's name, year and month of manufacture, No. of manufacture

(2) Unit

Name, manufacturer's name, year and month of manufacture, No. of manufacture

(3) Name and symbol number

Names of track circuits etc. to be used will be subject to instructions from the customer.

## 11. Accessories and Spare Parts

For accessories and spare parts, see tables 11-1 and 11-2.

Table 11-1 Accessories

| ACCESSORY | QUANTITY | DESCRIPTION |
|---|---|---|
| Inter-bay cable | As instructed | |
| LDC set | Ditto | Personal computer, printer, logic data compiler, ROM writer, ROM eraser |
| LDC set base | Ditto | |
| Floppy disk | Ditto | 3.5-inch, 2HD |
| Printer ribbon | Ditto | |
| Paper for printer | Ditto | |
| Tools | Ditto | Crimp tool, pull-out tool for inter-bay cable connector |
| Others | Ditto | |

Table 11-2 Spare parts

| Parts | QUANTITY | DESCRIPTION |
|---|---|---|
| Cabinet for housing spare parts | As instructed | |
| LED, fuses, etc. | Ditto | |
| Relays, switches, etc. | Ditto | |
| Mounted devices etc. | Ditto | |
| Units etc. | Ditto | |

Cited standard specifications etc.

| CITED SPECIFICATION | TITLE |
|---|---|
| JIS C 2353 | Coil impregnating varnishes for electrical insulation |
| JIS C 2552 | Non-oriented magnetic steel sheet and strip |
| JIS C 3202 | Enameled winding wires |
| JIS C 6484 | Copper-clad laminates for printed wiring boards - glass fabric base, epoxy resin |
| JIS C 6832 | Silica glass multi-mode optical fibers |
| JIS C 8370 | Molded case circuit breakers |
| JIS E 3004 | Inspection of relay interlocking machines |
| JIS E 3013 | Glossary of terms for railway signaling |
| JIS G 3101 | Rolled steel for general structure |
| JIS G 3141 | Cold rolled carbon steel sheets and strip |
| JIS H 4000 | Aluminum and aluminum alloy sheets and plates, strip and coiled sheets |
| JIS H 4100 | Aluminum and aluminum alloy extruded shapes |
| JIS K 6719 | Polycarbonate moulding material |
| JIS K 6915 | Phenolic molding compounds |
| JIS X 0001 ~ 0022 | Glossary of terms used in information processing |
| JIS X 5001 | Character structure on the transmission circuits and horizontal parity method |
| JIS X 5104 ~ 5106 | High level data link control procedures |
| JIS Z 8703 | Standard atmospheric conditions for testing |

# Acceptance Test Format

# for K5BMC Electronic Interlocking System

# As per RDSO/SPN/192/2005.

Document No. Z914-C73000011G

Version 7

12. Feb. 2011



**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. Mar. 2009 | First Issue | T. Suzuki |
| 2 | 25. May 2010 | Revised the Content of the Test | T. Suzuki |
| 3 | 26. Jul. 2010 | Revised for adding Card failure Display screen for MTC for Simplified Card Tester | T. Suzuki |
| 4 | 13. Aug. 2010 | Improvement of MTC Display function, correction of Words-and-phrases, Re-examination of Failure message. | T. Suzuki |
| 5 | 12. Nov. 2010 | Revised the Content of the Test and addition of Journal Module | T. Suzuki |
| 6 | 13. Dec. 2010 | Added the normal condition check table for Journal Module, (10 in Annex 4.)<br>Revised the screen name of Failure Indication Display Screen for MTC of K5BMC. (Annex 5) | T. Suzuki |
| 7 | 12. Feb. 2011 | Addition of check item of LED indication of the Card panel to each card test of Journal Module | Y.Kanno |

# Acceptance Test Format for K5BMC Electronic Interlocking System As per RDSO/SPN/192/2005.

## Test Procedures for K5BMC Electronic Interlocking System

Table of Content

Attached Document

**SIGNAL DIRECTORATE**

**RESEARCH DESIGNS AND STANDARDS ORGANISATION**
**MANAK NAGAR, LUCKNOW- 226011**

# Title: Acceptance Test Format for K5BMC Electronic Interlocking System As per RDSO/SPN/192/2005.

| S.No. | Issue | Version | Reason of Amendment |
|---|---|---|---|
| 1 | First | 1 | First Issue |
| 2 | Second | 2 | Revised the Content of the Test |
| 3 | Third | 3 | Revised for adding Card failure Display screen for MTC for Simplified Card Tester |
| 4 | Fourth | 4 | Improvement of MTC Display function, correction of Words-and-phrases, Re-examination of Failure message. |
| 5 | Fifth | 5 | Revised the Content of the Test and addition of Journal Module |
| 6 | Sixth | 6 | Added the normal condition check table for Journal Module, (10 in Annex 4.)<br>Revised the screen name of Failure Indication Display Screen for MTC of K5BMC. (Annex 5) |
| 7 | Seventh | 7 | Addition of check item of LED indication of the Card panel to each card test of Journal Module |

| Prepared by: | Approved by: |
|---|---|
| | |

**SIGNAL DIRECTORATE**

**RESEARCH DESIGNS AND STANDARDS ORGANISATION**
**MANAK NAGAR, LUCKNOW- 226011**

# ACCEPTANCE TEST FORMAT for K5BMC ELECTRONIC INTERLOCKING

**(SPECIFICATION NO RDSO/SPN/192/2005)**

| | |
|---|---|
| **NAME & TYPE OF THE EQUIPMENT** | **ELECTRONIC INTERLOCKING (K5BMC)** |
| **SPECIFICATION NO.** | **RDSO/SPN/192/2005** |
| **NAME OF THE TEST** | **ACCEPTANCE TEST** |
| **NAME & ADDRESS OF THE FIRM** | **INSTRUMENTATION LIMITED**<br>**Kota - 324 005, RAJASTHAN, (INDIA)** |
| **SL. NO. OF THE EQUIPMENT** | |

**Abbreviation**:

| | |
|---|---|
| EI | Electronic Interlocking |
| K5BMC | K5BMC type |
| LDC | Logical Data Compiler |
| CT | Card Tester |
| MTC | Maintenance Console |
| OPC | Operator Console |
| ET | Electronic Terminal |
| CH | Channel |
| GI | GI type optical fiber cable |
| DL | Data Logger |
| I/O | input / output |
| SW | switch |

**COMPOSITION OF THE EQUIPMENT**: Electronic Interlocking consists of the following Cards:

| Sl. No. | Card Name | Part No. | Mounting part | Part No. |
|---|---|---|---|---|
| 1 | IPU6C | F2666PA480 | Logic Sub-Rack | |
| 2 | F486-4I | J2987PA330B+J2987PA320 | | |
| 3 | FSIO | J2987PA260C | | |
| 4 | FSIO-EX | J2987PA260C | | |
| 5 | FIO7-[P] | F2666PA310C+F2666PA360B | | |
| 6 | EXTFIO7P | F2666PA370B | | |
| 7 | DID | F2666PA380B | | |
| 8 | LINEM2 | F3602PA550C+F3602PA200C | Electronic Terminal Sub-Rack for MMIF | |
| 9 | MMIF2 | J2828PA410E | | |
| 10 | LINE2B | F2242PA190B+F3602PA200C | Electronic Terminal Sub-Rack for PIO | |
| 11 | ET-PIO2 | F2242PA800B | | |
| 12 | SPHC-TT | J2448PA860D | Others | |
| 13 | SPHC-PW | J2448PA830B | | |
| 14 | INIO2 | J2718PA360B | | |
| 15 | ZPEN3 | J2988PA440E + J2988PA430C | Journal Module | |
| 16 | ZNIO2 | J2988PA520B | | |
| 17 | ZSIO2 | J2988PA450E | | |
| 18 | KDD172-KY48-2 | PKW0401 | | |

Others

| | | | | |
|---|---|---|---|---|
| 1 | L-K7C | F2666PA350 | Motherboard of Logic Sub-Rack | |
| 2 | E-M2 | F3602PA560 | Motherboard of Electronic Terminal Sub-Rack for MMIF | |
| 3 | E-M6 | F3602PA560+F3602PA570 | | |
| 4 | E-P5 | F2242PA200C+J2828PA480C | Motherboard of Electronic Terminal Sub-Rack for PIO | |

| Signature of Firm's Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
|---|---|
| | |

**TEST PROCEDURES FOR ELECTRONIC INTERLOCKING**

## 1. TEST AND REQUIREMENTS

### 1.1 Conditions of Tests

Unless otherwise specified all tests shall be carried out at ambient atmospheric conditions.

### 1.2 For inspection of material, relevant clauses of IRS :

S 23 and RDSO/SPN/144/2006 and the latest version shall apply.

### 1.3 Acceptance Test: (As per clause 11.4 of RDSO/SPN/192/2005)

The following tests shall constitute Acceptance test.

a) Visual Inspection
b) Insulation Resistance Test.
c) Card-level functional test on all the cards.
d) System level functional test.
e) System Diagnostics test.
f) Verification of application software Vis-a Vis Interlocking Table
g) Any other tests shall be carried out as considered necessary by purchaser

Tests above **a)** to **c)** should be carried out by RDSO & the tests from **d)** to **g)** shall be carried out by consignee/user Railway.

## 2. TEST PROCEDURE

### 2.1 Visual Inspection (clause No. 12.1 of RDSO/SPN/192/2005.)

The equipment shall be visually inspected to ensure compliance with the requirement of this specification. The visual inspection will broadly include:-

**i) System Level checking:**

| Sr. No. | Test performed | Observation (Yes/No) | Remarks |
|---|---|---|---|
| 1 | Constructional details in compliance with requirements/specifications. | | |
| 2 | Dimensional check<br>Cards shall be housed in racks which are specified in approved specification. . | | |
| 3 | General workmanship is satisfactory (Check whether all connections are made through crimped eyelets and are numbered with PVC cable marker rings). | | |
| 4 | Configuration of whole system is provided. | | |
| 5 | Dust protection in cabinet is provided. | | |
| 6 | Locking arrangement for equipment to prevent unauthorized access. | | |

**ii) Card Level checking:**

| Sr. No. | Test performed | Observation (Yes/No) | Remarks |
|---|---|---|---|
| 1 | No extra wire/ jumper is provided on the PCB. | | |
| 2 | General layout is satisfactory. | | |
| 3 | Whether quality of soldering and component mounting is satisfactory. | | |
| 4 | Legend printing is provided. | | |
| 5 | Green masking is provided. | | |
| 6 | Whether nomenclature of card for identification is properly done for the following:<br>i) Equipment name and number.<br>i) Card/Module name and Part number,<br>ii) Manufacturing date (Month and year of manufacturing), | | |
| 7 | Manufacturer's embossing is done to indicate:<br>i) Component outline,<br>ii) Manufacturer's name,<br>iii) PCB Name,<br>iv) Component number. | | |

**iii) Module Level Checking:**

| Sr. No. | Test performed | Observation (Yes/No) | Remarks |
|---|---|---|---|
| 1 | Mechanical/Electrical polarization of Sub-Rack/card is provided. | | |
| 2 | General shielding arrangement of individual card is provided. | | |
| 3 | Shielding at chassis/ rack level is provided. | | |
| 4 | Indication and display is provided. | | |
| 5 | Mounting and clamping of connectors is provided. | | |
| 6 | Proper housing of cards is provided. | | |
| 7 | Modular expansion provision. | | |

**2.2 Insulation Resistance Test: (clause No.- 12.2 of RDSO/SPN/192/2005)**

This test shall be conducted between the equipment power supply (24V) line terminals and the main rack. If there is a possibility of the meggering voltage reaching the cards, these will be taken out before starting the IR Test.

The measurement shall be made at a potential of not less than 500 volts DC.

| Procedure | Insulation Resistance values | | Satisfactory/ Unsatisfactory |
|---|---|---|---|
| | Specified | Measured value | |
| B (24V/26V DC) - and rack | Not less than 10 M ohm. | | |
| C (24V/26V DC) - and rack | Not less than 10 M ohm. | | |

**2.3 Card Level Functional Test for K5BMC:**

This test shall be carried out on the IC cards and the cards.

The program stored in the IC card for the test is confirmed by using LDC-PC for the K5BMC.

Module level functional tests for each cards are carried out by the K5BMC EI-CT(Card Tester, refer to Annex 2 attached) and the MTC(Maintenance Console) for EI-CT.

**2.3.1 Devices used in Card Level Test**

Devices that are used in the card level tests for each cards are EI-CT, OPC(operator console), MTC and a off-line PC for LDC.

a. Purposes of the EI-CT are as follows.

(1) to check each cards that are used in EI for their integrity at hardware level,

(2) to confirm whether the card under test is in working order or not with corresponding EI-CT Indication Panel, only by inserting the card under test in place in the CT rack and then turn ON the rack and the card,
(3) to confirm detailed operating condition of each cards at the MTC by connecting with the MTC to EI-CT with a GI optical fiber cable, and
(4) to confirm integrity of other cards such as spares etc..

b. EI-CT Configuration
The CT main rack is equipped with the Logic Sub-Rack, the ET(electronic terminal) Sub-Rack, the EI-CT Indication Panel, the power supply card and the circuit breaker.
The MMIF Sub-Rack has been equipped with a LINEM2 card and a MMIF2 card(B) for outputting information to the LED lamps on the EI-CT Indication Panel. And a IC card for EI-CT and a connecting cable that are used for testing (refer to the Annex 3.)

c. The following cards are tested with the EI-CT.
(1) Logic Cards: IPU6C, F486-4I, FSIO, FSIO-EX, DID, FIO7-[P], EXTFIO7P, SPHC-TT and SPHC-PW(Power card for SPHC-TT)
(2) PIO Terminal Cards: LINE2B and PIO2
(3) MMIF Terminal Cards: LINEM2 and MMIF2 (A)
(4) Sub Rack: L-K7C(Logic Cards), E-P5(ET-PIO), E-M2 and E-M6(MMIF2)

d. The MTC which is composed of a PC, performs information transmission with the EI-CT via the INIO2 card and is used to grasp operating stats of the Logic Cards and Electronic Terminals （ET） as a image relay at card level in detail.

e. The OPC which is composed of a PC, performs information communication with the EI-CT via INIO2-ET(electronic terminal) attached to the expansion slot.

f. The PC for LDC is used for checking the software stored in the IC card for the EI-CT.

### 2.3.2 Checking for Application Software stored in IC card for EI-CT

This section describes test procedure for confirming software names, version No., date, sum value and results of checking of programs in IC card by PC for LDC.

**Functional Test Procedure**

a. Install the IC card of EI-CT into the PC LDC.
b. Select “Program Reading” from the menu of the off line system on the PC display and then the test program in IC card is indicated on the PC screen.
c. Confirm the followings.

| Test No. | Test description | Expected Result / Indication | | | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|---|---|
| 1 | Confirmation for the program stored in IC Card of the test set. | File name | Version No. | Date of Creation | Check Sum | | |
| | | K6LGC_J3.EXP | C3.82 | 22/12/2005 | 0047F003 | | |
| | | K6STP_C5.EXP | C5.00 | 24/11/2005 | 000B66D4 | | |
| | | K6ET_J3.EXP | C3.82 | 22/12/2005 | 00186A7B | | |
| | | K6MTN_I5.EXP | I5.01 | 12/08/2010 | 0010F8AF | | |
| 2 | Confirmation for data stored in IC Card for test set. (compare parameter) | Confirm date of creation and sum values of the data. | | | Date of Creation | | |
| | | | | | Check Sum | | |

| Signature of Firm’s Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
|---|---|
| | |

### 2.3.3 Test Procedure for Card installed in Logic Sub-Rack

This section describes test procedure for confirming integrity of cards which are installed into the Logic Sub-Rack of the EI-CT.

In this section, system configuration of this test is required EI-CT and MTC as per "Cards Test System Configuration for K5BMC(No.1)" in Annex 1.

**Functional Test Procedure**

**1) Preparation for Logic Cards Test**

a. Install cards under test, IPU6C, F486-4I, FSIO and FSIO-EX cards into corresponding slots on the front of the EI-CT Logic Sub-Rack.
   Install DID, FIO7-[P] and EXTFIO7P cards into corresponding slots on the back of the EI-CT Logic Sub-Rack.
b. Install the IC card that has been confirmed in the previous section into the F486-4I card on the front.
c. Turn ON the Breaker back of the rack.
d. Turn ON the front SW of the cards concerned (i.e. SW1 of IPU6C for logic cards power, DC5V SW of LINEM2 , and Power SW of MMIF2(B) for EI-CT Indication Panel Power.)
   The logic cards reads program and data from the IC card and start up.
e. The LED lamps of LINEM2 and MMIF2(B) on the Indication Pannel light up green and this shows that the MMIF2 (B) is in full working order.
   （LINEM2, MMIF2(B)）

**2) IPU6C Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| 1 | Check Power Supply unit Output voltage. | voltage at output terminal of Power Supply unit should be regulated within: 24V±10% | | | |
| 2 | Check IPU6C card output voltage. | output voltages at 24V and 5V output terminals should be regulated within: | 24V±10% | | |
| | | | 5V+5% -0% | | |
| 3 | Check IPU6C card normal work by IPU6C LED lamp on EI-CT Indication Panel. | IPU6C LED on the indication panel should be lit up. [Note: This LED Indication means that Next Test No. 4 is successfully completed.] | | | |
| 4 | Check IPU6C card normal work by relay status of "IPU6-FL" on MTC display. | "IPU6-FL" on the display should be "1". | | | |

**3) F486-4I Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check F486-4I card normal work by F486-4I LED lamp on EI-CT Indication Panel. | F486-4I LED on the Indication panel should be lit up. [Note: This LED Indication means that Next Test No.2 and 3-1 to 3-15 are all successfully completed.] | | |
| 2 | Check F486-4I card normal work by relay status of "StartUp" on MTC display. | "StartUp" on the display should be "1". | | |
| 3.-1 | Check the self-diagnostic function of F486-4I card normal work by relay status of "A-Abar-Ok" on MTC display. | "A-Abar-Ok" on the display should be "1". | | |
| 3-2 | Check the self-diagnostic function of F486-4I card normal work by relay status of "TRACE-Ok" on MTC display. | "TRACE-Ok" on the display should be "1". | | |
| 3-3 | Check the self-diagnostic function of F486-4I card normal work by relay status of "KEY-OK" on MTC display. | "KEY-OK" on the display should be "1". | | |
| 3-4 | Check the self-diagnostic function of F486-4I card normal work by relay status of "ICCARD-OK" on MTC display. | "ICCARD-OK" on the display should be "1". | | |
| 3-5 | Check the self-diagnostic function of F486-4I card normal work by relay status of "RAM-OK" on MTC display. | " RAM-OK" on the display should be "1". | | |
| 3-6 | Check the self-diagnostic function of F486-4I card normal work by relay status of "TIM-OK" on MTC display. | " TIM-OK" on the display should be "1". | | |
| 3-7 | Check the self-diagnostic function of F486-4I card normal work by relay status of "COMP-OK" on MTC display. | " COMP-OK" on the display should be "1". | | |
| 3-8 | Check the self-diagnostic function of F486-4I card normal work by relay status of "FSIN-OK" on MTC display. | " FSIN-OK" on the display should be "1". | | |
| 3-9 | Check the self-diagnostic function of F486-4I card normal work by relay status of "SsysOk" on MTC display. | " SsysOk" on the display should be "1". | | |
| 3-10 | Check the self-diagnostic function of F486-4I card normal work by relay status of "WdtOk" on MTC display. | "WdtOk" on the display should be "1". | | |
| 3-11 | Check the self-diagnostic function of F486-4I card normal work by relay status of "ItlIdleOk" on MTC display. | "ItlIdleOk" on the display should be "1". | | |
| 3-12 | Check the self-diagnostic function of F486-4I card normal work by relay status of "FurikoOk" on MTC display. | " FurikoOk" on the display should be "1". | | |
| 3-13 | Check the self-diagnostic function of F486-4I card normal work by relay status of "RomComp" on MTC display. | " RomComp" on the display should be "1". | | |
| 3-14 | Check the self-diagnostic function of F486-4I card normal work by relay status of "VME-OK" on MTC display. | " VME-OK" on the display should be "1". | | |
| 3-15 | Check the self-diagnostic function of F486-4I card normal work by relay status of "ICCIns-OK" on MTC display. | "ICCIns-OK" on the display should be "1". | | |

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**4) FSIO Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check FSIO card normal work by FSIO LED lamp on EI-CT Indication Panel. | FSIO LED on the indication panel should be lit up. [Note: This LED Indication means that Next Test No. 2, 3, 4 and 5 are all successfully completed.] | | |
| 2 | Check FSIO card normal work for ET line CH1 by relay status of " E1PelphErr" on MTC display. | "E1PelphErr" on the display should be "0". | | |
| 3 | Check FSIO card normal work for ET line CH2 by relay status of " E2PelphErr" on MTC display. | "E2PelphErr" on the display should be "0". | | |
| 4 | Check FSIO card normal work for ET line CH3 by relay status of " E3PelphErr" on MTC display. | "E3PelphErr" on the display should be "0". | | |
| 5 | Check FSIO card normal work for ET line maintenance CH by relay status of "MPelphErr" on MTC display. | "MPelphErr" on the display should be "0". | | |

**5) FSIO-EX Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check FSIO-EX card normal work by FSIO-EX LED lamp on EI-CT Indication Panel. | FSIO-EX LED on the indication panel should be lit up. [Note: This LED Indication means that Next Test No. 2 to 4 are all successfully completed. ] | | |
| 2 | Check ET line CH4 of FSIO-EX card normal work by relay status of " E4PelphErr " on MTC display. | "E4PelphErr" on the display should be "0". | | |
| 3 | Check ET line CH5 of FSIO-EX card normal work by relay status of " E5PelphErr " on MTC display. | "E5PelphErr" on the display should be "0". | | |
| 4 | Check ET line Option CH of FSIO-EX card normal work by relay status of "OPelphErr" on MTC display. | "OPelphErr" on the display should be "0". | | |

**6) DID Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check DID card normal work by DID LED lamp on EI-CT Indication Panel. | DID LED on the indication panel should be lit up. [Note: This LED Indication means that Next Test No. 2 is successfully completed. ] | | |
| 2 | Check DID card normal work by relay status of "DID-FL" on MTC display. | "DID-FL" on the display should be "1". | | |
| 3 | Check to be abnormal by another Station ID set. | LED lamp "BER" on the F486-4I front panel should be lit red. | | |

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**7) FIO7-[P] Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check FIO7-[P] card normal work by FIO7-[P] LED lamp on EI-CT Indication Panel. | FIO7-[P] LED on the indication panel should be lit up.<br>Note: following Test No. 2 to 5 are all successfully completed. | | |
| 2 | Check FIO7-[P] card normal work for ET line CH1 by relay status of "E1PelphErr" on MTC display. | "E1PelphErr" on the display should be "0". | | |
| 3 | Check FIO7-[P] card normal work for ET line CH2 by relay status of "E2PelphErr" on MTC display. | "E2PelphErr" on the display should be "0". | | |
| 4 | Check FIO7-[P] card normal work for ET line CH3 by relay status of "E3PelphErr" on MTC display. | "E3PelphErr" on the display should be "0". | | |
| 5 | Check FIO7-[P] card normal work for ET line maintenance CH by relay status of "MPelphErr" on MTC display. | "MPelphErr" on the display should be "0". | | |

**8) EXTFIO7P Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check EXTFIO7P card normal work by EXTFIO7P LED lamp on EI-CT Indication Panel. | EXTFIO7P LED on the indication panel should be lit up.<br>[Note: This LED Indication means that following Test No. 2 to 4 are all successfully completed]. | | |
| 2 | Check EXTFIO7P card normal work for ET line CH4 by relay status of "E4PelphErr" on MTC display. | "E4PelphErr" on the display should be "0". | | |
| 3 | Check EXTFIO7P card normal work for ET line CH5 by relay status of "E5PelphErr" on MTC display. | "E5PelphErr" on the display should be "0". | | |
| 4 | Check EXTFIO7P card normal work for ET line Option CH by relay status of "OpelphErr" on MTC display. | "OpelphErr" on the display should be "0". | | |

### 2.3.4 Test Procedure of Cards inserted into the ET-PIO Electronic Terminal Sub-Rack

This section describes test procedures for confirming integrity of cards that are installed into the ET-PIO electronic terminal Sub-Rack and successful operation of the ET CH4 by using EI-CT.

In this section, system configuration of this test is required EI-CT and MTC as per "Cards Test System Configuration for K5BMC(No.1)" in Annex 1 attached.

**Functional Test Procedure**

**1) Preparation for ET-PIO Cards Test**

a. In advance of the testing, Logic Cards and an IC card possessing integrity proven (for example by test in Section 2.3.3) have been installed into the Logic Sub-Rack.
b. Install cards under test, LINE2B and ET-PIO2 into corresponding slots of ET-PIO Sub-Rack in EI-CT.
c. Turn ON the breaker back of the Sub-rack.
d. Turn ON the front SW of the cards concerned (i.e. SW1 of IPU6C, DC5V SW of LINEM2, and Power SW of MMIF2(B))
   The logic card starts activation process and after a period of time, all the LEDs on the logic card side of the EI-CT Indication Panel light up green. (IPU6, F486-4I, FSIO, FSIO-EX, DID, FIO7-[P] and EXTFIO7P)
e. All the LEDs showing that the MMIF2(B) card for EI-CT Indication Panel output is in working order light up.
   （LINEM2 and MMIF2(B)）
f. And then Turn ON the front SW of the LINE2B card and the front SW inside of the cover of ET-PIO2 cards.

**2) LINE2B Card Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| 1 | Check Power Supply unit output voltage. | Voltage at the output terminal of Power supply unit should be regulated in: 24V±10% | | | |
| 2 | Check LINE2B power output voltage of 24V/5V. | Voltage at 24V and 5V at the measuring terminal should be regulated within: | 24V±10% | | |
| | | | 5V+5% -0% | | |
| 3 | Check LINE2B card normal work by LINE2B LED lamp on EI-CT Indication Panel. | LINE2B LED on the indication panel should be lit up. [Note: This LED Indication means that following Test No.4 is successfully completed.] | | | |
| 4 | Check LINE2B card normal work by relay status of "LINE2B-FL" on MTC display. | "LINE2B-FL" on the display should be "1". | | | |

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**3). ET-PIO2 Card Test and ET CH4 Communication Test**

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check ET-PIO2 input voltage. | Voltage at the measuring terminal of ET-PIO2 card 5V line should be regulated: 5V± 5% | | |
| 2 | Check ET-PIO2 normal work by PIO2 LED lamp on EI-CT Indication Panel. | PIO2 LED on the indication panel should be lit up. [Note: This LED Indication means following Test No.3, No.4-1 to 4-3, and No.5-1 to 5-8 are successfully competed.] | | |
| 3 | Check ET-PIO2 normal work by relay status of "PIOA-FR" on MTC display. | "PIOA-FR" on the display should be "1". [Note: This Relay status also shows whether following Test No.4-1 to 4-3 and No.5-1 to 5-8 are All fully completed.] | | |
| 4-1 | Check ET-PIO2 for Control Information Receiving condition of system 1 normal by relay status of "2PI1ANSA" on MTC display. | "2PI1ANSA" on the display should be "1". | | |
| 4-2 | Check ET-PIO2 for ET CH4 condition of System 1 normal by relay status of "2PI1SIO1A" on MTC display. | "2PI1SIO1A" on the display should be "1". | | |
| 4-3 | Check ET-PIO2 for ET Number Input Circuit condition of System 1 normal by relay status of "2PI1TNOA" on MTC display. | "2PI1TNOA" on the display should be "1". | | |
| 5-1 | Check ET-PIO2 for PIO2 circuit No.0 of System 1 normal by relay status of "2PI1No0A" on MTC display. | "2PI1No0A" on the display should be "1". | | |
| 5-2 | Check ET-PIO2 for PIO2 circuit No.1 of System 1 normal by relay status of "2PI1No1A" on MTC display. | "2PI1No1A" on the display should be "1". | | |
| 5-3 | Check ET-PIO2 for PIO2 circuit No.2 of System 1 normal by relay status of "2PI1No2A" on MTC display. | "2PI1No2A" on the display should be "1". | | |
| 5-4 | Check ET-PIO2 for PIO2 circuit No.3 of System 1 normal by relay status of "2PI1No3A" on MTC display. | "2PI1No3A" on the display should be "1". | | |
| 5-5 | Check ET-PIO2 for PIO2 circuit No.4 of System 1 normal by relay status of "2PI1No4A" on MTC display. | "2PI1No4A" on the display should be "1". | | |
| 5-6 | Check ET-PIO2 for PIO2 circuit No.5 of System 1 normal by relay status of "2PI1No5A" on MTC display. | "2PI1No5A" on the display should be "1". | | |
| 5-7 | Check ET-PIO2 for PIO2 circuit No.6 of System 1 normal by relay status of "2PI1No6A" on MTC display. | "2PI1No6A" on the display should be "1" | | |
| 5-8 | Check ET-PIO2 for PIO2 circuit No.7 of System 1 normal by relay status of "2PI1No7A" on MTC display. | "2PI1No7A" on the display should be "1" | | |

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**4). ET-PIO2 I/O Test**

a. Turn OFF the front SW inside of the cover of the ET-PIO2 card.
b. Install a cable which is connecting 32 input points and 32 output points one to one(refer to Annex 3) to the receptacle of input and output part of the ET-PIO2 card.
c. Turn ON the SW of the ET-PIO2 again.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check ET-PIO2 card for ET-PIO2 I/O normal by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED Indication means the following test No.2, and No.3-1 to 3-32 are successfully completed.] | | |
| 2 | Check General I/O loop back work of ET-PIO2 from Port 1 to 32 normal by relay status of "PIOA-IO-FR" on MTC display. | "PIOA-IO-FR" on the display should be "1". [Note: This Relay indication also shows whether the following Test No.3-1 to 3-32 are all fully completed]. | | |
| 3-1 | Check ET-PIO2 loop back work of I/O port 1 normal by relay status of "2PI1-IO-1FR" on MTC display. | "2PI1-IO-1 FR" on the display should be "1". | | |
| 3-2 | Check ET-PIO2 loop back work of I/O port 2 normal by relay status of "2PI1-IO-2 FR" on MTC display. | "2PI1-IO-2 FR" on the display should be "1". | | |
| 3-3 | Check ET-PIO2 loop back work of I/O port 3 normal by relay status of "2PI1-IO-3 FR" on MTC display. | "2PI1-IO-3 FR" on the display should be "1". | | |
| 3-4 | Check ET-PIO2 loop back work of I/O port 4 normal by relay status of "2PI1-IO-4FR" on MTC display. | "2PI1-IO-4FR" on the display should be "1". | | |
| 3-5 | Check ET-PIO2 loop back work of I/O port 5 of normal by relay status of "2PI1-IO-5FR" on MTC display. | "2PI1-IO-5FR" on the display should be "1". | | |
| 3-6 | Check ET-PIO2 loop back work of I/O port 6 normal by relay status of "2PI1-IO-6FR" on MTC display. | "2PI1-IO-6FR" on the display should be "1". | | |
| 3-7 | Check ET-PIO2 loop back work of I/O port 7 normal by relay status of "2PI1-IO-7FR" on MTC display. | "2PI1-IO-7FR" on the display should be "1". | | |
| 3-8 | Check ET-PIO2 loop back work of I/O port 8 normal by relay status of "2PI1-IO-8FR" on MTC display. | "2PI1-IO-8FR" on the display should be "1". | | |
| 3-9 | Check ET-PIO2 loop back work of I/O port 9 normal by relay status of "2PI1-IO-9FR" on MTC display. | "2PI1-IO-9FR" on the display should be "1". | | |
| 3-10 | Check ET-PIO2 loop back work of I/O port 10 normal by relay status of "2PI1-IO-10FR" on MTC display. | "2PI1-IO-10FR" on the display should be "1". | | |
| 3-11 | Check ET-PIO2 loop back work of I/O port 11 normal by relay status of "2PI1-IO-11FR" on MTC display. | "2PI1-IO-11FR" on the display should be "1" | | |

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| 3-12 | Check ET-PIO2 loop back work of I/O port 12 normal by relay status of "2PI1-IO-12FR" on MTC display. | "2PI1-IO-12FR" on the display should be "1". | | |
| 3-13 | Check ET-PIO2 loop back work of I/O port 13 normal by relay status of "2PI1-IO-13FR" on MTC display. | "2PI1-IO-13FR" on the display should be "1". | | |
| 3-14 | Check ET-PIO2 loop back work of I/O port 14 normal by relay status of "2PI1-IO-14FR" on MTC display. | "2PI1-IO-14FR" on the display should be "1". | | |
| 3-15 | Check ET-PIO2 loop back work of I/O port 15 normal by relay status of "2PI1-IO-15FR" on MTC display. | "2PI1-IO-15FR" on the display should be "1". | | |
| 3-16 | Check ET-PIO2 loop back work of I/O port 16 normal by relay status of "2PI1-IO-16FR" on MTC display. | "2PI1-IO-16FR" on the display should be "1". | | |
| 3-17 | Check ET-PIO2 loop back work of I/O port 17 normal by relay status of "2PI1-IO-17FR" on MTC display. | "2PI1-IO-17FR" on the display should be "1". | | |
| 3-18 | Check ET-PIO2 loop back work of I/O port 18 normal by relay status of "2PI1-IO-18FR" on MTC display. | "2PI1-IO-18FR" on the display should be "1". | | |
| 3-19 | Check ET-PIO2 loop back work of I/O port 19 normal by relay status of "2PI1-IO-19FR" on MTC display. | "2PI1-IO-19FR" on the display should be "1". | | |
| 3-20 | Check ET-PIO2 loop back work of I/O port 20 normal by relay status of "2PI1-IO-20FR" on MTC display. | "2PI1-IO-20FR" on the display should be "1". | | |
| 3-21 | Check ET-PIO2 loop back work of I/O port 21 normal by relay status of "2PI1-IO-21FR" on MTC display. | "2PI1-IO-21FR" on the display should be "1". | | |
| 3-22 | Check ET-PIO2 loop back work of I/O port 22 normal by relay status of "2PI1-IO-22FR" on MTC display. | "2PI1-IO-22FR" on the display should be "1". | | |
| 3-23 | Check ET-PIO2 loop back work of I/O port 23 normal by relay status of "2PI1-IO-23FR" on MTC display. | "2PI1-IO-23FR" on the display should be "1". | | |
| 3-24 | Check ET-PIO2 loop back work of I/O port 24 normal by relay status of "2PI1-IO-24FR" on MTC display. | "2PI1-IO-24FR" on the display should be "1". | | |
| 3-25 | Check ET-PIO2 loop back work of I/O port 25 normal by relay status of "2PI1-IO-25FR" on MTC display. | "2PI1-IO-25FR" on the display should be "1". | | |
| 3-26 | Check ET-PIO2 loop back work of I/O port 26 normal by relay status of "2PI1-IO-26FR" on MTC display. | "2PI1-IO-26FR" on the display should be "1". | | |
| 3-27 | Check ET-PIO2 loop back work of I/O port 27 normal by relay status of "2PI1-IO-27FR" on MTC display. | "2PI1-IO-27FR" on the display should be "1". | | |
| 3-28 | Check ET-PIO2 loop back work of I/O port 28 normal by relay status of "2PI1-IO-28FR" on MTC display. | "2PI1-IO-28FR" on the display should be "1". | | |
| 3-29 | Check ET-PIO2 loop back work of I/O port 29 normal by relay status of "2PI1-IO-29FR" on MTC display. | "2PI1-IO-29FR" on the display should be "1" | | |

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| 3-30 | Check ET-PIO2 loop back work of I/O port 30 normal by relay status of "2PI1-IO-30FR" on MTC display. | "2PI1-IO-30FR" on the display should be "1". | | |
| 3-31 | Check ET-PIO2 loop back work of I/O port 31 normal by relay status of "2PI1-IO-31FR" on MTC display. | "2PI1-IO-31FR" on the display should be "1". | | |
| 3-32 | Check ET-PIO2 loop back work of I/O port 32 normal by relay status of "2PI1-IO-32FR" on MTC display. | "2PI1-IO-32FR" on the display should be "1". | | |

### 2.3.5 Test Procedures of Cards inserted into ET-MMIF Sub-Rack

This section describes test procedures for confirming integrity of the cards which are installed into the ET-MMIF Sub-Rack in EI-CT and successful operation of the ET CH1.

In this section, system configuration of this test is required EI-CT and MTC as per "Cards Test System Configuration for K5BMC(No.1)" in Annex 1 attached.

**Functional Test Procedure**

1) **Preparation for ET-MMIF Cards Test**

a. Make sure that MMIF2 card attached to EI-CT has been installed into the position B of MMIF Sub-Rack.
b. Make sure that a logic card and an IC card possessing integrity proven(for example by test in Section 2.3.3) have been installed into the Logic card Sub-Rack.
c. Install cards under test (i.e. LINEM2 and MMIF2(A)) into corresponding slots of the ET-MMIF Sub-Rack at the EI-CT.
d. Turn ON the Breaker back of the Rack.
e. Turn ON the cards corresponding to the Logic Card and the EI-CT Indication Panel. (SW1 of IPU6C, DC5V SW of LINEM2, and Power SW of MMIF2(B))
The Logic Cards will start activation process, and after a period of time all the LEDs on the Logic Card side of EI-CT EI-CT Indication Panel light up green. (IPU6, F486-4I, FSIO, FSIO-EX, DID, FIO7-[P] and EXTFIO7P)
f. And then, the LEDs showing that the MMIF2 card output for EI-CT Indication Panel are in working order light up. （LINEM2 and MMIF2(B)）
g. Turn ON the front Power SW of the MMIF2(A) card under test.

**2) LINEM2 Card Test**

The aim of this test is to confirm the integrity and enough function of the LINEM2 card by adding more MMIF2 card to MMIF Sub-Rack.

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check Power Supply unit output voltage. | Voltage at the output terminal of Power supply unit should be regulated: 24±10% | | |
| 2 | Check LINEM2 card Output voltage (5V). | Voltage at 5V output terminals of MMIF2 card (B) should be regulated within: 5V+5% -0%: [Note: This test includes measurement of input voltage of MMIF2(A) card.] | | |
| 3 | Check LINEM2 card normal work by LINEM2 LED lamp on EI-CT Indication Panel. | LINEM2 LED on the indication panel should be lit up. [Note: This LED indication means that the following Test No.4 is successfully completed.] | | |
| 4 | Check LINEM2 card normal work by relay status of "LINEM2-FL" on MTC display. | "LINEM2-FL". on the display should be "1". | | |
| 5 | Check MMIF2 card (B) normal work by MMIF2(B) LED lamp on Indication Panel. | MMIF2(B) LED on the indication panel should be lit up. [Note: This LED means that the following Test No.6 is completed successfully.] | | |
| 6 | Check MMIF2 card (B) normal work by relay status of "MM2A-FR" on MTC display. | "MM2A-FR" on the display should be "1". | | |

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**3) MMIF2 Card Test**

This test is to confirm integrity of the MMIF2 card which is installed into the position (A).
Testing of the MMIF2 card (A) input voltage is covered in the test No.2 in the previous section(2 LINEM2 Card Test.)

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check MMIF2 card (A) normal work by MMIF2(A) LED lamp on EI-CT Indication Panel. | MMIF2(A) LED on the indication panel should be lit up. [Note: This LED indication means that the following Test No.2 and No.3-1 to 3-5 are all successfully completed.] | | |
| 2 | Check MMIF2 card (A) normal work by relay status of "MM1A-FR" on MTC display. | "MM1A-FR" on the display should be "1". [Note: This LED indication means that the following Test No.3-1 to 3-5 are all successfully completed.] | | |
| 3-1 | Check MMIF2 card (A) work normal for Control Information Receiving condition of system 1 by relay status of "1MM1ANSA" on MTC display. | "1MM1ANSA" on the display should be "1". | | |
| 3-2 | Check MMIF2 card (A) work normal for ET CH1 condition of system 1 by relay status of "1MM1SIO1A" on MTC display. | "1MM1SIO1A" on the display should be "1". | | |
| 3-3 | Check MMIF2 card (A) work normal for ET Number Input Circuit condition of system 1 by relay status of "1MM1TNOA" on MTC display. | "1MM1TNOA" on the display should be "1". | | |
| 3-4 | Check MMIF2 card (A) work normal for I/O condition of system 1 normal by relay status of "1MM1IO1A" on MTC display. | "1MM1IO1A" on the display should be "1". | | |
| 3-5 | Check MMIF2 card (A) work normal for System 1 MMIF2 condition by relay status of "1MM1SYSA" on MTC display. | "1MM1SYSA" on the display should be "0". | | |

**4) MMIF2 Card I/O Tests**

As the MMIF 2 card has 32 input and 64 output points, 2 tests are required, one is conducted by connecting first-half 32 output points to 32 input points and the other, connecting latter-half 32 output points to 32 input points.

For this test, two kinds of cables are used. One is Cable 1, the other one is Cable 2.

**4)-1. MMIF2 Card (A) I/O between first-half 32 output and 32 input points.**

a. Turn OFF the front SW of the MMIF2 card (A).
b. Connect the "Cable 1" that is for connecting first-half 32 output and 32 input points one to one up to corresponding input and output receptacles on the MMIF card (A) (refer to Annex 3 attached.)
c. Turn ON the front SW of the MMIF2 card (A).

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check MMIF2(A) I/O port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means the following Test No.2, and No.3-1 to 3-32 are successfully completed.] | | |
| 2 | Check general MMIF2(A) loop back normal work of I/O port 1 to 32 by relay status of "MM1A-IO-FR" on MTC display. | "MM1A-IO-FR" on the display should be "1". [Note: This relay shows organized operation status of I/O in following Test No.3-1 to 3-32.] | | |
| 3-1 | Check MMIF2(A) loop back normal work of I/O port 1 by relay status of "1MM1-IO-1FR" on MTC display. | "1MM1-IO-1FR" on the display should be "1". | | |
| 3-2 | Check MMIF2(A) loop back normal work of I/O port 2 by relay status of "1MM1-IO-2FR" on MTC display. | "1MM1-IO-2FR" on the display should be "1". | | |
| 3-3 | Check MMIF2(A) loop back normal work of I/O port 3 by relay status of "1MM1-IO-3FR" on MTC display. | "1MM1-IO-3FR" on the display should be "1". | | |
| 3-4 | Check MMIF2(A) loop back normal work of I/O port 4 by relay status of "1MM1-IO-4FR" on MTC display. | "1MM1-IO-4FR" on the display should be "1". | | |
| 3-5 | Check MMIF2(A) loop back normal work of I/O port 5 by relay status of "1MM1-IO-5FR" on MTC display. | "1MM1-IO-5FR" on the display should be "1". | | |
| 3-6 | Check MMIF2(A) loop back normal work of I/O port 6 by relay status of "1MM1-IO-6FR" on MTC display. | "1MM1-IO-6FR" on the display should be "1". | | |
| 3-7 | Check MMIF2(A) loop back normal work of I/O port 7 by relay status of "1MM1-IO-7FR" on MTC display. | "1MM1-IO-7FR" on the display should be "1". | | |
| 3-8 | Check MMIF2(A) loop back normal work of I/O port 8 by relay status of "1MM1-IO-8FR" on MTC display. | "1MM1-IO-8FR" on the display should be "1". | | |

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| 3-9 | Check MMIF2(A) loop back normal work of I/O port 9 by relay status of "1MM1-IO-9FR" on MTC display. | "1MM1-IO-9FR" on the display should be "1". | | |
| 3-10 | Check MMIF2(A) loop back normal work of I/O port 10 by relay status of "1MM1-IO-10FR" on MTC display. | "1MM1-IO-10FR" on the display should be "1". | | |
| 3-11 | Check MMIF2(A) loop back normal work of I/O port 11 by relay status of "1MM1-IO-11FR" on MTC display. | "1MM1-IO-11FR" on the display should be "1". | | |
| 3-12 | Check MMIF2(A) loop back normal work of I/O port 12 by relay status of "1MM1-IO-12FR" on MTC display. | "1MM1-IO-12FR" on the display should be "1". | | |
| 3-13 | Check MMIF2(A) loop back normal work of I/O port 13 by relay status of "1MM1-IO-13FR" on MTC display. | "1MM1-IO-13FR" on the display should be "1". | | |
| 3-14 | Check MMIF2(A) loop back normal work of I/O port 14 by relay status of "1MM1-IO-14FR" on MTC display. | "1MM1-IO-14FR" on the display should be "1". | | |
| 3-15 | Check MMIF2(A) loop back work of I/O port 15 normal by relay status of "1MM1-IO-15FR" on MTC display. | "1MM1-IO-15FR" on the display should be "1". | | |
| 3-16 | Check MMIF2(A) loop back normal work of I/O port 16 by relay status of "1MM1-IO-16FR" on MTC display. | "1MM1-IO-16FR" on the display should be "1". | | |
| 3-17 | Check MMIF2(A) loop back normal work of I/O port 17 by relay status of "1MM1-IO-17FR" on MTC display. | "1MM1-IO-17FR" on the display should be "1". | | |
| 3-18 | Check MMIF2(A) loop back normal work of I/O port 18 by relay status of "1MM1-IO-18FR" on MTC display. | "1MM1-IO-18FR" on the display should be "1". | | |
| 3-19 | Check MMIF2(A) loop back normal work of I/O port 19 by relay status of "1MM1-IO-19FR" on MTC display. | "1MM1-IO-19FR" on the display should be "1". | | |
| 3-20 | Check MMIF2(A) loop back normal work of I/O port 20 by relay status of "1MM1-IO-20FR" on MTC display. | "1MM1-IO-20FR" on the display should be "1". | | |
| 3-21 | Check MMIF2(A) loop back normal work of I/O port 21 by relay status of "1MM1-IO-21FR" on MTC display. | "1MM1-IO-21FR" on the display should be "1". | | |
| 3-22 | Check MMIF2(A) loop back normal work of I/O port 22 by relay status of "1MM1-IO-22FR" on MTC display. | "1MM1-IO-22FR" on the display should be "1". | | |
| 3-23 | Check MMIF2(A) loop back normal work of I/O port 23 by relay status of "1MM1-IO-23FR" on MTC display. | "1MM1-IO-23FR" on the display should be "1". | | |
| 3-24 | Check MMIF2(A) loop back normal work of I/O port 24 by relay status of "1MM1-IO-24FR" on MTC display. | "1MM1-IO-24FR" on the display should be "1". | | |
| 3-25 | Check MMIF2(A) loop back normal work of I/O port 25 by relay status of "1MM1-IO-25FR" on MTC display | "1MM1-IO-25FR" on the display should be "1" | | |

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| 3-26 | Check MMIF2(A) loop back normal work of I/O port 26 by relay status of "1MM1-IO-26FR" on MTC display. | "1MM1-IO-26FR" on the display should be "1". | | |
| 3-27 | Check MMIF2(A) loop back normal work of I/O port 27 by relay status of "1MM1-IO-27FR" on MTC display. | "1MM1-IO-27FR" on the display should be "1". | | |
| 3-28 | Check MMIF2(A) loop back normal work of I/O port 28 by relay status of "1MM1-IO-28FR" on MTC display. | "1MM1-IO-28FR" on the display should be "1". | | |
| 3-29 | Check MMIF2(A) loop back normal work of I/O port 29 by relay status of "1MM1-IO-29FR" on MTC display. | "1MM1-IO-29FR" on the display should be "1". | | |
| 3-30 | Check MMIF2(A) loop back normal work of I/O port 30 by relay status of "1MM1-IO-30FR" on MTC display. | "1MM1-IO-30FR" on the display should be "1". | | |
| 3-31 | Check MMIF2(A) loop back normal work of I/O port 31 by relay status of "1MM1-IO-31FR" on MTC display. | "1MM1-IO-31FR" on the display should be "1". | | |
| 2-32 | Check MMIF2(A) loop back normal work of I/O port 32 by relay status of "1MM1-IO-32FR" on MTC display. | "1MM1-IO-32FR" on the display should be "1". | | |

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**4)-2 MMIF2 Card (A) Test between latter-half 32 output and 32 input points.**

a. Turn OFF the MMIF2 card (A) Power SW.
b. Connect the "Cable 2" that is for connecting latter-half 32 output and 32 input points 1 to 1 up to corresponding input and output receptacles on the MMIF card (A) (refer to Annex 3 attached.)
c. Turn ON the MMIF2 card (A) Power SW.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check MMIF2(A) I/O normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means the following Test No.2 and No.3-1 to 3-32 are successfully completed.] | | |
| 2 | Check general MMIF2(A) loop back normal work of I/O port 33 to 64 by relay status of "MM1A-IO-FR" on MTC display. | "MM1A-IO-FR" on the display should be "1".<br>[Note: This relay shows organized operation status of I/O in following Test No.3-1 to 3-32.] | | |
| 3-1 | Check MMIF2(A) loop back normal work of I/O port 33 by relay status of "1MM1-IO-33FR" on MTC display. | "1MM1-IO-33FR" on the display should be "1". | | |
| 3-2 | Check MMIF2(A) loop back normal work of I/O port 34 by relay status of "1MM1-IO-34FR" on MTC display. | "1MM1-IO-34FR" on the display should be "1". | | |
| 3-3 | Check MMIF2(A) loop back normal work of I/O port 35 by relay status of "1MM1-IO-35FR" on MTC display | "1MM1-IO-35FR" on the display should be "1". | | |
| 3-4 | Check MMIF2(A) loop back normal work of I/O port 36 by relay status of "1MM1-IO-36FR" on MTC display. | "1MM1-IO-36FR" on the display should be "1". | | |
| 3-5 | Check MMIF2(A) loop back normal work of I/O port 37 by relay status of "1MM1-IO-37FR" on MTC display. | "1MM1-IO-37FR" on the display should be "1". | | |
| 3-6 | Check MMIF2(A) loop back normal work of I/O port 38 by relay status of "1MM1-IO-38FR" on MTC display. | "1MM1-IO-38FR" on the display should be "1". | | |
| 3-7 | Check MMIF2(A) loop back normal work of I/O port 39 by relay status of "1MM1-IO-39FR" on MTC display. | "1MM1-IO-39FR" on the display should be "1". | | |
| 3-8 | Check MMIF2(A) loop back normal work of I/O port 40 by relay status of "1MM1-IO-40FR" on MTC display. | "1MM1-IO-40FR" on the display should be "1". | | |
| 3-9 | Check MMIF2(A) loop back normal work of I/O port 41 by relay status of "1MM1-IO-41FR" on MTC display. | "1MM1-IO-41FR" on the display should be "1". | | |
| 3-10 | Check MMIF2(A) loop back normal work of I/O port 42 by relay status of "1MM1-IO-42FR" on MTC display. | "1MM1-IO-42FR" on the display should be "1". | | |

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| 3-11 | Check MMIF2(A) loop back normal work of I/O port 43 by relay status of "1MM1-IO-43FR" on MTC display. | "1MM1-IO-43FR" on the display should be "1". | | |
| 3-12 | Check MMIF2(A) loop back normal work of I/O port 44 by relay status of "1MM1-IO-44FR" on MTC display. | "1MM1-IO-44FR" on the display should be "1". | | |
| 3-13 | Check MMIF2(A) loop back normal work of I/O port 45 by relay status of "1MM1-IO-45FR" on MTC display. | "1MM1-IO-45FR" on the display should be "1". | | |
| 3-14 | Check MMIF2(A) loop back normal work of I/O port 46 by relay status of "1MM1-IO-46FR" on MTC display. | "1MM1-IO-46FR" on the display should be "1". | | |
| 3-15 | Check MMIF2(A) loop back normal work of I/O port 47 by relay status of "1MM1-IO-47FR" on MTC display. | "1MM1-IO-47FR" on the display should be "1". | | |
| 3-16 | Check MMIF2(A) loop back normal work of I/O port 48 by relay status of "1MM1-IO-48FR" on MTC display. | "1MM1-IO-48FR" on the display should be "1". | | |
| 3-17 | Check MMIF2(A) loop back normal work of I/O port 49 normal by relay status of "1MM1-IO-49FR" on MTC display. | "1MM1-IO-49FR" on the display should be "1". | | |
| 3-18 | Check MMIF2(A) loop back normal work of I/O port 50 normal by relay status of "1MM1-IO-50FR" on MTC display. | "1MM1-IO-50FR" on the display should be "1". | | |
| 3-19 | Check MMIF2(A) loop back normal work of I/O port 51 by relay status of "1MM1-IO-51FR" on MTC display. | "1MM1-IO-51FR" on the display should be "1". | | |
| 3-20 | Check MMIF2(A) loop back normal work of I/O port 52 by relay status of "1MM1-IO-52FR" on MTC display. | "1MM1-IO-52FR" on the display should be "1". | | |
| 3-21 | Check MMIF2(A) loop back normal work of I/O port 53 by relay status of "1MM1-IO-53FR" on MTC display. | "1MM1-IO-53FR" on the display should be "1". | | |
| 3-22 | Check MMIF2(A) loop back normal work of I/O port 54 by relay status of "1MM1-IO-54FR" on MTC display. | "1MM1-IO-54FR" on the display should be "1" | | |
| 3-23 | Check MMIF2(A) loop back normal work of I/O port 55 by relay status of "1MM1-IO-55FR" on MTC display. | "1MM1-IO-55FR" on the display should be "1". | | |
| 3-24 | Check MMIF2(A) loop back normal work of I/O port 56 by relay status of "1MM1-IO-56FR" on MTC display. | "1MM1-IO-56FR" on the display should be "1". | | |
| 3-25 | Check MMIF2(A) loop back normal work of I/O port 57 by relay status of "1MM1-IO-57FR" on MTC display. | "1MM1-IO-57FR" on the display should be "1". | | |
| 3-26 | Check MMIF2(A) loop back normal work of I/O port 58 by relay status of "1MM1-IO-58FR" on MTC display. | "1MM1-IO-58FR" on the display should be "1". | | |
| 3-27 | Check MMIF2(A) loop back normal work of I/O port 59 by relay status of "1MM1-IO-59FR" on MTC display. | "1MM1-IO-59FR" on the display should be "1". | | |

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| 3-28 | Check MMIF2(A) loop back normal work of I/O port 60 by relay status of "1MM1-IO-60FR" on MTC display. | "1MM1-IO-60FR" on the display should be "1". | | |
| 3-29 | Check MMIF2(A) loop back normal work of I/O port 61 by relay status of "1MM1-IO-61FR" on MTC display. | "1MM1-IO-61FR" on the display should be "1". | | |
| 3-30 | Check MMIF2(A) loop back normal work of I/O port 62 by relay status of "1MM1-IO-62FR" on MTC display. | "1MM1-IO-62FR" on the display should be "1". | | |
| 3-31 | Check MMIF2(A) loop back normal work of I/O port 63 by relay status of "1MM1-IO-63FR" on MTC display. | "1MM1-IO-63FR" on the display should be "1". | | |
| 3-32 | Check MMIF2(A) loop back normal work of I/O port 64 by relay status of "1MM1-IO-64FR" on MTC display. | "1MM1-IO-64FR" on the display should be "1". | | |

### 2.3.6 ET CH (Electronic Terminal Channel) Communication Test

This section describes test procedures for CH2, 3 and 5 other than for CH1 and CH4 mentioned in Section 2.3.4 and 2.3.5.

In this section, system configuration of this test is required EI-CT, MTC and OPC as per "Cards Test System Configuration for K5BMC(No.2) in Annex 1 attached.

**Functional Test Procedure**

**1) Preparation for ET CH Test**

a. The MTC is connected by a GI optical fiber cable in advance of this test.
b. Install LINE2B and MMIF2 card (B) which are attachment of EI-CT to the MMIF Sub-Rack and connect to ET CH1.
c. In advance of the testing, Logic cards and an IC card possessing integrity proven (for example by test in Section 2.3.3) have been installed into the Logic Sub-Rack
d. And LINE2B and ET-PIO cards possessing integrity proven (for example by test in Section 2.3.4) are also installed into the ET-PIO Sub-Rack, and connect the electronic terminal line to CH4.
e. The MMIF2 card that has proven integrity (for example by test in Section 2.3.5) has been installed into the position A of MMIF Sub-Rack.
f. Turn ON the breaker back of the EI-CT rack and the front SW of all the cards.
i.e. SW1 of IPUC6, SW of DC5V on LINE2B, SW inside of the cover of ET-PIO2, SW of DC5V of LINEM2, Power SW of MMIF2(A), Power SW of MMIF2(B).
g. Turn ON the MTC and the OPC.
h. The logic cards and the electronic terminal cards start activating process, and after a while, all the LEDs on the logic card side of EI-CT Indication Panel light up green.

**2) Electronic Terminal(ET) CH2 Test**

Connect the GI $2^C$ optical fiber cable from the OPC to the FIO7-[P] on the back of Logic Sub-Rack and check following.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check ET CH 2 (OPC CH) communication condition (as MMIF2 7-8) of System 1 normal by relay status of "2MM8A-FR" on MTC display. | "2MM8A-FR" on the display should be "1". | | |
| 1-2 | Check ET CH 2 (OPC CH) communication condition (as MMIF2 7-9) of System 1 normal by relay status of "2MM9A-FR" on MTC display. | "2MM9A-FR" on the display should be "1". | | |
| 1-3 | Check ET CH 2 (OPC CH) communication condition (as MMIF2 7-10) of System 1 normal by relay status of " MM10A-FR " on MTC display. | "2MM10A-FR" on the display should be "1". | | |
| 1-4 | Check ET CH 2 (OPC CH) communication condition (as MMIF2 7-11) of System 1 normal by relay status of "2MM11A-FR " on MTC display | "2MM11A-FR" on the display should be "1". | | |
| 1-5 | Check ET CH 2 (OPC CH) communication condition (as MMIF2 7-12) of System 1 normal by relay status of "2MM12A-FR " on MTC display. | "2MM12A-FR" on the display should be "1". | | |
| 1-6 | Check ET CH 2 (OPC CH) communication condition (as MMIF2 7-13) of System 1 normal by relay status of "2MM13A-FR " on MTC display. | "2MM13A-FR" on the display should be "1". | | |
| 1-7 | Check ET CH 2 (for OPC) communication condition (as MMIF2 7-14) of System 1 normal by relay status of "2MM14A-FR " on MTC display. | "2MM14A-FR" on the display should be "1". | | |
| 1-8 | Check ET CH 2 (OPC CH) communication condition (as MMIF2 7-15) of System 1 normal by relay status of "2MM15A-FR " on MTC display. | "2MM15A-FR" on the display should be "1". | | |

**3) Electronic Terminal (ET) CH3 Test**

Pull the GI $2^C$ optical fiber cable connecting with the out of "EXTFIO7P" CH4, and connect it to "FIO7-[P]" CH3.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check ET CH 3 (for PIO) communication condition. (as MMIF2 7-15) of System 1 normal by relay status of "1PI1A-FR " on MTC display | "1PI1A-FR" on the display should be "1". | | |

**4 ) Electronic Terminal (ET) CH5 Test**

Connect the GI $2^C$ optical fiber cable from the OPC to the "EXTFIO7P" CH5 on the back of Logic Sub-Rack and check following.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check ET CH 5 communication condition for OPC (as MMIF2 7-8) of System 1 normal by relay status of "3MM8A-FR" on MTC display. | "3MM8A-FR" on the display should be "1". | | |
| 1-2 | Check ET CH 5 communication condition for OPC (as MMIF2 7-9) of System 1 normal by relay status of "3MM9A-FR" on MTC display. | "3MM9A-FR" on the display should be "1". | | |
| 1-3 | Check ET CH 5 communication condition for OPC (as MMIF2 7-10) of System 1 normal by relay status of "3MM10A-FR" on MTC display. | "3MM10A-FR" on the display should be "1". | | |
| 1-4 | Check ET CH 5 communication condition for OPC (as MMIF2 7-11) of System 1 normal by relay status of "3MM11A-FR" on MTC display. | "3MM11A-FR" on the display should be "1". | | |
| 1-5 | Check ET CH 5 communication condition for OPC (as MMIF2 7-12) of System 1 normal by relay status of "3MM12A-FR" on MTC display. | "3MM12A-FR" on the display should be "1". | | |
| 1-6 | Check ET CH 5 communication condition for OPC (as MMIF2 7-13) of System 1 normal by relay status of "3MM13A-FR" on MTC display. | "3MM13A-FR" on the display should be "1". | | |
| 1-7 | Check ET CH 5 communication condition for OPC (as MMIF2 7-14) of System 1 normal by relay status of "3MM14A-FR" on MTC display. | "3MM14A-FR" on the display should be "1". | | |
| 1-8 | Check ET CH 5 communication condition for OPC (as MMIF2 7-15) of System 1 normal by relay status of "3MM15A-FR" on MTC display. | "3MM15A-FR" on the display should be "1". | | |

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### 2.3.7 SPHC Card Test Procedure

This section describes test procedure of the SPHC-TT/PW cards that are for branching optical lines. EI-CT, OPC and MTC are used for the test.

In this section, system configuration of this test is required EI-CT, MTC and OPC as per “Cards Test System Configuration for K5BMC(No.3)” in Annex 1 attached.

**Functional Test Procedure**

**1) Preparation for SPHC Card Test**

a. MTC and OPC are used for the test in addition to the EI-CT.
b. In advance of testing, insert the LINE2B and the MMIF2(B) cards of the EI-CT attachment to MMIF Sub-Rack and connect them to ET CH1.
c. Install Logic cards and IC card possessing integrity proven (for example by test in Section 2.3.3) to the Logic Sub-Rack.
d. Install the LINE2B and the ET-PIO cards possessing integrity proven (for example by test in Section 2.3.4) to the ET-PIO Sub-Rack and connect the electronic terminal line to CH4.
e. Install the MMIF2 card that has integrity proven (for example by test in Section 2.3.5) to the position A of MMIF Sub-Rack.
f. The SPHC-TT card is tested with the power card SPHC-PW.
g. The card test is carried out by connecting SPHC-TT card under test to ET CH1 between the FIO7-[P] card in the Logic Sub-Rack and the LINEM2 in the MMIF Sub-rack.

**2) SPHC Card Test**

a. Turn ON the breaker back of the EI-CT rack and the front SW of all the cards.
(i.e. SW1 of IPU6C, DC5V SW of LINE2B, DC5V SW of LINEM2,and Power SW of MMIF2.)
b. Turn the MTC and the OPC ON.
c. The logic card and the electronic terminals start activation process and after a while, all the LEDs on the EI-CT Indication Panel light up.

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| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check power input voltage of SPHC card and it. | Voltage should be regulated: 5V+5%-0% | | |
| 2 | Check SPHC normal work by FSIO LED and FIO-[P] LED lamp on EI-CT Indication Panel. | FSIO LED and FIO-[P] LED lamps on the indication panel should be lit up. | | |
| 3 | Check I/O communication normal work of MMIF2 side by relay status of "1MM1A-FR" on MTC display. | "1MM1A-FR" on the display should be "1". | | |
| 4-1 | Check I/O communication normal work of OPC side by relay status of "1MM8A-FR" on MTC display. | "1MM8A-FR" on the display should be "1". . | | |
| 4-2 | Check I/O communication normal work of OPC side by relay status of "1MM9A-FR" on MTC display. | "1MM9A-FR" on the display should be "1". . | | |
| 4-3 | Check I/O communication normal work of OPC side by relay status of "1MM10A-FR" on MTC display. | "1MM10A-FR" on the display should be "1". | | |
| 4-4 | Check I/O communication normal work of OPC side by relay status of "1MM11A-FR" on MTC display. | "1MM11A-FR" on the display should be "1". | | |
| 4-5 | Check I/O communication normal work of OPC side by relay status of "1MM12A-FR" on MTC display. | "1MM12A-FR" on the display should be "1". | | |
| 4-6 | Check I/O communication normal work of OPC side by relay status of "1MM13A-FR" on MTC display. | "1MM13A-FR" on the display should be "1". | | |
| 4-7 | Check I/O communication normal work of OPC side by relay status of "1MM14A-FR" on MTC display. | "1MM14A-FR" on the display should be "1". | | |
| 4-8 | Check I/O communication normal work of OPC side by relay status of "1MM15A-FR" on MTC display. | "1MM15A-FR" on the display should be "1". | | |

### 2.3.8 INIO2 Card Test Procedure

This section describes test procedure of the INIO2 electronic terminal Card that is used as an extension board of the MTC and the OPC connecting to the EI.

In this section, system configuration of this test is required EI-CT, MTC and OPC as per "Cards Test System Configuration for K5BMC(No.3)" in Annex 1 attached.

**Functional Test Procedure**

**1) Preparation for INIO2 Card Test**

a. MTC and OPC are used for test in addition to the EI-CT.
b. Install the LINE2B card and the MMIF2 card (B) of the EI-CT attachments to the MMIF Sub-Rack and connect to ET CH1.
c. Insert Logic cards and IC card possessing integrity proven to the Logic Sub-Rack.
d. According to the Card Test System configuration in Annex 1, install LINE2B and ET-PIO2 cards possessing integrity proven to the ET-PIO Sub-Rack and connect to ET CH4.
e. Install MMIF2 card possessing integrity proven to the position A of the MMIF Sub-Rack.
f. Connect SPHC-TT and SPHC-PW cards possessing integrity proven to the ET CH1 in between the FIO7-[P] and the LINEM2 cards.
g. Cards under test are INIO2-MTC card for MTC and INIO2-ET card for OPC.

**2) INIO2-MTC Card (for MTC) Test**

Install the INIO2-MTC in expansion slot of MTC, and start up the MTC.

Turn the EI-CT rack and the cards ON. Turn ON the front SW of the cards concerned
(i.e. Breaker back of the rack, SW1 of IPU6C, DC5V SW of LINE2B, DC5V SW of LINEM2, and Power SW of MMIF2(B))

After the card operation becomes stable, check the following.

Sl No.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check INIO2-MTC card normal work by MTC LED lamp on EI-CT Indication Panel. | MTC LED on the indication panel should be lit up. [Note: This LED indicator shows that the Test No.2 below is successfully completed.] | | |
| 2 | Check INIO2-MTC card normal work by relay status of "MTC-OK" on MTC display. | ""MTC-OK" on the display should be "1". | | |

| Signature of Firm's Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
|---|---|

**3) INIO2-ET Card (for OPC) Test**

Install the INIO2-ET card in expansion slot of OPC, and start up the OPC.
After the activation becomes stable, check the following.

Sl No.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check INIO2-ET card normal work by asterisk(*) flash on the OPC display. | asterisk mark(*) should be flashed on the display. | | |
| 2-1 | Check INIO2-ET card normal work by relay status of "1MM8A-FR" on MTC display. | "1MM8A-FR". on the display should be "1". | | |
| 2-2 | Check INIO2-ET card normal work by relay status of "1MM9A-FR" on MTC display. | "1MM9A-FR". on the display should be "1". | | |
| 2-3 | Check INIO2-ET card normal work by relay status of "1MM10A-FR" on MTC display. | "1MM10A-FR". on the display should be "1". | | |
| 2-4 | Check INIO2-ET card normal work by relay status of "1MM11A-FR" on MTC display. | "1MM11A-FR". on the display should be "1". | | |
| 2-5 | Check INIO2-ET card normal work by relay status of "1MM12A-FR" on MTC display. | "1MM12A-FR". on the display should be "1". | | |
| 2-6 | Check INIO2-ET card normal work by relay status of "1MM13A-FR" on MTC display. | "1MM13A-FR". on the display should be "1". . | | |
| 2-7 | Check INIO2-ET card normal work by relay status of "1MM14A-FR" on MTC display. | "1MM14A-FR". on the display should be "1". | | |
| 2-8 | Check INIO2-ET card normal work by relay status of "1MM15A-FR" on MTC display. | "1MM15A-FR". on the display should be "1". | | |

### 2.3.9 Journal Module Card Test

This section describes test procedure for confirming integrity of the cards of the Journal Module.
In this section, system configuration of this test is required EI of particular station, as per "Cards Test System Configuration for K5BMC (No.5)" in Annex 1 attached.

**Functional Test Procedure**

1) Preparation for Journal Module test
   a. EI system is configurated as particular station's. Data Logger system (or Data Logger simulator) is connected with the communication cable between EI and Data Logger.
   b. Turn ON the MTC, OPC and breaker, and then turn on each Sub-Rack's cards to start up the EI system. SW(back of Rack),SW1(IPU6C),DC5V(LINE2B), SW inside the cover(ET-PIO2),DC5V(LINEM2, Power (MMIF2)
   c. Turn on the Journal Module.
   d. Turn on the Data Logger.
   e. After the system operation becomes stable, check the following.

2) ZPEN3 card test

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check ZPEN3 card normal work by relay status of "ZPEN3-FL"on MTC display. | "ZPEN3-FL" on the display should be "1". | | |
| 2 | Check ZPEN3 card normal work by LED lamp on ZPEN3 card | ZPEN3 LED "D7" should blink. | | |
| 3 | Check ZNIO2-S1 card normal work by LED lamp on ZPEN3 card | ZPEN3 LED "D6" should be lit up. | | |
| 4 | Check ZNIO2-S2 card normal work by LED lamp on ZPEN3 card | ZPEN3 LED "D5"should be lit up. | | |
| 5 | Check ZSIO2 card normal work by LED lamp on ZPEN3 card | ZPEN3 LED "D4" should be lit up. | | |
| 6 | Check KDD172-KY48-2 card normal work by LED lamp on ZPEN3 card | ZPEN3 LED "D3'"should be lit up. | | |
| 7 | Check ZNIO2-S1 card normal data receiving by LED lamp on ZPEN3 card | ZPEN3 LED "D2" should be lit up. | | |
| 8 | Check ZNIO2-S2 card normal data receiving by LED lamp on ZPEN3 card | ZPEN3 LED "D1"should be lit up. | | |
| 9 | Check ZSIO2 card normal data receiving by LED lamp on ZPEN3 card | ZPEN3 LED "D0" should be lit up. | | |
| 10 | Check normal WDT output from ZPEN3 card by LED lamp on ZPEN3 card | ZPEN3 LED "WDT" should be lit up. | | |
| 11 | Check normal VME bus access of ZPEN3 card by LED lamp on ZPEN3 card | ZPEN3 LED "BO" should be lit up. | | |

| Signature of Firm's Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
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| | |

| | | | | |
|---|---|---|---|---|
| 12 | Check normal data receiving & sending with MTC by LED lamp on ZPEN3 card | ZPEN3 LED"'ChB TR" should blink. | | |
| 13 | Check connection status with MTC via Ethernet link by LED lamp on ZPEN3 card | ZPEN3 LED"ChB LK" should be lit up. | | |
| 14 | Check the other LED lamps (not used) on ZPEN3 card | ZPEN3 LED<br>"ID", "FN", "ChA TR","ChA LK" should not be lit. | | |

3) ZNIO2 (S1) Card test

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check ZNIO2-S1 card normal work by relay status of "ZNIO2-S1_M-FL"on MTC display. | "ZNIO2-S1_M-FL" on the display should be "1". | | |
| 2 | Check ZNIO2-S1 card normal work by "ZNIO2-S1-Rx-FL" relay status on MTC display. | "ZNIO2-S1-Rx-FL" on the display should be "1". | | |
| 3 | Check ZNIO2-S1 card normal work by LED lamp on ZNIO2-S1 card | ZNIO2-S1 LED "WDT" should be lit up. | | |
| 4 | Check ZNIO2-S1 card normal data receiving by LED lamp on ZNIO2-S1 card | ZNIO2-S1 LED "ChA RD" should blink. | | |
| 5 | Check the other LED lamps (not used) on ZNIO2-S1 card | ZNIO2-S1 LED<br>"D1" and "ChA SD" should be lit up.<br>"D0", "ChB SD", "ChB RD" should not be lit. | | |

4) ZNIO2 (S2) Card test

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check ZNIO2-S2 card normal work by "ZNIO2-S2_M-FL" relay status on MTC display. | "ZNIO2-S2_M-FL" on the display should be "1". | | |
| 2 | Check ZNIO2-S2 card normal work by "ZNIO2-S2-Rx-FL" relay status on MTC display. | "ZNIO2-S2-Rx-FL" on the display should be "1". | | |
| 3 | Check ZNIO2-S2 card normal work by LED lamp on ZNIO2-S2 card | ZNIO2-S2 LED "WDT" should be lit up. | | |
| 4 | Check ZNIO2-S2 card normal data receiving by LED lamp on ZNIO2-S2 card | ZNIO2-S2 LED "ChA RD" should be blink. | | |
| 5 | Check the other LED lamps (not used) on ZNIO2-S2 card | ZNIO2-S2 LED<br>"D1" and "ChA SD" should be lit up.<br>"D0", "ChB SD", "ChB RD" should not be lit. | | |

| Signature of Firm's Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
|---|---|
| | |

5) ZSIO2 Card test

**Sl No.**

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check ZSIO2 card normal work by "ZSIO2_M-FL" relay status on MTC display. | "ZSIO2_M-FL" on the display should be "1". | | |
| 2 | Check ZSIO2 card normal work by "ZSIO2-Rx-FL" relay status on MTC display. | "ZSIO2-Rx-FL" on the display should be "1". | | |
| 3 | Check ZSIO2 card normal work by LED lamp on ZSIO2 card | ZSIO2 LED "WDT" should blink. | | |
| 4 | Check ZSIO2 card none parity error by LED lamp on ZSIO2 card | ZSIO2 LED "PE" should not be lit. | | |
| 5 | Check ZSIO2 card normal Response frame control status by LED lamp on ZSIO2 card | ZSIO2 LED "D1" should be lit up. | | |
| 6 | Check ZSIO2 card set up completed by LED lamp on ZSIO2 card | ZSIO2 LED "D0" should be lit up. | | |
| 7 | Check ZSIO2 card data sending by LED lamp on ZSIO2 card | ZSIO2 LED "ChA SD" should blink. | | |
| 8 | Check ZSIO2 card data receving by LED lamp on ZSIO2 card | ZSIO2 LED "ChA RD" should blink. | | |
| 9 | Check the other LED lamps (not used) on ZSIO2 card | ZSIO2 LED<br>"ChA ER" and "ChB ER" should be lit up.<br>"ChA RS", "ChA CS", "ChA DR", "ChB SD", "ChB RD", "ChB RS", "ChB CS", "ChB DR" should not be lit. | | |

6) KDD172-KY48-2 card test

**Sl No.**

| Test No. | Test description | Test description | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1 | Check KDD172-KY48-2 card normal work by "J-DD_CON-FL" relay status on MTC display. | "J-DD_CON-FL" on the display should be "1" | | |
| 2 | Check KDD172-KY48-2 card normal DC5V power by LED lamp on KDD172-KY48-2 card | KDD172-KY48-2 LED "DC5V" should be lit up. | | |
| 3 | Check KDD172-KY48-2 card normal DC12V power by LED lamp on KDD172-KY48-2 card | KDD172-KY48-2 LED "DC12V" should be lit up. | | |
| 4 | Check KDD172-KY48-2 card normal DC24V power by LED lamp on KDD172-KY48-2 card | KDD172-KY48-2 LED "DC24V" "DC24V" should be lit up. | | |

| Signature of Firm's Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
|---|---|

7) Real Time synchronous check inspection

**Sl No.**

| Test No.. | Test description | Test description | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 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. | | |

### 2.4 K5BMC Sub-Rack Test:

This test is conducted on the logic, the MMIF and the PIO Sub-Rack.

Each Sub-Rack consists of metallic chassis which accommodates the electronic cards, and the motherboard in which the cards are installed.

On the motherboard, wiring for transmitting and receiving power supply and signals between the cards installed in the Sub-Rack has been printed and Power Supply connectors for the cards have been attached. The motherboard has no electronic element.

The purpose of the test is to confirm that the wirings and the connectors of motherboards of Sub-Rack under test are fully operational by replacing each Sub-Rack with the K5BMC EI-CT (EI Card Tester) and installing the cards in working order.

#### 2.4.1 Logic Sub-Rack (L-K7C) Test Procedure

This section describes test procedure for confirming integrity of the logic Sub-Rack by using EI-CT.

In this section, system configuration of this test is required EI-CT and MTC as per “Cards Test System Configuration for K5BMC(No.1)” in Annex 1.

**Functional Test Procedure**

**1) Preparation for Sub-Rack Test**

a. Replace the logic Sub-Rack of EI-CT with that of the Sub-Rack under test.
b. Install the logic card and IC card that have been proven (in clause 2.3.3) in system 1 of the logic Sub-Rack.
c. Install the IC card that has been confirmed in the previous section into the F486-4I card on the front.
d. Turn ON the breaker back of the rack.
e. Turn ON the front SW of the cards concerned ((i.e. SW1 of IPU6C, DC5V SW of LINEM2, and Power SW of MMIF2(B))
   The logic cards reads program and data from the IC card and start up.
f. The Indication lamps of LINEM2 and MMIF2(B) on the Indication Panel light up green and this shows that the MMIF2 card (B) is in full working order. LINEM2, MMIF2(B)）
g. MTC shall be set to system 1.
h. On completion of Logic Sub-Rack test for the system 1, the same test is carried out for the system 2.
i. MTC shall be set to system 2.

**2) System 1 Logic Sub-Rack Test**

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| | **(IPU6C)** | | | | |
| 1 | Check Power Supply unit output voltage. | voltage at the output terminal is regulated within: | 24V±10% | | |
| 2 | Check IPU6C card output voltage. | output voltages at 24V and 5V output terminals should be regulated within: | 24V±10% | | |
| | | | 5V+5% -0% | | |
| 3 | Check IPU6C card normal work by IPU6C LED lamp on EI-CT Indication Panel. | IPU6C LED on the indication panel should be lit up. | | | |
| | **(F486-4I)** | | | | |
| 4 | Check F486-4I card normal work by F486-4I LED lamp on EI-CT Indication Panel. | F486-4I LED on the Indication panel should be lit up. | | | |
| | **(FSIO)** | | | | |
| 5 | Check FSIO card normal work by FSIO LED lamp on EI-CT Indication Panel. | FSIO LED on the indication panel should be lit up. | | | |
| | **(FSIO-EX)** | | | | |
| 6 | Check FSIO-EX card normal work by FSIO-EX LED lamp on EI-CT Indication Panel. | FSIO-EX LED on the indication panel should be lit up. | | | |
| | **(DID)** | | | | |
| 7 | Check DID card normal work by DID LED lamp on EI-CT Indication Panel. | DID LED on the indication panel should be lit up. | | | |
| | **(FIO7-[P])** | | | | |
| 8 | Check FIO7-[P] card normal work by FIO7-[P] LED lamp on EI-CT Indication Panel. | FIO7-[P] LED on the indication panel should be lit up. | | | |
| | **(EXTFIO7P)** | | | | |
| 9 | Check EXTFIO7P card normal work by EXTFIO7P LED lamp on EI-CT Indication Panel. | EXTFIO7P LED on the indication panel should be lit up. | | | |

**3) System 2 Logic Sub-Rack Test**

MTC shall be changed to system 2.

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| | **(IPU6C)** | | | | |
| 1 | Check Power Supply unit output voltage. | voltage at the output terminal is regulated within: 24V±10% | | | |
| 2 | Check IPU6C card output voltage. | output voltages at 24V and 5V output terminals should be regulated within: | 24V±10% | | |
| | | | 5V+5% -0% | | |
| 3 | Check IPU6C card normal work by IPU6C LED lamp on EI-CT Indication Panel. | IPU6C LED on the indication panel should be lit up. | | | |
| | **(F486-4I)** | | | | |
| 4 | Check F486-4I card normal work by F486-4I LED lamp on EI-CT Indication Panel. | F486-4I LED on the Indication panel should be lit up. | | | |
| | **(FSIO)** | | | | |
| 5 | Check FSIO card normal work by FSIO LED lamp on EI-CT Indication Panel. | FSIO LED on the indication panel should be lit up. | | | |
| | **(FSIO-EX)** | | | | |
| 6 | Check FSIO-EX card normal work by FSIO-EX LED lamp on EI-CT Indication Panel. | FSIO-EX LED on the indication panel should be lit up. | | | |
| | **(DID)** | | | | |
| 7 | Check DID card normal work by DID LED lamp on EI-CT Indication Panel. | DID LED on the indication panel should be lit up. | | | |
| | **(FIO7-[P])** | | | | |
| 8 | Check FIO7-[P] card normal work by FIO7-[P] LED lamp on EI-CT Indication Panel. | FIO7-[P] LED on the indication panel should be lit up. | | | |
| | **(EXTFIO7P)** | | | | |
| 9 | Check EXTFIO7P card normal work by EXTFIO7P LED lamp on EI-CT Indication Panel. | EXTFIO7P LED on the indication panel should be lit up. | | | |

### 2.4.2 ET-PIO Electronic Terminal Sub-Rack (E-P5) Test Procedure

This section describes test procedure for confirming integrity of the ET-PIO electronic terminal Sub-Rack by connecting the EI-CT logic Sub-Rack and the ET-PIO electronic terminal Sub-Rack.
In this section, system configuration of this test is required the Sub-Rack as per “Cards Test System Configuration for K5BMC (No. 4)” in Annex 1.

**Functional Test Procedure**

**1) Preparation for Sub-Rack Test**

a. In advance of the testing, Logic cards and an IC card possessing integrity proven (for example by test in Section 2.3.3) have been installed into the Logic Sub-Rack.
b. Install one LINE2B card and five ET-PIO2 cards both of which have been proven to the system 1 of ET-PIO Sub-Rack under test.
c. Connect power supply 24V to the ET-PIO Sub-Rack under test.
Connect the EI-CT logic Sub-Rack CH3 upto the LINE2B system1 with a GI optical fiber cable.
d. Turn ON the breaker back of the rack.
e. Turn ON the front SW of the cards concerned (i.e. SW1 of IPU6C, DC5V SW of LINE2B, DC5V SW of LINEM2, and Power SW of MMIF2(B))
The logic card starts activation process and after a period of time, all the LEDs on the logic card side of the EI-CT Indication Panel light up green. (IPU6, F486-4I, FSIO, FSIO-EX, DID, FIO7-[P] and EXTFIO7P)
f. All the LEDs showing that the MMIF2 card (B) for EI-CT Indication Panel output is in working order light up.
（LINEM2 and MMIF2(B)）
g. And then Turn ON the front DC5V SW of the LINE2B card and the SW inside of the cover of ET-PIO2 cards.
h. MTC shall be set to system 1.
i. On completion of ET-PIO Sub-Rack test for the system 1, the same test is carried out for the system 2.
J. MTC shall be set to system 2.

**2) System 1 ET-PIO Sub-Rack Test. (ET-CH3)**

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| | **(LINE2B)** | | | | |
| 1 | Check Power Supply unit output voltage. | Voltage at the output terminal of the unit should be regulated in: 24V±10% | | | |
| 2 | Check LINE2B power output voltage of 24V/5V. | Voltage at 24V and 5V at the measuring terminal should be regulated within: | 24V±10% | | |
| | | | 5V+5% -0% | | |
| 3 | Check LINE2B card normal work by LINE2B LED lamp on EI-CT Indication Panel. | LINE2B LED on the indication panel should be lit up. | | | |
| | **(ET-PIO2)** | | | | |
| 4 | Check ET-PIO2 input voltage on each card of ET-PIO Sub-Rack. | Voltage at the measuring terminal of the card 5V line should be regulated: 5V± 5 %. | No.1 | | |
| | | | No.2 | | |
| | | | No.3 | | |
| | | | No.4 | | |
| | | | No.5 | | |
| 5 | Check ET-PIO2 card normal work by PIO2 LED lamp on EI-CT Indication Panel. | PIO2 LED on the indication panel should be lit up. [Note: This LED indicator shows that the Test No.6-1 to 6-5 below are successfully completed.] | | | |
| 6-1 | Check ET-PIO2 card normal work by relay status of "CH3PIO1A-FR" on MTC display. | "CH3PIO1A-FR" on the display should be "1". | | | |
| 6-2 | Check ET-PIO2 card normal work by relay status of "CH3PIO2A-FR" on MTC display. | "CH3PIO2A-FR" on the display should be "1". | | | |
| 6-3 | Check ET-PIO2 card normal work by relay status of "CH3PIO3A-FR" on MTC display. | "CH3PIO3A-FR" on the display should be "1". | | | |
| 6-4 | Check ET-PIO2 card normal work by relay status of "CH3PIO4A-FR" on MTC display. | "CH3PIO4A-FR" on the display should be "1". | | | |
| 6-5 | Check ET-PIO2 card normal work by relay status of "CH3PIO5A-FR" on MTC display. | "CH3PIO5A-FR" on the display should be "1". | | | |

**3). ET-PIO2 I/O Connector Test**

This clause Test is performed with the Sub-Rack composition of the preceding clause.

a. Turn OFF the front SW inside of the cover of the ET-PIO2 card in the slot ID No.1.
b. Install a cable which is connecting 32 input points and 32 output points one to one(refer to Annex 3) to the receptacle of input and output part of the PIO2.
c. Turn ON the front SW inside of the cover of the ET-PIO2 again.
d. Repeat the same test for the slots ID No.2, 3, 4 and 5 in the same method.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check ET-PIO2(slot ID No.1) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.1-2 is successfully completed.] | | |
| 1-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO1-IO-FR" on MTC display. | "CH3PIO1-IO-FR" on the display should be "1". | | |
| 2-1 | Check ET-PIO2(slot ID No.2) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.2-2 is successfully completed.] | | |
| 2-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO2-IO-FR" on MTC display. | "CH3PIO2-IO-FR" on the display should be "1". | | |
| 3-1 | Check ET-PIO2(slot ID No.3) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.3-2 is successfully completed.] | | |
| 3-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO3-IO-FR" on MTC display. | "CH3PIO3-IO-FR" on the display should be "1". | | |
| 4-1 | Check ET-PIO2(slot ID No.4) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.4-2 is successfully completed.] | | |
| 4-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO4-IO-FR" on MTC display. | "CH3PIO4-IO-FR" on the display should be "1". | | |
| 5-1 | Check ET-PIO2(slot ID No.5) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.5-2 is successfully completed.] | | |
| 5-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO5-IO-FR" on MTC display. | "CH3PIO5-IO-FR" on the display should be "1". | | |

**4) System 2 ET-PIO Sub-Rack Test. (ET-CH3)**

Change all the ET-PIO cards from the system1 to system2 (Replace from slot 1 to slot 2)

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| | **(LINE2B)** | | | | |
| 1 | Check Power Supply unit output voltage. | Voltage at the output terminal of the unit should be regulated in: 24V±10% | | | |
| 2 | Check LINE2B power output voltage of 24V/5V. | Voltage at 24V and 5V at the measuring terminal should be regulated within: | 24V±10% | | |
| | | | 5V+5% -0% | | |
| 3 | Check LINE2B card normal work by LINE2B LED lamp on EI-CT Indication Panel. | LINE2B LED on the indication panel should be lit up. | | | |
| | **(ET-PIO2)** | | | | |
| 4 | Check each ET-PIO2 cards input voltage. | Voltage at the measuring terminal of the card 5V line should be regulated: 5V± 5 %. | No.1 | | |
| | | | No.2 | | |
| | | | No.3 | | |
| | | | No.4 | | |
| | | | No.5 | | |
| 5 | Check ET-PIO2 card normal work by PIO2 LED lamp on EI-CT Indication Panel. | PIO2 LED on the indication panel should be lit up. [Note: This LED indicator shows that the Test No.6-1 to 6-5 below are successfully completed.] | | | |
| 6-1 | Check ET-PIO2 card normal work by relay status of "CH3PIO1B-FR" on MTC display. | "CH3PIO1B-FR" on the display should be "1". | | | |
| 6-2 | Check ET-PIO2 card normal work by relay status of "CH3PIO2B-FR" on MTC display. | "CH3PIO2B-FR" on the display should be "1". | | | |
| 6-3 | Check ET-PIO2 card normal work by relay status of "CH3PIO3B-FR" on MTC display. | "CH3PIO3B-FR" on the display should be "1". | | | |
| 6-4 | Check ET-PIO2 card normal work by relay status of "CH3PIO4B-FR" on MTC display. | "CH3PIO4B-FR" on the display should be "1". | | | |
| 6-5 | Check ET-PIO2 card normal work by relay status of "CH3PIO5B-FR" on MTC display. | "CH3PIO5B-FR" on the display should be "1". | | | |

**5). ET-PIO2 I/O Connector Test**

This clause Test is performed with the Sub-Rack composition of the preceding clause.

a. Turn OFF the front SW inside of the cover of the ET-PIO2 card in the slot ID No.1.
b. Install a cable which is connecting 32 input points and 32 output points one to one(refer to Annex 3) to the receptacle of input and output part of the ET-PIO2 card.
c. Turn ON the front SW inside of the cover of the ET-PIO2 again.
d. Repeat the same test for the slots ID No.2, 3, 4 and 5 in the same method.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check ET-PIO2(slot ID No.1) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.1-2 is successfully completed.] | | |
| 1-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO1-IO-FR" on MTC display. | "CH3PIO1-IO-FR" on the display should be "1". | | |
| 2-1 | Check ET-PIO2(slot ID No.2) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.2-2 is successfully completed.] | | |
| 2-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO2-IO-FR" on MTC display. | "CH3PIO2-IO-FR" on the display should be "1". | | |
| 3-1 | Check ET-PIO2(slot ID No.3) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.3-2 is successfully completed.] | | |
| 3-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO3-IO-FR" on MTC display. | "CH3PIO3-IO-FR" on the display should be "1". | | |
| 4-1 | Check ET-PIO2(slot ID No.4) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.4-2 is successfully completed.] | | |
| 4-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO4-IO-FR" on MTC display. | "CH3PIO4-IO-FR" on the display should be "1". | | |
| 5-1 | Check ET-PIO2(slot ID No.5) I/O Port normal work by PIO2 I/O LED lamp on EI-CT Indication Panel. | PIO2 I/O LED on the indication panel should be lit up. [Note: This LED indicator shows that next test No.5-2 is successfully completed.] | | |
| 5-2 | Check ET-PIO2 I/O Port normal work by Relay status of "CH3PIO5-IO-FR" on MTC display. | "CH3PIO5-IO-FR" on the display should be "1". | | |

### 2.4.3 ET-MMIF Electronic Terminal Sub-Rack (E-M2 or E-M6) Test Procedure

This section describes test procedure for confirming integrity of the ET-MMIF electronic terminal Sub-Rack by connecting the EI-CT logic Sub-Rack and the ET-MMIF electronic terminal Sub-Rack.
In this section, system configuration of this test is required the Sub-Rack as per “Cards Test System Configuration forK5BMC (No.4)” in Annex 1.

**Functional Test Procedure**

**1) Preparation for Sub-Rack Test**

a. In advance of the testing, Logic cards and an IC card possessing integrity proven (for example by test in Section 2.3.3) have been installed into the Logic Sub-Rack.
b. Install the LINEM2 1 card and the MMIF2 2(or 6) cards both of which have been proven to the system 1 of Sub-Rack under test.
c. Connect power supply 24V to the ET-MMIF Sub-Rack under test.
Connect the EI-CT logic Sub-Rack CH3 upto the LINE2B system1 with a GI optical fiber cable.
d. Turn ON the breaker back of the rack.
e. Turn ON the front SW of the cards concerned (i.e. SW1 of IPU6C, DC5V SW of LINE2B, DC5V SW of LINEM2, and Power SW of MMIF2(B).
The logic card starts activation process and after a period of time, all the LEDs on the logic card side of the EI-CT Indication Panel light up green. (IPU6, F486-4I, FSIO, FSIO-EX, DID, FIO7-[P] and EXTFIO7P)
f. All the LEDs showing that the MMIF2(B) card for EI-CT Indication Panel output is in working order light up.
（LINEM2 and MMIF2(B)）
g. And then Turn ON the front SW of the LINEM2 and the MMIF2 cards.

h. On completion of test for the system 1, the same test is carried out for the system 2.
h. MTC shall be set to system 1.
i. On completion of MMIF Sub-Rack test for the system 1, the same test is carried out for the system 2.
J. MTC shall be set to system 2.

**2) System 1 MMIF Sub-Rack Test. (ET-CH2)**

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| | **(LINEM2)** | | | | |
| 1 | Check Power Supply unit output voltage. | Voltage at the output terminal of the unit should be regulated: 24V±10% | | | |
| 2 | Check LINEM2 card normal work by LINEM2 LED lamp on EI-CT Indication Panel. | LINEM2 LED on the indication panel should be lit up. | | | |
| | **(MMIF2)** | | | | |
| 3 | Check input voltage (5V) of each MMIF2 card of MMIF Sub-Rack . | Voltage at 5V input terminals of MMIF2 should be regulated within: 5V+5% -0% | No.1 | | |
| | | | No.2 | | |
| | | | No.3 | | |
| | | | No.4 | | |
| | | | No.5 | | |
| | | | No.6 | | |
| 4 | Check MMIF2 card normal work by "MMIF2(A)" LED lamp on EI-CT Indication Panel. | MMIF2(A) LED on the indication panel should be lit up. [Note: The LED Indication means the following Test No.5-1 to 5-6 are successfully completed.] | | | |
| 5-1 | Check MMIF2 card normal work by relay status of "CH2MM1A-FR" on MTC display. | "CH2MM1A-FR" on the display should be "1". | | | |
| 5-2 | Check MMIF2 card normal work by relay status of "CH2MM2A-FR" on MTC display. | "CH2MM2A-FR" on the display should be "1". | | | |
| 5-3 | Check MMIF2 card normal work by relay status of "CH2MM3A-FR" on MTC display. | "CH2MM3A-FR" on the display should be "1". | | | |
| 5-4 | Check MMIF2 card normal work by relay status of "CH2MM4A-FR" on MTC display. | "CH2MM4A-FR" on the display should be "1". | | | |
| 5-5 | Check MMIF2 card normal work by relay status of "CH2MM5A-FR" on MTC display. | "CH2MM5A-FR" on the display should be "1". | | | |
| 5-6 | Check MMIF2 card normal work by relay status of "CH2MM6A-FR" on MTC display. | "CH2MM6A-FR" on the display should be "1". | | | |

**3). MMIF2 I/O Connector Test**

The following tests of 3)-1 and 3)-2 should be carried out with the Sub-Rack composition of the preceding clause.

In case of the E-M2, from 1 to 2 of ID numbers are performed, and in case of the E-M6, from 1 to 6 of ID numbers are performed.

(Slot ID No. : n = 1,2,3,4,5,6)

3)-1. MMIF2(ID No. n) card I/O between first-half 32 output and 32 input points connector test.

a. Turn OFF the front Power SW of the MMIF2(ID No. n) card.
b. Connect the cable 1 that is for connecting first-half 32 output and 32 input points one to one up to corresponding input and output receptacles on the MMIF(ID No. n) card (refer to Annex 3 attached.)
c. Turn ON the front Power SW of the MMIF2(corresponding to the ID No. n) card.
d. To be tested from Slot ID No.2 to No.6 as same of above a to c.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check MMIF2(Slot ID No1) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.1-2 is successfully completed.] | | |
| 1-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM1-IO-FR". | "CH2MM1-IO-FR" on the display should be "1" | | |
| 2-1 | Check MMIF2(Slot ID No2) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.2-2 is successfully completed.] | | |
| 2-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM2-IO-FR". | "CH2MM2-IO-FR" on the display should be "1". | | |
| 3-1 | Check MMIF2(Slot ID No3) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.3-2 is successfully completed.] | | |
| 3-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM3-IO-FR". | "CH2MM3-IO-FR" on the display should be "1". | | |
| 4-1 | Check MMIF2(Slot ID No4) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.4-2 is successfully completed.] | | |
| 4-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM4-IO-FR". | "CH2MM4-IO-FR" on the display should be "1". | | |
| 5-1 | Check MMIF2(Slot ID No5) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.5-2 is successfully completed.] | | |
| 5-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM5-IO-FR". | "CH2MM5-IO-FR" on the display should be "1". | | |

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| 6-1 | Check MMIF2(Slot ID No6) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.6-2 is successfully completed.] | | |
| 6-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM6-IO-FR". | "CH2MM6-IO-FR" on the display should be "1". | | |

3)-2. MMIF2(ID No. n ) card Test between latter-half 32 output and 32 input points connector test.

a. Turn OFF the MMIF2(ID No. n ) card.
b. Connect the cable 2 that is for connecting latter-half 32 output and 32 input points 1 to 1 up to corresponding input and output receptacles on the MMIF2 (ID No. n ) card (refer to Annex 3 attached.)
c. Turn ON the MMIF2(ID No. n ) card.
d. To be tested from Slot ID No.2 to No.6 as same of above a to c.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check MMIF2(Slot ID No1) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.1-2 is successfully completed.] | | |
| 1-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM1-IO-FR". | "CH2MM1-IO-FR" on the display should be "1". | | |
| 2-1 | Check MMIF2(Slot ID No2) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.2-2 is successfully completed.] | | |
| 2-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM2-IO-FR". | "CH2MM2-IO-FR" on the display should be "1". | | |
| 3-1 | Check MMIF2(Slot ID No3) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.3-2 is successfully completed.] | | |
| 3-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM3-IO-FR". | "CH2MM3-IO-FR" on the display should be "1". | | |
| 4-1 | Check MMIF2(Slot ID No4) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.4-2 is successfully completed.] | | |
| 4-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM4-IO-FR". | "CH2MM4-IO-FR" on the display should be "1". | | |
| 5-1 | Check MMIF2(Slot ID No5) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.5-2 is successfully completed.] | | |
| 5-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM5-IO-FR". | "CH2MM5-IO-FR" on the display should be "1". | | |

| Signature of Firm's Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
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| 6-1 | Check MMIF2(Slot ID No6) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.6-2 is successfully completed.] | | |
| 6-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM6-IO-FR". | "CH2MM6-IO-FR" on the display should be "1". | | |

**4) System 2 MMIF Sub-Rack Test. (ET-CH2)**

| Test No. | Test description | Expected Result / Indication | | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|---|
| | **(LINEM2)** | | | | |
| 1 | Check Power Supply unit output voltage. | Voltage at the output terminal of the unit should be regulated: 24V±10% | | | |
| 2 | Check LINEM2 card normal work by LINEM2 LED lamp on EI-CT Indication Panel. | LINEM2 LED on the indication panel should be lit up. | | | |
| | **(MMIF2)** | | | | |
| 3 | Check input voltage (5V).of each MMIF2 card in MMIF Sub-Rack. | Voltage at 5V input terminals of MMIF2 should be regulated within 5V+5% -0% | No.1 | | |
| | | | No.2 | | |
| | | | No.3 | | |
| | | | No.4 | | |
| | | | No.5 | | |
| | | | No.6 | | |
| 4 | Check the MMIF2 card normal work by "MMIF2(A)" LED lamp on EI-CT Indication Panel. | MMIF2(A) LED on the indication panel should be lit up. [Note: The LED Indication means the following Test No.5-1 to 5-6 are successfully completed.] | | | |
| 5-1 | Check MMIF2 card normal work by relay status of "CH2MM1B-FR" on MTC display. | "CH2MM1B-FR" on the display should be "1". | | | |
| 5-2 | Check MMIF2 card normal work by relay status of "CH2MM2B-FR" on MTC display. | "CH2MM2B-FR" on the display should be "1". | | | |
| 5-3 | Check MMIF2 card normal work by relay status of "CH2MM3B-FR" on MTC display. | "CH2MM3B-FR" on the display should be "1". | | | |
| 5-4 | Check MMIF2 card normal work by relay status of "CH2MM4B-FR" on MTC display. | "CH2MM4B-FR" on the display should be "1". | | | |
| 5-5 | Check MMIF2 card normal work by relay status of "CH2MM5B-FR" on MTC display. | "CH2MM5B-FR" on the display should be "1". | | | |
| 5-6 | Check MMIF2 card normal work by relay status of "CH2MM6B-FR" on MTC display. | "CH2MM6B-FR" on the display should be "1". | | | |

**5). MMIF2 I/O Connector Test**

The following tests of 5)-1 and 5)-2 should be carried out with the Sub-Rack composition of the preceding clause.

In case of the E-M2, from 1 to 2 of ID numbers exist. In case of the E-M6, from 1 to 6 of ID numbers exist. (Slot ID No.: n = 1,2,3,4,5,6)

5)-1. MMIF2(ID No. n) card I/O between first-half 32 output and 32 input points connector test.

a. Turn OFF the front Power SW of the MMIF2(ID No. n) card.
b. Connect the cable 1 that is for connecting first-half 32 output and 32 input points one to one up to corresponding input and output receptacles on the MMIF2(ID No. n) card (refer to Annex 3 attached.)
c. Turn ON the front Power SW of the MMIF2(corresponding to the ID No. n) card.
d. To be tested from Slot ID No.2 to No.6 as same of above a to c.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check MMIF2(Slot ID No1) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.1-2 is successfully completed.] | | |
| 1-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM1-IO-FR". | "CH2MM1-IO-FR" on the display should be "1" | | |
| 2-1 | Check MMIF2(Slot ID No2) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.2-2 is successfully completed.] | | |
| 2-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM2-IO-FR". | "CH2MM2-IO-FR" on the display should be "1". | | |
| 3-1 | Check MMIF2(Slot ID No3) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.3-2 is successfully completed.] | | |
| 3-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM3-IO-FR". | "CH2MM3-IO-FR" on the display should be "1". | | |
| 4-1 | Check MMIF2(Slot ID No4) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.4-2 is successfully completed.] | | |
| 4-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM4-IO-FR". | "CH2MM4-IO-FR" on the display should be "1". | | |
| 5-1 | Check MMIF2(Slot ID No5) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up. [Note: The LED Indication means next Test No.5-2 is successfully completed.] | | |
| 5-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM5-IO-FR". | "CH2MM5-IO-FR" on the display should be "1". | | |

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| 6-1 | Check MMIF2(Slot ID No6) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.6-2 is successfully completed.] | | |
| 6-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM6-IO-FR". | "CH2MM6-IO-FR" on the display should be "1". | | |

5)-2. MMIF2(ID No. n ) card Test between latter-half 32 output and 32 input points connector test.

a. Turn OFF the MMIF2(ID No. n ) card.
b. Connect the cable 2 that is for connecting latter-half 32 output and 32 input points 1 to 1 up to corresponding input and output receptacles on the MMIF2(ID No. n ) card (refer to Annex 3 attached.)
c. Turn ON the MMIF2(ID No. n ) card.
d. To be tested from Slot ID No.2 to No.6 as same of above a to c.

| Test No. | Test description | Expected Result / Indication | Observed Result / Indication | OK/ NOT OK |
|---|---|---|---|---|
| 1-1 | Check MMIF2(Slot ID No1) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.1-2 is successfully completed.] | | |
| 1-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM1-IO-FR". | "CH2MM1-IO-FR" on the display should be "1". | | |
| 2-1 | Check MMIF2(Slot ID No2) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.2-2 is successfully completed.] | | |
| 2-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM2-IO-FR". | "CH2MM2-IO-FR" on the display should be "1". | | |
| 3-1 | Check MMIF2(Slot ID No3) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.3-2 is successfully completed.] | | |
| 3-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM3-IO-FR". | "CH2MM3-IO-FR" on the display should be "1". | | |
| 4-1 | Check MMIF2(Slot ID No4) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.4-2 is successfully completed.] | | |
| 4-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM4-IO-FR". | "CH2MM4-IO-FR" on the display should be "1". | | |
| 5-1 | Check MMIF2(Slot ID No5) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.5-2 is successfully completed.] | | |
| 5-2 | Check MMIF2 I/O Port normal work by Relay status of "CH2MM5-IO-FR". | "CH2MM5-IO-FR" on the display should be "1". | | |

| Signature of Firm's Representative with Name, designation & date. | Signature of RDSO representative with Name, designation & date. |
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| 6-1 | Check MMIF2(Slot ID No6) I/O Port normal work by MMIF2(A) I/O LED lamp on EI-CT Indication Panel. | MMIF2(A) I/O LED on the indication panel should be lit up.<br>[Note: The LED Indication means next Test No.6-2 is successfully completed.] | | |
| 6-2 | Check MMIF2 I/O Port normal work by Relay status of “CH2MM6-IO-FR”. | “CH2MM6-IO-FR” on the display should be “1”. | | |

### 2.5 K5BMC card Level Test with the MTC of EI-CT

This clause is described the procedure of checking the Sub-Rack and card of K5BMC operating normally with the monitoring display of the Maintenance Console (MTC) for EI-CT in which the card state is shown.

### 2.5.1 Indication Display of the System Status

The display of this MTC including how to operate is shown in the documents and Drawings as Annex 5. When abnormalities are there in each card in a system, failure indication is displayed into an applicable portion. Unless specified, system status is to be indicated in green for in normal and in red for abnormal. General System Status is displayed in Display of Mounted Logic Rack, by pressing part of the card on the General System Display detail status of each card can be checked on the display.

### 2.5.2 The List of Status Level of Logic Rack

The next tables from 2.5.2.1 to 2.5.2.3 are for checking the state of the system mounted in the EI-CT. (refer to Figure 1 in Annex 5).

The state of each portion of the MTC screen directed in each item of the table can be checked by a color(normal: green, and abnormal: red), and the state can be checked by the message displayed on a screen.

#### 1) Logic Sub-Rack

Table 2.5.2.1

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK/ Not OK |
|---|---|---|---|---|
| 1 | IPU6C | Normal (G) | | |
| 2 | F486-4I | Normal (G) | | |
| 3 | FSIO | Normal (G) | | |
| 4 | FSIO-EX | Normal (G) | | |
| 5 | DID | Normal (G) | | |
| 6 | FIO7-[P] | Normal (G) | | |
| 7 | EXTFIO7P | Normal (G) | | |

#### 2) ET-PIO Sub-Rack

Table 2.5.2.2

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK/ Not OK |
|---|---|---|---|---|
| 1 | S1 LINE2B | Normal (G) | | |
| 2 | S1 PIO2 -1 | Normal (G) | | |
| 3 | I/O | Normal (G) | | |

#### 3) MMIF Sub-Rack

Table 2.5.2.3

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | S1 LINEM2 | Normal (G) | | |
| 2 | S1 MMIF2(A) | Normal (G) | | |
| 3 | I/O | Normal (G) | | |
| 4 | S1 MMIF2(B) | Normal (G) | | |

### 2.5.3 The List of Status of Card Level of Logic Sub-Rack

The tables of this clause are for checking the state of the card level of Logic Sub-Rack mounted in the EI-CT. (refer to Figure 2.1 to 2.4 in Annex 5) .
This Card Level Display of Logic Sub-Rack can be appeared by clicking the portion of the card of the System Level Display of Logic Rack which is mentioned in clause 2.5.2.
These Displays are shown the detail status of card level of Logic Sub-Rack. And each Display shows a status corresponding to the circuit of the card of the system.

#### 1) F486-4I and DID

Table 2.5.3.1

| Test No. | Check Item | Expected Result / Message | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | CPU | Normal (G) | | |
| 2 | ROM | Normal (G) | | |
| 3 | RAM | Normal (G) | | |
| 4 | Ctrl Data Tx | Normal (G) | | |
| 5 | Indic. Data Rx | Normal (G) | | |
| 6 | Inter-sys Tx/Rx Rx | Normal (G) | | |
| 7 | Inter-sys Tx/Rx Tx | Normal (G) | | |
| 8 | IC Card | Normal (G) | | |
| 9 | DID | Normal (G) | | |

#### 2) FSIO and FIO7-[P]

Table 2.5.3.2

| Test No. | Check Item | Expected Result / Message | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | Ctrl Data Rx | Normal (G) | | |
| 2 | Indic. Data Tx | Normal (G) | | |
| 3 | MTC CH Tx | Normal (G) | | |
| 4 | MTC CH Rx | Normal (G) | | |
| 5 | ET CH1 Tx | Normal (G) | | |
| 6 | ET CH1 Rx | Normal (G) | | |

#### 3) FSIO-EX and EXTFIO7P

Table 2.5.3.3

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | Ctrl Data Rx | Normal (G) | | |
| 2 | Indic. Data Tx | Normal (G) | | |
| 3 | ET CH4 Tx | Normal (G) | | |
| 4 | ET CH4 Rx | Normal (G) | | |

**4) IPU6C**

Table 2.5.3.4

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | DC24/DC5 | Normal (G) | | |
| 2 | DC24/DC24 | Normal (G) | | |

### 2.5.4 The List of Status of Card Level of ET-PIO Sub-Rack

The tables of this clause are for checking the state of the card level of ET-PIO Sub-Rack mounted in the Simple Card Tester. (refer to Figure 3.1 to 3.2 in Annex 5) .
This Card Level Display of ET-PIO Sub-Rack can be appeared by clicking the portion of the card of the System Level Display of Logic Rack which is mentioned in clause 2.5.2.
These Displays are shown the detail status of card level of ET-PIO Sub-Rack. And each Display shows a status corresponding to the circuit of the card of the system.

**1) LINE2B**

Table 2.5.4.1

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | ET Ctrl Data OE Transform | Normal (G) | | |
| 2 | ET Indic. Data EO Transform | Normal (G) | | |
| 3 | DC24/DC5 | Normal (G) | | |

**2) PIO2**

Table 2.5.4.2

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | ET Ctrl Data Rx | Normal (G) | | |
| 2 | ET Indic. Data Tx | Normal (G) | | |
| 3 | PIO2 ID CHECK | Normal (G) | | |
| 4 | I/O | Normal (G) | | |
| 5 | DC24/DC5 | Normal (G) | | |

**3) PIO2 I/O Loop back Check**

A. The next table shows the state of the output/input of ET-PIO2 card by loopback.

B. This table is also correspondingly applied in clause “ET-PIO2 Card Out/In loopback Check” in “2.6.2 The List pf Status of ET-PIO Sub-Rack (E-P5)”

Table 2.5.4.3

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | 1 | Normal (G) | | |
| 2 | 2 | Normal (G) | | |
| 3 | 3 | Normal (G) | | |
| 4 | 4 | Normal (G) | | |
| 5 | 5 | Normal (G) | | |
| 6 | 6 | Normal (G) | | |
| 7 | 7 | Normal (G) | | |
| 8 | 8 | Normal (G) | | |
| 9 | 9 | Normal (G) | | |
| 10 | 10 | Normal (G) | | |
| 11 | 11 | Normal (G) | | |
| 12 | 12 | Normal (G) | | |
| 13 | 13 | Normal (G) | | |
| 14 | 14 | Normal (G) | | |
| 15 | 15 | Normal (G) | | |
| 16 | 16 | Normal (G) | | |
| 17 | 17 | Normal (G) | | |
| 18 | 18 | Normal (G) | | |
| 19 | 19 | Normal (G) | | |
| 20 | 20 | Normal (G) | | |
| 21 | 21 | Normal (G) | | |
| 22 | 22 | Normal (G) | | |
| 23 | 23 | Normal (G) | | |
| 24 | 24 | Normal (G) | | |
| 25 | 25 | Normal (G) | | |
| 26 | 26 | Normal (G) | | |
| 27 | 27 | Normal (G) | | |
| 28 | 28 | Normal (G) | | |
| 29 | 29 | Normal (G) | | |
| 30 | 30 | Normal (G) | | |
| 31 | 31 | Normal (G) | | |
| 32 | 32 | Normal (G) | | |

### 2.5.5 The List of Status of Card Level of MMIF Sub-Rack

The tables of this clause are for checking the state of the card level of MMIF Sub-Rack mounted in the EI-CT. (refer to Figure 4.1 to 4.2 in Annex 5) .
This Card Level Display of MMIF Sub-Rack can be appeared by clicking the portion of the card of the System Level Display of Logic Rack which is mentioned in clause 2.5.2.
These Displays are shown the detail status of card level of MMIF Sub-Rack. And each Display shows a status corresponding to the circuit of the card of the system.

**1) LINEM2**

Table 2.5.5.1

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | ET Ctrl Data OE Transform | Normal (G) | | |
| 2 | ET Indic. Data EO Transform | Normal (G) | | |
| 3 | DC24/DC5 | Normal (G) | | |

**2) MMIF2**

Table 2.5.5.2

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | ET Ctrl Data Rx | Normal (G) | | |
| 2 | ET Indic. Data Tx | Normal (G) | | |
| 3 | MMIF2 ID CHECK | Normal (G) | | |
| 4 | I/O | Normal (G) | | |

**3) MMIF2 I/O Loop back Check**

A. The I/O loopback check is performed in two times of I/O Ports 1 to 32 and 33 to 64.
B. This table is also correspondingly applied to the check of clause “MMIF2 Card Out/In loopback Check” of “2.6.3 The List of Status of MMIF Sub-Rack (E-M2) or (E-M6). “n” of column message shows ID No. of mounted card MMIF2.

Table 2.5.5.3

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | 1 | Normal (G) | | |
| 2 | 2 | Normal (G) | | |
| 3 | 3 | Normal (G) | | |
| 4 | 4 | Normal (G) | | |
| 5 | 5 | Normal (G) | | |
| 6 | 6 | Normal (G) | | |
| 7 | 7 | Normal (G) | | |
| 8 | 8 | Normal (G) | | |
| 9 | 9 | Normal (G) | | |
| 10 | 10 | Normal (G) | | |
| 11 | 11 | Normal (G) | | |
| 12 | 12 | Normal (G) | | |
| 13 | 13 | Normal (G) | | |
| 14 | 14 | Normal (G) | | |
| 15 | 15 | Normal (G) | | |
| 16 | 16 | Normal (G) | | |
| 17 | 17 | Normal (G) | | |
| 18 | 18 | Normal (G) | | |
| 19 | 19 | Normal (G) | | |
| 20 | 20 | Normal (G) | | |
| 21 | 21 | Normal (G) | | |
| 22 | 22 | Normal (G) | | |
| 23 | 23 | Normal (G) | | |
| 24 | 24 | Normal (G) | | |
| 25 | 25 | Normal (G) | | |
| 26 | 26 | Normal (G) | | |
| 27 | 27 | Normal (G) | | |
| 28 | 28 | Normal (G) | | |
| 29 | 29 | Normal (G) | | |
| 30 | 30 | Normal (G) | | |
| 31 | 31 | Normal (G) | | |
| 32 | 32 | Normal (G) | | |

（to be continued to the next page）

（from the previous page）

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 33 | 33 | Normal (G) | | |
| 34 | 34 | Normal (G) | | |
| 35 | 35 | Normal (G) | | |
| 36 | 36 | Normal (G) | | |
| 37 | 37 | Normal (G) | | |
| 38 | 38 | Normal (G) | | |
| 39 | 39 | Normal (G) | | |
| 40 | 40 | Normal (G) | | |
| 41 | 41 | Normal (G) | | |
| 42 | 42 | Normal (G) | | |
| 43 | 43 | Normal (G) | | |
| 44 | 44 | Normal (G) | | |
| 45 | 45 | Normal (G) | | |
| 46 | 46 | Normal (G) | | |
| 47 | 47 | Normal (G) | | |
| 48 | 48 | Normal (G) | | |
| 49 | 49 | Normal (G) | | |
| 50 | 50 | Normal (G) | | |
| 51 | 51 | Normal (G) | | |
| 52 | 52 | Normal (G) | | |
| 53 | 53 | Normal (G) | | |
| 54 | 54 | Normal (G) | | |
| 55 | 55 | Normal (G) | | |
| 56 | 56 | Normal (G) | | |
| 57 | 57 | Normal (G) | | |
| 58 | 58 | Normal (G) | | |
| 59 | 59 | Normal (G) | | |
| 60 | 60 | Normal (G) | | |
| 61 | 61 | Normal (G) | | |
| 62 | 62 | Normal (G) | | |
| 63 | 63 | Normal (G) | | |
| 64 | 64 | Normal (G) | | |

### 2.6 Sub-Rack Level Test with the MTC of EI-CT

The Sub-Rack test can be performed by connecting the objective Sub-Rack and choosing the Sub-Rack Test push button on the right-hand side of a Display. (Color of applicable button changes with white to yellow, and return key color also to white).
In the normal condition of a result of a Sub-Rack examination, the indication of applicable card in the Sub-Rack will be indicated in green, and also Sub-Rack name left side will be indicated in green. If case of unusual, red indication will be displayed at the part of card, and Sub-Rack name is also indicated in red. By clicking a card portion, it shifts to the Display of the state of card level. (However, except to I/O loop back test)

#### 2.6.1 The List of Status of Logic Sub-Rack

This test can be performed by connecting Logic Sub-Rack(L-K7C) and choosing the Test push button on the right-hand side of a Display. (refer to Figure 5.1 in Annex 5)

Table 2.6.1

| Test No. | Check Item | | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|---|
| 1 | LOGIC S1 | IPU6C | Normal (G) | | |
| 2 | | F486-4I | Normal (G) | | |
| 3 | | FSIO | Normal (G) | | |
| 4 | | FSIO-EX | Normal (G) | | |
| 5 | | DID | Normal (G) | | |
| 6 | | FIO7-[P] | Normal (G) | | |
| 7 | | EXTFIO7P | Normal (G) | | |
| 8 | LOGIC S2 | IPU6C | Normal (G) | | |
| 9 | | F486-4I | Normal (G) | | |
| 10 | | FSIO | Normal (G) | | |
| 11 | | FSIO-EX | Normal (G) | | |
| 12 | | DID | Normal (G) | | |
| 13 | | FIO7-[P] | Normal (G) | | |
| 14 | | EXTFIO7P | Normal (G) | | |
| 15 | L-K7C | | Normal (G) | | |

### 2.6.2 The List of Status of ET-PIO Sub-Rack (E-P5)

This test can be performed by connecting ET-PIO Sub-Rack(E-P5) and choosing the Test push button on the right-hand side of a Display. (refer to Figure 5.2 in Annex 5)

#### 1) Status of ET-PIO Sub-Rack (E-P5) for System 1

Table 2.6.2.1

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | S1 LINE2B | Normal (G) | | |
| 2 | S1 PIO2 -1 | Normal (G) | | |
| 3 | S1 PIO2 -2 | Normal (G) | | |
| 4 | S1 PIO2 -3 | Normal (G) | | |
| 5 | S1 PIO2 -4 | Normal (G) | | |
| 6 | S1 PIO2 -5 | Normal (G) | | |
| 7 | I/O-1 | Normal (G) | | |
| 8 | I/O-2 | Normal (G) | | |
| 9 | I/O-3 | Normal (G) | | |
| 10 | I/O-4 | Normal (G) | | |
| 11 | I/O-5 | Normal (G) | | |
| 12 | E-P5 | Normal (G) | | |

#### 2) Status of ET-PIO Sub-Rack (E-P5) for System 2

Table 2.6.2.2

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK |
|---|---|---|---|---|
| 1 | S2 LINE2B | Normal (G) | | |
| 2 | S2 PIO2 -1 | Normal (G) | | |
| 3 | S2 PIO2 -2 | Normal (G) | | |
| 4 | S2 PIO2 -3 | Normal (G) | | |
| 5 | S2 PIO2 -4 | Normal (G) | | |
| 6 | S2 PIO2 -5 | Normal (G) | | |
| 7 | I/O-1 | Normal (G) | | |
| 8 | I/O-2 | Normal (G) | | |
| 9 | I/O-3 | Normal (G) | | |
| 10 | I/O-4 | Normal (G) | | |
| 11 | I/O-5 | Normal (G) | | |
| 12 | E-P5 | Normal (G) | | |

**2.6.3 The List of Status of MMIF Sub-Rack (E-M2) or (E-M6)**

This test can be performed by connecting MMIF Sub-Rack (E-M2) or (E-M6) and choosing the Test push button of a Display. (refer to Figure 5.3 to 5.4 in Annex 5)

**1) Status of MMIF Sub-Rack (E-M2) for System 1**

Table 2.6.3.1

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK Status |
|---|---|---|---|---|
| 1 | S1 LINEM2 | Normal (G) | | |
| 2 | S1 MMIF2-1 | Normal (G) | | |
| 3 | S1 MMIF2-2 | Normal (G) | | |
| 4 | I/O-1 | Normal (G) | | |
| 5 | I/O-2 | Normal (G) | | |
| 6 | E-M2 | Normal (G) | | |

**2) Status of MMIF Sub-Rack (E-M2) for System 2**

Table 2.6.3.2

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK Status |
|---|---|---|---|---|
| 1 | S2 LINEM2 | Normal (G) | | |
| 2 | S2 MMIF2-1 | Normal (G) | | |
| 3 | S2 MMIF2-2 | Normal (G) | | |
| 4 | I/O-1 | Normal (G) | | |
| 5 | I/O-2 | Normal (G) | | |
| 6 | E-M2 | Normal (G) | | |

**3) Status of MMIF Sub-Rack (E-M6) for system 1**

Table 2.6.3.3

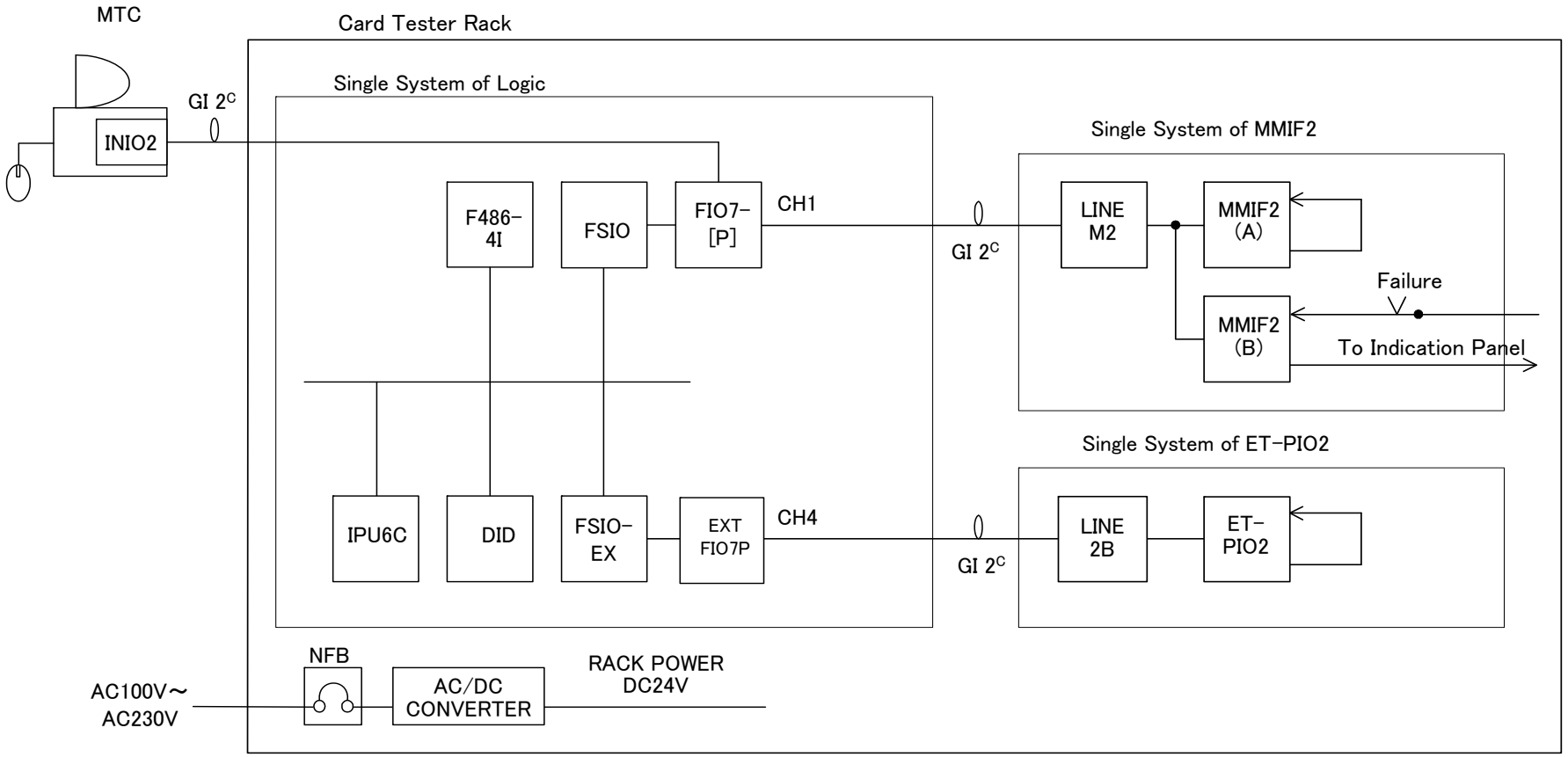
| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK Status |
|---|---|---|---|---|
| 1 | S1 LINEM2 | Normal (G) | | |
| 2 | S1 MMIF2 -1 | Normal (G) | | |
| 3 | S1 MMIF2 -2 | Normal (G) | | |
| 4 | S1 MMIF2 -3 | Normal (G) | | |
| 5 | S1 MMIF2 -4 | Normal (G) | | |
| 6 | S1 MMIF2 -5 | Normal (G) | | |
| 7 | S1 MMIF2 -6 | Normal (G) | | |
| 8 | I/O-1 | Normal (G) | | |
| 9 | I/O-2 | Normal (G) | | |
| 10 | I/O-3 | Normal (G) | | |
| 11 | I/O-4 | Normal (G) | | |
| 12 | I/O-5 | Normal (G) | | |
| 13 | I/O-6 | Normal (G) | | |
| 14 | E-M6 | Normal (G) | | |

**4) Status of MMIF Sub-Rack (E-M6) for system 2**

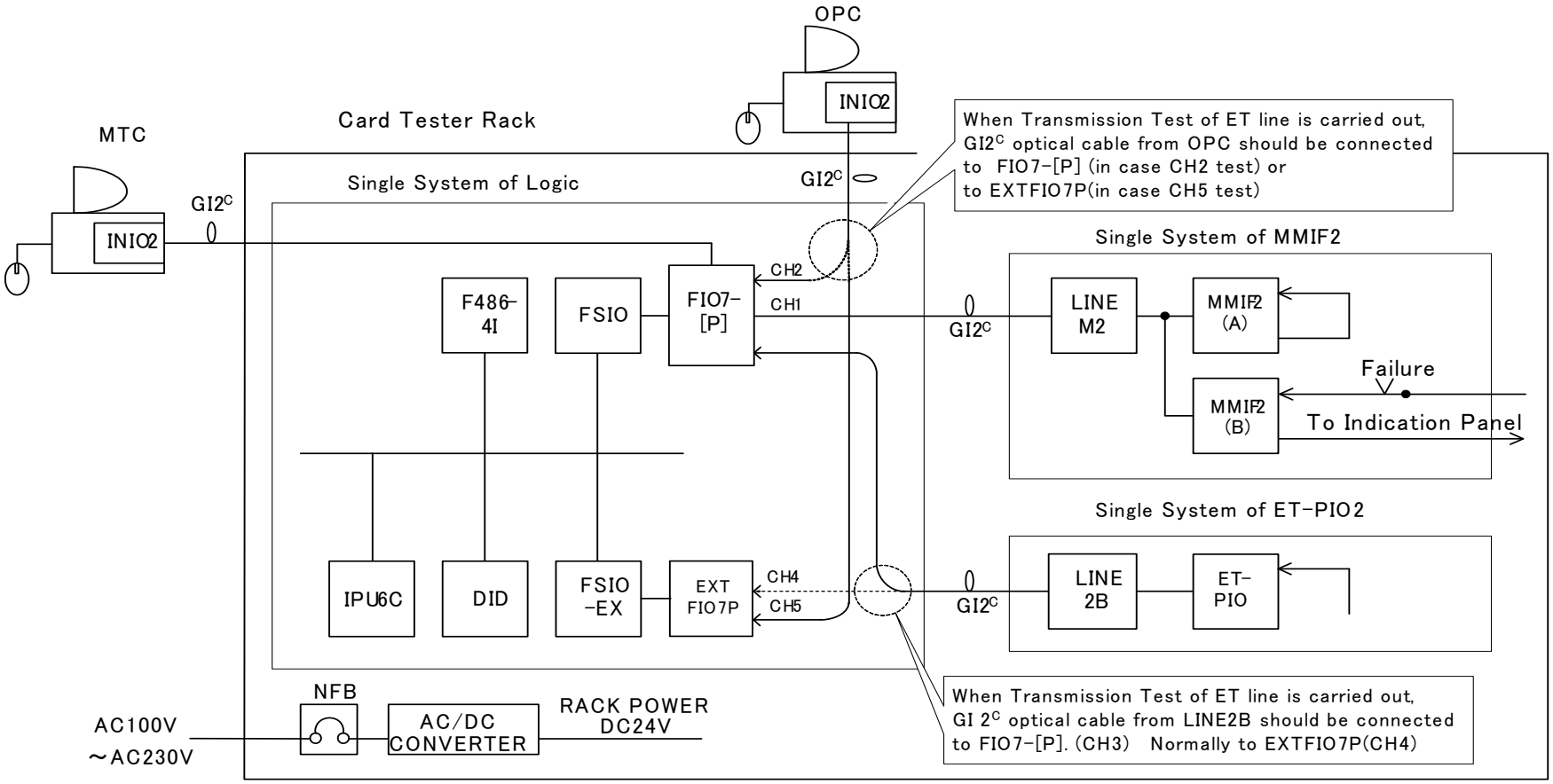
Table 2.6.3.4

| Test No. | Check Item | Expected Result | Observed Result/ Indication | OK / Not OK Status |
|---|---|---|---|---|
| 1 | S2 LINEM2 | Normal (G) | | |
| 2 | S2 MMIF2 -1 | Normal (G) | | |
| 3 | S2 MMIF2 -2 | Normal (G) | | |
| 4 | S2 MMIF2 -3 | Normal (G) | | |
| 5 | S2 MMIF2 -4 | Normal (G) | | |
| 6 | S2 MMIF2 -5 | Normal (G) | | |
| 7 | S2 MMIF2 -6 | Normal (G) | | |
| 8 | I/O-1 | Normal (G) | | |
| 9 | I/O-2 | Normal (G) | | |
| 10 | I/O-3 | Normal (G) | | |
| 11 | I/O-4 | Normal (G) | | |
| 12 | I/O-5 | Normal (G) | | |
| 13 | I/O-6 | Normal (G) | | |
| 14 | E-M6 | Normal (G) | | |

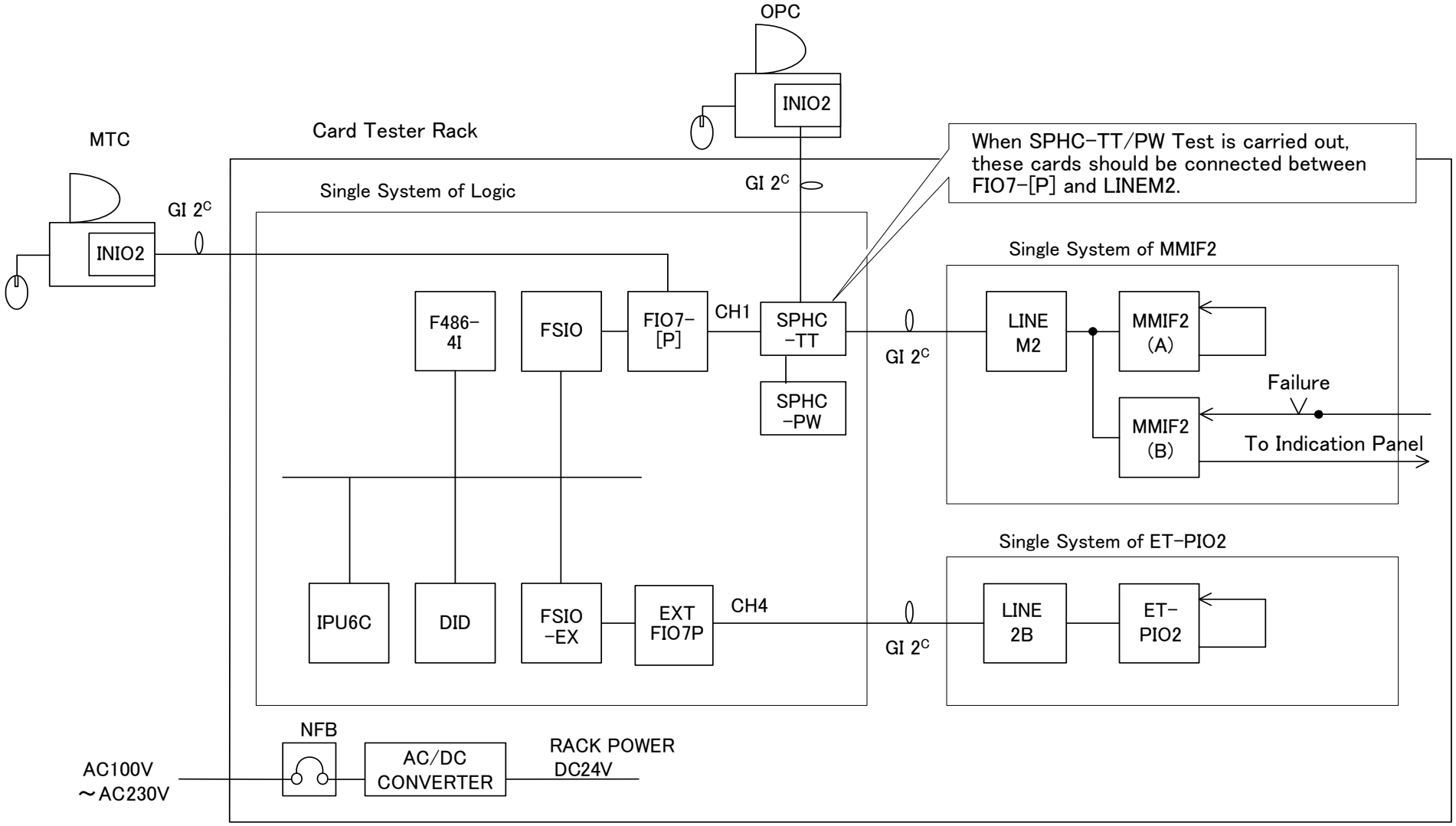
Annex 1



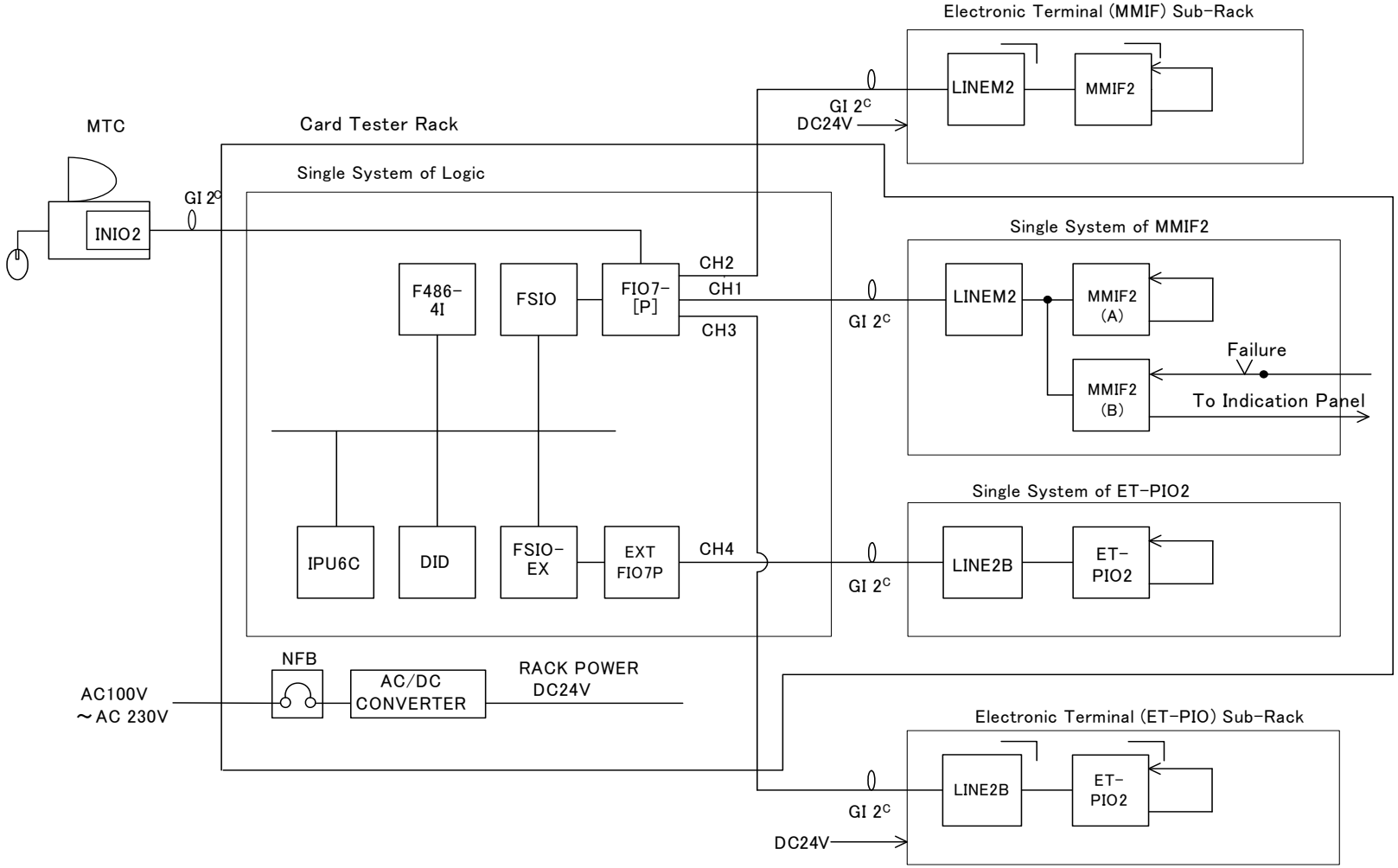

Cards Test System Configuration for K5BMC (No.1)




Cards Test System Configuration for K5BMC (No.2)

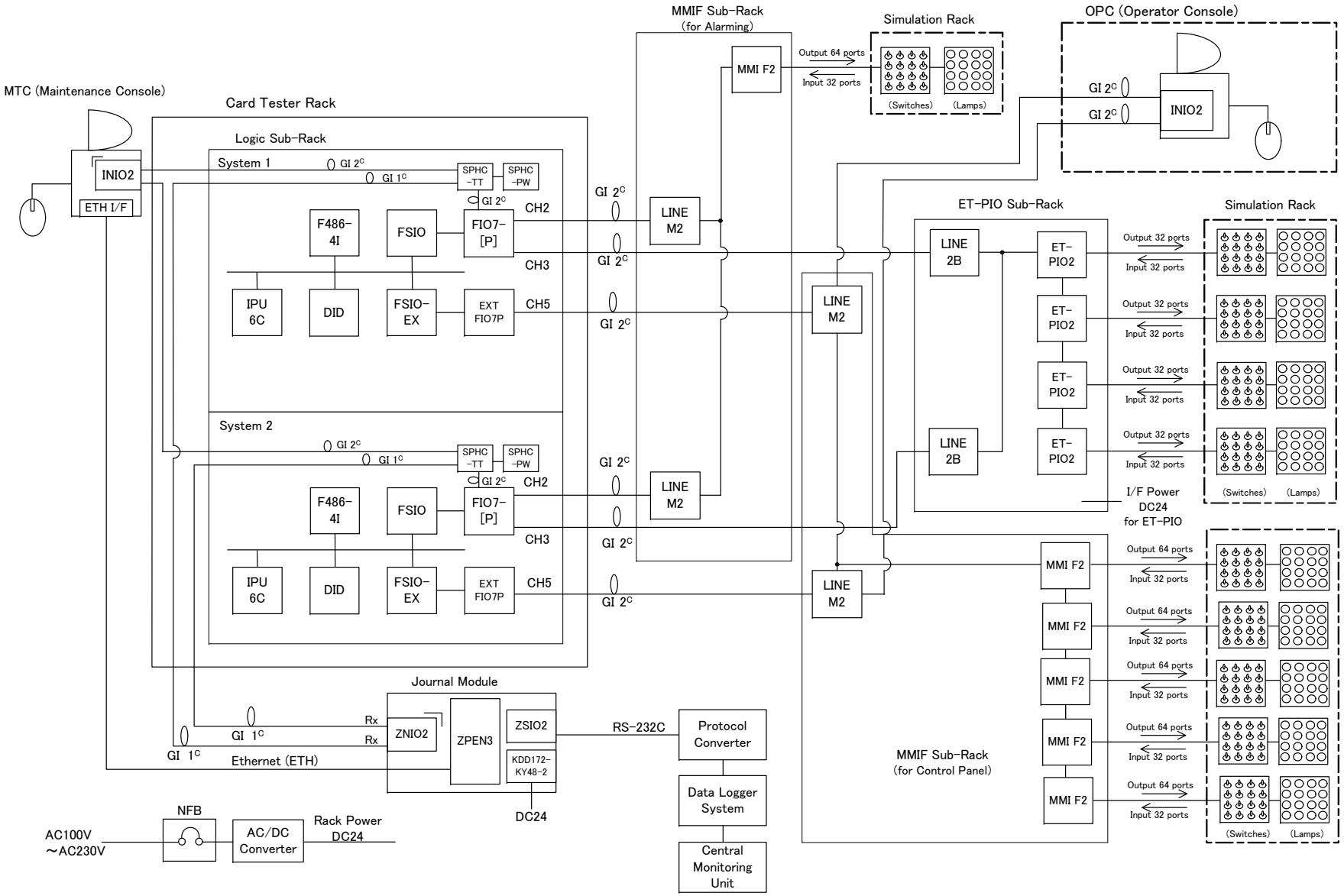



Cards Test System Configuration for K5BMC (No.3)



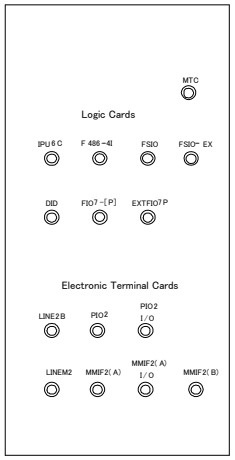

Cards Test System Configuration for K5BMC (No.4)

K5BMC EI System Configuration for Interlocking Test (for sample station)

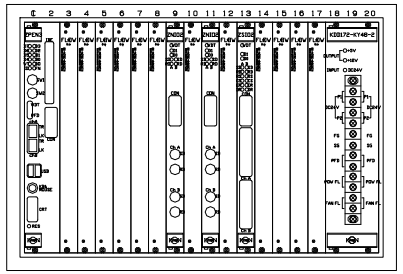



Cards Test System Configuration for K5BMC (No.5)

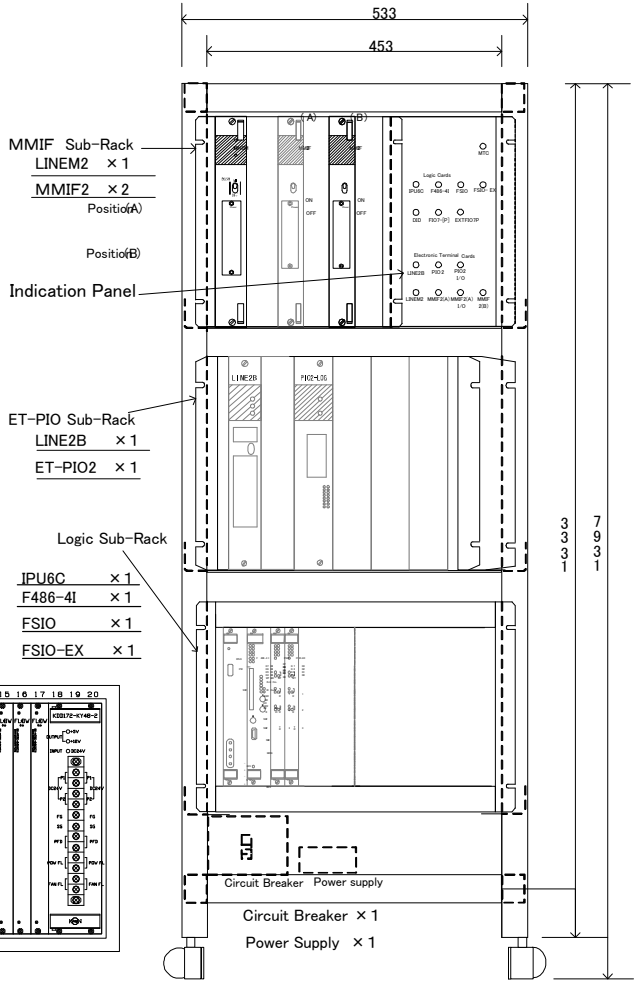
Annex 2



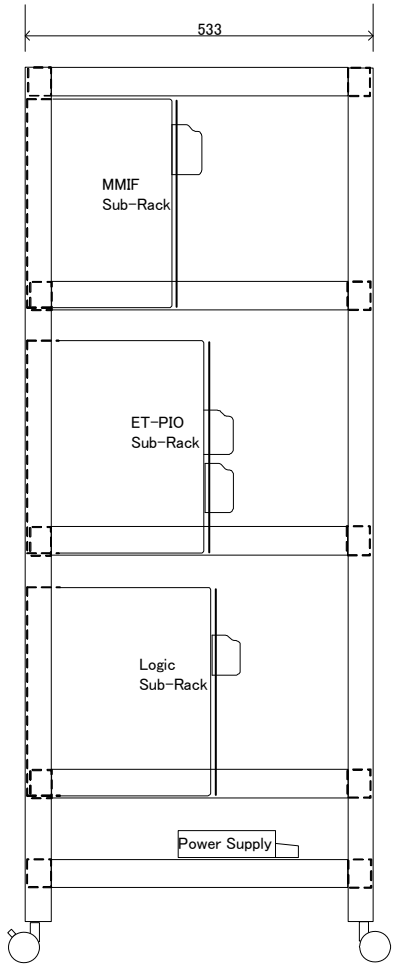

Indication Panel
(for checking Card status)



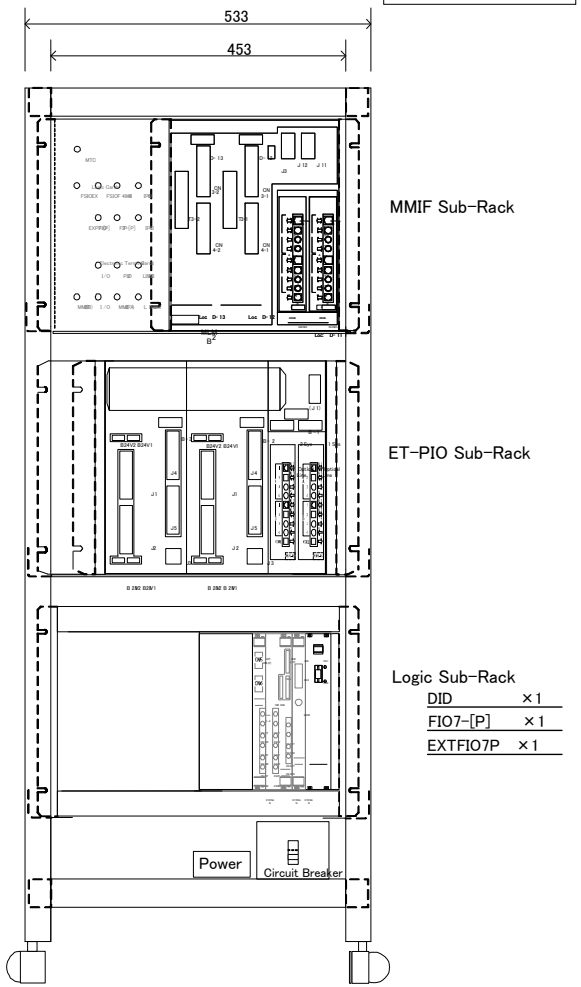
Journal Module




Front View




Side View (right side)

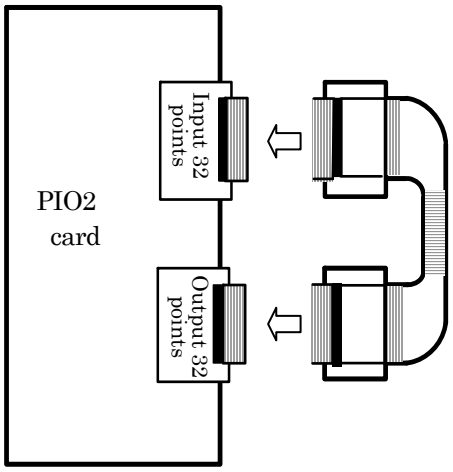



Rear View

Note 1. Rating Power Supply Unit: Input: AC100-230V, Output: 24VDC
Plug shapes must be adequately localized to a specified national standard.
2. Card name with under line shows card for test to be inserted.
(They are not included in this Card Tester, CT.)
3. IC card for this CT and Connecting cables are contained in addition to the above mentioned figure.

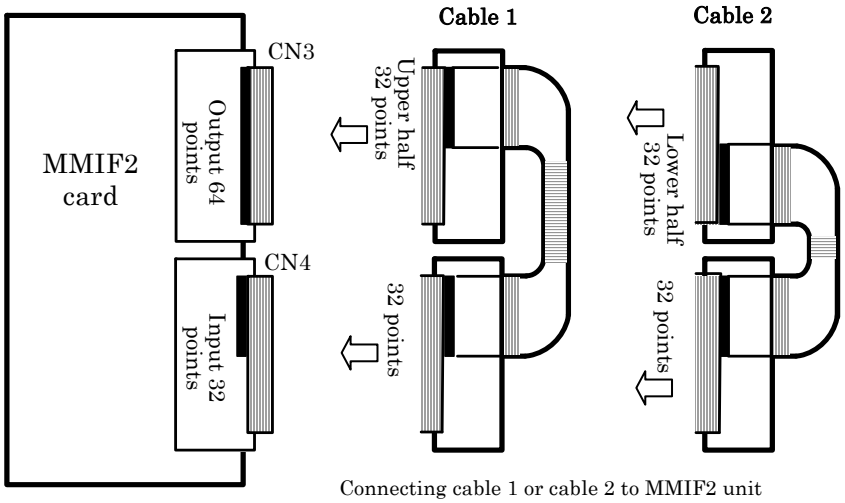
# Card Tester for K5BMC EI

Connecting Input 32 point and Output 32 point with Cable




Connecting Cable for ET-PIO2 I/O Test

Connecting Input 32 point and Output 64 point
with Cable 1 or Cable2




Connecting cable 1 or cable 2 to MMIF2 unit

Connecting Cable for MMIF2 I/O Test

Connecting Cable for I/O Loopback Test

Annex 4

## The normal condition check table of K5BMC EI Card by MTC of Card Tester

Note: The Relay Names in the table are cyber relays for the LDC relay wiring.
1/0 in the table of normal condition is shown relay Pick Up/Drop Down state.

1. Logic Cards

1-1. IPU6C

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | IPU6-FL | IPU6C condition | 1 |

1-2. F486-4I Start-up

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | Start Up | Normal Start-up completion | 1 |

1-3. F486-4I Self-Diagnosis

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | A-Abar-Ok | A-A bar comparison check | 1 |
| 2 | TRACE-Ok | Module trace check condition | 1 |
| 3 | KEY-OK | Key code check condition | 1 |
| 4 | ICCARD-OK | Program diagnosis condition | 1 |
| 5 | RAM-OK | RAM diagnosis condition | 1 |
| 6 | TIM-OK | Timer diagnosis condition | 1 |
| 7 | COMP-OK | Bus mismatch detection circuit condition | 1 |
| 8 | FSIN-OK | Input Check condition | 1 |
| 9 | SsysOk | S-SYS output condition | 1 |
| 10 | WdtOk | WDT output condition | 1 |
| 11 | ItlIdleOk | Initial idol diagnosis condition | 1 |
| 12 | FurikoOk | Alternation Output condition | 1 |
| 13 | RomComp | ROM diagnosis condition | 1 |
| 14 | VME-OK | VME bus condition | 1 |
| 15 | ICCIns-OK | Inserted condition of IC Card | 1 |

1-4. FSIO

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | E1PelphErr | ET CH1 peripheral failure | 0 |
| 2 | E2PelphErr | ET CH2 peripheral failure | 0 |
| 3 | E3PelphErr | ET CH3 peripheral failure | 0 |
| 4 | MPelphErr | Maintenance line peripheral failure | 0 |

1-5. FIO7-[P]

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | E1PelphErr | ET CH1 peripheral failure | 0 |
| 2 | E2PelphErr | ET CH2 peripheral failure | 0 |
| 3 | E3PelphErr | ET CH3 peripheral failure | 0 |
| 4 | MPelphErr | Maintenance line peripheral failure | 0 |

1-6. FSIO-EX

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | E4PelphErr | ET CH4 peripheral failure | 0 |
| 2 | E5PelphErr | ET CH5 peripheral failure | 0 |
| 3 | OPelphErr | Option line peripheral failure (DL I/F) | 0 |

1-7. EXTFIO7P

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | E4PelphErr | ET CH4 peripheral failure | 0 |
| 2 | E5PelphErr | ET CH5 peripheral failure | 0 |
| 3 | OPelphErr | Option line peripheral failure (DL I/F) | 0 |

1-8. DID

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | DID-FL | Station ID check condition | 1 |

2. ET(Electronic Terminal)-PIO2 Cards

2-1. LINE2B

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | LINE2B-FL | LINE2B condition | 1 |

2-2. PIO2

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | PIOA-FR | General condition of System 1 ET-PIO 6-1 (organized from next Item No.2 to No.12) | 1 |
| 2 | 2PI1ANSA | Control Information Receiving condition of System 1 ET-PIO 6-1 | 1 |
| 3 | 2PI1SIO1A | ET CH, condition of System 1 ET-PIO 6-1 | 1 |
| 4 | 2PI1TNOA | ET Number Input Circuit condition of System 1 ET-PIO 6-1 | 1 |
| 5 | 2PI1No0A | Circuit No.0 condition of System 1 ET-PIO 6-1 | 1 |
| 6 | 2PI1No1A | Circuit No.1 condition of System 1 ET-PIO 6-1 | 1 |
| 7 | 2PI1No2A | Circuit No.2 condition of System 1 ET-PIO 6-1 | 1 |
| 8 | 2PI1No3A | Circuit No.3 condition of System 1 ET-PIO 6-1 | 1 |
| 9 | 2PI1No4A | Circuit No.4 condition of System 1 ET-PIO 6-1 | 1 |
| 10 | 2PI1No5A | Circuit No.5 condition of System 1 ET-PIO 6-1 | 1 |
| 11 | 2PI1No6A | Circuit No.6 condition of System 1 ET-PIO 6-1 | 1 |
| 12 | 2PI1No7A | Circuit No.7 condition of System 1 ET-PIO 6-1 | 1 |

2-3. PIO2 I/O Output

(In this table, the Output is 5 sec 1/0 Cycle.)

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 2PI1-1OUT | I/O port 1 output of ET-PIO 6-1 | cyclic 1/0 |
| 2 | 2PI1-2OUT | I/O port 2 output of ET-PIO 6-1 | cyclic 1/0 |
| 3 | 2PI1-3OUT | I/O port 3 output of ET-PIO 6-1 | cyclic 1/0 |
| 4 | 2PI1-4OUT | I/O port 4 output of ET-PIO 6-1 | cyclic 1/0 |
| 5 | 2PI1-5OUT | I/O port 5 output of ET-PIO 6-1 | cyclic 1/0 |
| 6 | 2PI1-6OUT | I/O port 6 output of ET-PIO 6-1 | cyclic 1/0 |
| 7 | 2PI1-7OUT | I/O port 7 output of ET-PIO 6-1 | cyclic 1/0 |
| 8 | 2PI1-8OUT | I/O port 8 output of ET-PIO 6-1 | cyclic 1/0 |
| 9 | 2PI1-9OUT | I/O port 9 output of ET-PIO 6-1 | cyclic 1/0 |
| 10 | 2PI1-10OUT | I/O port 10 output of ET-PIO 6-1 | cyclic 1/0 |
| 11 | 2PI1-11OUT | I/O port 11 output of ET-PIO 6-1 | cyclic 1/0 |
| 12 | 2PI1-12OUT | I/O port 12 output of ET-PIO 6-1 | cyclic 1/0 |
| 13 | 2PI1-13OUT | I/O port 13 output of ET-PIO 6-1 | cyclic 1/0 |
| 14 | 2PI1-14OUT | I/O port 14 output of ET-PIO 6-1 | cyclic 1/0 |
| 15 | 2PI1-15OUT | I/O port 15 output of ET-PIO 6-1 | cyclic 1/0 |
| 16 | 2PI1-16OUT | I/O port 16 output of ET-PIO 6-1 | cyclic 1/0 |
| 17 | 2PI1-17OUT | I/O port 17 output of ET-PIO 6-1 | cyclic 1/0 |
| 18 | 2PI1-18OUT | I/O port 18 output of ET-PIO 6-1 | cyclic 1/0 |
| 19 | 2PI1-19OUT | I/O port 19 output of ET-PIO 6-1 | cyclic 1/0 |
| 20 | 2PI1-20OUT | I/O port 20 output of ET-PIO 6-1 | cyclic 1/0 |
| 21 | 2PI1-21OUT | I/O port 21 output of ET-PIO 6-1 | cyclic 1/0 |
| 22 | 2PI1-22OUT | I/O port 22 output of ET-PIO 6-1 | cyclic 1/0 |
| 23 | 2PI1-23OUT | I/O port 23 output of ET-PIO 6-1 | cyclic 1/0 |
| 24 | 2PI1-24OUT | I/O port 24 output of ET-PIO 6-1 | cyclic 1/0 |
| 25 | 2PI1-25OUT | I/O port 25 output of ET-PIO 6-1 | cyclic 1/0 |
| 26 | 2PI1-26OUT | I/O port 26 output of ET-PIO 6-1 | cyclic 1/0 |
| 27 | 2PI1-27OUT | I/O port 27 output of ET-PIO 6-1 | cyclic 1/0 |
| 28 | 2PI1-28OUT | I/O port 28 output of ET-PIO 6-1 | cyclic 1/0 |
| 29 | 2PI1-29OUT | I/O port 29 output of ET-PIO 6-1 | cyclic 1/0 |
| 30 | 2PI1-30OUT | I/O port 30 output of ET-PIO 6-1 | cyclic 1/0 |
| 31 | 2PI1-31OUT | I/O port 31 output of ET-PIO 6-1 | cyclic 1/0 |
| 32 | 2PI1-32OUT | I/O port 32 output of ET-PIO 6-1 | cyclic 1/0 |

2-4. PIO2 I/O Input

(In this table, the Input is 5 sec 1/0 Cycle.)

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 2PI1-1IN | I/O port 1 Input of ET-PIO 6-1 | cyclic 1/0 |
| 2 | 2PI1-2IN | I/O port 2 Input of ET-PIO 6-1 | cyclic 1/0 |
| 3 | 2PI1-3IN | I/O port 3 Input of ET-PIO 6-1 | cyclic 1/0 |
| 4 | 2PI1-4IN | I/O port 4 Input of ET-PIO 6-1 | cyclic 1/0 |
| 5 | 2PI1-5IN | I/O port 5 Input of ET-PIO 6-1 | cyclic 1/0 |
| 6 | 2PI1-6IN | I/O port 6 Input of ET-PIO 6-1 | cyclic 1/0 |
| 7 | 2PI1-7IN | I/O port 7 Input of ET-PIO 6-1 | cyclic 1/0 |
| 8 | 2PI1-8IN | I/O port 8 Input of ET-PIO 6-1 | cyclic 1/0 |
| 9 | 2PI1-9IN | I/O port 9 Input of ET-PIO 6-1 | cyclic 1/0 |
| 10 | 2PI1-10IN | I/O port 10 Input of ET-PIO 6-1 | cyclic 1/0 |
| 11 | 2PI1-11IN | I/O port 11 Input of ET-PIO 6-1 | cyclic 1/0 |
| 12 | 2PI1-12IN | I/O port 12 Input of ET-PIO 6-1 | cyclic 1/0 |
| 13 | 2PI1-13IN | I/O port 13 Input of ET-PIO 6-1 | cyclic 1/0 |
| 14 | 2PI1-14IN | I/O port 14 Input of ET-PIO 6-1 | cyclic 1/0 |
| 15 | 2PI1-15IN | I/O port 15 Input of ET-PIO 6-1 | cyclic 1/0 |
| 16 | 2PI1-16IN | I/O port 16 Input of ET-PIO 6-1 | cyclic 1/0 |
| 17 | 2PI1-17IN | I/O port 17 Input of ET-PIO 6-1 | cyclic 1/0 |
| 18 | 2PI1-18IN | I/O port 18 Input of ET-PIO 6-1, | cyclic 1/0 |
| 19 | 2PI1-19IN | I/O port 19 Input of ET-PIO 6-1 | cyclic 1/0 |
| 20 | 2PI1-20IN | I/O port 20 Input of ET-PIO 6-1 | cyclic 1/0 |
| 21 | 2PI1-21IN | I/O port 21 Input of ET-PIO 6-1 | cyclic 1/0 |
| 22 | 2PI1-22IN | I/O port 22 Input of ET-PIO 6-1 | cyclic 1/0 |
| 23 | 2PI1-23IN | I/O port 23 Input of ET-PIO 6-1 | cyclic 1/0 |
| 24 | 2PI1-24IN | I/O port 24 Input of ET-PIO 6-1 | cyclic 1/0 |
| 25 | 2PI1-25IN | I/O port 25 Input of ET-PIO 6-1 | cyclic 1/0 |
| 26 | 2PI1-26IN | I/O port 26 Input of ET-PIO 6-1 | cyclic 1/0 |
| 27 | 2PI1-27IN | I/O port 27 Input of ET-PIO 6-1 | cyclic 1/0 |
| 28 | 2PI1-28IN | I/O port 28 Input of ET-PIO 6-1 | cyclic 1/0 |
| 29 | 2PI1-29IN | I/O port 29 Input of ET-PIO 6-1 | cyclic 1/0 |
| 30 | 2PI1-30IN | I/O port 30 Input of ET-PIO 6-1 | cyclic 1/0 |
| 31 | 2PI1-31IN | I/O port 31 Input of ET-PIO 6-1 | cyclic 1/0 |
| 32 | 2PI1-32IN | I/O port 32 Input of ET-PIO 6-1 | cyclic 1/0 |

2-5. PIO2 I/O Loopback Check

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | PIOA-IO-FR | General I/O Loopback of ET-PIO 6-1 (organized from next No.2 to No.33) | 1 |
| 2 | 2PI1-IO-1FR | I/O port 1 Loopback of ET-PIO 6-1 | 1 |
| 3 | 2PI1-IO-2FR | I/O port 2 Loopback of ET-PIO 6-1 | 1 |
| 4 | 2PI1-IO-3FR | I/O port 3 Loopback of ET-PIO 6-1 | 1 |
| 5 | 2PI1-IO-4FR | I/O port 4 Loopback of ET-PIO 6-1 | 1 |
| 6 | 2PI1-IO-5FR | I/O port 5 Loopback of ET-PIO 6-1 | 1 |
| 7 | 2PI1-IO-6FR | I/O port 6 Loopback of ET-PIO 6-1 | 1 |
| 8 | 2PI1-IO-7FR | I/O port 7 Loopback of ET-PIO 6-1 | 1 |
| 9 | 2PI1-IO-8FR | I/O port 8 Loopback of ET-PIO 6-1 | 1 |
| 10 | 2PI1-IO-9FR | I/O port 9 Loopback of ET-PIO 6-1 | 1 |
| 11 | 2PI1-IO-10FR | I/O port 10 Loopback of ET-PIO 6-1 | 1 |
| 12 | 2PI1-IO-11FR | I/O port 11 Loopback of ET-PIO 6-1 | 1 |
| 13 | 2PI1-IO-12FR | I/O port 12 Loopback of ET-PIO 6-1 | 1 |
| 14 | 2PI1-IO-13FR | I/O port 13 Loopback of ET-PIO 6-1 | 1 |
| 15 | 2PI1-IO-14FR | I/O port 14 Loopback of ET-PIO 6-1 | 1 |
| 16 | 2PI1-IO-15FR | I/O port 15 Loopback of ET-PIO 6-1 | 1 |
| 17 | 2PI1-IO-16FR | I/O port 16 Loopback of ET-PIO 6-1 | 1 |
| 18 | 2PI1-IO-17FR | I/O port 17 Loopback of ET-PIO-1 | 1 |
| 19 | 2PI1-IO-18FR | I/O port 18 Loopback of ET-PIO 6-1 | 1 |
| 20 | 2PI1-IO-19FR | I/O port 19 Loopback of ET-PIO 6-1 | 1 |
| 21 | 2PI1-IO-20FR | I/O port 20 Loopback of ET-PIO 6-1 | 1 |
| 22 | 2PI1-IO-21FR | I/O port 21 Loopback of ET-PIO 6-1 | 1 |
| 23 | 2PI1-IO-22FR | I/O port 22 Loopback of ET-PIO 6-1 | 1 |
| 24 | 2PI1-IO-23FR | I/O port 23 Loopback of ET-PIO 6-1 | 1 |
| 25 | 2PI1-IO-24FR | I/O port 24 Loopback of ET-PIO 6-1 | 1 |
| 26 | 2PI1-IO-25FR | I/O port 25 Loopback of ET-PIO 6-1 | 1 |
| 27 | 2PI1-IO-26FR | I/O port 26 Loopback of ET-PIO 6-1 | 1 |

| | | | |
|---|---|---|---|
| 28 | 2PI1-IO-27FR | I/O port 27 Loopback of ET-PIO 6-1 | 1 |
| 29 | 2PI1-IO-28FR | I/O port 28 Loopback of ET-PIO 6-1 | 1 |
| 30 | 2PI1-IO-29FR | I/O port 29 Loopback of ET-PIO 6-1 | 1 |
| 31 | 2PI1-IO-30FR | I/O port 30 Loopback of ET-PIO 6-1 | 1 |
| 32 | 2PI1-IO-31FR | I/O port 31 Loopback of ET-PIO 6-1 | 1 |
| 33 | 2PI1-IO-32FR | I/O port 32 Loopback of ET-PIO 6-1 | 1 |

3. Electronic Terminal (ET) –MMIF2 Cards

3-1. LINEM2

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | LINEM2-FL | LINEM2 condition | 1 |

3-2. MMIF2(A)

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | MM1A-FR | General condition of System 1 MMIF2 7-1 (organized from next No.2 to No.6) | 1 |
| 2 | 1MM1ANSA | Control Information Receiving condition of System 1 MMIF2 7-1, | 1 |
| 3 | 1MM1SIO1A | ET CH1 condition of System 1 MMIF2 7-1 | 1 |
| 4 | 1MM1TNOA | ET Number Input Circuit condition of System 1 MMIF2 7-1 | 1 |
| 5 | 1MM1IO1A | I/O condition of System 1 MMIF2 7-1 | 1 |
| 6 | 1MM1SYSA | System 1 MMIF2 7-1 condition | 0 |

3-3. MMIF2(B)

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | MM2A-FR | System 1 MMIF2 7-2 condition | 1 |

3-4. MMIF2 I/O Output

(In this table, the Output is 5 sec 1/0 Cycle.)

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 1MM1-1OUT | I/O port 1 Output of MMIF2 7-1 | cyclic 1/0 |
| 2 | 1MM1-2OUT | I/O port 2 output ofMMIF2 7-1, | cyclic 1/0 |
| 3 | 1MM1-3OUT | I/O port 3 output of MMIF2 7-1 | cyclic 1/0 |
| 4 | 1MM1-4OUT | I/O port 4 output of MMIF2 7-1 | cyclic 1/0 |
| 5 | 1MM1-5OUT | I/O port 5 output of MMIF2 7-1 | cyclic 1/0 |
| 6 | 1MM1-6OUT | I/O port 6 output of MMIF2 7-1 | cyclic 1/0 |
| 7 | 1MM1-7OUT | I/O port 7 output of MMIF2 7-1 | cyclic 1/0 |
| 8 | 1MM1-8OUT | I/O port 8 output of MMIF2 7-1 | cyclic 1/0 |
| 9 | 1MM1-9OUT | I/O port 9 output of MMIF2 7-1 | cyclic 1/0 |
| 10 | 1MM1-10OUT | I/O port 10 output of MMIF2 7-1 | cyclic 1/0 |
| 11 | 1MM1-11OUT | I/O port 11 output of MMIF2 7-1 | cyclic 1/0 |
| 12 | 1MM1-12OUT | I/O port 12 output of MMIF2 7-1 | cyclic 1/0 |
| 13 | 1MM1-13OUT | I/O port 13 output of MMIF2 7-1 | cyclic 1/0 |
| 14 | 1MM1-14OUT | I/O port 14 output of MMIF2 7-1 | cyclic 1/0 |
| 15 | 1MM1-15OUT | I/O port 15 output of MMIF2 7-1 | cyclic 1/0 |
| 16 | 1MM1-16OUT | I/O port 16 output of MMIF2 7-1 | cyclic 1/0 |
| 17 | 1MM1-17OUT | I/O port 17 output of MMIF2 7-1 | cyclic 1/0 |
| 18 | 1MM1-18OUT | I/O port 18 output of MMIF2 7-1 | cyclic 1/0 |
| 19 | 1MM1-19OUT | I/O port 19 output of MMIF2 7-1 | cyclic 1/0 |
| 20 | 1MM1-20OUT | I/O port 20 output of MMIF2 7-1 | cyclic 1/0 |
| 21 | 1MM1-21OUT | I/O port 21 output of MMIF2 7-1 | cyclic 1/0 |
| 22 | 1MM1-22OUT | I/O port 22 output of MMIF2 7-1 | cyclic 1/0 |
| 23 | 1MM1-23OUT | I/O port 23 output of MMIF2 7-1 | cyclic 1/0 |
| 24 | 1MM1-24OUT | I/O port 24 output of MMIF2 7-1 | cyclic 1/0 |
| 25 | 1MM1-25OUT | I/O port 25 output of MMIF2 7-1 | cyclic 1/0 |
| 26 | 1MM1-26OUT | I/O port 26 output of MMIF2 7-1 | cyclic 1/0 |
| 27 | 1MM1-27OUT | I/O port 27 output of MMIF2 7-1 | cyclic 1/0 |
| 28 | 1MM1-28OUT | I/O port 28 output of MMIF2 7-1 | cyclic 1/0 |
| 29 | 1MM1-29OUT | I/O port 29 output of MMIF2 7-1 | cyclic 1/0 |
| 30 | 1MM1-30OUT | I/O port 30 output of MMIF22 7-1 | cyclic 1/0 |
| 31 | 1MM1-31OUT | I/O port 31 output of MMIF2 7-1 | cyclic 1/0 |
| 32 | 1MM1-32OUT | I/O port 32 output of MMIF2 7-1 | cyclic 1/0 |
| 33 | 1MM1-33OUT | I/O port 33 output of MMIF2 7-1 | cyclic 1/0 |

| | | | |
|---|---|---|---|
| 34 | 1MM1-34OUT | I/O port 34 output of MMIF2 7-1 | cyclic 1/0 |
| 35 | 1MM1-35OUT | I/O port 35 output of MMIF2 7-1 | cyclic 1/0 |
| 36 | 1MM1-36OUT | I/O port 36 output of MMIF2 7-1 | cyclic 1/0 |
| 37 | 1MM1-37OUT | I/O port 37 output of MMIF2 7-1 | cyclic 1/0 |
| 38 | 1MM1-38OUT | I/O port 38 output of MMIF2 7-1 | cyclic 1/0 |
| 39 | 1MM1-39OUT | I/O port 39 output of MMIF2 7-1 | cyclic 1/0 |
| 40 | 1MM1-40OUT | I/O port 40 output of MMIF2 7-1 | cyclic 1/0 |
| 41 | 1MM1-41OUT | I/O port 41 output of MMIF2 7-1 | cyclic 1/0 |
| 42 | 1MM1-42OUT | I/O port 42 output of MMIF2 7-1 | cyclic 1/0 |
| 43 | 1MM1-43OUT | I/O port 43 output of MMIF2 7-1 | cyclic 1/0 |
| 44 | 1MM1-44OUT | I/O port 44 output of MMIF2 7-1 | cyclic 1/0 |
| 45 | 1MM1-45OUT | I/O port 45 output of MMIF2 7-1 | cyclic 1/0 |
| 46 | 1MM1-46OUT | I/O port 46 output of MMIF2 7-1 | cyclic 1/0 |
| 47 | 1MM1-47OUT | I/O port 47 output of MMIF2 7-1 | cyclic 1/0 |
| 48 | 1MM1-48OUT | I/O port 48 output of MMIF2 7-1 | cyclic 1/0 |
| 49 | 1MM1-49OUT | I/O port 49 output of MMIF2 7-1 | cyclic 1/0 |
| 50 | 1MM1-50OUT | I/O port 50 output of MMIF2 7-1 | cyclic 1/0 |
| 51 | 1MM1-51OUT | I/O port 51 output of MMIF2 7-1 | cyclic 1/0 |
| 52 | 1MM1-52OUT | I/O port 52 output of MMIF2 7-1 | cyclic 1/0 |
| 53 | 1MM1-53OUT | I/O port 53 output of MMIF2 7-1 | cyclic 1/0 |
| 54 | 1MM1-54OUT | I/O port 54 output of MMIF2 7-1 | cyclic 1/0 |
| 55 | 1MM1-55OUT | I/O port 55 output of MMIF2 7-1 | cyclic 1/0 |
| 56 | 1MM1-56OUT | I/O port 56 output of MMIF2 7-1 | cyclic 1/0 |
| 57 | 1MM1-57OUT | I/O port 57 output of MMIF2 7-1 | cyclic 1/0 |
| 58 | 1MM1-58OUT | I/O port 58 output of MMIF2 7-1 | cyclic 1/0 |
| 59 | 1MM1-59OUT | I/O port 59 output of MMIF2 7-1 | cyclic 1/0 |
| 60 | 1MM1-60OUT | I/O port 60 output of MMIF2 7-1 | cyclic 1/0 |
| 61 | 1MM1-61OUT | I/O port 61 output of MMIF2 7-1 | cyclic 1/0 |
| 62 | 1MM1-62OUT | I/O port 62 output of MMIF2 7-1 | cyclic 1/0 |
| 63 | 1MM1-63OUT | I/O port 63 output of MMIF2 7-1, | cyclic 1/0 |
| 64 | 1MM1-64OUT | I/O port 64 output of MMIF2 7-1, | cyclic 1/0 |

3-5. MMIF2 I/O Input

(In this table, the Intput is 5 sec 1/0 Cycle.)

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 1MM1-1IN | I/O port 1 input of MMIF2 7-1 | cyclic 1/0 |
| 2 | 1MM1-2IN | I/O port 2 input of MMIF2 7-1, | cyclic 1/0 |
| 3 | 1MM1-3IN | I/O port 3 input of MMIF2 7-1 | cyclic 1/0 |
| 4 | 1MM1-4IN | I/O port 4 input of MMIF2 7-1 | cyclic 1/0 |
| 5 | 1MM1-5IN | I/O port 5 input of MMIF2 7-1 | cyclic 1/0 |
| 6 | 1MM1-6IN | I/O port 6 input of MMIF2 7-1 | cyclic 1/0 |
| 7 | 1MM1-7IN | I/O port 7 input of MMIF2 7-1 | cyclic 1/0 |
| 8 | 1MM1-8IN | I/O port 8 input of MMIF2 7-1 | cyclic 1/0 |
| 9 | 1MM1-9IN | I/O port 9 input of MMIF2 7-1 | cyclic 1/0 |
| 10 | 1MM1-10IN | I/O port 10 input of MMIF2 7-1 | cyclic 1/0 |
| 11 | 1MM1-11IN | I/O port 11 input of MMIF2 7-1 | cyclic 1/0 |
| 12 | 1MM1-12IN | I/O port 12 input of MMIF2 7-1 | cyclic 1/0 |
| 13 | 1MM1-13IN | I/O port 13 input of MMIF2 7-1 | cyclic 1/0 |
| 14 | 1MM1-14IN | I/O port 14 input of MMIF2 7-1 | cyclic 1/0 |
| 15 | 1MM1-15IN | I/O port 15 input of MMIF2 7-1 | cyclic 1/0 |
| 16 | 1MM1-16IN | I/O port 16 input of MMIF2 7-1 | cyclic 1/0 |
| 17 | 1MM1-17IN | I/O port 17 input of MMIF2 7-1 | cyclic 1/0 |
| 18 | 1MM1-18IN | I/O port 18 input of MMIF2 7-1 | cyclic 1/0 |
| 19 | 1MM1-19IN | I/O port 19 input of MMIF2 7-1 | cyclic 1/0 |
| 20 | 1MM1-20IN | I/O port 20 input of MMIF2 7-1 | cyclic 1/0 |
| 21 | 1MM1-21IN | I/O port 21 input of MMIF2 7-1 | cyclic 1/0 |
| 22 | 1MM1-22IN | I/O port 22 input of MMIF2 7-1 | cyclic 1/0 |
| 23 | 1MM1-23IN | I/O port 23 input of MMIF2 7-1 | cyclic 1/0 |
| 24 | 1MM1-24IN | I/O port 24 input of MMIF2 7-1 | cyclic 1/0 |
| 25 | 1MM1-25IN | I/O port 25 input of MMIF2 7-1 | cyclic 1/0 |
| 26 | 1MM1-26IN | I/O port 26 input of MMIF2 7-1 | cyclic 1/0 |
| 27 | 1MM1-27IN | I/O port 27 input of MMIF2 7-1 | cyclic 1/0 |
| 28 | 1MM1-28IN | I/O port 28 input of MMIF2 7-1 | cyclic 1/0 |
| 29 | 1MM1-29IN | I/O port 29 input of MMIF2 7-1 | cyclic 1/0 |
| 30 | 1MM1-30IN | I/O port 30 input of MMIF2 7-1 | cyclic 1/0 |
| 31 | 1MM1-31IN | I/O port 31 input of MMIF2 7-1 | cyclic 1/0 |
| 32 | 1MM1-32IN | I/O port 32 input of MMIF2 7-1 | cyclic 1/0 |

3-6. MMIF2 I/O Loopback Check

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | MM1A-IO-FR | General I/O condition of MMIF2 7-1, (organized from next Item No.2 to No.33, or from No.34 to No.65 , according to Connecting Cable of Annex 3.) | 1 |
| 2 | 1MM1-IO-1FR | I/O port 1 Loopback of MMIF2 7-1, | 1 |
| 3 | 1MM1-IO-2FR | I/O port 2 Loopback of MMIF2 7-1 | 1 |
| 4 | 1MM1-IO-3FR | I/O port 3 Loopback of MMIF2 7-1 | 1 |
| 5 | 1MM1-IO-4FR | I/O port 4 Loopback of MMIF2 7-1 | 1 |
| 6 | 1MM1-IO-5FR | I/O port 5 Loopback of MMIF2 7-1 | 1 |
| 7 | 1MM1-IO-6FR | I/O port 6 Loopback of MMIF2 7-1 | 1 |
| 8 | 1MM1-IO-7FR | I/O port 7 Loopback of MMIF2 7-1 | 1 |
| 9 | 1MM1-IO-8FR | I/O port 8 Loopback of MMIF2 7-1 | 1 |
| 10 | 1MM1-IO-9FR | I/O port 9 Loopback of MMIF2 7-1 | 1 |
| 11 | 1MM1-IO-10FR | I/O port 10 Loopback of MMIF2 7-1 | 1 |
| 12 | 1MM1-IO-11FR | I/O port 11 Loopback of MMIF2 7-1 | 1 |
| 13 | 1MM1-IO-12FR | I/O port 12 Loopback of MMIF2 7-1 | 1 |
| 14 | 1MM1-IO-13FR | I/O port 13 Loopback of MMIF2 7-1 | 1 |
| 15 | 1MM1-IO-14FR | I/O port 14 Loopback of MMIF2 7-1 | 1 |
| 16 | 1MM1-IO-15FR | I/O port 15 Loopback of MMIF2 7-1 | 1 |
| 17 | 1MM1-IO-16FR | I/O port 16 Loopback of MMIF2 7-1 | 1 |
| 18 | 1MM1-IO-17FR | I/O port 17 Loopback of MMIF2 7-1 | 1 |
| 19 | 1MM1-IO-18FR | I/O port 18 Loopback of MMIF2 7-1 | 1 |
| 20 | 1MM1-IO-19FR | I/O port 19 Loopback of MMIF2 7-1 | 1 |
| 21 | 1MM1-IO-20FR | I/O port 20 Loopback of MMIF2 7-1 | 1 |
| 22 | 1MM1-IO-21FR | I/O port 21 Loopback of MMIF2 7-1 | 1 |
| 23 | 1MM1-IO-22FR | I/O port 22 Loopback of MMIF2 7-1 | 1 |
| 24 | 1MM1-IO-23FR | I/O port 23 Loopback of MMIF2 7-1 | 1 |
| 25 | 1MM1-IO-24FR | I/O port 24 Loopback of MMIF2 7-1 | 1 |
| 26 | 1MM1-IO-25FR | I/O port 25 Loopback of MMIF2 7-1 | 1 |
| 27 | 1MM1-IO-26FR | I/O port 26 Loopback of MMIF2 7-1 | 1 |
| 28 | 1MM1-IO-27FR | I/O port 27 Loopback of MMIF2 7-1 | 1 |
| 29 | 1MM1-IO-28FR | I/O port 28 Loopback of MMIF2 7-1 | 1 |
| 30 | 1MM1-IO-29FR | I/O port 29 Loopback of MMIF2 7-1 | 1 |
| 31 | 1MM1-IO-30FR | I/O port 30 Loopback of MMIF2 7-1 | 1 |
| 32 | 1MM1-IO-31FR | I/O port 31 Loopback of MMIF2 7-1 | 1 |
| 33 | 1MM1-IO-32FR | I/O port 32 Loopback of MMIF2 7-1 | 1 |
| 34 | 1MM1-IO-33FR | I/O port 33 Loopback of MMIF2 7-1 | 1 |
| 35 | 1MM1-IO-34FR | I/O port 34 Loopback of MMIF2 7-1 | 1 |
| 36 | 1MM1-IO-35FR | I/O port 35 Loopback of MMIF2 7-1 | 1 |
| 37 | 1MM1-IO-36FR | I/O port 36 Loopback of MMIF2 7-1 | 1 |
| 38 | 1MM1-IO-37FR | I/O port 37 Loopback of MMIF2 7-1 | 1 |
| 39 | 1MM1-IO-38FR | I/O port 38 Loopback of MMIF2 7-1 | 1 |
| 40 | 1MM1-IO-39FR | I/O port 39 Loopback of MMIF2 7-1 | 1 |
| 41 | 1MM1-IO-40FR | I/O port 40 Loopback of MMIF2 7-1 | 1 |
| 42 | 1MM1-IO-41FR | I/O port 41 Loopback of MMIF2 7-1 | 1 |
| 43 | 1MM1-IO-42FR | I/O port 42 Loopback of MMIF2 7-1 | 1 |
| 44 | 1MM1-IO-43FR | I/O port 43 Loopback of MMIF2 7-1 | 1 |
| 45 | 1MM1-IO-44FR | I/O port 44 Loopback of MMIF2 7-1 | 1 |
| 46 | 1MM1-IO-45FR | I/O port 45 Loopback of MMIF2 7-1 | 1 |
| 47 | 1MM1-IO-46FR | I/O port 46 Loopback of MMIF2 7-1 | 1 |
| 48 | 1MM1-IO-47FR | I/O port 47 Loopback of MMIF2 7-1 | 1 |
| 49 | 1MM1-IO-48FR | I/O port 48 Loopback of MMIF2 7-1 | 1 |
| 50 | 1MM1-IO-49FR | I/O port 49 Loopback of MMIF2 7-1 | 1 |
| 51 | 1MM1-IO-50FR | I/O port 50 Loopback of MMIF2 7-1 | 1 |
| 52 | 1MM1-IO-51FR | I/O port 51 Loopback of MMIF2 7-1 | 1 |
| 53 | 1MM1-IO-52FR | I/O port 52 Loopback of MMIF2 7-1 | 1 |
| 54 | 1MM1-IO-53FR | I/O port 53 Loopback of MMIF2 7-1 | 1 |
| 55 | 1MM1-IO-54FR | I/O port 54 Loopback of MMIF2 7-1 | 1 |
| 56 | 1MM1-IO-55FR | I/O port 55 Loopback of MMIF2 7-1 | 1 |
| 57 | 1MM1-IO-56FR | I/O port 56 Loopback of MMIF2 7-1 | 1 |
| 58 | 1MM1-IO-57FR | I/O port 57 Loopback of MMIF2 7-1 | 1 |
| 59 | 1MM1-IO-58FR | I/O port 58 Loopback of MMIF2 7-1 | 1 |
| 60 | 1MM1-IO-59FR | I/O port 59 Loopback of MMIF2 7-1 | 1 |
| 61 | 1MM1-IO-60FR | I/O port 60 Loopback of MMIF2 7-1 | 1 |
| 62 | 1MM1-IO-61FR | I/O port 61 Loopback of MMIF2 7-1 | 1 |

| | | | |
|---|---|---|---|
| 63 | 1MM1-IO-62FR | I/O port 62 Loopback of MMIF2 7-1 | 1 |
| 64 | 1MM1-IO-63FR | I/O port 63 Loopback of MMIF2 7-1 | 1 |
| 65 | 1MM1-IO-64FR | I/O port 64 Loopback of MMIF2 7-1 | 1 |

4. MTC connection

4-1. INIO2-MTC

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | MTC-OK | MTC condition | 1 |

5. OPC connection

5-1. INIO2-ET (an example：MMIF2 ID8～15)

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 1MM8A-FR | System 1　MMIF2 7-8 condition | 1 |
| 2 | 1MM9A-FR | System 1　MMIF2 7-9 condition | 1 |
| 3 | 1MM10A-FR | System 1　MMIF2 7-10 condition | 1 |
| 4 | 1MM11A-FR | System 1　MMIF2 7-11 condition | 1 |
| 5 | 1MM12A-FR | System 1　MMIF2 7-12 condition | 1 |
| 6 | 1MM13A-FR | System 1　MMIF2 7-13 condition | 1 |
| 7 | 1MM14A-FR | System 1　MMIF2 7-14 condition | 1 |
| 8 | 1MM15A-FR | System 1　MMIF2 7-15 condition | 1 |

6. DL connection

| Item No. | Function | Description | Normal condition |
|---|---|---|---|
| 1 | Communication with DL | Check the communicating Data Contents with DL | Same Data |

7. I/O between Logic Cards and Electronic Terminals

7-1. CH1: MMIF2 connection

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 1MM1A-FR | System 1 MMIF2 7-1　condition of ET CH 1 | 1 |

7-2 CH2: OPC connection

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 2MM8A-FR | System 1 MMIF2 7-8 condition of ET CH 2 | 1 |
| 2 | 2MM9A-FR | System 1 MMIF2 7-9 condition of ET CH 2 | 1 |
| 3 | 2MM10A-FR | System 1 MMIF2 7-10 condition of ET CH 2 | 1 |
| 4 | 2MM11A-FR | System 1 MMIF2 7-11 condition of ET CH 2 | 1 |
| 5 | 2MM12A-FR | System 1 MMIF2 7-12 condition of ET CH 2 | 1 |
| 6 | 2MM13A-FR | System 1 MMIF2 7-13 condition of ET CH 2 | 1 |
| 7 | 2MM14A-FR | System 1 MMIF2 7-14 condition of ET CH 2 | 1 |
| 8 | 2MM15A-FR | System 1 MMIF2 7-15 condition of ET CH 2 | 1 |

7-3. CH3: ET-PIO2 connection

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 1PI1A-FR | System 1　“PIO2” 6-1 condition of ET CH 3 | 1 |

7-4. CH4: ET-PIO2 connection

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 2PI1A-FR | System 1 “PIO2” 6-1 condition of ET CH 4 | 1 |

7-5. CH5: OPC connection

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | 3MM8A-FR | System 1 MMIF2 7-8 condition of CH 5 | 1 |
| 2 | 3MM9A-FR | System 1 MMIF2 7-9 condition of CH 5 | 1 |
| 3 | 3MM10A-FR | System 1 MMIF2 7-10 condition of CH 5 | 1 |
| 4 | 3MM11A-FR | System 1 MMIF2 7-11 condition of CH 5 | 1 |
| 5 | 3MM12A-FR | System 1 MMIF2 7-12 condition of CH 5 | 1 |
| 6 | 3MM13A-FR | System 1 MMIF2 7-13 condition of CH 5 | 1 |
| 7 | 3MM14A-FR | System 1 MMIF2 7-14 condition of CH 5 | 1 |
| 8 | 3MM15A-FR | System 1 MMIF2 7-15 condition of CH 5 | 1 |

8. Electronic Terminal (PIO) Sub-rack

8-1. PIO2 System 1 slot

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | CH3PIO1A-FR | System 1 PIO2 6-1 condition of ET CH 3 | 1 |
| 2 | CH3PIO2A-FR | System 1 PIO2 6-2 condition of ET CH 3 | 1 |
| 3 | CH3PIO3A-FR | System 1 PIO2 6-3 condition of ET CH 3 | 1 |
| 4 | CH3PIO4A-FR | System 1 PIO2 6-4 condition of ET CH 3 | 1 |
| 5 | CH3PIO5A-FR | System 1 PIO2 6-5 condition of ET CH 3 | 1 |

8-2. PIO2 System 2 slot

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | CH3PIO1B-FR | System 2 PIO2 6-1 condition of ET CH 3 | 1 |
| 2 | CH3PIO2B-FR | System 2 PIO2 6-2 condition of ET CH 3 | 1 |
| 3 | CH3PIO3B-FR | System 2 PIO2 6-3 condition of ET CH 3 | 1 |
| 4 | CH3PIO4B-FR | System 2 PIO2 6-4 condition of ET CH 3 | 1 |
| 5 | CH3PIO5B-FR | System 2 PIO2 6-5 condition of ET CH 3 | 1 |

8-3. PIO2 I/O Conector

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | CH3PIO1-IO-FR | PIO2 6-1 All I/O condition of ET CH3 | 1 |
| 2 | CH3PIO2-IO-FR | PIO2 6-2 All I/O condition of ET CH3 | 1 |
| 3 | CH3PIO3-IO-FR | PIO2 6-3 All I/O condition of ET CH3 | 1 |
| 4 | CH3PIO4-IO-FR | PIO2 6-4 All I/O condition of ET CH3 | 1 |
| 5 | CH3PIO5-IO-FR | PIO2 6-5 All I/O condition of ET CH3 | 1 |

9. Electronic Terminal (MMIF) Sub-rack

9-1. MMIF2 System 1 slot

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | CH2MM1A-FR | System 1 MMIF2 7-1 condition of ET CH 2 | 1 |
| 2 | CH2MM2A-FR | System 1 MMIF2 7-2 condition of ET CH 2 | 1 |
| 3 | CH2MM3A-FR | System 1 MMIF2 7-3 condition of ET CH 2 | 1 |
| 4 | CH2MM4A-FR | System 1 MMIF2 7-4 condition of ET CH 2 | 1 |
| 5 | CH2MM5A-FR | System 1 MMIF2 7-5 condition of ET CH 2 | 1 |
| 6 | CH2MM6A-FR | System 1 MMIF2 7-6 condition of ET CH 2 | 1 |

9-2. MMIF2 System 2 slot

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | CH2MM1B-FR | System 2 MMIF2 7-1 condition of ET CH 2 | 1 |
| 2 | CH2MM2B-FR | System 2 MMIF2 7-2 condition of ET CH 2 | 1 |
| 3 | CH2MM3B-FR | System 2 MMIF2 7-3 condition of ET CH 2 | 1 |
| 4 | CH2MM4B-FR | System 2 MMIF2 7-4 condition of ET CH 2 | 1 |
| 5 | CH2MM5B-FR | System 2 MMIF2 7-5 condition of ET CH 2 | 1 |
| 6 | CH2MM6B-FR | System 2 MMIF2 7-6 condition of ET CH 2 | 1 |

9-3. MMIF2 I/O Conector

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | CH2MM1-IO-FR | MMIF2 7-1 All I/O condition of ET CH2 | 1 |
| 2 | CH2MM2-IO-FR | MMIF2 7-2 All I/O condition of ET CH2 | 1 |
| 3 | CH2MM3-IO-FR | MMIF2 7-3 All I/O condition of ET CH2 | 1 |
| 4 | CH2MM4-IO-FR | MMIF2 7-4 All I/O condition of ET CH2 | 1 |
| 5 | CH2MM5-IO-FR | MMIF2 7-5 All I/O condition of ET CH2 | 1 |
| 6 | CH2MM6-IO-FR | MMIF2 7-6 All I/O condition of ET CH2 | 1 |

10. Journal Module

| Item No. | Relay Name | Description | Normal condition |
|---|---|---|---|
| 1 | ZPEN3-FL | ZPEN3 card failure | 1 |
| 2 | ZNIO2-S1_M-FL | ZNIO2-S1 card main processor failure | 1 |
| 3 | ZNIO2-S1-Rx-FL | ZNIO2-S1 Rx failure | 1 |
| 4 | ZNIO2-S2_M-FL | ZNIO2-S2 card main processor failure | 1 |
| 5 | ZNIO2-S2-Rx-FL | ZNIO2-S2 Rx failure | 1 |
| 6 | ZSIO2_M-FL | ZSIO2 card main processor failure | 1 |
| 7 | ZSIO2-Rx-FL | ZSIO2 Rx failure | 1 |
| 8 | J-DD_CON-FL | Journal Module DC/DC converter failure. | 1 |

Annex 5

**Card Failure Indication Display Screen for MTC of K5BMC EI Card Tester**

## 1 Mounted EI Card Tester Rack Screen

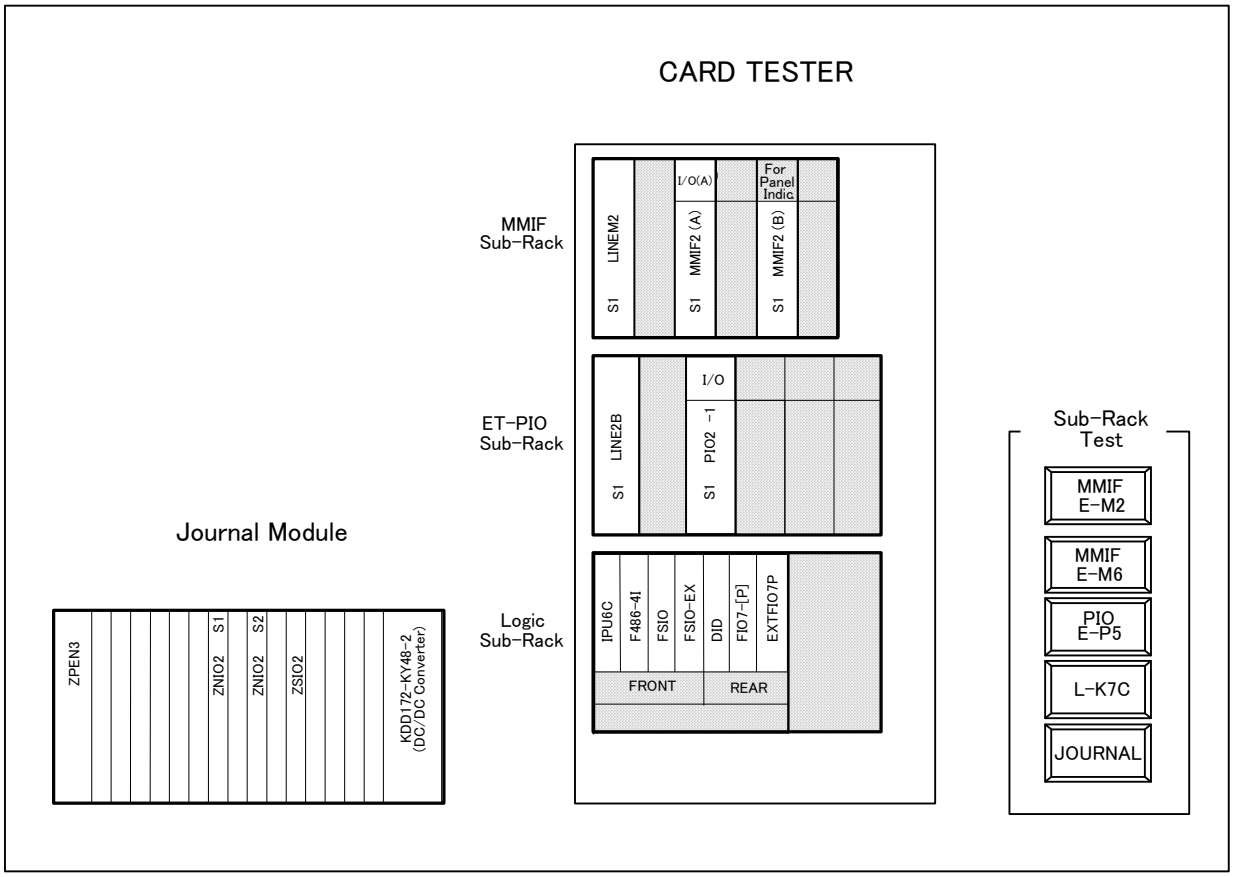



Figure 1.

General System Status is displayed in screen of Mounted Logic Rack, by pressing part of the Card on the General System Display detail status of each card can be checked on the Screen.

This mark. means a push button. Usually this color is white. When it is pushed, the color is changed to yellow.

Dot portion is indicated in gray and means non operatable part or not to be displayed the status.

1) When mounted Card on Display of CARDS STATUS above is clicked, the state will be displayed by the screen of each Card level. However MMIF2 card(B) can be displayed only status indication.
2) When each sub-Rack test of relevance is carried out, by clicking the push button of Sub-Rack Test, the screen above is shifted to the relevant Sub-Rack screen.

## 2 Card level Display of Mounted Logic Rack Sub-Rack

### 1) F486-4I and DID Screen

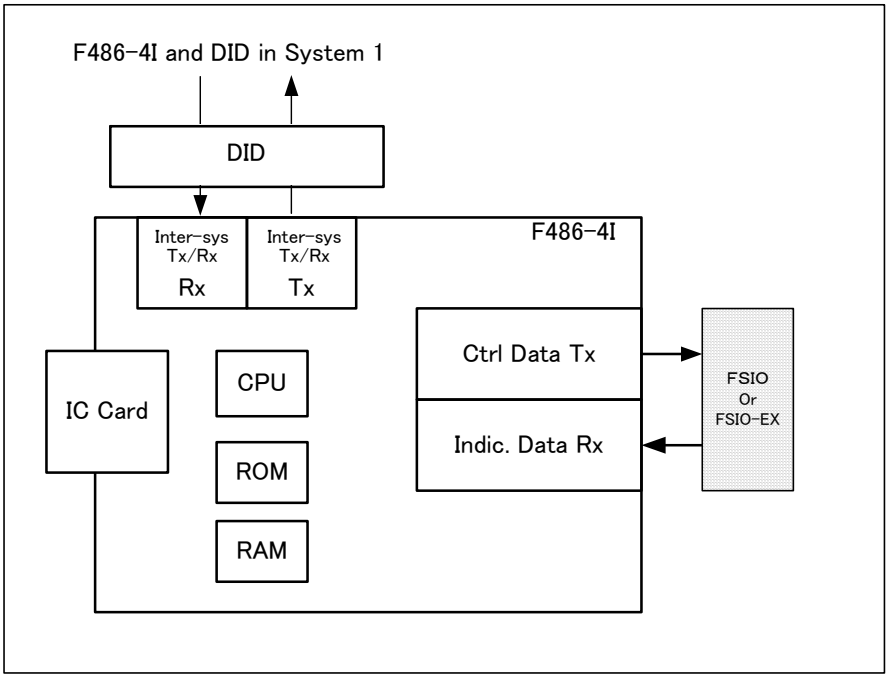



Figure 2.1

### 2) FSIO and FIO7-[P] Screen

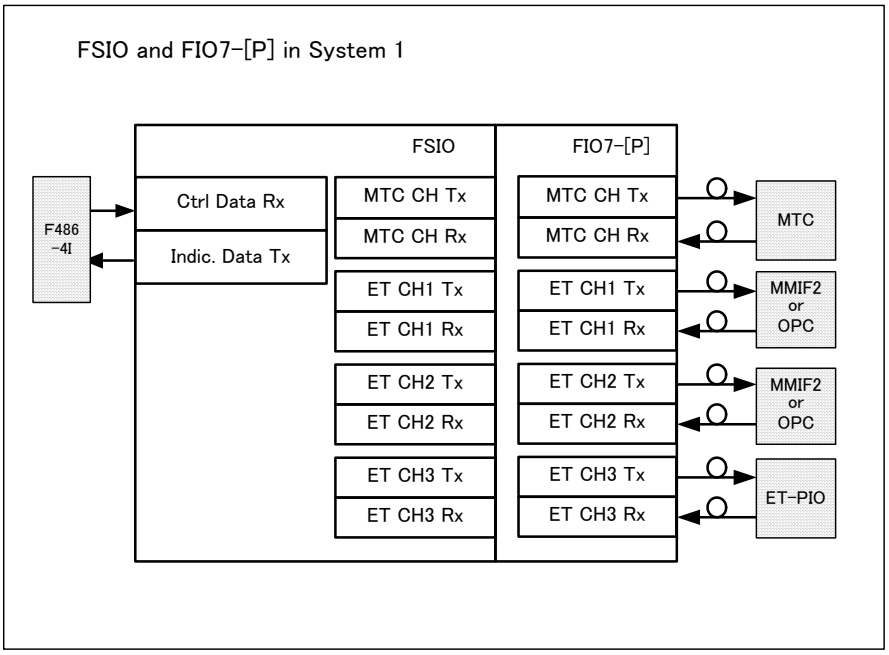



Figure 2.2

**3) FSIO-EX and EXTFIO7P Screen**

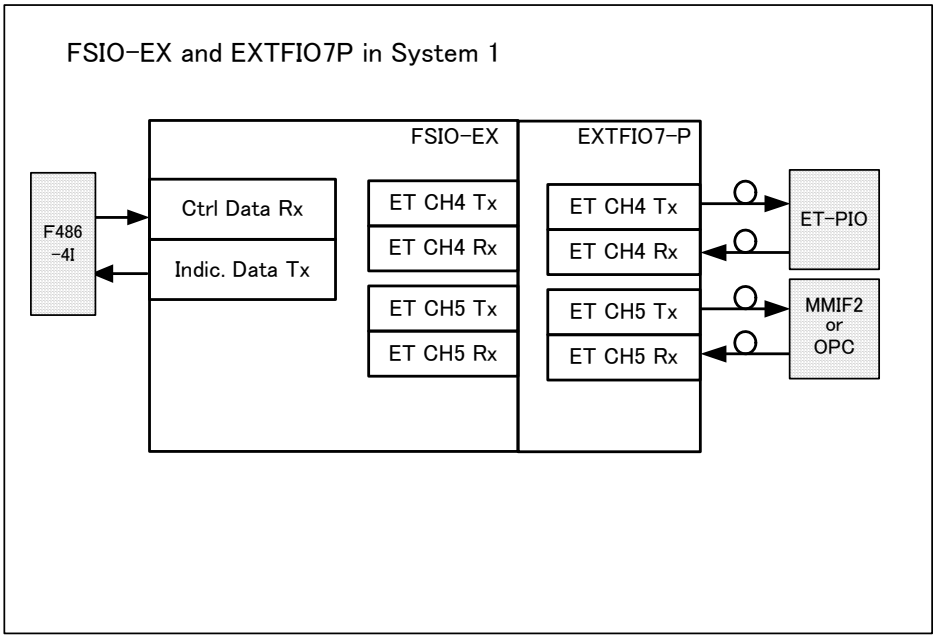



Figure 2.3

**4) IPU6C Screen**

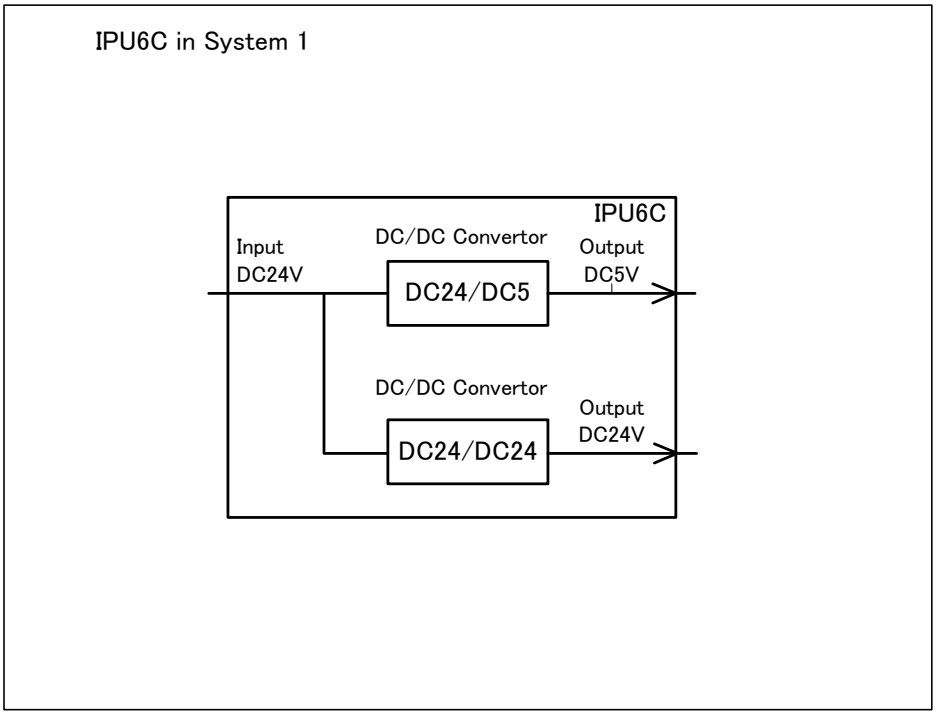



Figure 2.4

## 3 Card level Display of Mounted ET-PIO Sub-Rack

### 1) LINE2B Screen

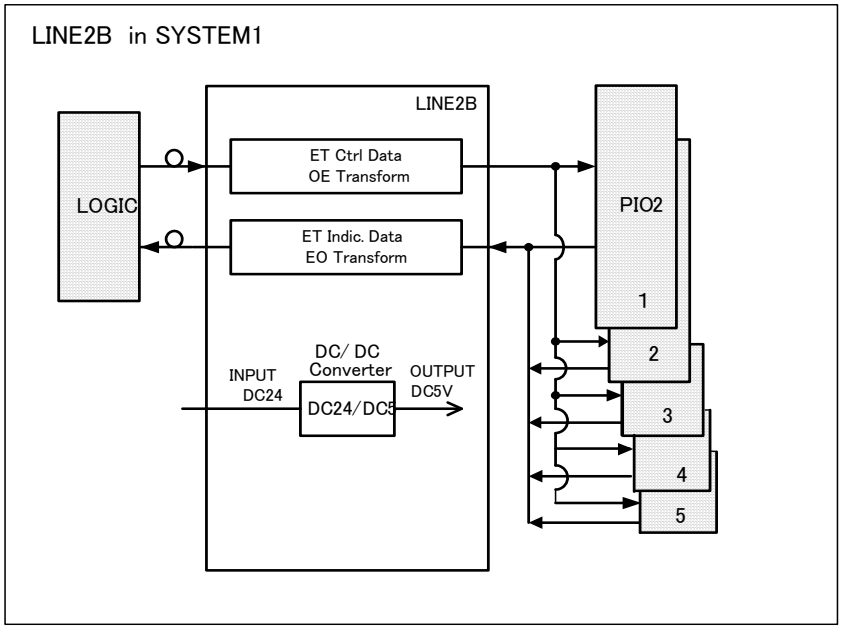



Figure 3.1

### 2) ET-PIO2 Screen

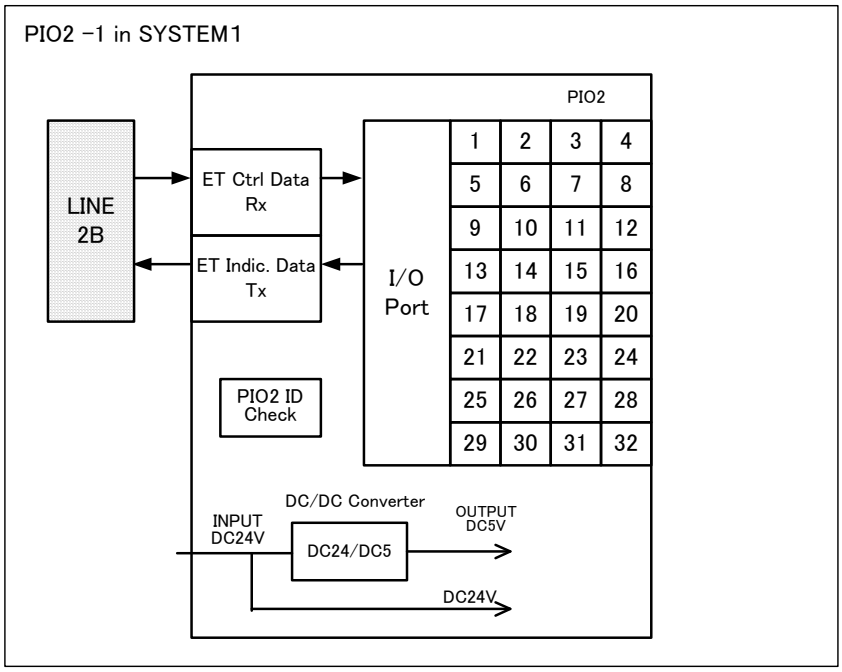



Figure 3.2

The result of I/O loop back test(Return back the output to input) is displayed at each I/O Port No. such as 1, 2, 3, etc. However the part of “I/O” shows the condition which is summarized the status from Port 1 to 32.

## 4 Card level Display of Mounted MMIF Sub-Rack

### 1) LINEM2 Screen

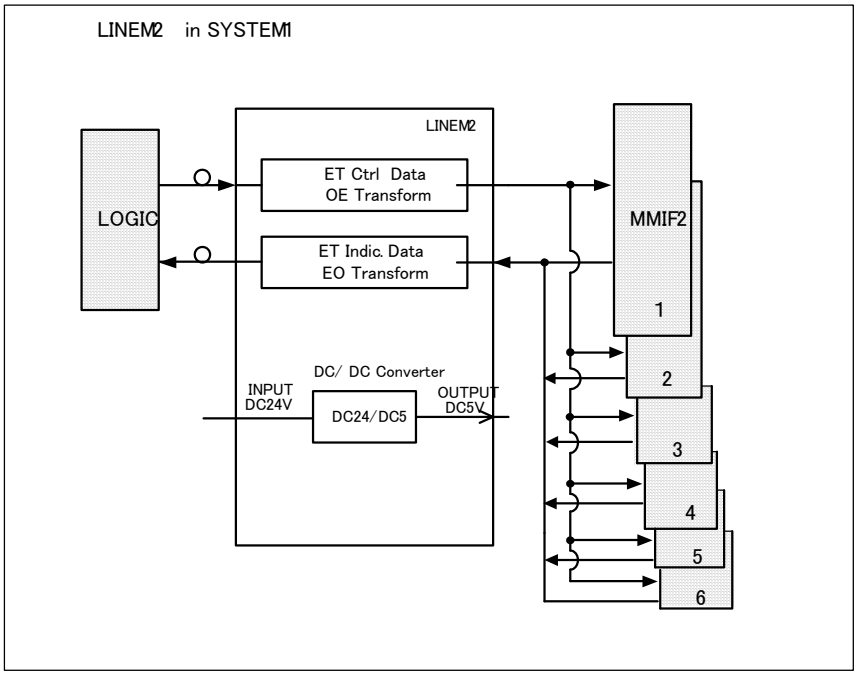



Figure 4.1

### 2) MMIF2 Screen

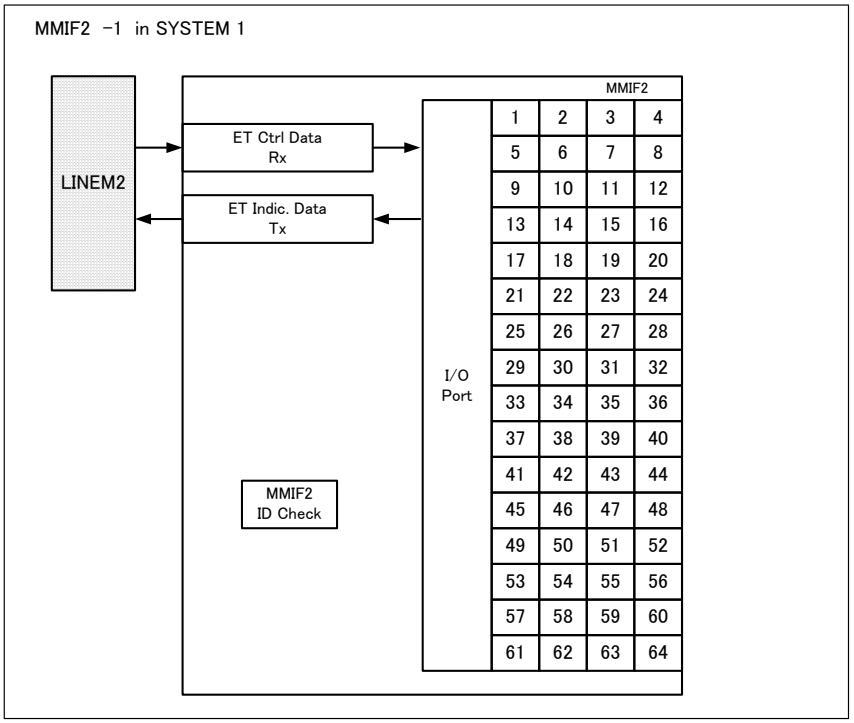



Figure 4.2

The result of I/O loop back test(Return back the output to input) is displayed at each I/O Port No. such as 1, 2, 3, etc. In addition, this test is carried out in divided two times, such as port No. 1 to 32 and 33 to 64.

However the part of “I/O” shows the condition which is summarized the status from Port 1 to 32 or from 33 to 64.

## 5. Display of Sub-Rack Level

A Sub-Rack test can be performed by connecting the objective Sub-Rack and choosing the Sub-Rack Test button on the right side of a screen. (The color of applicable button changes from white to yellow.) If the Sub-Rack state is normal, the portions of Card name of Sub-Rack are indicated by green, and also portion of Sub-Rack name is indicated with green. If unusual state is occurred on a Card, the applicable Card color is changed to red and also color of Sub-Rack name will be changed to red.

By clicking the Card name of the following figure screen, the screen of the Card level with the status is appeared.

### 1) Logic Sub-Rack (L-K7C) Screen

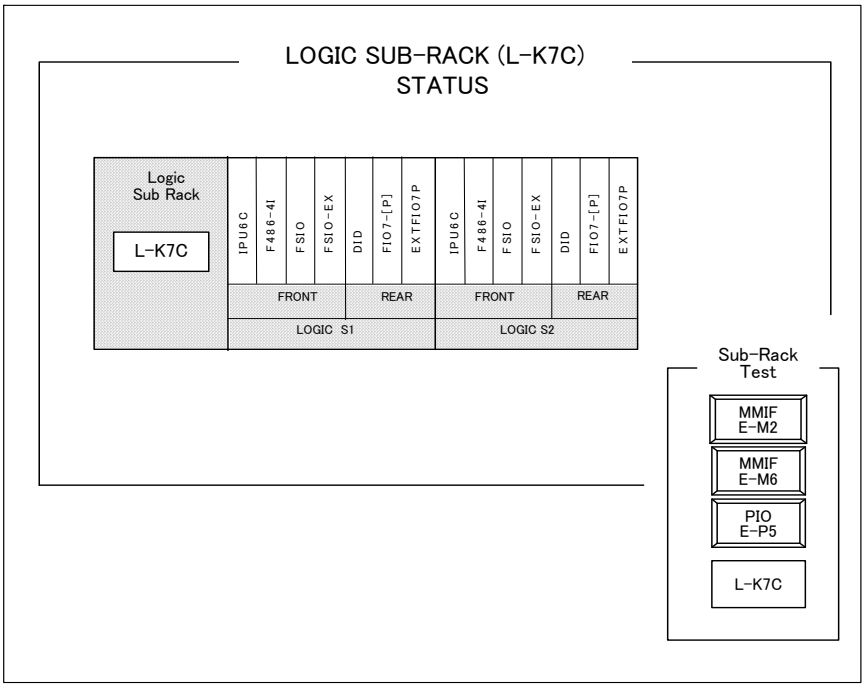



Figure 5.1

### 2) ET-PIO Sub-Rack (E-P5) Screen

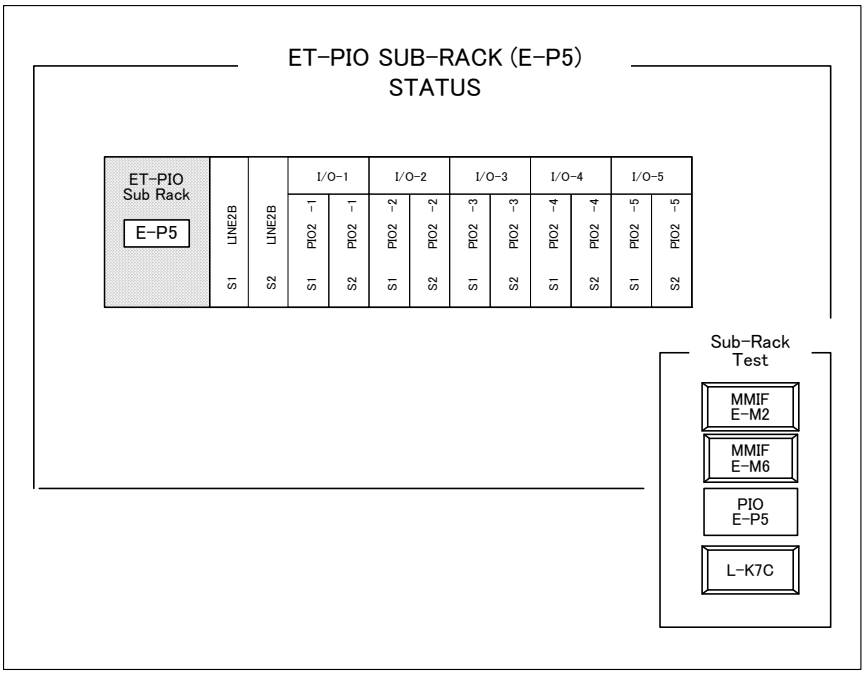



Figure 5.2

The portion of above I/O-1, I/O-2, etc. can be indicated only status, and click function is not carried out.。

### 3) MMIF Sub-Rack(E-M2) Screen

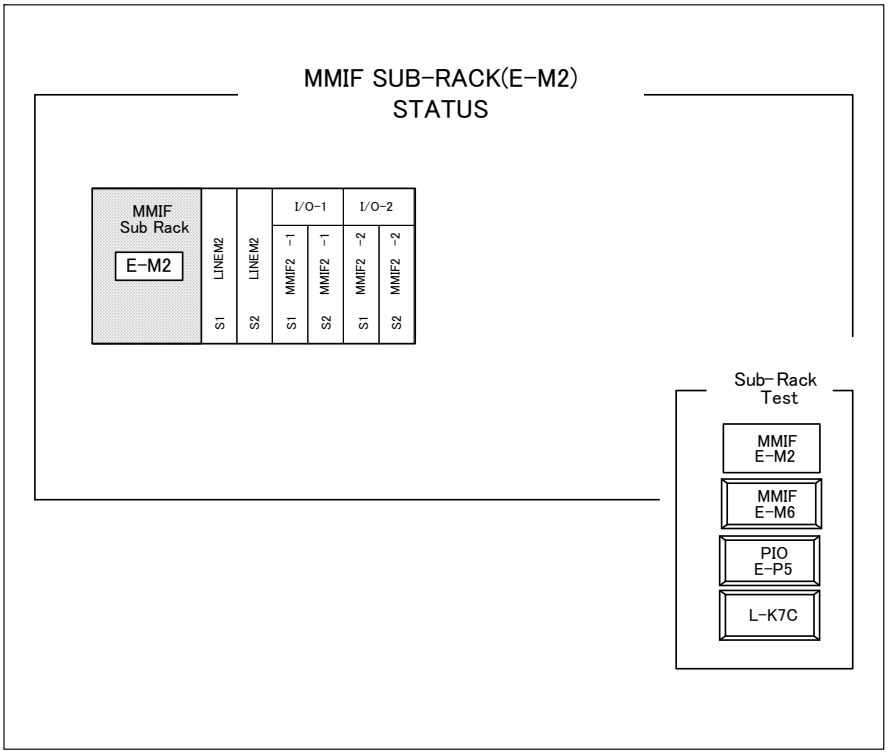



Figure 5.3

### 4) MMIF Sub-Rack(E-M6) Screen

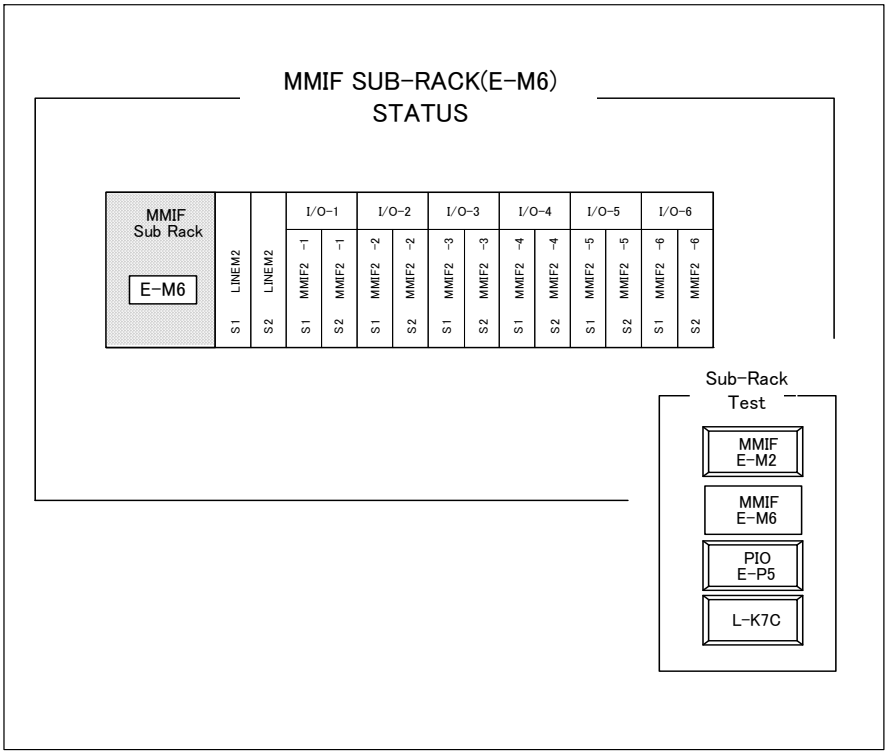



Figure 5.4

The portion of above I/O-1, I/O-2, etc. can be indicated only status, and click function is not carried out.

# Factory Test Procedure
# for K5BMC Electronic Interlocking System

**Document Z914-C72000138B**

**Version 2**

**12. Feb. 2011**



**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 | 27. Feb. 2008 | First Issue | T. Suzuki |
| 2 | 12. Feb. 2011 | Addition of inspection of Data Logger I/F<br>Terminology revision | Y. Kanno |
| | | | |
| | | | |
| | | | |

CONTENTS

1. Abbreviations

| | |
|---|---|
| OPC | Operator Console |
| C.P | Control Panel |
| EPROM | Erasable and Programmable Read Only Memory |
| ET-PIO | Electronic Terminal-Parallel Input/Output |
| I/O | Input/Output |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| LDP | Large Display Panel |
| MTC | Maintenance Console |
| NFB | No Fuse Breaker |
| OR | Operation Room |
| PC | Personal Computer |
| RH | Relay House |
| ROM | Read Only Memory |
| EI | Electronic Interlocking System |
| CT | Connecting Terminal |

2. Scope

This document applies to factory type tests (in-house/witness tests) for Electronic Interlocking (EI) System.

3. Items under Test and Quantities

Table 3.1 Quantities

| Location | Component | Unit | Amount | Remarks |
|---|---|---|---|---|
| OR | Operator Console | Set | 1 | Computer, LCD, mouse, I/F unit |
| | Control panel | Set | 1 | |
| Equipment room | Logic rack | Rack | 1 | |
| | Relay rack | Rack | 1 | |
| | CT Rack | Rack | 1 | |
| | Maintenance console | Set | 1 | Computer, LCD, mouse, I/F unit |

4. Test Set-up Configuration

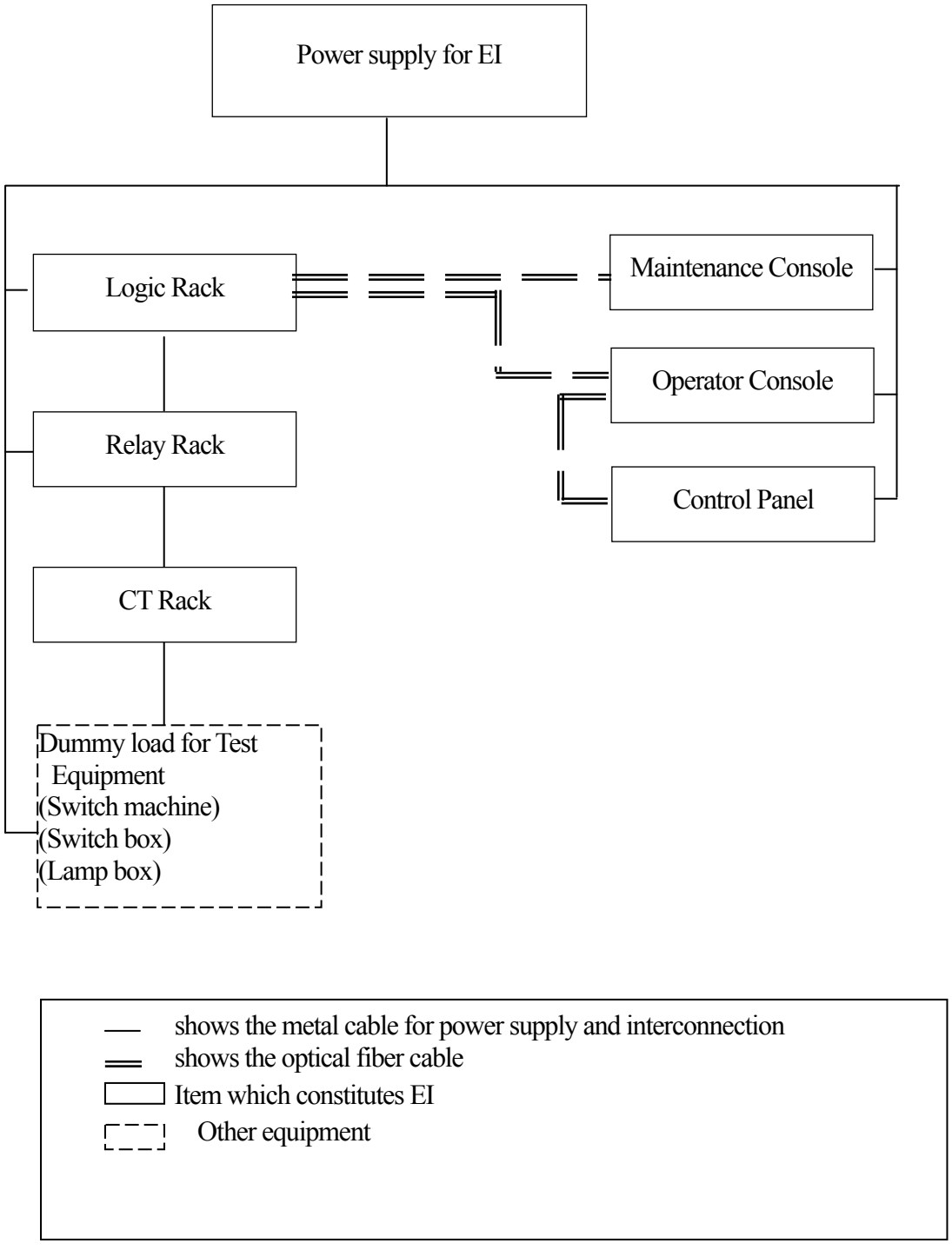



Fig. 4.1 System Configuration

5. Test Procedure and Criteria for Hardware Items except Functional Test

5.1. Quantity Inspection

| No. | Item | Test procedure | Criteria |
|---|---|---|---|
| 1 | Quantity confirmation | Quantity of Items shall be confirmed as Table 3.1. | In accordance with the Table 3.1. |

5.2. Visual Inspection

5.2.1. Visual / Structure Inspection.

| No. | Item | Inspection procedure | Criteria |
|---|---|---|---|
| 1 | Painting | Inspection of color, brilliance, etc, with color samples. | In accordance with the specification and instructions in the drawings. |
| 2 | Components attachment status | Fitting status of Electronic Terminals, relays, connectors, etc. is confirmed by visual inspection or touching index pins. | All the items must have been fairly fitted. Index pins must have been set in accordance with the instructions in the figures. Check marks must have been given. |
| 3 | Wiring status | Check for colors and thickness of wires. | In accordance with the specification and wiring diagram" |
| | | Visual check for wiring route and connecting status | Wiring route must be reasonably arranged and wire binding must not touch terminals or any metallic material. |
| | | Visual check for fitting status of crimp contacts and plug-in fingers. | Crimp contact and plug-in finger must be fairly fitted. |
| 4 | Company and equipment nameplates | Visual check for fitting position and inscriptions. | In accordance with the instructions in the drawings. |

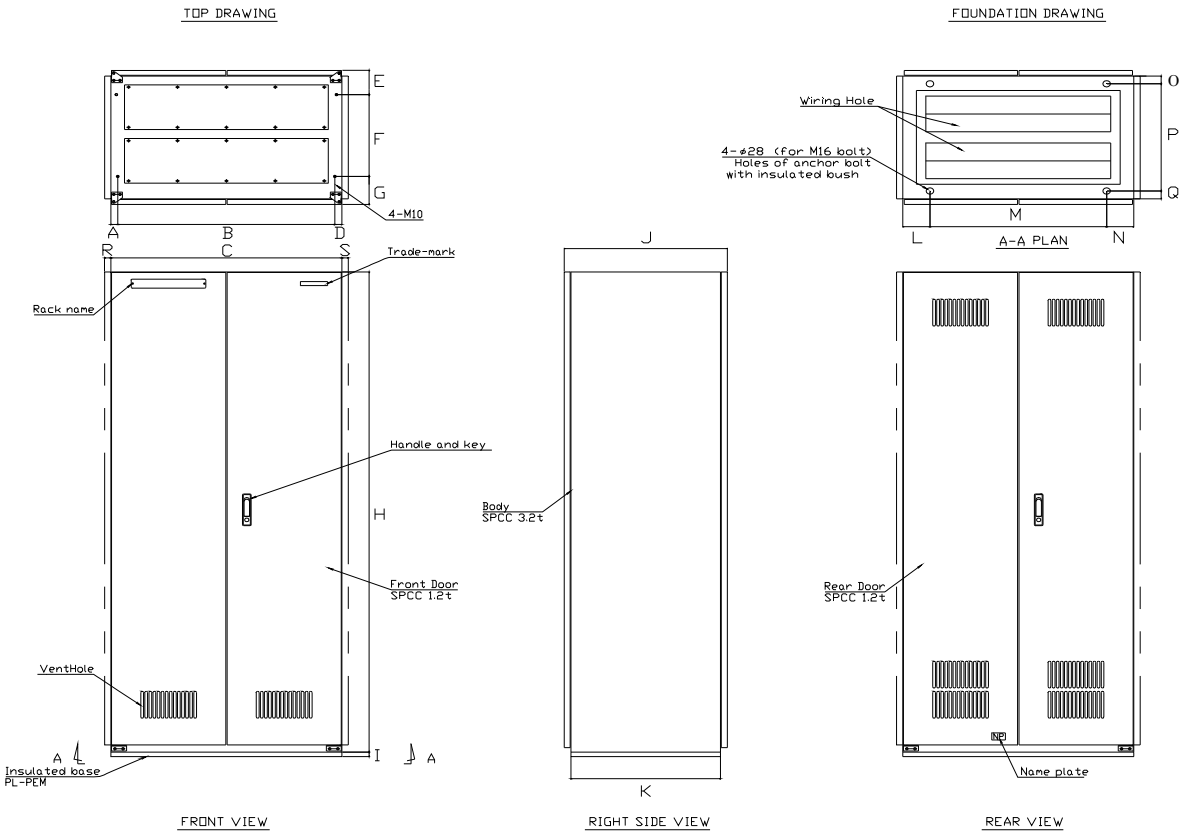
5.2.2. Dimension Inspection

| No. | Item | Test procedrue | Criteria |
|---|---|---|---|
| 1 | Shape and dimensions | Check whether there are scratches and/or warps on surface or not. | No scratches and/or warps. |
| | | Measurement of external dimensions and holes for fittings. | All dimensions must be within range specified in the approved drawings. |

All dimensions of each equipment must be within range specified in the drawing of external view.

Electronic Interlocking Logic Rack

All the racks have the same dimensions.




| PRODUCT NO. | External dimensions (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| Measured value | | | | | | | |
| Permitted range | 30 ±1.0 | 790 ±2.0 | 850 ±2.0 | 30 ±1.0 | 125 ±1.0 | 350 ±2.0 | 125 ±1.0 |
| | H | I | J | K | L | M | N |
| Measured value | | | | | | | |
| Permitted range | 2150 ±4.0 | 20 ±1.0 | 600 ±2.0 | 550 ±2.0 | 100 ±1.0 | 650 ±2.0 | 100 ±1.0 |
| | O | P | Q | R | S | | |
| Measured value | | | | | | | |
| Permitted range | 35 ±1.0 | 480 ±2.0 | 35 ±1.0 | 20 ±1.0 | 20 ±1.0 | | |

5.2.3. Configuration Checking

| No. | Item | Test procedure | Criteria |
|---|---|---|---|
| 1 | System configuration | System configuration is confirmed as Fig. 4.1. | In accordance with the Fig. 4.1. |

5.2.4. Card Level Checking

| No. | Item | Test procedure | Criteria |
|---|---|---|---|
| 1 | Lamination thickness | Visual Inspection of lamination thickness of PCBs. | In accordance with the specification and drawings. |
| 2. | Track layout | Visual inspection of track layout on PCBs. | In accordance with the specification and drawings. |
| 3. | Soldering quality | Visual checking of soldering done on PCBs. | In accordance with the specification. |
| 4. | Component mounting | Checking of component mounting on PCBs. | In accordance with the specification and drawings. |
| 5. | Conformal coating | Visual checking of conformal coating. | In accordance with the specification. |
| 6. | Legend printing | Visual checking of legend printing. | In accordance with the specification. |
| 7. | Green masking | Visual checking of green masking on PCBs. | In accordance with the specification. |

5.2.5. Module Level Checking

| No. | Item | Test procedure | Criteria |
|---|---|---|---|
| 1 | Mechanical polarisation | Visual inspection of mechanical polarisation. | In accordance with the specification. |
| 2. | Shielding arrangement | Visual inspection of shielding arrangement. | In accordance with the specification. |
| 3. | Indications and displays. | Visual inspection of indications and displays on the module. | In accordance with the specification. |
| 4. | Mounting and clamping of connectors | Visual inspection of mounting and clamping of connectors on modules. | In accordance with the specification. |
| 5. | Housing of cards. | Visual inspection for the proper housing of cards. | In accordance with the specification. |

5.3. Insulation resistance inspection

| No. | Item | Test procedure | Criteria |
|---|---|---|---|
| 1 | Insulation resistance | Measure resistance between power input terminal and equipment case (earth) with DC 500V insulation resistance meter. | More than 10MΩ. |

5.4. Dielectric strength inspection

| No. | Item | Test procedure | Criteria |
|---|---|---|---|
| 1 | Dielectric strength | Apply 1500V of commercial frequency between power input terminal and equipment case for 1 minuite. | No abnormalities observed. |

5.5. Card Inspection Method and Acceptance Criteria

This test is in accordance to clause 2.3 to 2.6 of Acceptance Test Format for Electronic Interlocking K5BMC.

# 6. Procedure and Criteria for Functional Tests

## 6.1 Electronic interlocking equipment

### 6.1.1 Preparation work

#### 6.1.1.1 Voltage measurement of components

| No. | | Procedure | Criteria |
|---|---|---|---|
| 1 | Preparation | (1) Install software | In accordance with the drawings. |
| | | (2) Connect specific simulator equivalent to on-site equipment. | |
| | | (3) Mount cards, terminals, relays, etc. according to drawings. | |
| | | (4) Connect power cables, cables for connecting between racks and optical cables according to the drawing of cable connection. | |
| | | (5) Connect power supply. | |
| 2 | Confirmation power supply at Operator Console and each rack | Measure at power input terminal with voltmeter. | DC5V +5%, - 0% (5.25 ~ 5.0V)<br>DC24V±10% (26.4 ~ 21.6V)<br>AC 230V±10% (253 ~ 207V) |
| 3 | Logic card voltage setting | Connect voltmeter to power terminal at power supply unit, adjust output of each power supply unit so that voltage is within regular range. Record measured value. | DC5V +5%, - 0% (5.25 ~ 5.0V)<br>DC24V±10% (26.4 ~ 21.6V) |
| 4 | Electronic terminal voltage setting | Connect voltmeter to terminal of each card which is the furthest from power supply unit. Regulate each power supply output so that voltage can be within control value and record value obtained. | DC5V +5%, - 0% (5.25 ~ 5.0V)<br>DC24V±10% (26.4 ~ 21.6V) |

6.1.1.2. Startup inspection

| No. | Item | Procedure | Criteria |
|---|---|---|---|
| 1 | Logic rack | (1) Turn the NFB of logic rack ON. | |
| | | (2) Turn the System 1 logic IPU6C card ON. | Normal indication of system 1 logic card (F486-4I) must light up. |
| | | (3) Turn power switch of system 1 OFF and turn power switch of system 2 ON. | Normal indication of system 2 logic card (F486-4I) must light up. |
| 2 | Electronic terminal rack | (1) Turn power switch of system 1 LINE2B card ON and turn power switch of terminal ON. | Normal indication of system1 LINE2B card must light up. |
| | | (2) Turn power switch of system 1 OFF, turn power switch of system 2 ON, and then turn power switch of terminal ON. | Normal indication of system 2 LINE2B card must light up. |
| 3 | Operator console | (1) Turn NFB of Operator Console ON. | |
| | | (2) Turn computer ON. | Track plan and status of on-site equipment must be properly indicated on OPC.<br>Route must be able to be cancelled and cleared. |
| 4 | Maintenance console | (1) Turn NFB of maintenance console ON. | |
| | | (2) Turn computer ON. | Displaying the MTC screen is properly |

6.1.1.3. System in use changeover inspection

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

| No. | Items | Procedure | Criteria |
|---|---|---|---|
| 1 | Logic rack/logic card | Confirm normal operation with system 1 and 2.<br>Set two or more routes, and then proceed following operation. | Route settings are confirmed at LCD display at Operator Console.<br><br>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).<br>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).<br>Indication in LCD display should not change.<br>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). |

### 6.1.2. 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.

#### 6.1.2.1. Contents of function test

| No. | | Procedure | Criteria |
|---|---|---|---|
| 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. |

#### 6.1.2.2. Interlocking inspection

a)Point lock by route control

| No. | Item | Procedure | Criteria |
|---|---|---|---|
| 1 | Point lock | (1) Perform route setting operation. | Route must be set.<br>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 |
|---|---|---|---|
| 1 | Route normal position lock | Perform route setting operation for route A. | Route A must be set.<br>Proceed aspect of signal must be indicated. |
| | | (1) Perform route setting operation for route B. | Route B should not be set.<br>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. |

6.1.2.3. 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 |
|---|---|---|---|
| 1 | Track condition | (1) Perform route setting operation. | Route must be set.<br>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.<br>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. |

6.1.2.4. Point Lock inspection

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

| No. | Item | Procedure | Criteria |
|---|---|---|---|
| 1 | Points | (1) Short track of points and operate point to the opposite direction against cleared direction. | Points should not switch over. |
| | | (2) Release track which shorted above and operate points to the opposite direction against cleared direction. | Points must switch over. |

6.1.2.5. 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 |
|---|---|---|
| 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 |
|---|---|---|---|
| 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. |

6.1.2.6 Approach lock or stick lock

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

| No. | Item | Procedure | Criteria |
|---|---|---|---|
| 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. |

6.1.2.7. Inspection between parallel routes

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

| No. | Procedure | Criteria |
|---|---|---|
| 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. |

6.1.2.8. Slot Normal

| No. | Procedure | Criteria |
|---|---|---|
| 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. |

6.1.3. Failure functional inspection

6.1.3.1 Fault information inspection (Logic card)

| No. | Item | Procedure | Criteria |
|---|---|---|---|
| 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. |

6.1.3.2. Fault information inspection (Electronic terminal card)

| No. | Procedure | Criteria |
|---|---|---|
| 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. |

6.1.4. Signal sequence inspection

| No. | Procedure | Criteria |
|---|---|---|
| 1. | Set route. | Signal aspects must be in accordance with the Signal Sequence Table. |

6.1.5. Fail safe related inspection

6.1.5.1. HBP (Check for indicating lock)

| No. | Procedure | Criteria |
|---|---|---|
| 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. |

6.1.5.2. PORBP (Check for point control relay)

| No. | Procedure | Criteria |
|---|---|---|
| 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. |

6.1.6 Data Logger connecting test

6.1.6.1 Transmission Data check inspection

| No. | Procedure | Criteria |
|---|---|---|
| 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". |

6.1.6.2 Real Time synchronous check inspection

| No. | Procedure | Criteria |
|---|---|---|
| 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. |

12. Feb. 2011

Kyosan Electric Mfg. Co., Ltd.

# MTBF Calculation for K5BMC EI System with Journal Module

Reliability of K5BMC EI System with Journal Module has been calculated based on sample station. The calculation results are described as follows.

1. Preconditions and formulae for the reliability calculation

1.1 Preconditions for the reliability calculation

(1) The failure rate of a card is calculated by accumulating failure rates of components used in the card (i.e., part-count method).

(2) Basic failure rates of the components

Basic failure rates are based on the basic failure rate table which have been created from actual failure records of the component.

(3) Correction factor against the failure rate

Mechanical Correction: 1.2

(4) Elements which have no effect on the system operation (e.g., maintenance system, etc.) are to be excluded from the reliability calculation.

(5) Maintenance is to be performed on demand, and a failed part to be repaired within six hours.

1.2 Formulae for the reliability calculation

Where a failure rate of a single card = λ and MTBF = 1/λ, provided that two cards are used in combination to achieve parallel redundancy (without maintenance), the MTBF will be calculated using the formula (1):

$$MTBF = \frac{3}{2\lambda} \cdots (1)$$

On the other hand, where the failed part is repaired within six hours (maintenance on demand), the MTBF will be calculated using the formula (2):

$$MTBF = \frac{1}{\lambda_S}$$

$$\lambda_S = \frac{\mu}{1 + \frac{\mu}{\lambda} + \frac{1}{2}\left(\frac{\mu}{\lambda}\right)^2} \quad , \qquad \frac{1}{\mu} = 6 \cdots (2)$$

2. Reliability model

Redundancy is applied to Logic Module and input/output (i.e., ET-PIO Modules and MMIF Modules). The input/output consists of four ET-PIO Modules, four MMIF Modules and one Journal Module.

This architecture is depicted in Figure 1, in the form of a reliability model. In addition, failure rates of the Logic Modules, ET-PIO Modules, MMIF Modules and Journal Module are shown in Table 1.

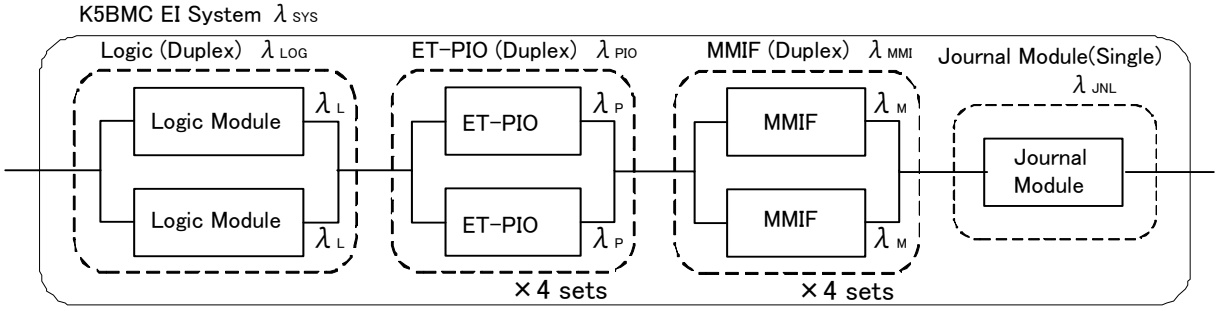



Figure 1: Reliability model of the EI System

3. Failure rates of the redundant modules

Table 1 shows failure rates of the redundant Logic Modules, ET-PIO Modules, MMIF Modules and Journal Module which constitute the reliability model in Figure 1.

Table 1: Failure rates of the redundant Logic Modules, ET-PIO Modules, MMIF Modules and single Journal Module

| Module names | Failure rates [1/h] |
|---|---|
| Logic Modules $\lambda_{LOG}$ | $1.30 \times 10^{-9}$ |
| ET-PIO Modules $\lambda_{PIO}$ | $1.35 \times 10^{-10}$ |
| MMIF Modules $\lambda_{MMI}$ | $5.26 \times 10^{-11}$ |
| Journal Module $\lambda_{JNL}$ | $1.89 \times 10^{-5}$ |

(Maintenance to be performed on demand and a failed part to be repaired within six hours)

Above failure rates have been calculated as shown in the following sub-clauses 3.1 ~ 3.4.

3.1 Failure rate of the redundant Logic Modules

Figure 2 depicts the reliability model of the Logic Modules. Failure rates of the cards which constitute a single Logic Module are shown in Table 2.

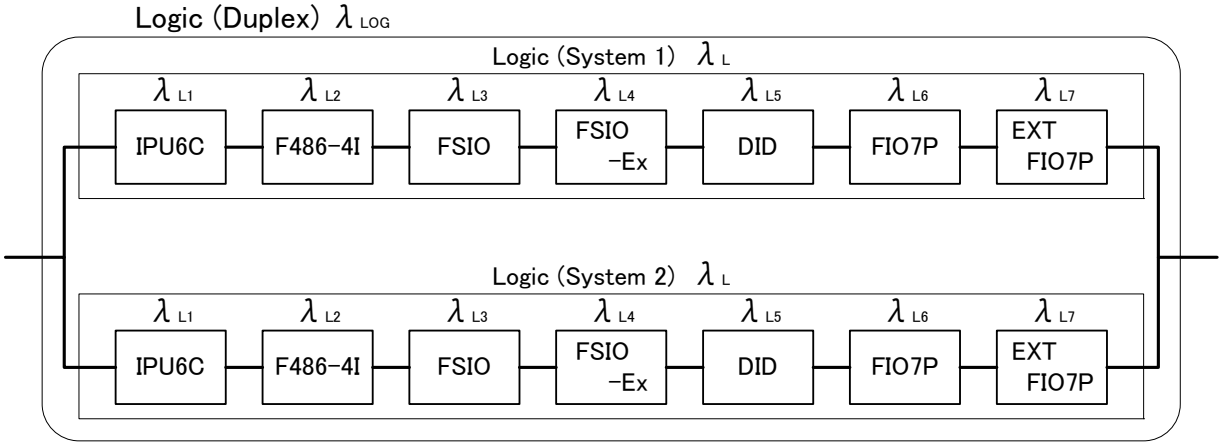



Figure 2: Reliability model of the Logic Modules

Table 2: Failure rates of the cards which constitute the single Logic Module

| Card names | | Failure rates [1/h] |
|---|---|---|
| IPU6C | $\lambda_{L1}$ | $6.56 \times 10^{-7}$ |
| F486-4I | $\lambda_{L2}$ | $3.62 \times 10^{-6}$ |
| FSIO | $\lambda_{L3}$ | $2.22 \times 10^{-6}$ |
| FSIO-Ex | $\lambda_{L4}$ | $2.16 \times 10^{-6}$ |
| DID | $\lambda_{L5}$ | $3.08 \times 10^{-7}$ |
| FIO7P | $\lambda_{L6}$ | $6.70 \times 10^{-7}$ |
| EXTFIO7P | $\lambda_{L7}$ | $7.61 \times 10^{-7}$ |

The failure rate of the single Logic Module is as follows:

$\lambda_L = \lambda_{L1} + \lambda_{L2} + \lambda_{L3} + \lambda_{L4} + \lambda_{L5} + \lambda_{L6} + \lambda_{L7}$

$= 1.04 \times 10^{-5}$

Hence, the failure rate of the redundant Logic Modules is calculated by using the formula (2):

$$\lambda_{LOG} = \frac{\mu}{1 + \frac{\mu}{\lambda_L} + \frac{1}{2}\left(\frac{\mu}{\lambda_L}\right)^2} = 1.30 \times 10^{-9}$$

3.2 Failure rate of the redundant ET-PIO Modules

The reliability model of the ET-PIO Modules is depicted in Figure 3, and Table 3 shows the failure rate of the card of a single ET-PIO Module.

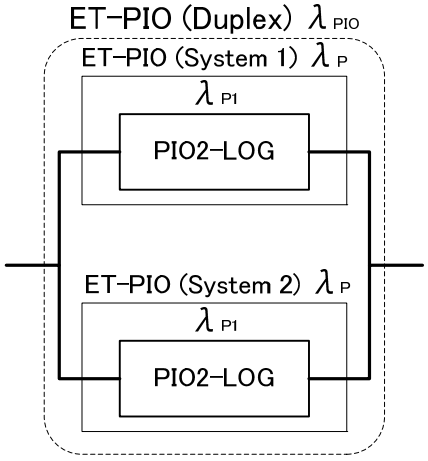



Figure 3: Reliability model of the ET-PIO Modules

Table 3: Failure rate of the card of a single ET-PIO Module

| Card name | Failure rate [1/h] |
|---|---|
| PIO2-LOG $\lambda_{P1}$ | $3.35 \times 10^{-6}$ |

The failure rate of the single ET-PIO Module is as follows:

$\lambda_P = \lambda_{P1}$

$= 3.35 \times 10^{-6}$

Hence, the failure rate of the redundant ET-PIO Modules is calculated by using the formula (2):

$$\lambda_{PIO} = \frac{\mu}{1 + \frac{\mu}{\lambda_P} + \frac{1}{2}\left(\frac{\mu}{\lambda_P}\right)^2} = 1.35 \times 10^{-10}$$

3.3 Failure rate of the redundant MMIF Modules

The reliability model of the MMIF Modules is depicted in Figure 4, and Table 4 shows the failure rate of the card of a single MMIF Module.

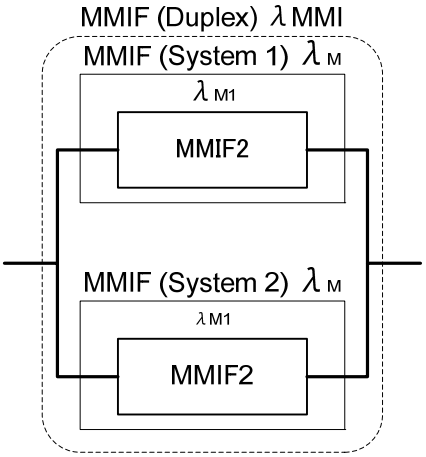



Figure 4: Reliability model of the MMIF Modules

Table 4: Failure rate of the card of a single MMIF Module

| Card name | | Failure rate [1/h] |
|---|---|---|
| MMIF2 | $\lambda_{M1}$ | $2.09 \times 10^{-6}$ |

The failure rate of the single MMIF Module is as follows:

$\lambda_M = \lambda_{M1}$

$= 2.09 \times 10^{-6}$

Hence, the failure rate of the redundant MMIF Modules is calculated by using the formula (2):

$$\lambda_{MMI} = \frac{\mu}{1 + \frac{\mu}{\lambda_M} + \frac{1}{2}\left(\frac{\mu}{\lambda_M}\right)^2} = 5.26 \times 10^{-11}$$

3.4 Failure rate of the single Journal Module

The reliability model of the Journal Module is depicted in Figure 5, and Table 5 shows the failure rate of each cards of Journal Module.

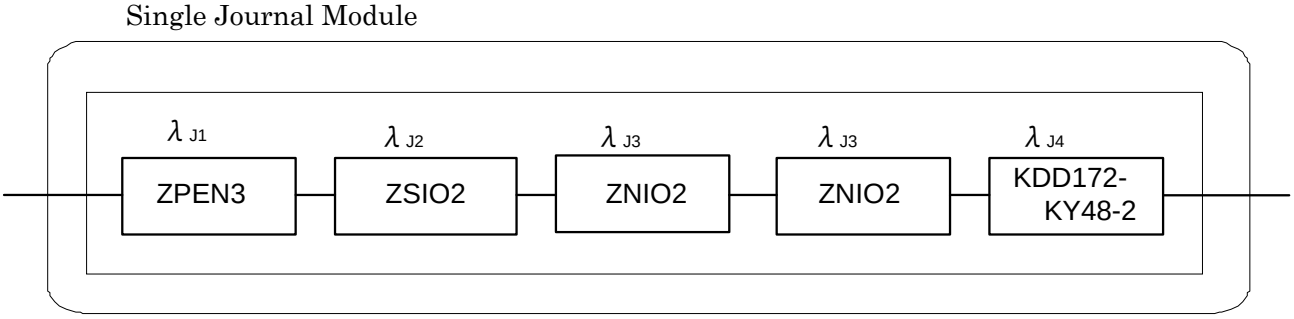



Figure 5. Reliability model of the Journal Module

Table 5.: Failure rate of the cards of single Journal Module

| Card name | Failure rate [1/h] |
|---|---|
| ZPEN3 $\lambda_{J1}$ | $1.97\times10^{-6}$ |
| ZSIO2 $\lambda_{J2}$ | $1.32\times10^{-6}$ |
| ZNIO2 $\lambda_{J3}$ | $1.39\times10^{-6}$ |
| KDD172･KY48-2 $\lambda_{J4}$ | $1.56\times10^{-5}$ |

The failure rate of single Journal Module is as follows:

$$\lambda_{JNL} = \lambda_{J1} + \lambda_{J2} + \lambda_{J3} \times 2 + \lambda_{J4}$$

$$= 2.17 \times 10^{-5}$$

4. Result of the reliability calculation

Based on the reliability model in Figure 1 and the failure rates in Table 1, the failure rate of the EI System is calculated as follows, provided that maintenance is performed on demand.

$$\lambda_{SYS} = \lambda_{LOG} + \lambda_{PIO} \times 4 + \lambda_{MMI} \times 4 + \lambda_{JNL}$$
$$= 1.30 \times 10^{-9} + 1.35 \times 10^{-10} \times 4 + 5.26 \times 10^{-11} \times 4 + 2.17 \times 10^{-5}$$
$$= 2.17 \times 10^{-5} \text{ [1/h]} \quad \text{(approximately)}$$

5. Calculation of MTBF as the K5BMC EI System

The MTBF of K5BMC EI System which included Logic Module of the signal safety system, the ET-PIO Module, the MMIF Module and the Journal Module is calculated following by using above $\lambda_{SYS}$ of at-any-time preservation system.

$$MTBF \text{ (at any time preservation system)} = \frac{1}{\lambda_{SYS}}$$
$$= \underline{4.26 \times 10^{4} \text{ [h]}}$$

5 Nov.2014

Kyosan Electric Mfg. Co., Ltd.

# Reasons of no earthing for EI

## 1. Introduction

The K5BMC EI System does not need grounding or earthing and the racks shall be kept without direct contact with the ground, as for the reason, the base of the racks shall be insulated by insulation material for preventing a direct contact with ground. .

The reasons are listed below.

## 2. Preventing the inflow of lightening surge and exogenous noise

The electronic interlocking (EI) system is an sensitive electric device. So the Inflow of lightening surge and exogenous noise from outside can damage the devices. Prevention of lightning surge is highly required for EI systems.

The countermeasures shall be taken for the lightning surge is as following:.

1) Prevention of the inflow of lightening surge from electric power line

The EI system power line input is (i.e. DC 110V) with a surge protection device of class D, which is preventing the inflow of the lightning surge from the external power lines, such as IPS, Battery bank etc. The surge protection devices shall be kept outside or far away from EI rack.

2) Grounding of outdoor cable shield connected in between the field equipment and the Cable Termination Rack (CTR)

The outdoor cables used between field equipment and the CTR are shielded cables and the cable shields are grounded at CTR end to prevent the surge/noise inflow to the EI system.

3) Relay interface

EI system is interfaced to field equipment through relays provided in the relay rack and the relays insulates EI system electrically, which prevents the external lightning surge inflow to the EI system

4) Uses of optical fiber cable for connection with control panel

The connection in between the EI system (signal equipment room) and the control panel are interfaced by an OFC (Optical Fiber Cable) in order to provide better insulation between the equipment.

## 3. Reason for no Earthing

There are chances of lightning surge to pass through the ground and enter into the EI system. Hence it is necessary to carry out the countermeasures, which prevents the lightning surge/noise. The preventive countermeasures for lightning surge inflow are described in below clauses.

1) The insulation in between each sub-racks and main-rack

The Sub-racks such as Logic sub-rack, ET Sub-rack etc., are insulated from main rack. These countermeasures are also ensuring that the surge passes through the ground, shall not affect the equipment.

2) The insulation in between racks and the ground.

The EI equipment racks shall be installed with the insulated material provided on the bottom of the rack. EI Rack & Relay racks shall not be connected to Ground/Earth to ensure complete isolation. Only CT Rack can be consider for grounding, if the customer insist for it.

Consideration of maintaining the above mentioned countermeasures, it can be assured that user/ customer can ensure a highly safe and reliable EI system operation. As per Kyosan supply record of EI, all system is operating without failure, as no problem reported from any of the customers (railway operating company's) till date.

# 【Provisions for Lightning Damages to EI System in India】

Measures for preventing lightning damages to the EI system are as follows.

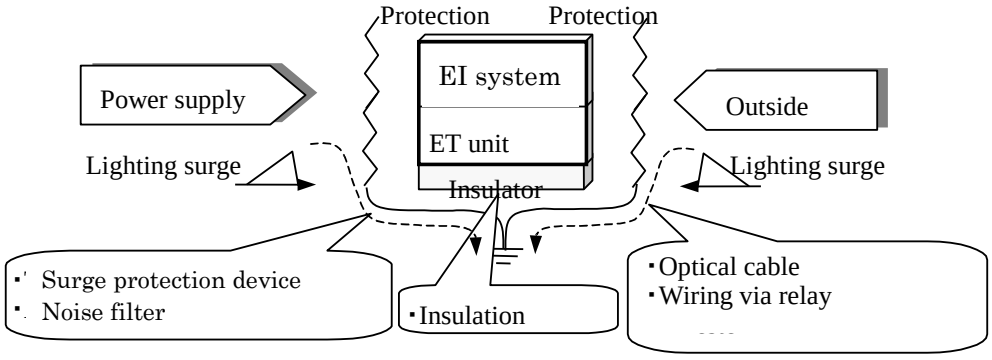



Figure 1 Basic concept

1. Provisions for lightning damages to the EI system
   1) Steps to prevent the lightning surge from the earth or power lines/connections to be taken.
   2) Measures for direct lightning cannot be taken.
2. Electronic devices which can be protected from damages.
   1) The Electronic components (i.e. all PCB cards and sub racks (See figure 2-a))
3. Surge types
   1) Vertical surge: Surge in between conductors and the ground
   2) Lateral surge: Surge in between conductors
4. Main points (See figure 1)
   1) To prevent lighting surge influx as much as possible
   2) To prevent defluxion of surge entered.
5. Lightning surge approach path and measures for preventing its approach
   1) Influx through the power supply
      a. Set the lightning surge impulse voltage below the specified value which is 2.5Kv for IPS room and 500v for Signal Equipment room. (See figure 2-b).
      b. Provide a surge protection device (SPD) into the power inlet of signal equipment room to let the lightning surge flow to the ground (See figure 2-c).

   2) Influx from the ground
      a. Set the each earth connection resistance value below the specified value (See figure 2-d)
      b. Separation in between SPD & EI rack wirings to prevent the lighting surge transition (See

figure2-e).

3) Influx from cables in between equipment rooms
   a. Use the optical fiber cables for connection in between ET, Logic, Journal sub racks for preventing lighting damages (See figure 2-f).
   b. Use of the electrical cables via a relay can completely prevent flux of the lightning surge to EI.
4) Influx from field equipment
   a. The lighting surge is difficult to control directly from the EI, for the safety all the racks surface is insulated by the insulation material. Thus, all field cables are wired via a relay rack to prevent the lighting surge (See figure 2-g).
   b. To prevent lightning surge transition to EI, the wirings from field equipment and electronic terminals are separated in Ladders/troughs.

6. Measures for defluxion of lighting surge entered

EI, ET, Relay rack, CTR shall be insulated by insulation material from the floors, walls and ladders. (See figure 2-h).

# Preventive Measures against Lightning Damages

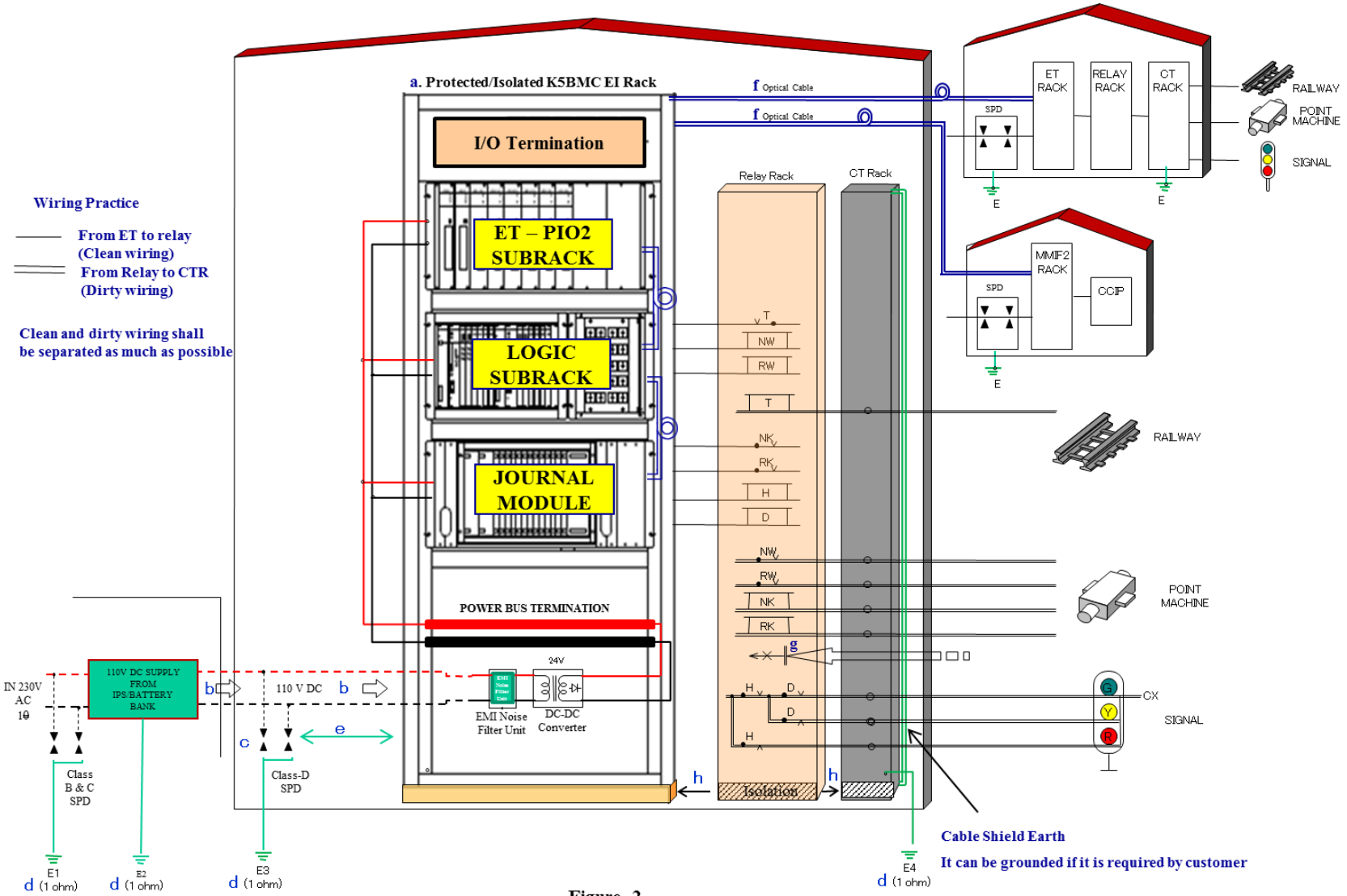



Figure -2

# Pre-commissioning Check List

# for K5BMC Electronic Interlocking System

**Document No. Z914-C72000815F**

**Version 5**

**19. December 2014**



**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 | 18. May 2011 | First Edition | T. Suzuki |
| 2 | 28. June.2013 | Add the ladder-related check item.<br>Specify the type of power supply used in each power input unit and the size. | Y. Kanno |
| 3 | 18. July 2013 | Addition of EI Logic Rack, types of power cables of Relay Rack and specification function inspection items of the size. | Y. Kanno |
| 4 | 25. July 2013 | Additional item about Ladder Visual Inspection, Visual Inspection of K5BMC EI Logic Rack, Route or Wiring Diagram of K5BMC EI Logic Rack, Visual Inspection of Relay Rack, Visual Inspection of OT/FT, Visual Inspection of CCIP, Visual Inspection of PC using OPC (VDU), and Visual Inspection of PC using MTC. | Y. Kanno |
| 5 | 20.December 2014 | For change in reason of no earthing document, Failure functionality test. Functional test is removed from this documents since it is in detail carried out by respective Zonal Railways. Some typographical mistake. Introduction of Actual reference voltage with appropriate value. | S.Yamamoto |

# 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:** Kyosan Electric Mfg., Co., Ltd., 2-29-1, Heian-cho, Tsurumi-ku, Yokohama, 230-0031 | | | **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 EI dated 5. Nov. 2014
   (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 EI dated 5. Nov. 2014" (including Provisions for Lightning Damage to EI System in India). | | |
| 2 | Check that each rack (EI rack, Relay rack) in signal equipment room is not grounded. | | |
| 3 | Check that earth pit and pipe burial is done as per each earthing. | | |
| 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 | Check that the grounding terminals of surge protective device are securely connected to EBB in signal equipment room. | | |
| | | | |
| | **Visual Inspection of Power Devices for Signal System** | | |
| 9 | Check that the power distribution for signal system such as rectifier or outer devices is through the surge protective device according to Fig. 2 of "Reasons of no earthing for EI dated 5. Nov.2014 (including Provisions for Lightning Damage to EI System in India)". | | |
| | | | |
| | **Ladder visual inspection** | | |
| 10 | Check whether the ladder is insulated by a rack from the wall. | | |
| 11 | The width of the ladder is from 200mm to 800mm as a standard. | | |
| | | | |
| | **Visual Inspection of K5BMC EI Logic Rack** | | |
| 12 | Check that proper ventilation is provided in the rack. | | |
| 13 | Check that adequate space for maintenance is available in the rack. | | |
| 14 | Check that the cards are inserted in the respective slots as per the EI Wiring Diagram. | | |
| 15 | Check that the equipment has been inspected by RDSO and RDSO inspection seal is stuck on the rack. | | |
| 16 | Check that locking arrangement is provided for front door. | | |

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|---|---|
| | |

| S. No | Check Point | Observed Result OK/Not OK | Remarks |
|---|---|---|---|
| 17 | Check that locking arrangement is provided for rear door. | | |
| 18 | Check that Dummy front cover panel are inserted on the unused slots. | | |
| 19 | Check that the nameplate contains serial no. and mfg. date. | | |
| 20 | Check that each sub-racks such as Logic sub-rack or Electronic sub-racks are insulated from the EI rack. | | |
| 21 | Check that all the cards are fixed firmly to the respective slots of sub-rack with fixing screws. | | |
| 22 | 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. | | |
| 23 | Check that all the wiring of terminals or connectors should be properly lugged and securely tightened. | | |
| 24 | In order to display the EI System Wiring Diagram, check whether the WAGO connector for I/O is fixed and connected to each position. | | |
| 25 | Check whether the relay for WDT directed to Relay panel of Connector parts in the EI System wiring diagram is installed. | | |
| 26 | Check whether the RS232C connector is firmly fixed by the installation screw of the connector. | | |
| 27 | 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. | | |
| 28 | 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. | | |
| 29 | Check whether the Logic Unit and Electronic Terminal are connected to fuse and inbuilt 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** | | |
| 30 | Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram.<br>110V DC – 16Sqmm*2<br>24V DC from Converter to sub rack – 1.5Sqmm<br>FSIO – 0.2Sqmm<br>I/O – 0.5Sqmm | | |
| 31 | Check that the wirings for logic power, interface of electronic terminal and outer power line are respectively separated and conducted in each wiring duct. | | |
| 32 | Check that the RS232C cables and wiring duct are routed and harnessed properly. | | |
| 33 | Check that the metal connectors of each sub-racks, such as the Logic sub-rack and the Electronic terminal sub-racks, are properly fixed. | | |
| 34 | Check that the connectors of metal cables between racks are properly fixed to the receptacles and rack. | | |

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| S. No | Check Point | Observed Result OK/Not OK | Remarks |
|---|---|---|---|
| 35 | Check that all the optical connectors are fastened with no slack and the caps has been put on all the unused optical connector. | | |
| 36 | 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 Relay Rack** | | |
| 37 | 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. | | |
| 38 | About the wiring, check if you have followed the displayed details on the Electronic Interlocking device wiring diagram. | | |
| 39 | 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. | | |
| 40 | Check that the wiring is carried out following the EI wiring diagram. | | |
| 41 | Check that wirings from outside and wirings from electronic terminals are crossed as much as possible at right angle in order to prevent electrical induction. | | |
| 42 | Check that all wires have proper lugs and are inserted properly in the terminal sub-racks. | | |
| 43 | Check that proper identification markers are attached to all terminals. | | |
| 44 | 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 CTR Rack with indoor side** | | |
| 45 | Check that wire ends of terminals or connectors shall be crimped with correct size lugs and there are no loose connections at the terminals. | | |
| 46 | Check that the wiring is carried out following EI wiring diagram. | | |
| 47 | Check that all wires have proper lugs and are inserted properly in the terminal. | | |
| 48 | Check that proper identification markers are attached to all terminals. | | |
| 49 | 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. | | |
| | | | |

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| S. No | Check Point | Observed Result OK/Not OK | Remarks |
|---|---|---|---|
| | **Visual Inspection of CCIP** | | |
| 50 | Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram. | | |
| 51 | 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. | | |
| 52 | Check that the yard layout on CCIP panel is as per the approved signalling plan. | | |
| 53 | Check that two redundant power inputs are provided for the panel. | | |
| 54 | 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)** | | |
| 55 | Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram. | | |
| 56 | Check that surge suppressor is provided for PC power input of OPC. | | |
| 57 | Check proper power connections from IPS to PC of OPC. | | |
| 58 | Check that all optical connections are fastened without slack and also connections with keyboard, mouse and monitor also shall be proper without slack. | | |
| 59 | Check whether the cable is connected from DC/DC converter of 24V of configuration of n+1. | | |
| 60 | 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** | | |
| 61 | Check that the wirings and connections from or to the EI are as per the details of the EI wiring diagram. | | |
| 62 | Check that surge suppressor is provided for PC power input of MTC. | | |
| 63 | Check proper power connections from IPS to PC of MTC. | | |
| 64 | Check that all optical connections are fastened without slack and also connections with keyboard, mouse and monitor also shall be proper without slack. | | |
| 65 | 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 |
|---|---|---|---|
| | | | |
| | **Check points after turning on K5BMC EI** | | |
| 66 | Check that power supplies for all signal equipment OPC, MTC and Data Logger etc. have been turned on. | | |
| 67 | 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. | | |
| 68 | Check that all switches of LINEM2 and MMIF2 in MMIF sub-rack have been turned on. | | |
| 69 | Check electric voltage of all measuring points and confirm all of those voltages are within standard range according to the voltage checklist. | | |
| 70 | Check that EI status is normal through General System Display of MTC. | | |
| 71 | Check that yard layout on OPC is as per approved signalling plan. | | |
| 72 | Check that the EI main, EI sub and INIO status on the OPC screen is illuminating steady Green. | | |
| 73 | Check that all the emergency operations on OPC are protected with password. | | |
| 74 | 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. | | |
| 75 | 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. | | |
| 76 | 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 | | |

# Functional Tests

Functional Tests by mock connection

1. 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.<br>Set two or more routes, and then proceed following operation. | Route settings are confirmed at LCD display at Operator Console.<br><br>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).<br>Indication in LCD display should not change.<br>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). | | |

2. Failure functional inspection

2.1 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).<br>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).<br>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).<br>Confirm at F486-4I card. | | |
| | | (2) Turn system 1 power supply ON. | System 1 normal indicator must light up with system 2 remaining active. | | |

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| | | | | | |
|---|---|---|---|---|---|
| 4 | System 2 power OFF | (1) Turn system 2 logic IPU6C card power supply OFF. | System 1 must become active (in use).<br>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. | | |

2.2 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. | | |

3. Fail safe related inspection

**FCOR Test Case**

| No. | Procedure | Criteria | Observed Result OK/Not OK | Remarks |
|---|---|---|---|---|
| 1. | Set the Front contact read back input bit (i.e. "_F" bits) to "1" when the corresponding Output is in "0" state. (More than **1.2 sec)** | 1. Signal OFF aspect power supply shall be cut off.<br>2. All the Outputs delivered will become "0"state<br>3. Panel become in-operative until the false feed is rectified. | | |

4. Data Logger connecting test

4.1 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". | | |

4.2 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 (1/3)

| | BLOCK | Power Supply Type | Voltage Adjustment Point | Voltage Measuring Point | Measurements | Observed Result OK/Not OK | Remarks |
|---|---|---|---|---|---|---|---|
| EI RACK | E | DC24V (LOGIC POWER) | | | **24V±10%** | | At no load |
| | | | | | **24V±10%** | | At no load |
| | | DC24V (I/F POWER) | | | **24V±10%** | | At no load |
| | | | | | **24V±10%** | | At no load |
| | C | DC24V (LOGIC POWER) | | SYSTEM1 CN1 3, 1 | **24V±10%** | | |
| | | | | SYSTEM2 CN1 3, 1 | **24V±10%** | | |
| | | | IPU6C (SYSTEM1) | IPU6C 24V measuring terminal | **24V±10%** | | |
| | | | IPU6C (SYSTEM2) | IPU6C 24V measuring terminal | **24V±10%** | | |
| | | DC5V | IPU6C (SYSTEM1) | IPU6C 5V measuring terminal | **5V+5%** | | |
| | | | IPU6C (SYSTEM2) | IPU6C 5V measuring terminal | **5V+5%** | | |
| | B | DC24V (LOGIC POWER) | | J1-6,8 | **24V±10%** | | |
| | | DC24V (I/F POWER) | | ET-PIO2 6-1 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-2 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-3 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-4 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-5 J3-1,3 | **24V±10%** | | |
| | | DC5V | LINE2B (SYSTEM1) | LINE2B 5V measuring terminal | **5V+5%** | | |
| | | | LINE2B (SYSTEM2) | LINE2B 5V measuring terminal | **5V+5%** | | |
| | D | DC24V (LOGIC POWER) | | KDD172-KY48-2 P1, P2 | **24V±10%** | | |
| | | | | SPHC-PW CN1-3,4 (For System 1 SPHC-TT) | **24V±10%** | | |
| | | | | SPHC-PW CN1-3,4 (For System 2 SPHC-TT) | **24V±10%** | | |
| | | DC 5V | System 1 SPHC-PW | System 1 SPHC-TT CN1-1,2 | **5V+5%** | | |
| | | | System 2 SPHC-PW | System 2 SPHC-TT CN1-1,2 | **5V+5%** | | |

VOLTAGE CHECK LIST (2/3)

| | 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) | **24V±10%** | | |
| | | | LINEM2 J12 - 6, 7 (System 2) | **24V±10%** | | |
| | DC5V | LINEM2 (System 1) | LINEM2 5V measurement terminal | **5V+5%** | | |
| | | LINEM2 (System 2) | LINEM2 5V measurement terminal | **5V+5%** | | |

VOLTAGE CHECK LIST (3/3)

| | BLOCK | Power Supply Type | Voltage Adjustment Point | Voltage Measuring Point | Measurements | Observed Result OK/Not OK | Remarks |
|---|---|---|---|---|---|---|---|
| ET RACK | B | DC24V (LOGIC POWER) | | J1-6,8 | **24V±10%** | | |
| | | DC24V (I/F POWER) | | ET-PIO2 6-1 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-2 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-3 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-4 J3-1,3 | **24V±10%** | | |
| | | | | ET-PIO2 6-5 J3-1,3 | **24V±10%** | | |
| | | DC5V | LINE2B (SYSTEM1) | LINE2B 5V measuring terminal | **5V+5%** | | |
| | | | LINE2B (SYSTEM2) | LINE2B 5V measuring terminal | **5V+5%** | | |
| ET RACK | C | DC24V (LOGIC POWER) | | J1-6,8 | 24V+10% | | |
| | | DC24V (I/F POWER) | | ET-PIO2 6-1 J3-1,3 | 24V+10% | | |
| | | | | ET-PIO2 6-2 J3-1,3 | 24V+10% | | |
| | | | | ET-PIO2 6-3 J3-1,3 | 24V+10% | | |
| | | | | ET-PIO2 6-4 J3-1,3 | 24V+10% | | |
| | | | | ET-PIO2 6-5 J3-1,3 | 24V+10% | | |
| | | DC5V | LINE2B (SYSTEM1) | LINE2B 5V measuring terminal | 5V+5% | | |
| | | | LINE2B (SYSTEM2) | LINE2B 5V measuring terminal | 5V+5% | | |

| Signature with date of Firm's Representative Name and Designation | Signature with date of Railway's Representative Name and Designation |
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