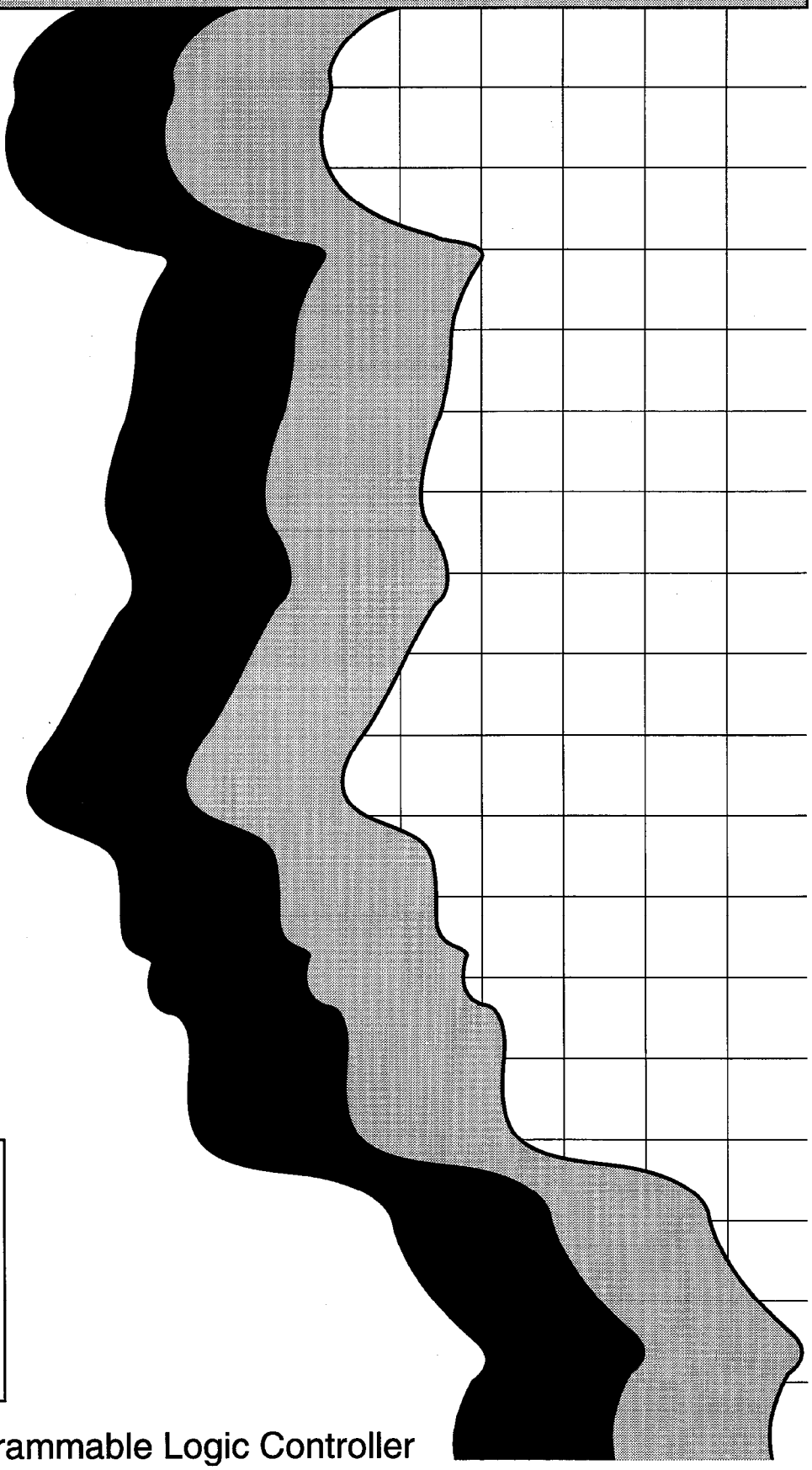
MITSUBISHI

# Operating boxes type AJ35PT-OPB-M1/AJ35T-OPB-P1

# User's Manual



MELSEC

Mitsubishi Programmable Logic Controller

## REVISIONS

※The manual number is given on the bottom left of the back cover.

| Print Date | ※Manual Number | Revision |
|---|---|---|
| Nov., 1989 | IB (NA) 66218-A | First edition |

## INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end User.

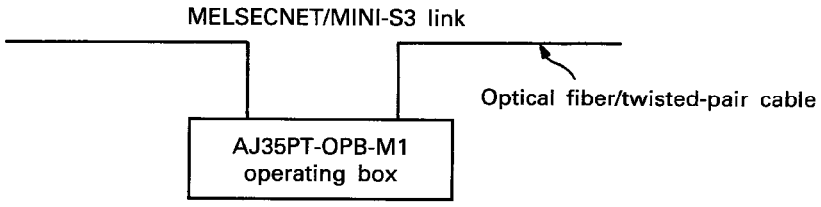
## CONTENTS

## 1. INTRODUCTION

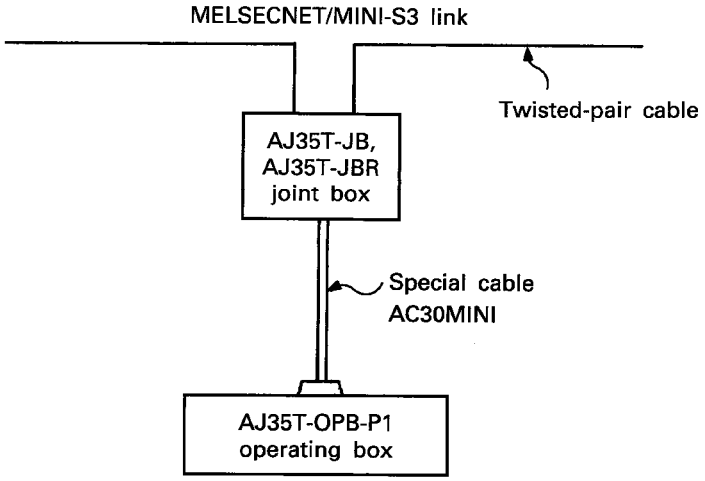
This manual includes the features, specifications, methods of linkage, and programming instructions for the AJ35PT-OPB-M1 and AJ35T-OPB-P1 type operating boxes which are used with the MELSECNET/MINI-S3 data link system (referred to as "MINI-S3").

The AJ35PT-OPB-M1 is a mount type operating box that can be used with either optical fiber or twisted-pair cable.
The AJ35T-OPB-P1 is a portable type operating box and can be used with only twisted-pair cable.
Use of the AJ35T-JB or AJ35T-JBR joint box in the MINI-S3 link enables the operating box to be connected and disconnected at will in the MINI-S3 link.

(1) AJ35PT-OPB-M1 operating box




(2) AJ35T-OPB-P1 portable type operating box



## 1.1 Operating Box Data Communication

The passage of I/O data between the PC CPU and the operating box in the MINI-S3 link is indicated in the data communication diagram in Fig. 1.1

(1) When the communication start signal is set to ON by the PC CPU in relation to a master module, data link process begins in the MINI-S3 link.

(2) Normal I/O refresh between the master module and the operating box occurs at 3.5 to 18ms intervals. I/O refresh and execution of the sequence program of the master module occur asynchronously.

(3) The input data from the touch keys and sheet keys of the operating box is stored in the buffer memory (remote unit reserved areas) of the master module. After the PC CPU detects that the receive request signal from the master module is ON and the PC CPU executes a FROM instruction, the data is read from the buffer memory.

(4) The output of the data to the operating box LEDs is written to the buffer memory of the master module when the PC CPU executes a TO instruction.

(5) The data displayed on the LCD display of the operating box is written to the buffer memory (remote unit reserved areas) of the master module when the PC CPU executes a TO instruction. It is then transmitted to the operating box when the transmit request signal is set to ON.

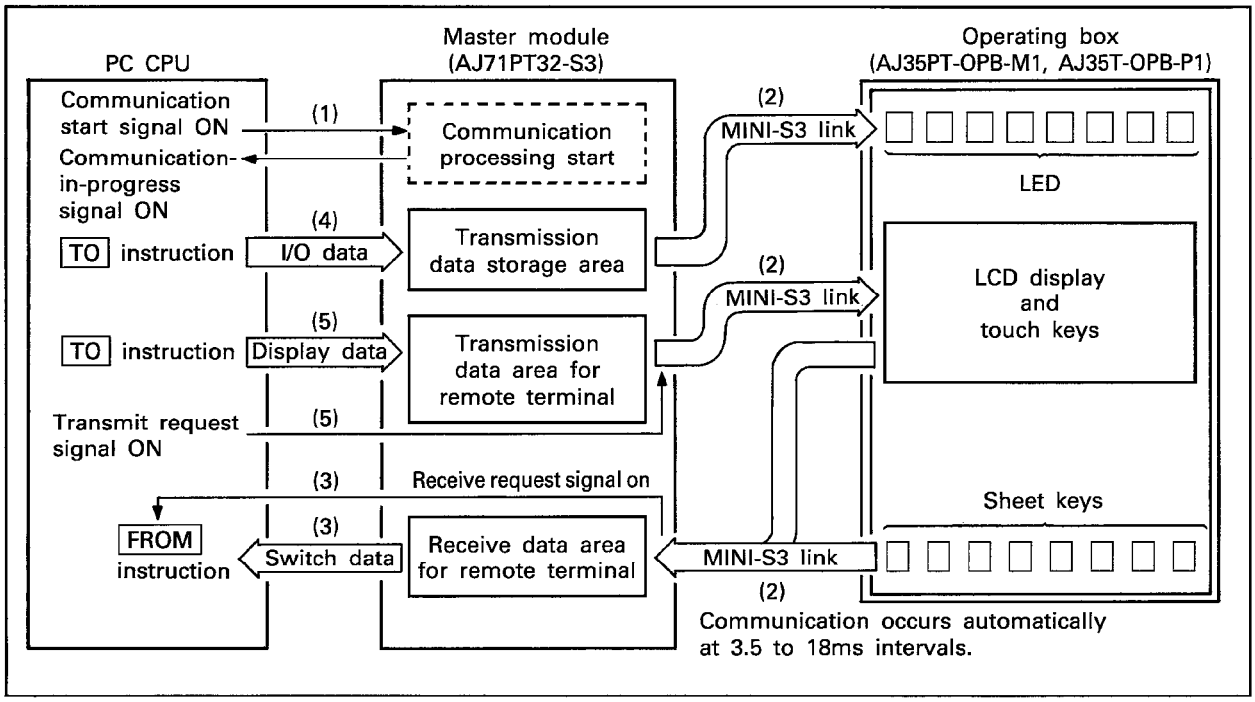


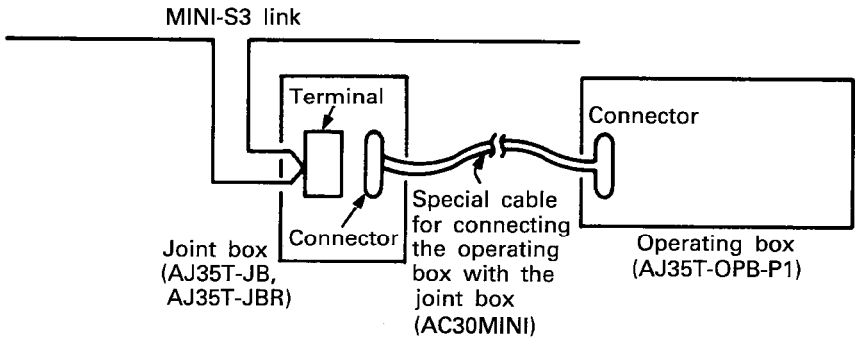

**Fig. 1.1 Data Communication Diagram**

## 1.2 Operating Box Features

(1) Two types of operating boxes are provided, the AJ35PT-OPB-M1, which is mounted as a fixed unit on the control panel or operation panel, and the AJ35T-OPB-P1 which is portable and can be used on a desk, etc.

(2) The mount-type AJ35PT-OPB-M1 can be used with either optical fiber or twisted-pair cable.

(3) The portable-type AJ35T-OPB-P1 can be connected and disconnected at will in the MINI-S3 link with the use of the joint box.




(4) The total number of input keys are 32; 24 touch keys and 8 sheet keys. 8 LEDs are also provided.

(5) The kinds of information that can be displayed on the LCD are messages, characters, comments, numeric data, and a bar graph along with a percent expression.
Up to 400 fixed messages can be registered in the message ROM.

- Display mode 1: Fixed messages only
  Example) A line start
- Display mode 2: Fixed message + defined character
  Example) [ ] Running
  A character determined by the sequence program is displayed.
- Display mode 3: Fixed message + device comment
  Example) X0 [ ] was turned on.
  A comment created by the SW[ ]GP-MINIP type system floppy disk is displayed.
- Display mode 4: Fixed message + numerical data
  Example) Production record Machinery A [ ] Machinery B [ ]
  Numerical values set by the BCD are displayed.
- Display mode 5: Fixed message + bar graph data
  Example) Goal achievement [ ] 40%
  The graph is automatically shown using the values set from 0 to 100.

(6) Up to 14 operating boxes can be connected within a single MINI-S3 link loop.



IB (NA) 66218-A

### 1.3 Related Manuals

Users of the operating box should refer to the following manuals when necessary.

(1) AJ71PT32-S3 MELSECNET/MINI-S3 Master Module User's Manual

This manual provides information concerning the specifications, handling, programming for the AJ71PT32-S3 master module and the full configuration of the MINI-S3 link.

(2) SW□GP-MINIP Operating Manual

This manual provides information concerning programming for the initial data ROM when the master module is used in the extension mode, and that for the message ROM and character generation ROM.

## 2. SYSTEM CONFIGURATION

### 2.1 Overall Configuration

Fig. 2.1 shows the configuration of the system when the AJ35PT-OPB-M1 and AJ35T-OPB-P1 operating boxes are connected in the MINI-S3 link.

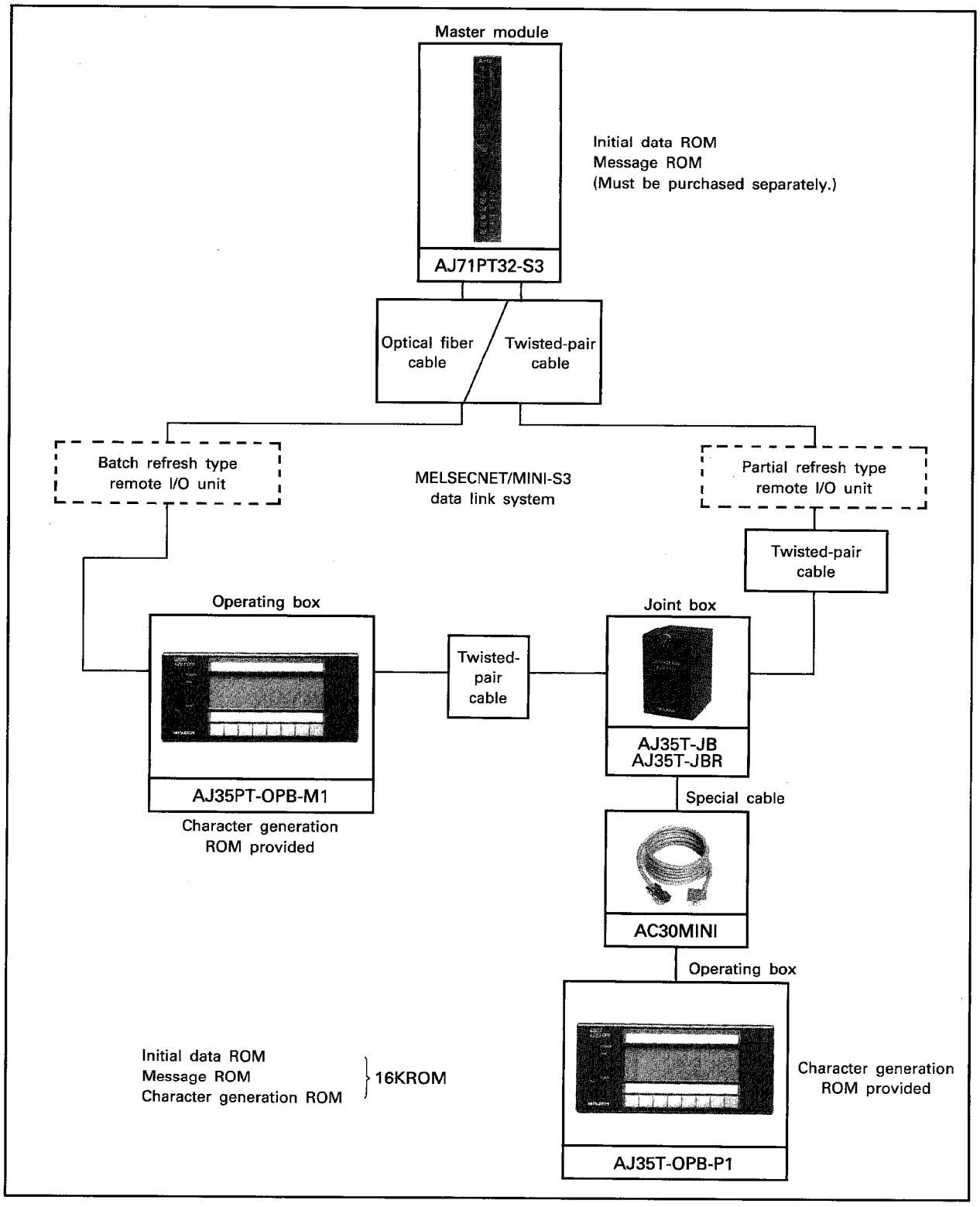



**Fig. 2.1 Overall Configuration for the System Using AJ35PT-OPB-M1/AJ35T-OPB-P1**

## 2.2 Configuration when the AJ35PT-OPB-M1 is Used

Fig. 2.2 shows how the AJ35PT-OPB-M1 mount type operating box is connected to the master module.

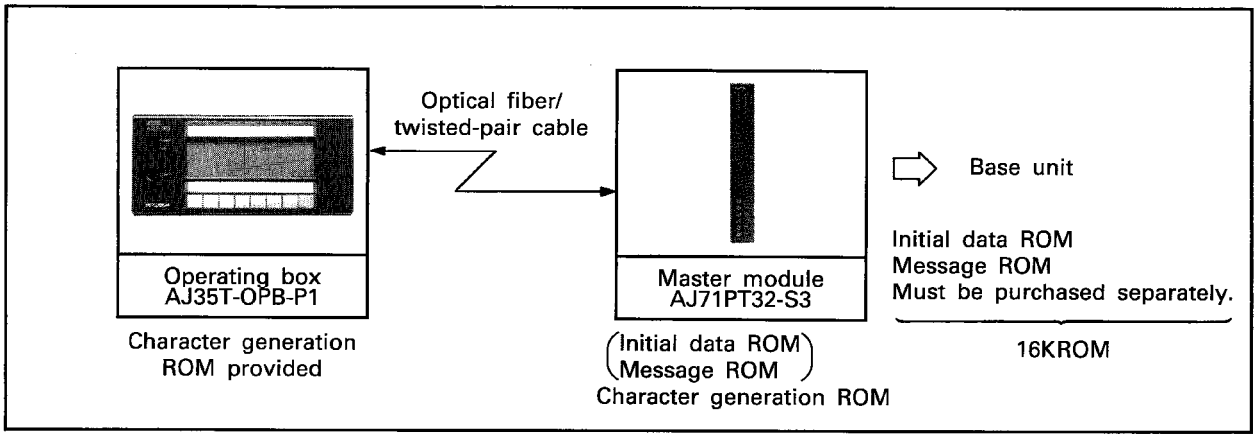



**Fig. 2.2 Configuration when the AJ35PT-OPB-M1 is Used**

## 2.3 Configuration when the AJ35T-OPB-P1 and AJ35T-JB are Used

Fig. 2.3 shows how the AJ35T-OPB-P1 portable type operating box is connected to the master module using the AJ35T-JB joint box.

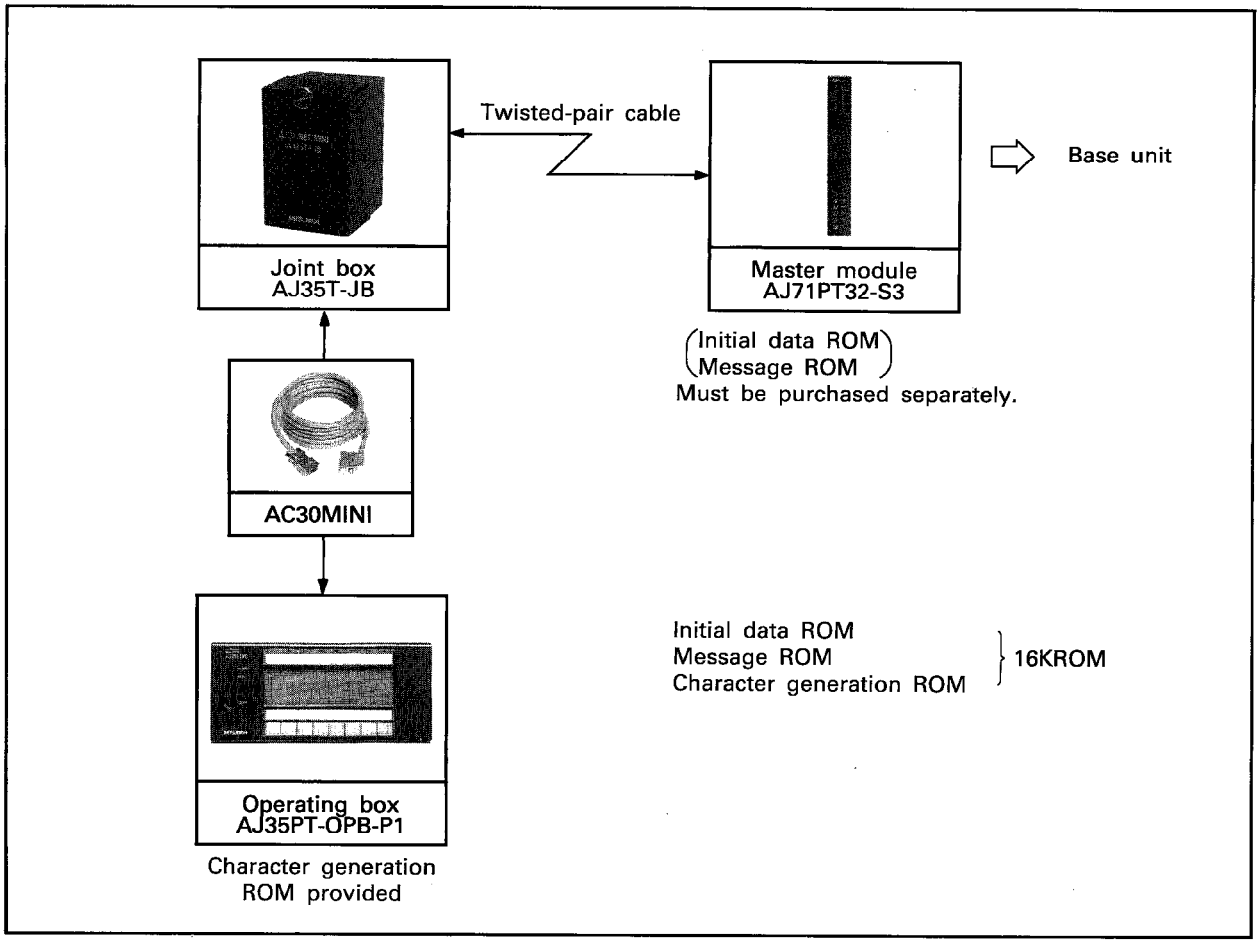



**Fig. 2.3 Configuration when the AJ35T-OPB-P1 is Used**

## 2.4 Configuration when the AJ35T-OPB-P1 and AJ35T-JBR are Used

Fig. 2.4 shows how the AJ35T-OPB-P1 portable type operating box is connected to the master module using the AJ35T-JBR joint box.

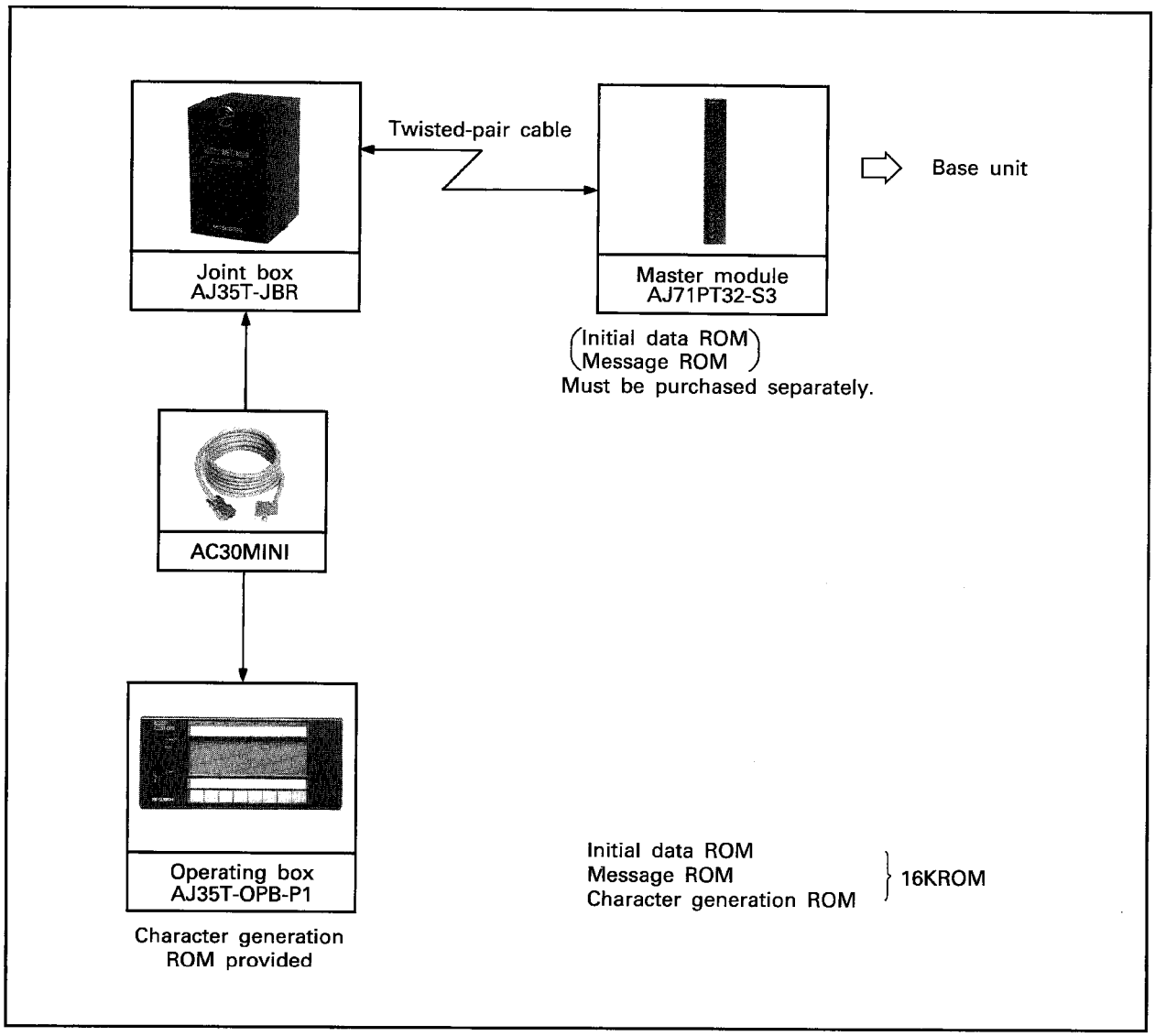
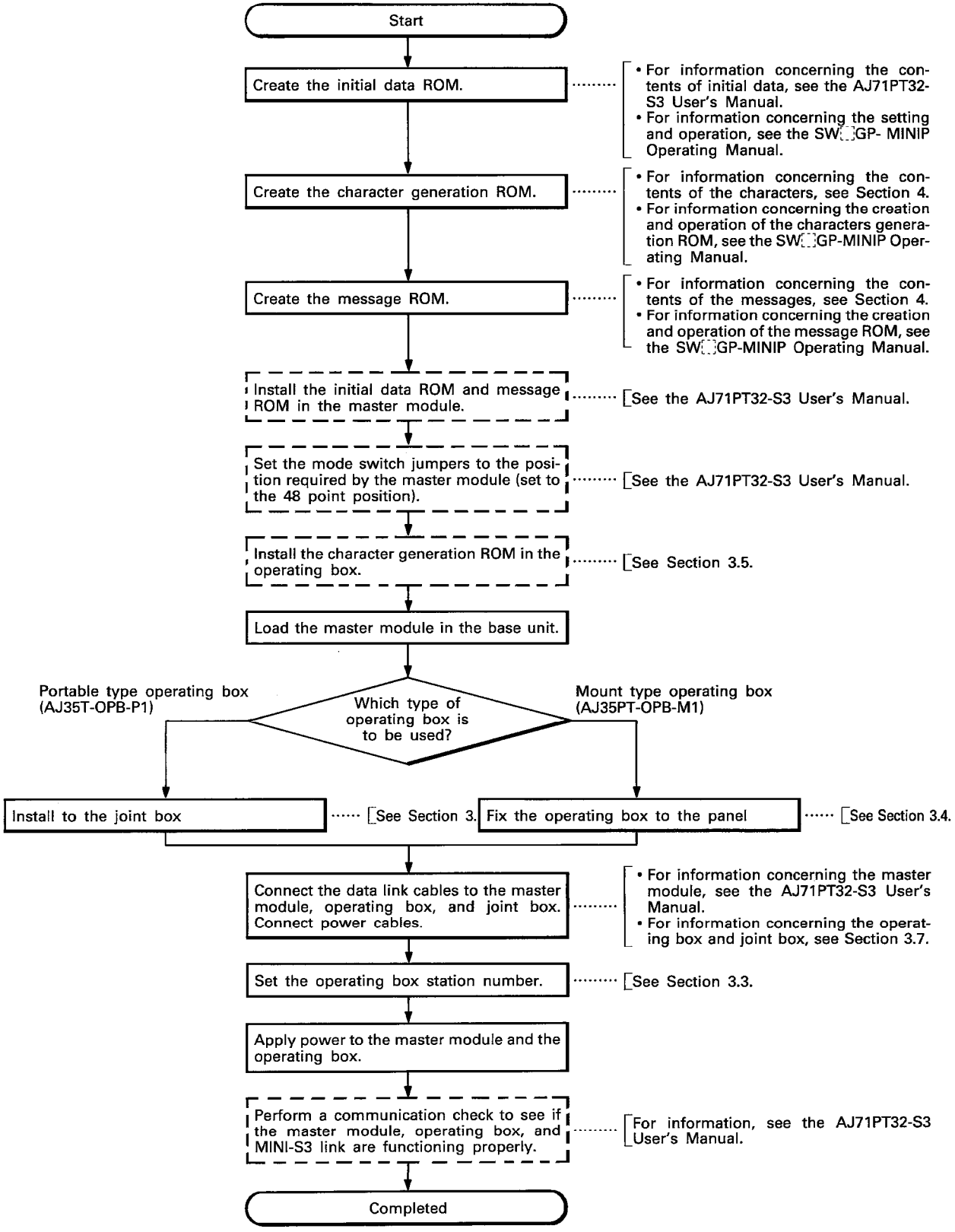



**Fig. 2.4 Configuration when the AJ35T-OPB-P1 and AJ35T-JBR are Connected**

# 3. PRE-OPERATION SETTING AND PROCEDURE

## 3.1 Pre-Operation Setting and Procedure

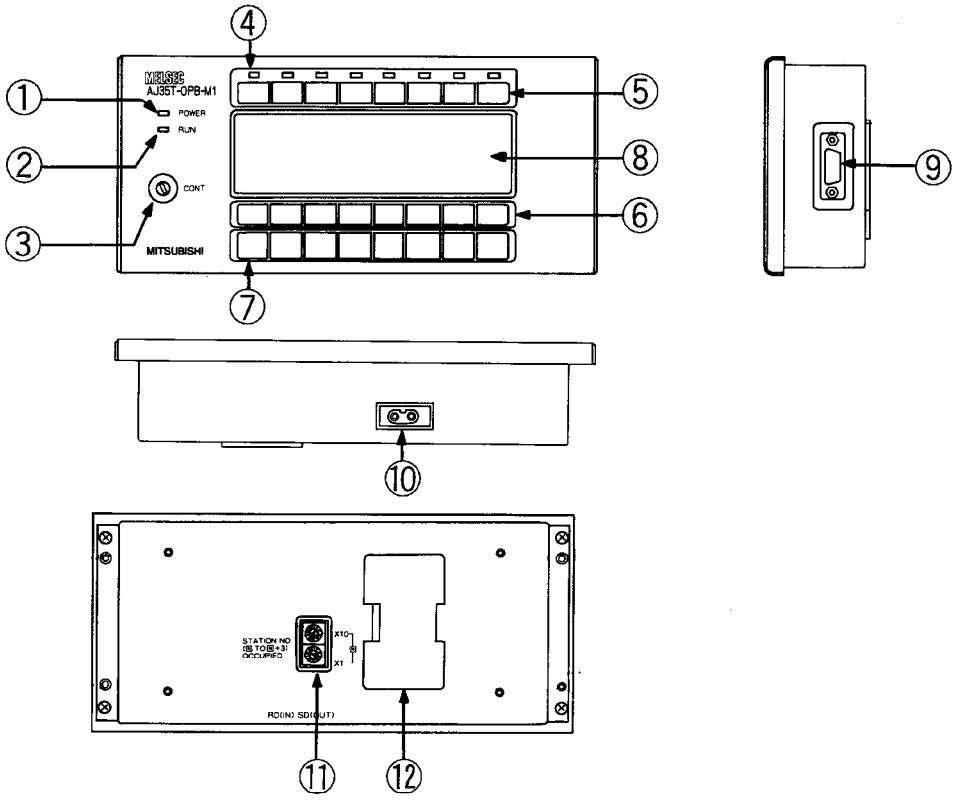





IB (NA) 66218-A

## 3.2 Nomenclature

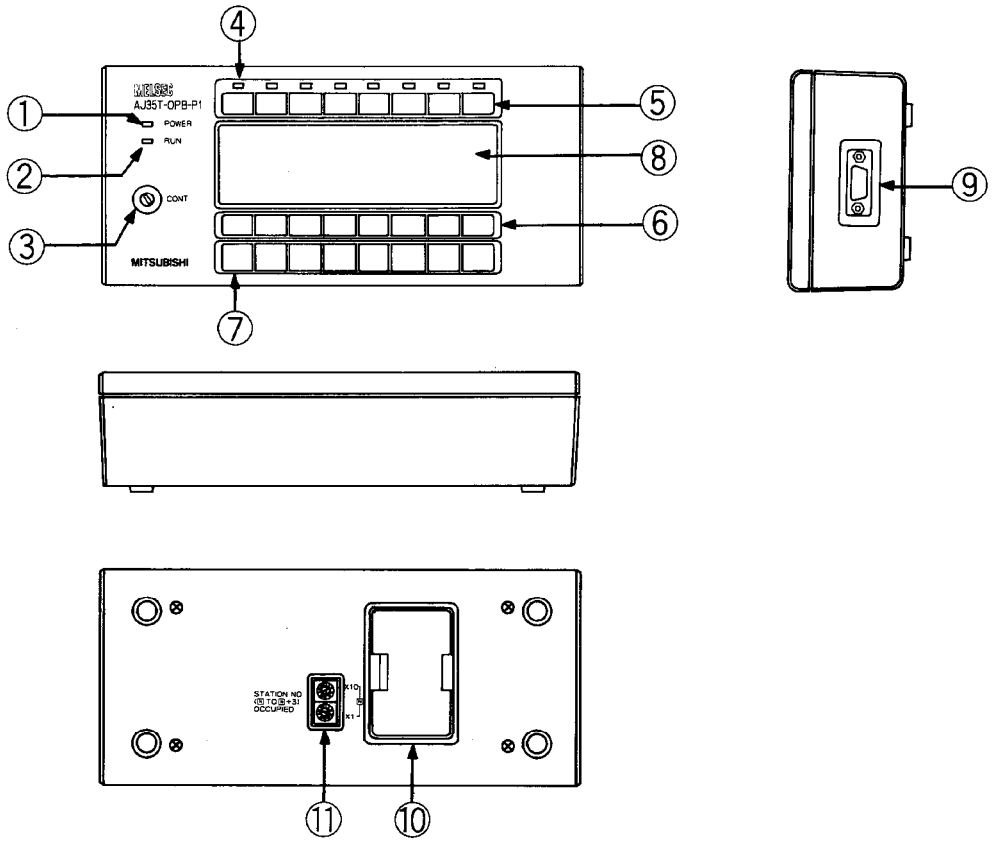
### 3.2.1 Nomenclature of the mount type operating box




| Number | Name | Description |
|---|---|---|
| ① | POWER LED | Lit when 24V DC is supplied. |
| ② | RUN LED | Lit when communication with the master module is being conducted correctly. |
| ③ | LCD contrast control | Adjusts the contrast of the LCD display. |
| ④ | Output LEDs | LED display of the data transmitted from the master module. (8 LEDs) |
| ⑤ | Name board | Used to designate the meanings of each output LED |
| ⑥ | Name board | Used to designate the meanings of each sheet key. |
| ⑦ | Sheet keys | The data input using the sheet key can be read with the master module. 8 keys. |
| ⑧ | LCD display | Displays the data transmitted from the master module. 24 touch keys are provided in the display. |
| ⑨ | Connector | Used to connect the remote unit power supply and the twisted-pair cable. |
| ⑩ | Optical fiber cable connector | Used to connect the optical fiber cable. |
| ⑪ | Station number switch | Sets the station number of the operating box to a value between 1 and (64-occupied station points+1). See Section 3.3 |
| ⑫ | Character generation ROM cover | |

**Fig. 3.1 External View of the AJ35PT-OPB-M1**

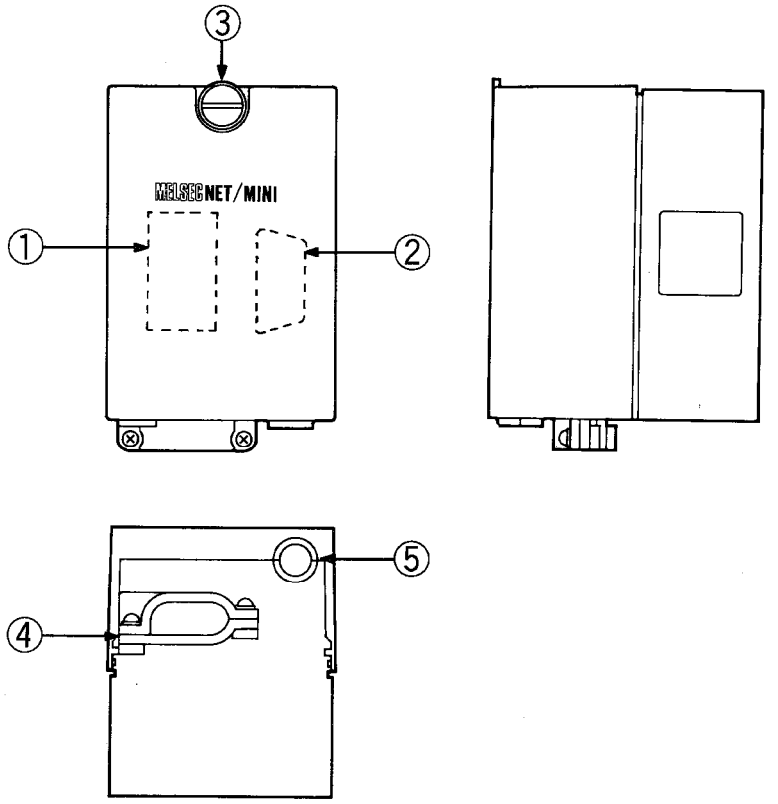
### 3.2.2 Nomenclature of the portable type operating box




| Number | Name | Description |
|---|---|---|
| ① | POWER LED | Lit when 24V DC is supplied. |
| ② | RUN LED | Lit when communication with the master module is being conducted correctly. |
| ③ | LCD contrast control | Adjusts the contrast of the LCD display. |
| ④ | Output LEDs | LED display of the data transmitted from the master module. (8 LEDs) |
| ⑤ | Name board | Used to designate the meanings of each output LED |
| ⑥ | Name board | Used to designate the meanings of each sheet key. |
| ⑦ | Sheet keys | The data input using the sheet key can be read with the master module. 8 keys. |
| ⑧ | LCD display | Displays the data transmitted from the master module. 24 touch keys are provided in the display. |
| ⑨ | Connector | Used to use special AC30MINI-P1 and AC30MINI-P2 cables. |
| ⑩ | Station number switch | Sets the station number of the operating box to a value between 1 and (64-occupied station points+1). See Section 3.3 |
| ⑪ | Character generation ROM cover | |

**Fig. 3.2 External View of the AJ35T-OPB-P1**

### 3.2.3 Nomenclature of the joint box




| Number | Name | Description |
|---|---|---|
| ① | Terminal block for twisted-pair cable | Used to connect the joint box to the MINI-S3 link via twisted-pair cable. |
| ② | Operating box connector | Connector for connecting the operating box. |
| ③ | Cover fastening screw | |
| ④ | Twisted-pair cable inlet port | Tighten only after the twisted-pair cable has been thoroughly wrapped with tape. |
| ⑤ | Operating box connecting cable inlet port | |

**Fig. 3.3 External View of the AJ35T-JB and AJ35T-JBR**

For information concerning the differences between the AJ35T-JB and the AJ35T-JBR, see Section 7.3 Joint Box Specifications.

### 3.3 Setting the Operating Box Station Numbers

Setting the station number of an operating box enables the user to determine the buffer memory address where the output data to be displayed on the LED of the operating box is stored, and to determine the remote terminal number of the terminal transmission data area where the I/O data of the LCD display and the touch keys and sheet keys is stored. The correspondence between the set station number and the remote terminal number is set by the initial data setting of the SW□GP-MINIP that is written to the initial data ROM.
For further information concerning the correspondence between the station number and the remote terminal number, see Section 7.5.2.
Set the station number taking the following into consideration.

(1) Station numbers may be set between 1 and 64.

(2) The I/O refresh range depends on the number of remote stations (buffer memory address 0). For example, if 10 exists at address 0, I/O refresh is performed with remote stations 1 to 10.

(3) Station numbers do not have to be sequential, e.g. as shown in Fig. 3.4.

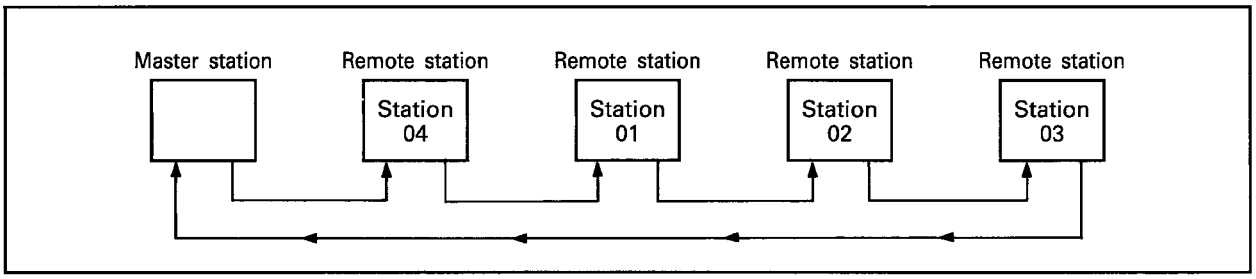



**Fig. 3.4 Remote I/O Station Number Setting**

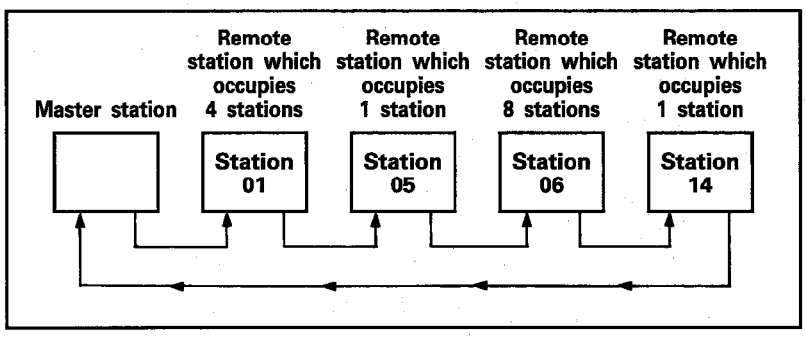
(4) Station numbers must not be skipped. Any station with a number specified but without a remote unit connected is regarded as faulty.

**POINT**

(1) Any station number must not be changed during I/O refresh to prevent input or output fault.

(2) A remote I/O station number must not be repeated in the same loop. After setting, check that the same number has not been used more than once.

(3) Station numbers must be specified in accordance with the number of stations occupied by the remote I/O station, e.g. the remote I/O station that occupies four stations (station 01 in the following example) must be accounted for as stations 1 to 4:



## 3.4 Installation of the Mount Type Operating Box on the Panel

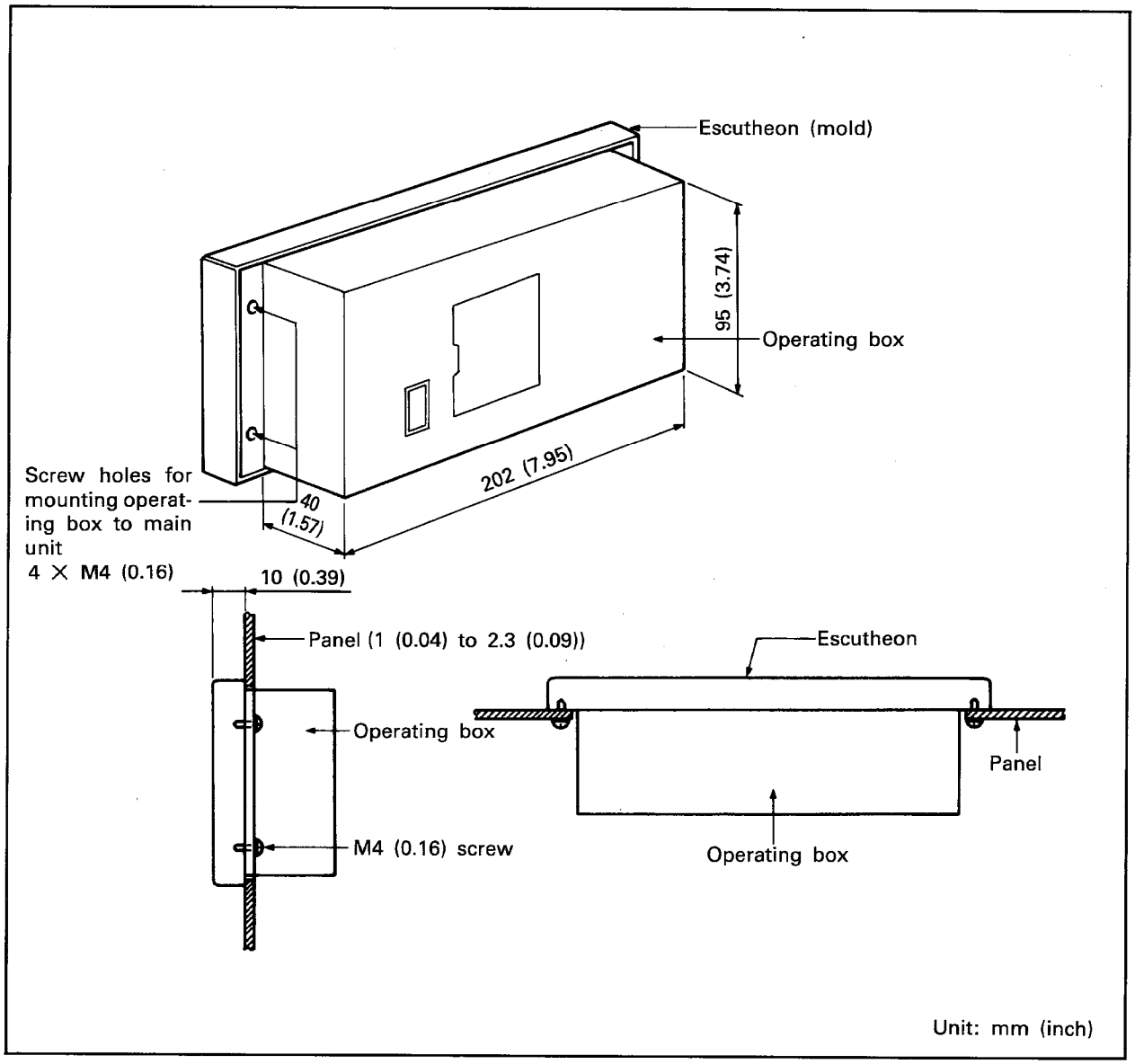



**Fig. 3.5 Diagram for Mounting Operating Box to Panel**

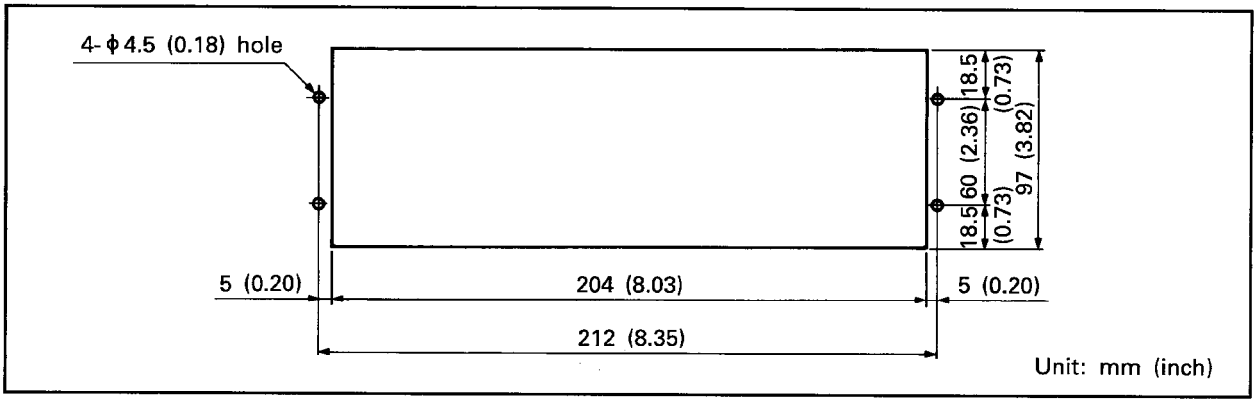



**Fig. 3.6 Dimensions for the Operating Box Mounting Hole Positions**

### 3.5 Installation of the Character Generation ROM

The following two diagrams provide information related to the installation of the character generation ROM in the character generation ROM socket located on the rear panel of the operating box.

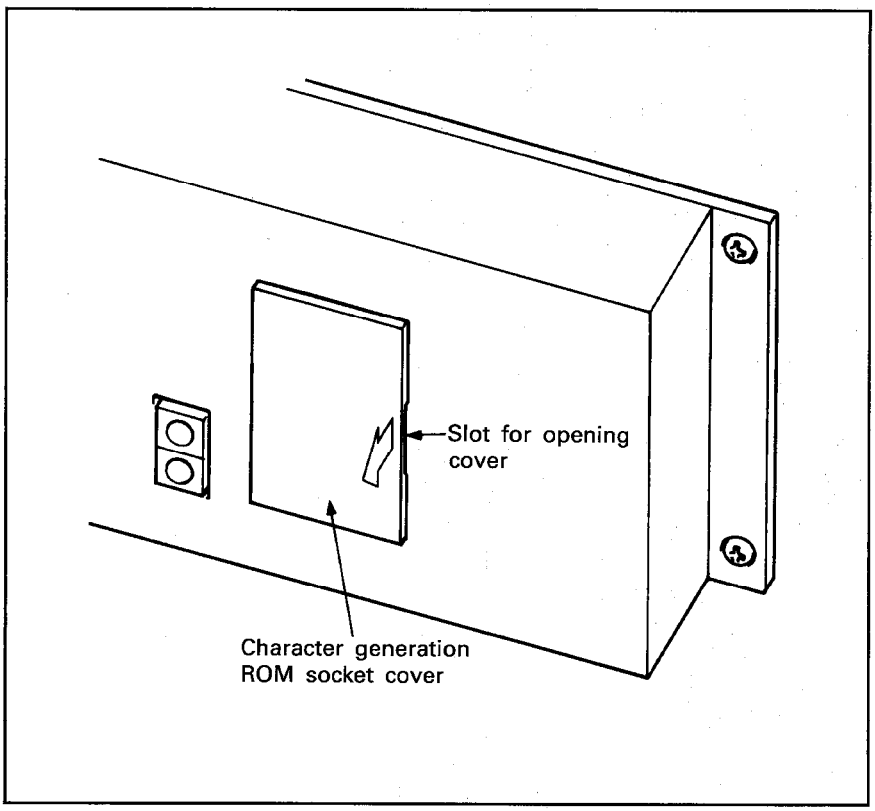



**Fig. 3.7 Removing the Socket Cover**

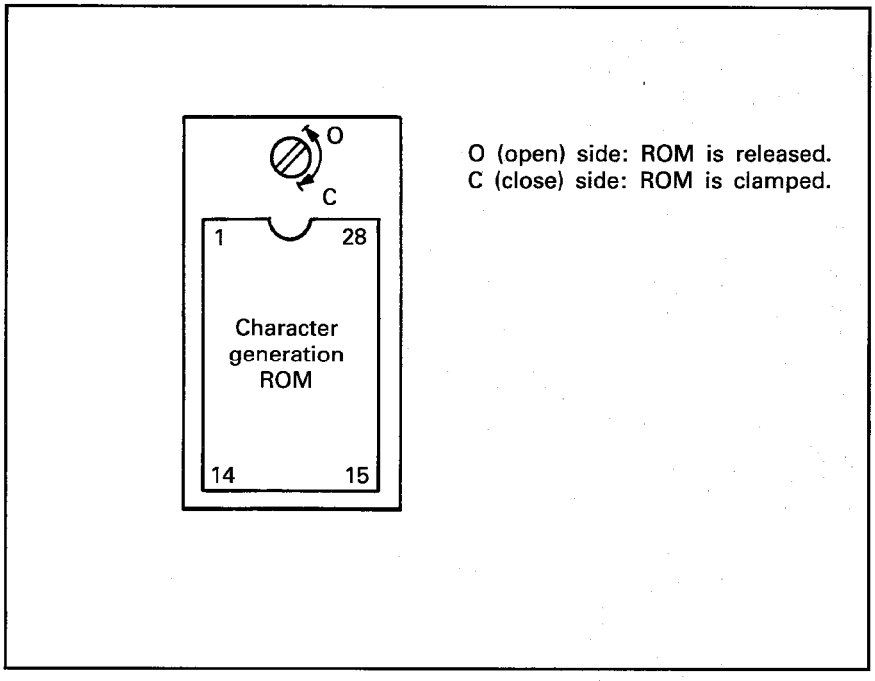



**Fig. 3.8 Character generation ROM socket setting**

## 3.6 Wiring

### 3.6.1 Handling instructions for optical fiber and twisted-pair cables

Handle cables with special care.

(1) Do not bend the cable to less than specified minimum bending radius.
(2) Do not crush the cable.
(3) Do not twist the cable.
(4) Do not pull the cable by the connector.
(5) Do not tension the cable.

### 3.6.2 Connection of optical fiber cables

The only operating box to which optical fiber cable can be connected is the AJ35PT-OPB-M1.

(1) Connect the optical fiber cables as shown in Fig. 3.9.

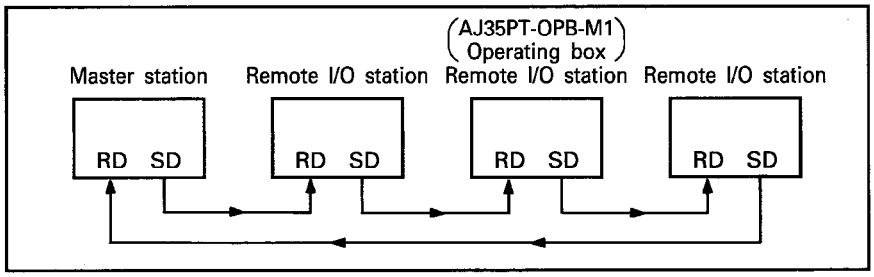



**Fig. 3.9 Connection of Optical Fiber Cables**

**POINT**

**Station numbers may be set independently of the data link cable connection sequence. For further information, see Section 3.3.**

(2) Optical fiber cable engagement

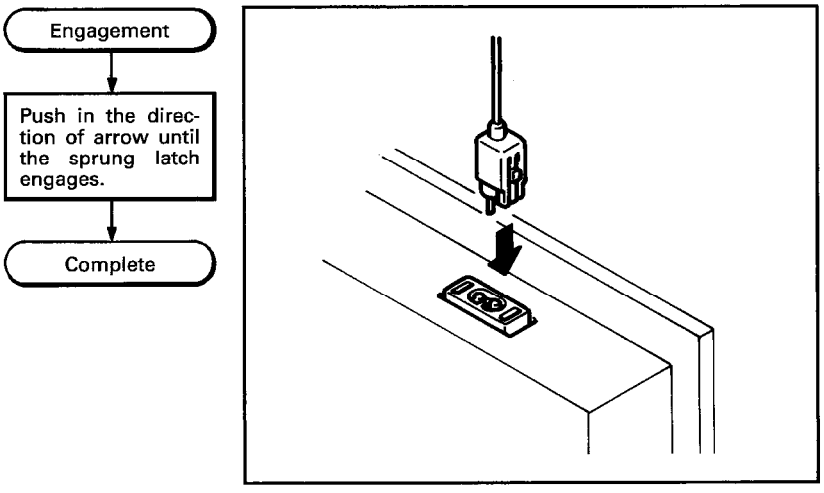



**Fig. 3.10 Optical Fiber Cable Engagement**

(3) Optical fiber cable disengagement

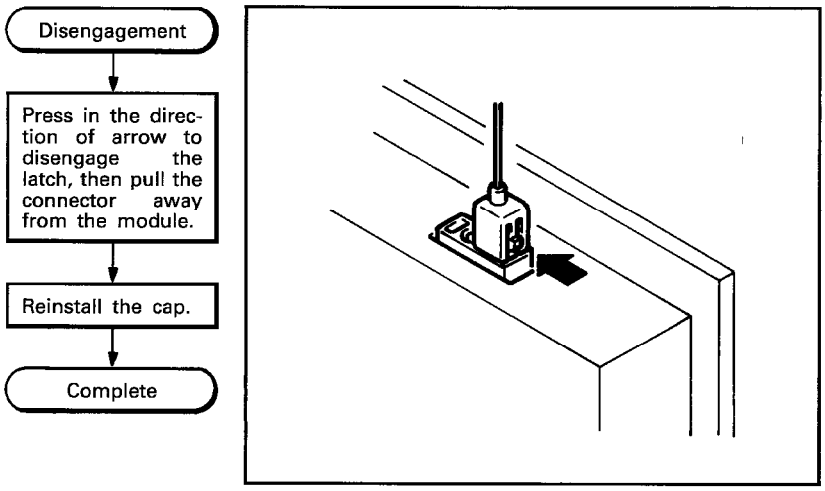
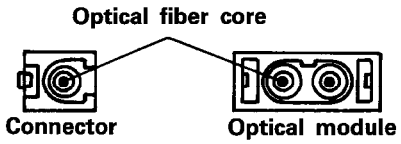


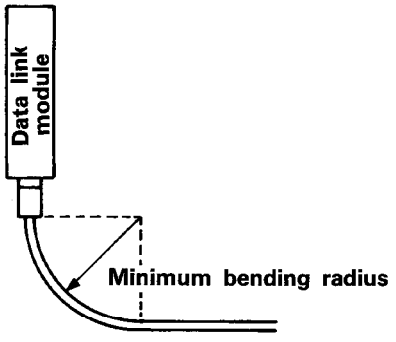

Fig. 3.11 Optical Fiber Cable Disengagement

**POINT**

**(1) Do not touch the optical fiber cores in the connector or the optical module and keep them clean. Always fit the protective cap to the connector and optical module when not in use.**

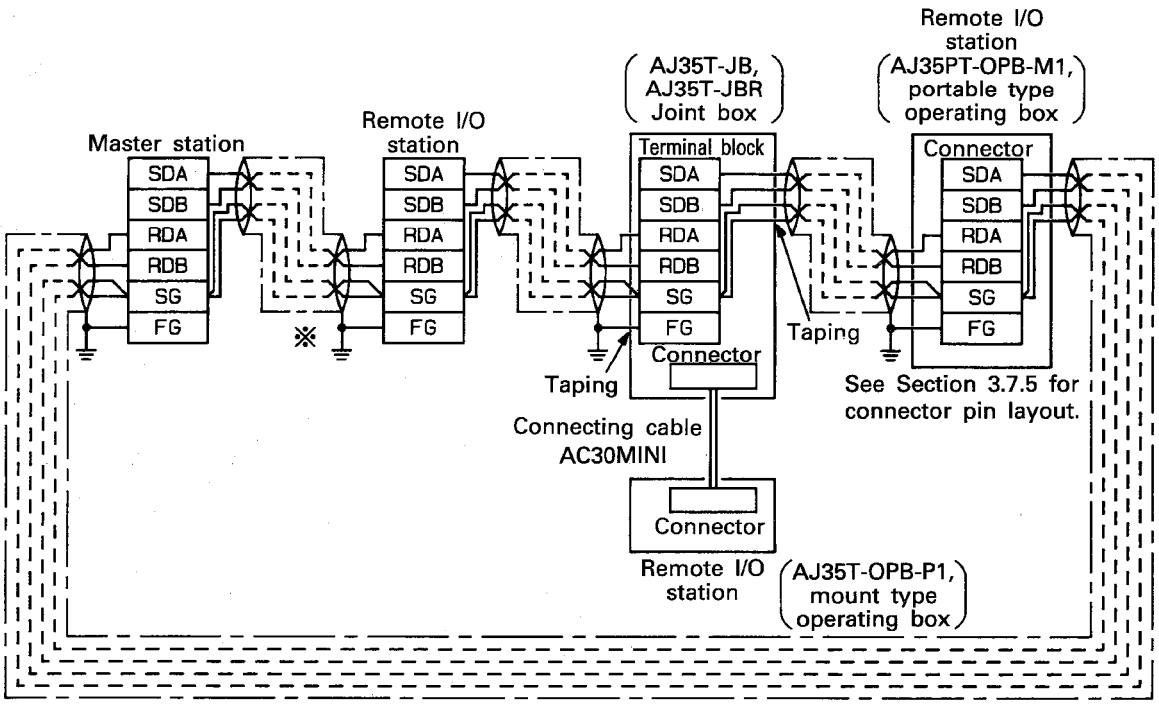



**(2) Any optical fiber cable must be bent within its minimum bending radius to protect the optical fiber core.**



### 3.6.3 Connection of the twisted-pair cables

The method of connecting twisted-pair cable to the AJ35PT-OPB-M1 mount type operating box and the AJ35T-OPB-P1 portable type operating box differs as shown in Fig. 3.12.




*Ground the shields of the receive or transmission terminals at one point.

**Fig. 3.12 Connection of Twisted-Pair Cables**

**REMARKS**

(1) Always use the AJ35T-JB or AJ35T-JBR joint box when the AJ35T-OPB-P1 portable type operating box is used.
Connect the operating box and joint box with the special cable provided.
(2) When using the AJ35PT-OPB-M1 mount type operating box, the user should make the connecting cables using the pin layout shown in Section 3.7.5.
(3) The twisted-pair shield cable terminal block uses M4 (0.16) screws. Use appropriate solderless terminals.
Tightening torque is 8 (6.93) to 14kg·cm (12.1lb·inch).

**POINT**

**When routing twisted-pair cables, pay cautions on the following points:**

**(1) Do not run or bundle the twisted-pair cables close to or with the main circuit, high-tension cables or load cables. Allow at least 100mm (3.94inch) clearance.**
**(2) When connecting the cables to the remote unit terminal block, run the twisted-pair cable as apart from the power supply or I/O cables as possible.**
**(3) Do not use a part of the twisted-pair cables (1 pair of 3 pairs of twisted-pair cable) for the power supply cable.**

### 3.6.4 Connection of units for both optical and twisted-pair cable

Both the optical fiber and twisted-pair cables may be used in the same loop to connect any link unit for use as an optical/twisted-pair data link model as shown in Fig. 3.11.

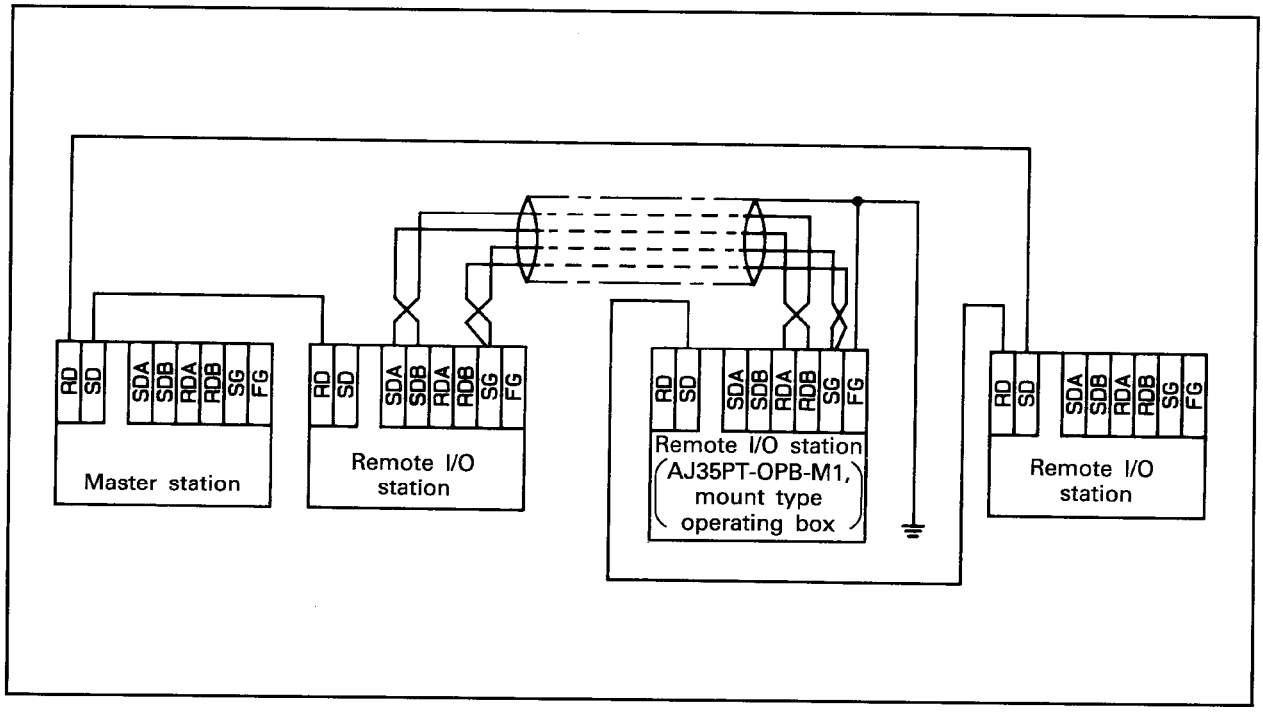



Fig. 3.13 Connection of Cables for Optical/Twisted-Pair Data Link Model

**POINT**

**(1) Ground the shields of the receive or transmission terminals at one point.**
**(2) For the connection of an optical/twisted-pair data link model, use either optical or twisted-pair cable. Connection using both of these cables is not allowed.**
**(3) Fit the supplied protective caps to optical connectors not in use.**

### 3.6.5 Pin layout for the mount type operating box connection

Fig. 3.14 shows the pin layout of the connector used to connect the AJ35PT-OPB-M1 mount type operating box to the MINI-S3 link with the twisted-pair cables.

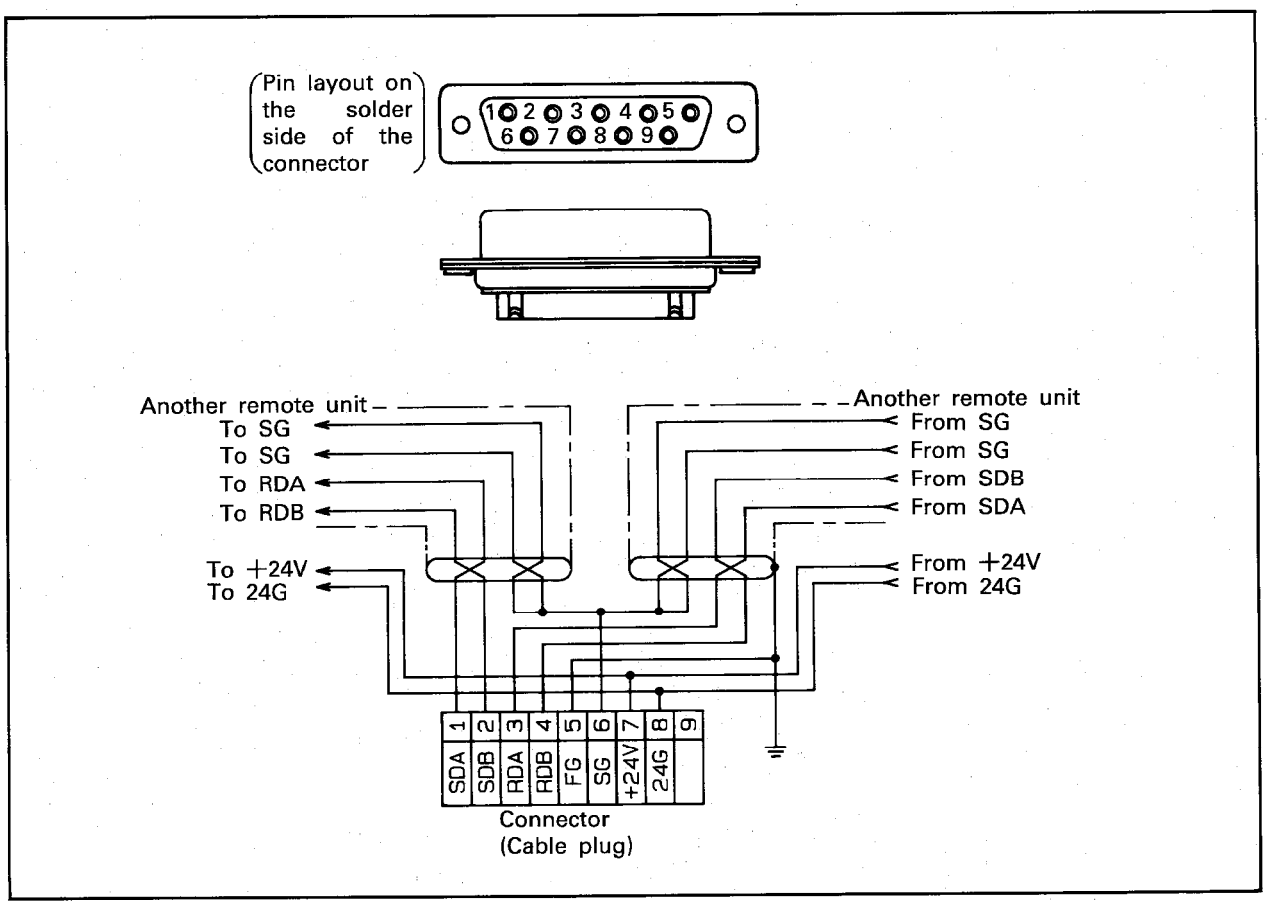



**Fig. 3.14 Connector Pin Layout and Wiring Diagram**

* The connector is supplied with the operating box.
Cable plug ····· 17JE-13090-02 (D8A)
Jack screw ····· 17J-001A

## 4. THE LCD AND DATA DISPLAY

### 4.1 LCD Display Functions

The operating box includes a 3-line by 30-character LCD display, which displays fixed messages stored in the message ROM of the master module, device comments, numeric data, and percentages based on a displayed bar graph.

(1) The following characters can be displayed on the LCD.
- Alphanumeric and special characters
- User designated characters

User designated characters created using the A6GPP/A6PHP and other already created characters stored in the SW□GP-MINIP are stored in the character generation ROM.
The character generation ROM is installed in the character generation ROM socket located on the rear panel of the operating box.

(2) The following messages can be displayed on the LCD.

• Display mode 1: Fixed messages only

Example) A line start

• Display mode 2: Fixed message + defined character

Example) □ Running

Characters stored in the character generation ROM are displayed by designating them by the corresponding code in a sequence program.

• Display mode 3: Fixed message + device comment

Example) X0 □ was turned on.

Comments stored in the CPU comment area are read and assigned the number; the required comment is designated by the number to be displayed.

• Display mode 4: Fixed message + numerical data

Example) Production record Machinery A □ Machinery B □

Numerical values set by the BCD are displayed.

• Display mode 5: Fixed message + bar graph data

Example) Goal achievement ▨ 40%

The graph is automatically shown using the values set from 0 to 100.

Fixed message number, fixed messages (30 characters), display mode are set using the SW□GP-MINIP and stored in the message ROM.
The message ROM is installed in the message ROM socket of the master module.
Up to 400 fixed messages can be registered.

### 4.2 Procedures for Creation of Messages

The following procedures should be used in the creation of messages using the SW[ ]GP-MINIP.

(1) The messages to be registered are designated in 25 point units.
Up to 400 messages can be registered.

(2) Messages are created starting with Message 1 and continuing with consecutive numbers. The display modes for each are designated and the messages are created in that order.
Up to 30 characters can be used in any one message.
Each character can be defined one of the following attributes; highlighted display, blinking, key underline, and monitor display.

Highlighted display:
The character is displayed highlighted, such as "A", when displayed in a column position where the highlighted display attribute is designated.

Blinking:
The character is displayed blinking, such as " " ⟷ "A", when displayed in a column position where the blinking display attribute is designated.

Key underline display:
The key underline display is used to invoke the touch key input function of the LCD. The following diagram shows the relationship between the columns and the key locations.

Touch keys (8 keys by 3 lines for 24 keys)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. 1 | No. 2 | No. 3 | No. 4 | No. 5 | No. 6 | No. 7 | No. 8 |
| No. 9 | No. 10 | No. 11 | No. 12 | No. 13 | No. 14 | No. 15 | No. 16 |
| No. 17 | No. 18 | No. 19 | No. 20 | No. 21 | No. 22 | No. 23 | No. 24 |

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Column locations of the LCD

The touch key designated by the key underline display attribute is effective only when the corresponding message is displayed on the LCD. If another message is displayed, the touch key in the column designated by the key underline corresponding to the new displayed message becomes effective.
Key underline display designation cannot be used for messages designated in Display Mode 4 (present value monitor).

Monitor display:

For messages for which the display mode 4 (present value monitor) is designated, the present value can be displayed by designating the monitor display at the column where the present value being monitored should be displayed.

The five types of display modes described in Section 4.1 (2) are displayed using the following name on the LCD display during message creation.

Display Mode 1: MESSAGE
Display Mode 2: MESSAGE + JIS CODE
Display Mode 3: MESSAGE + COMMENT
Display Mode 4: PRESENT VALUE MONITOR
Display Mode 5: BAR GRAPH

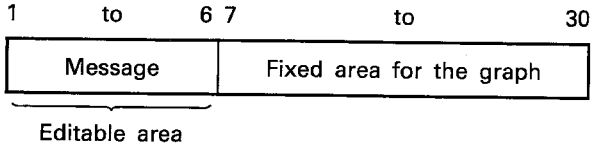
*JIS: Japanese industrial standard

(3) When using Display Mode 3 (message + comment), the comments for the sequence program that are stored in the user floppy disk are read and a comment number assigned to each required comment. The comments are then displayed by designating the comment number.
The SW□GP-MINIP type system floppy disk is used to read the comments from the user floppy disk and to assign numbers to them.

The number of comments that can be stored is determined by the number of stored messages as shown in the following table.

| Registered Message Numbers | Registered Comment Numbers | Registered Message Numbers | Registered Comment Numbers |
|---|---|---|---|
| No.1 to 25 | 1920 | No.1 to 224 | 896 |
| No.1 to 50 | 1792 | No.1 to 250 | 768 |
| No.1 to 75 | 1664 | No.1 to 275 | 640 |
| No.1 to 100 | 1536 | No.1 to 300 | 512 |
| No.1 to 125 | 1408 | No.1 to 325 | 384 |
| No.1 to 150 | 1280 | No.1 to 350 | 256 |
| No.1 to 175 | 1152 | No.1 to 375 | 128 |
| No.1 to 200 | 1024 | No.1 to 400 | 0 |

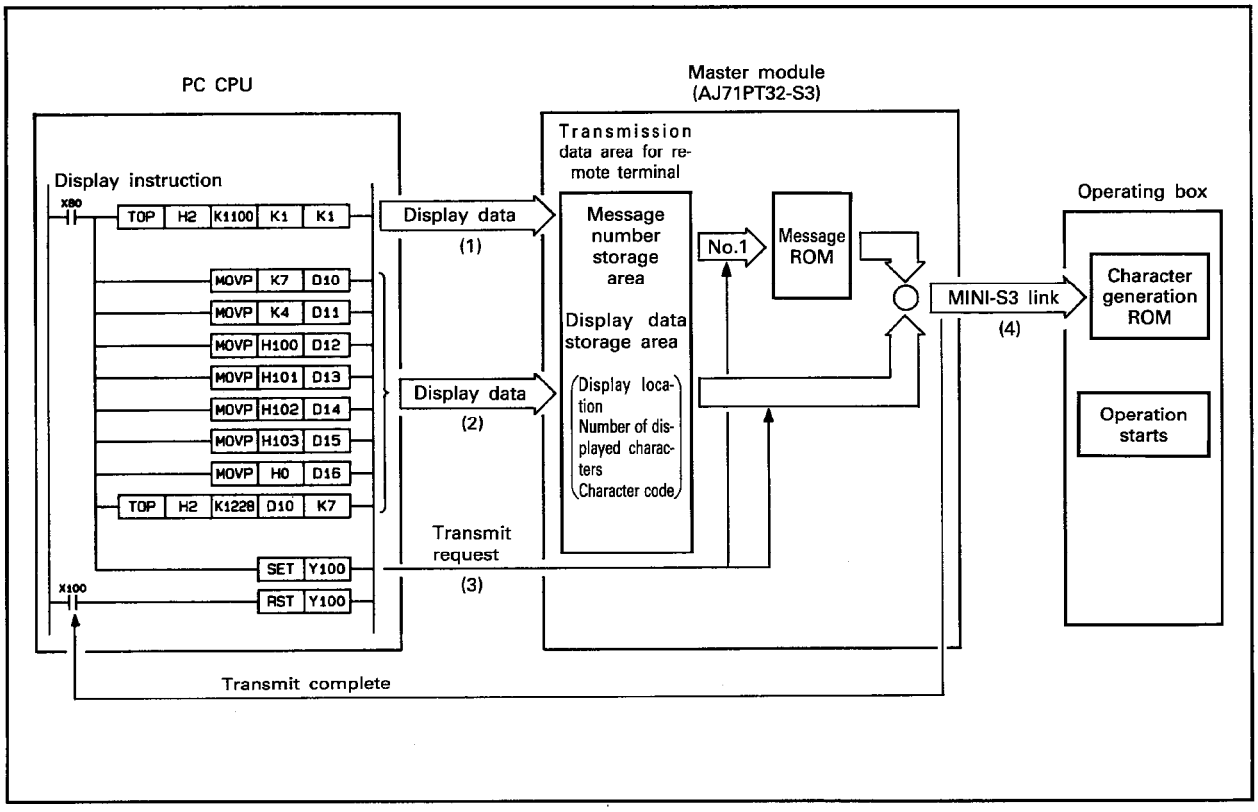
(4) When displaying in the Display Mode 5 (message + bar graph), the range in which the message can be edited is shown in the following diagram.



## 4.3 Display Procedures

The display of messages, comments, numeric data, or graphs on the LCD display unit of the operating box is processed in the following manner. First, when the TO instruction is executed by the sequence program, the message number, monitor data, bar graph value, character code, and comment number are written to the transmission data area of the remote terminal number that corresponds to the transmission data area for remote terminal of the master module. After this, the data is displayed when the transmit request flag is set to ON.

The correspondence between the station number of the operating box and the remote terminal number is set by the initial data setting of the SW□GP-MINIP. It is then stored in the initial data ROM, which is installed in the master module.
For further information concerning the I/O signals between the master module and the operating box or the transmission data area for remote terminal, see Sections 7.4 and 7.5 respectively.




(1) The number corresponding to the number of the fixed message that is to be displayed is stored in the buffer memory.

(2) The data that is to be displayed simultaneously with the fixed message is set in the display data storage area of the buffer memory.

(3) When the master module receives a transmit request from the PC CPU, the message corresponding to the designated message number is read from the message ROM.
The display data to be simultaneously displayed with the message from the message ROM is read from the display data storage area in accordance to the display mode set for each message stored in the message ROM.

(4) After the master module has simultaneously read the message and display data, they are "assembled" and transmitted to the operating box.

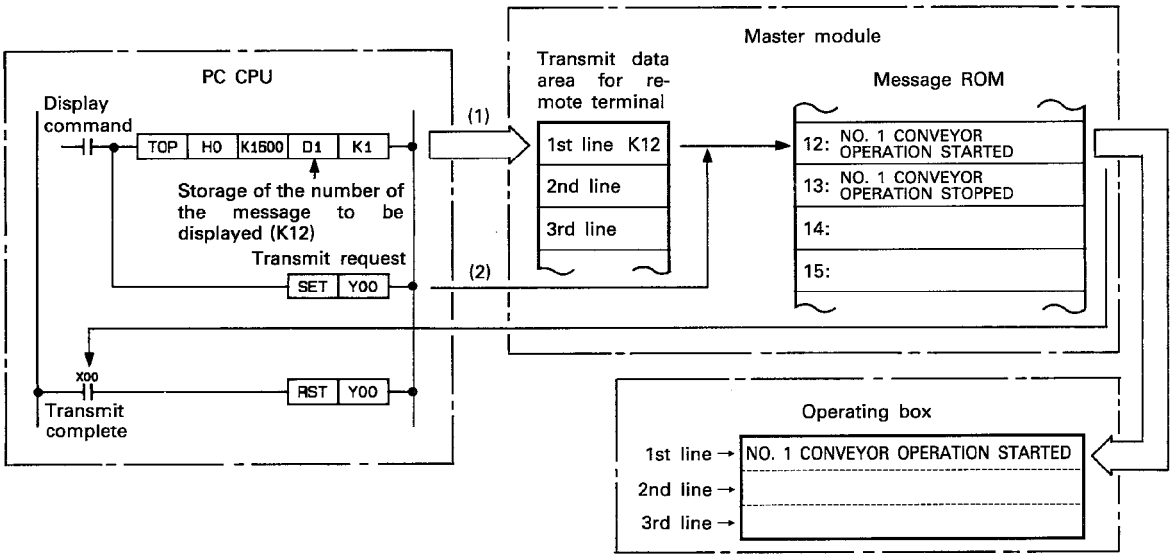
**POINT**

**When there are lines in which a message is not displayed, set message No. 0 (SP code) for such lines so that display data is set for all of three lines of the LCD display unit. Unless the display data is not set for all of three lines, the setting data error occurs precluding correct display.**

## 4.4 Example of Programming the Display of a Fixed Message

The following diagram shows the process used to display a fixed message which has been stored in the message ROM by the SW□GP-MINIP.

(1) Process




1) The message number of the fixed message that is to be selected from those stored in the message ROM and displayed is written to the transmission data area for remote terminal by the TO instruction.
2) The transmit request flag for the master module is set ON by a signal from the PC CPU. When the transmit request flag is set ON, the message corresponding to the message number stored in the transmission data area is read from the message ROM and output to the operating box.

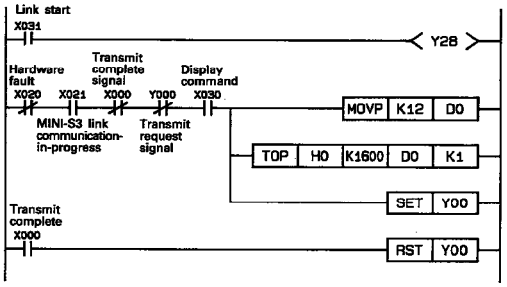


IB (NA) 66218-A

(2) Program example

The following example displays a fixed message on the first line of the LCD of operating box that is designated as remote terminal number "1".

〈Conditions〉 Receive data area head address: 1100
Transmission data area head address: 1600
Display message number: 12
No. 12 message: Display Mode 1 (message)



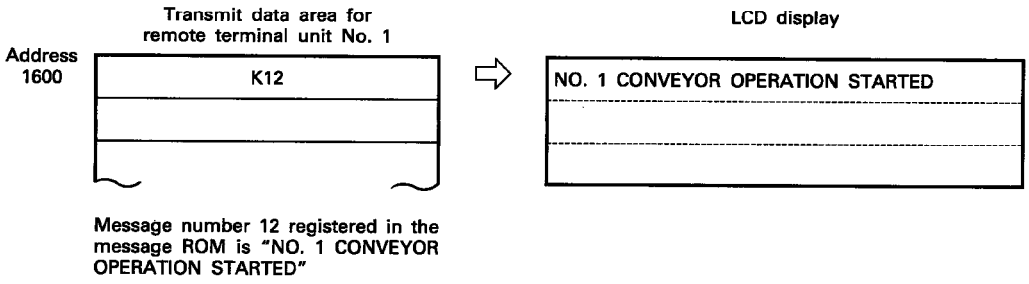

MINI LINK COMMUNICATION start

Message number "12" is set in D0.

The contents of D0 is stored in the first line message number storage area of the transmission data area.

Transmit request sent to remote terminal unit No. 1.

* See Section 4.3.

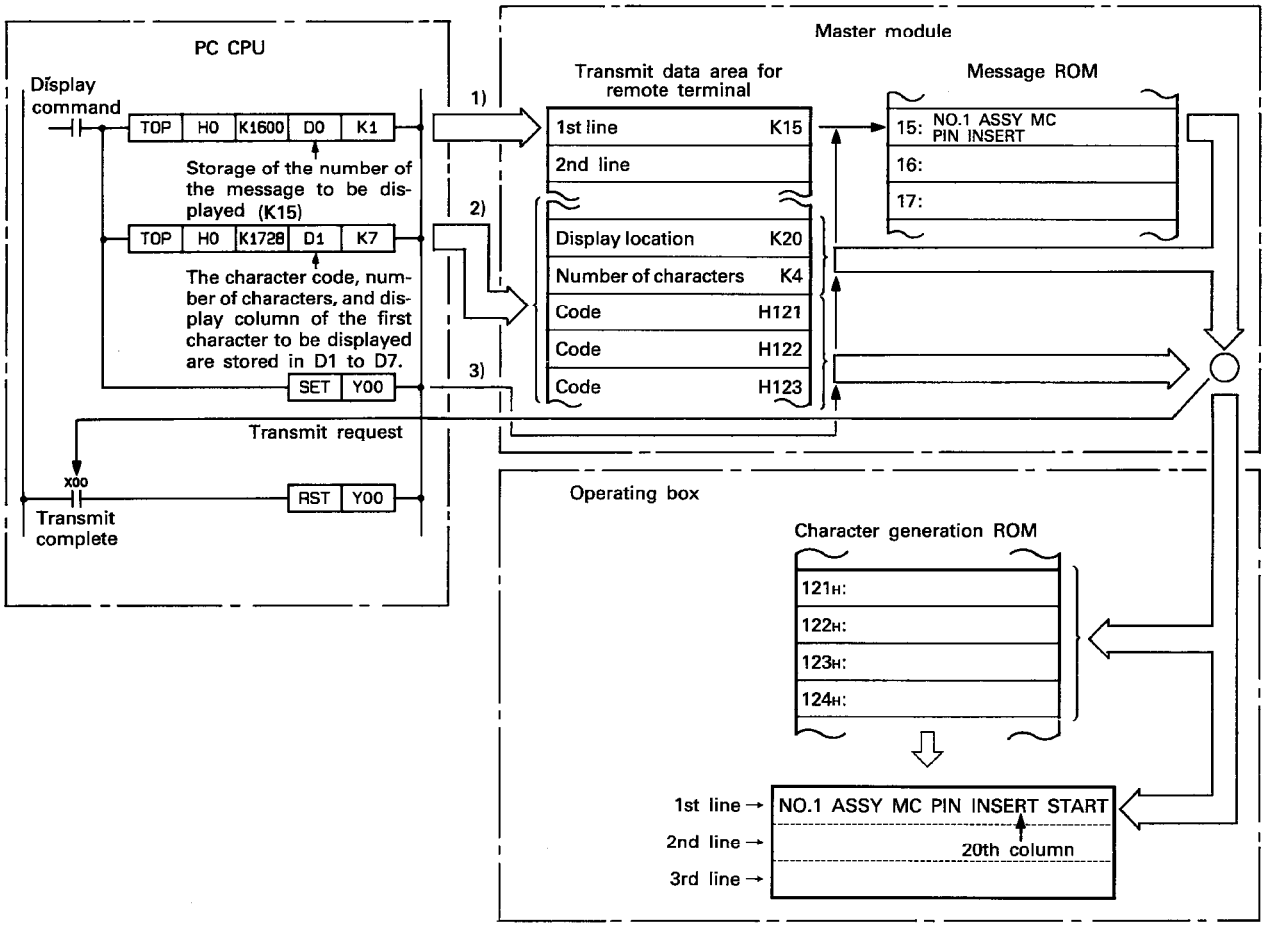



Message number 12 registered in the message ROM is "NO. 1 CONVEYOR OPERATION STARTED"

## 4.5 Example of Programming the Display of a Fixed Message with a Designated Character

The following diagram shows the process used to display a fixed message that has been stored in the message ROM by the SW□GP-MINIP with a character that has been stored in the character generation ROM.

(1) Process




1) The message number of the fixed message that is to be selected from those stored in the message ROM and displayed is written to the transmission data area for remote terminal by the TO instruction.

2) The display column, number of characters, and code of the characters stored in the character generation ROM that are to be displayed simultaneously with the fixed message are written to the transmission data area for remote terminal by the TO instruction.

3) The transmit request flag for the master module is set ON by a signal from the PC CPU.
When the transmit request flag is set ON, the message corresponding to the message number stored in the transmission data area is read from the message ROM and output to the operating box.
The data related to the character display is also simultaneously output.



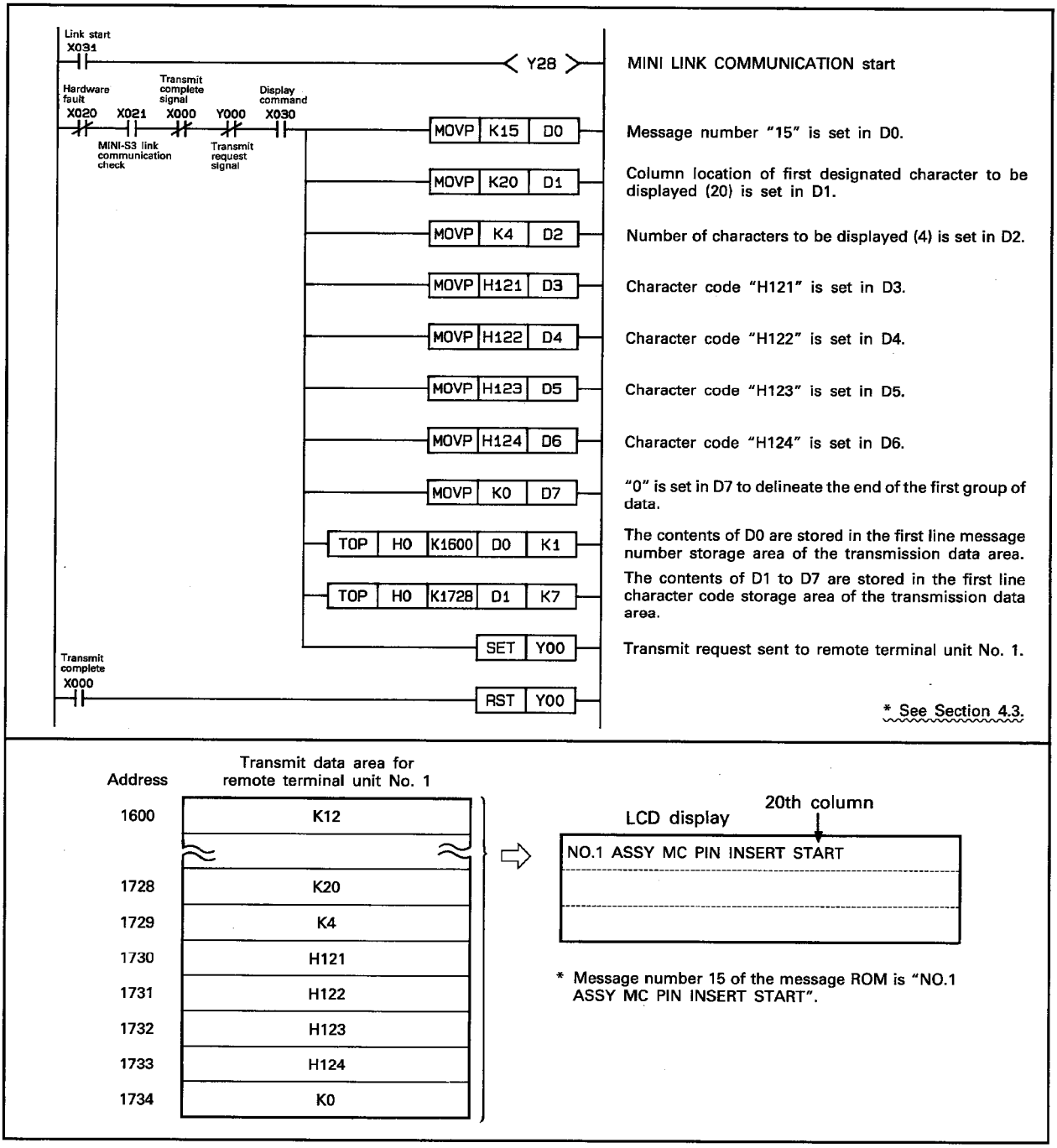
IB (NA) 66218-A

(2) Program example

The following example displays a fixed message and a designated character on the first line of the LCD display unit of operating box that is designated as remote terminal number "1".

〈Conditions〉 Receive data area head address: 1100
Transmission data area head address: 1600
Display message number: 15
No. 15 message: Display Mode 2 (message + JIS code)
Display character code: H121, H122, H123, H124
Column location of first designated character to be displayed: 20th column

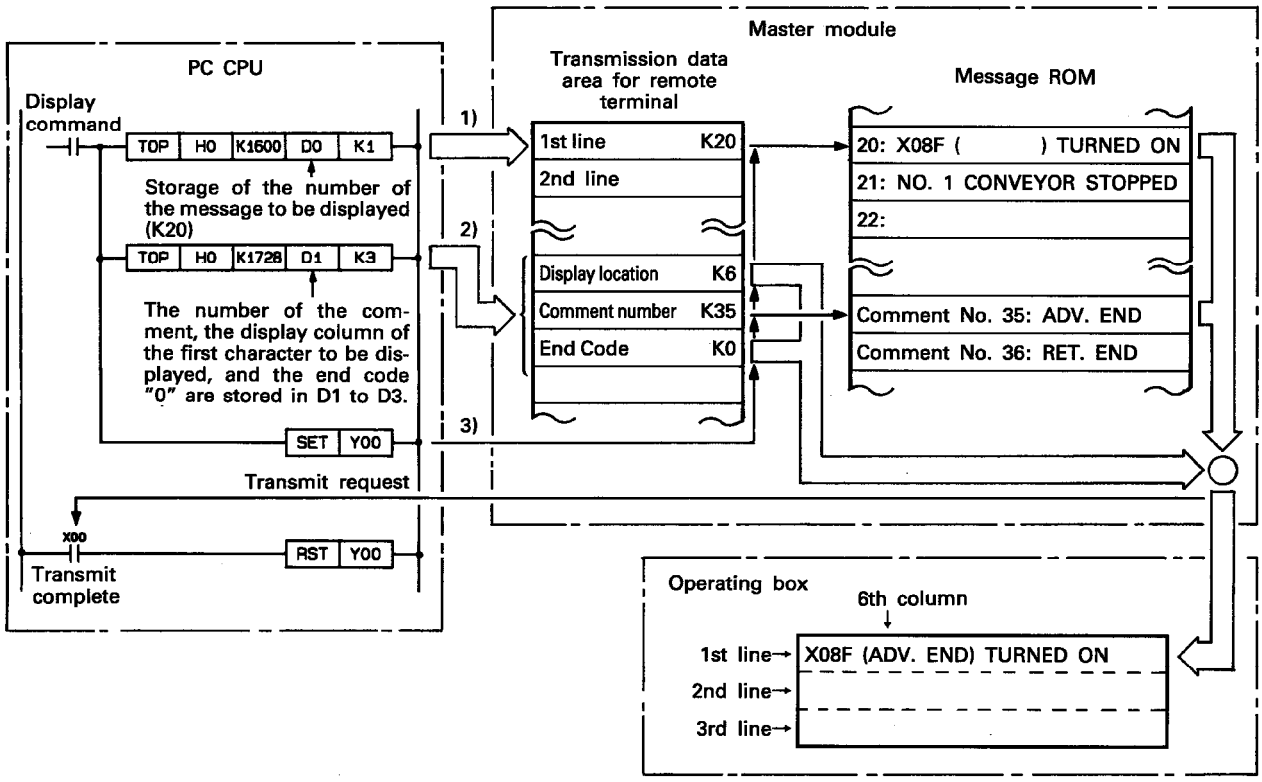
*JIS: Japanese industrial standard



## 4.6 Example of Programming the Display of a Fixed Message with a Comment

The following diagram shows the process used to display a fixed message and comment that has been stored in the message ROM by the SW□GP-MINIP.

(1) Process




1) The message number of the fixed message that is to be selected from those stored in the message ROM and displayed is written to the transmission data area for remote terminal by the TO instruction.
2) The comment number of the comment that is to be selected from those stored in the message ROM and displayed is written to the transmission data area for remote terminal by the TO instruction.
3) The transmit request flag for the master module is set ON by a signal from the PC CPU.
   When the transmit request flag is set ON, the message and comment corresponding to the message number and comment number stored in the transmission data area are read from the message ROM and output to the operating box.

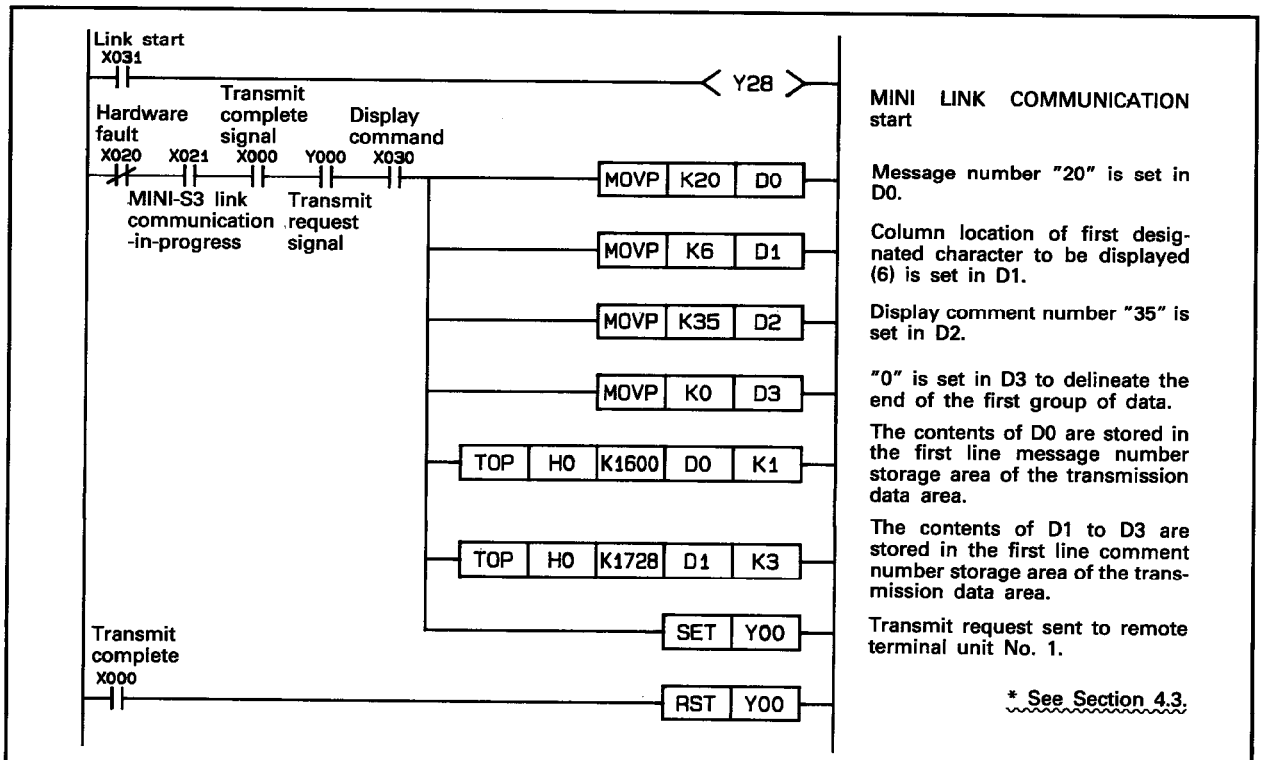


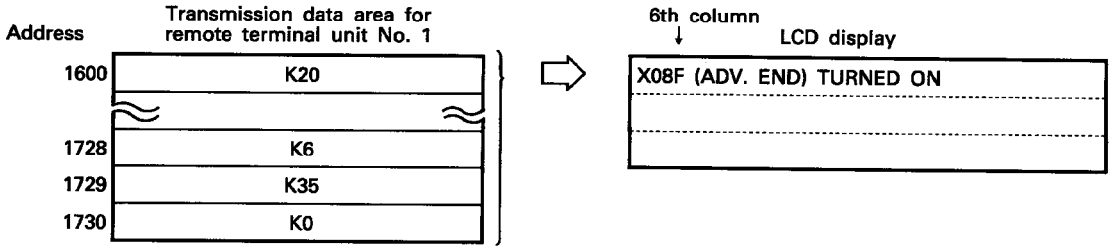
IB (NA) 66218-A

(2) Program example

The following example displays a fixed message and a designated comment on the first line of the LCD display unit of operating box that is designated as remote terminal number "1".

〈Conditions〉 Receive data area head address : 1100
Transmission data area head address : 1600
Display message number : 20
No. 20 message : Display Mode 3 (message + comment)
Designated comment number : 35
Column location of first desig- nated character to be displayed : 6th column



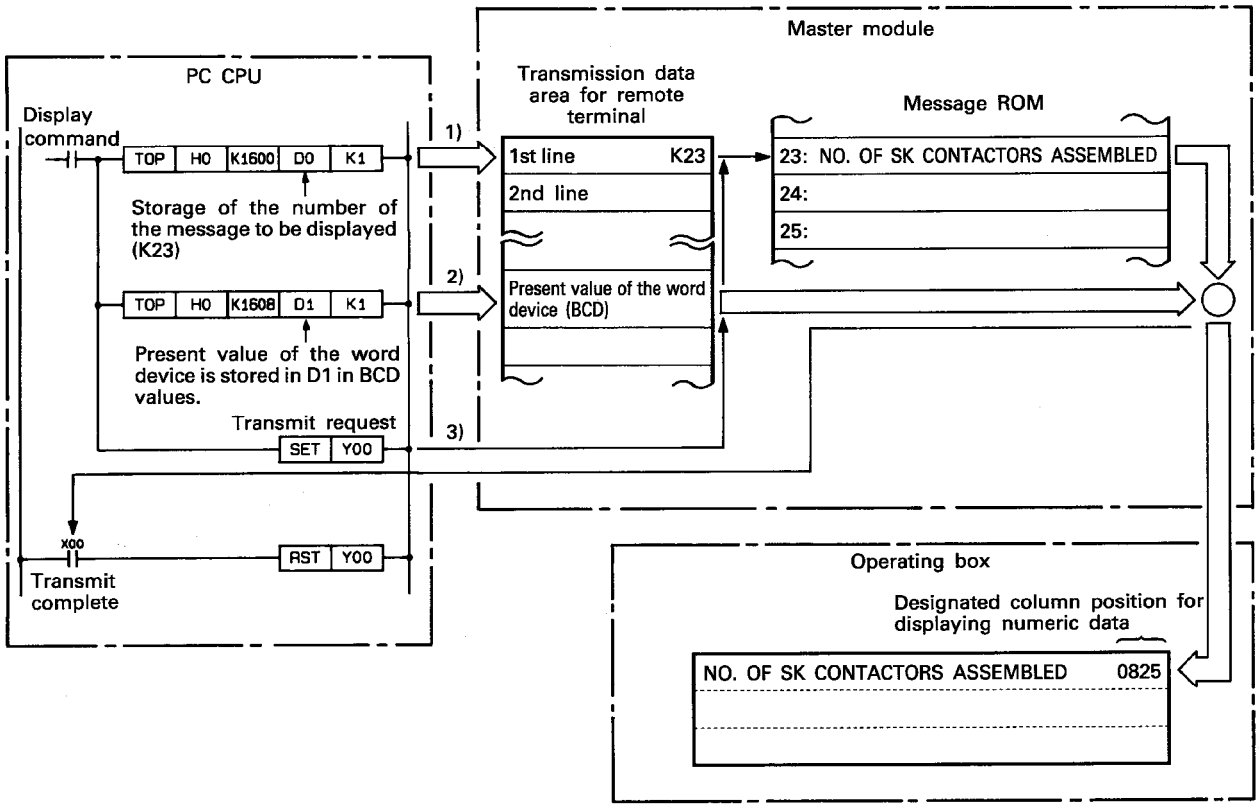




- Message number 20 of the message ROM is "X08F ( ) TURNED ON".
- Comment number 35 of the message ROM is "ADV. END".

## 4.7 Example of Programming the Display of a Fixed Message with a Numerical Value

The following diagram shows the process used to display a fixed message that has been stored in the message ROM by the SW□GP-MINIP and the present numeric value of a word device.

(1) Process




1) The message number of the fixed message that is to be selected from those stored in the message ROM and displayed is written to the transmission data area for remote terminal by the TO instruction.
2) The present value of word device of the PC CPU is converted to the BCD value and written to the transmission data area for remote terminal by the TO instruction.
3) The transmit request flag for the master module is set on by a signal from the PC CPU.
   When the transmit request flag is set on, the message corresponding to the message number stored in the transmission data area is read from the message ROM and output to the operating box.
   The value of the word device stored in the transmission data area for remote terminal is simultaneously output to the operating box.

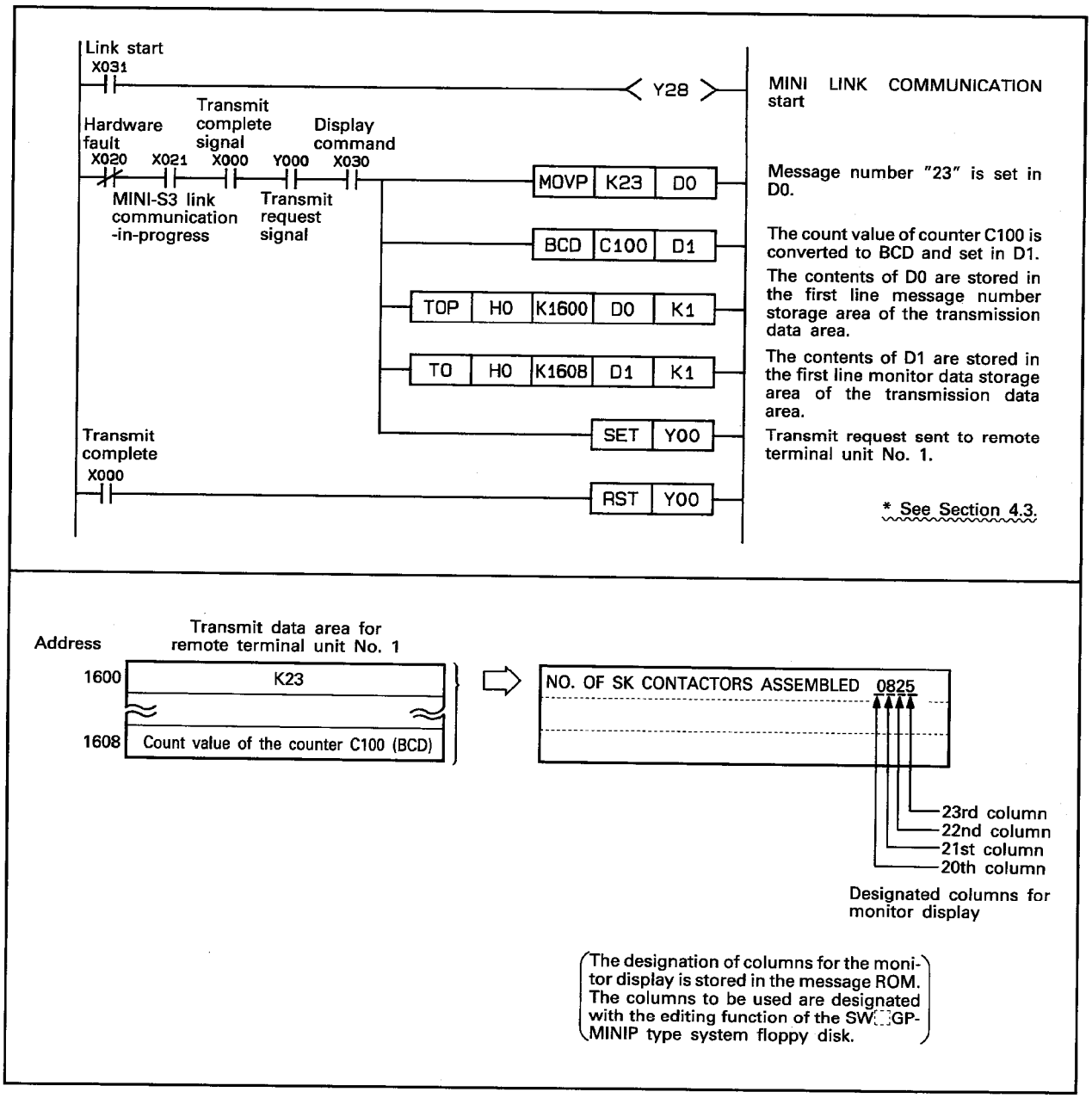


IB (NA) 66218-A

(2) Program example

The following example displays a fixed message and the present value of a designated device on the first line of the LCD display unit of operating box that is designated as remote terminal number "1".

〈Conditions〉 Receive data area head address : 1100
Transmission data area head address : 1600
Display message number : 23
No. 23 message : Display Mode 4 (message+ present value monitor)
Designated device : C100



### 4.8 Example of Programming the Display of a Fixed Message with a Bar Graph

The following diagram shows the process used to display a fixed message that has been stored in the message ROM by the SW□GP-MINIP and the present numeric value of a word device as a bar graph and a percentage.
When the present value of a word device is to be displayed as a bar graph and a percentage, the value has to be processed by the sequence program as shown below.

〈Example〉 Minimum and maximum values stored in the word device for control

Minimum value: 0
Maximum value: 2500

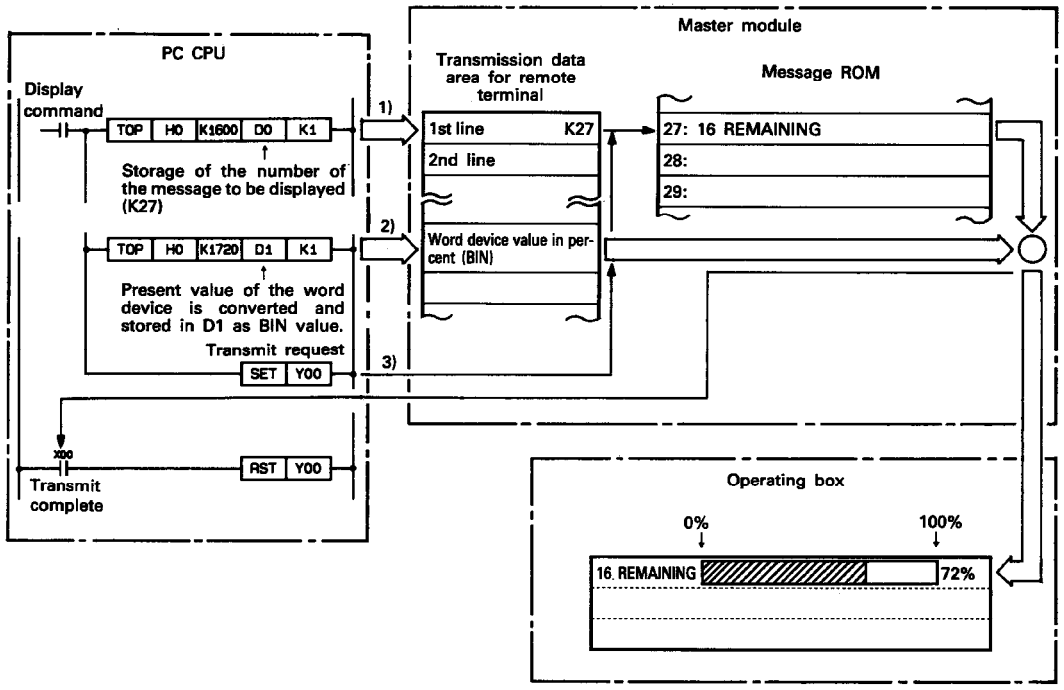
1/25 Conversion to percentages

Minimum and maximum values (BIN) to be used to display device value as a bar graph and percentage

Minimum value: 0
Maximum value: 100

0~100%

(1) Process

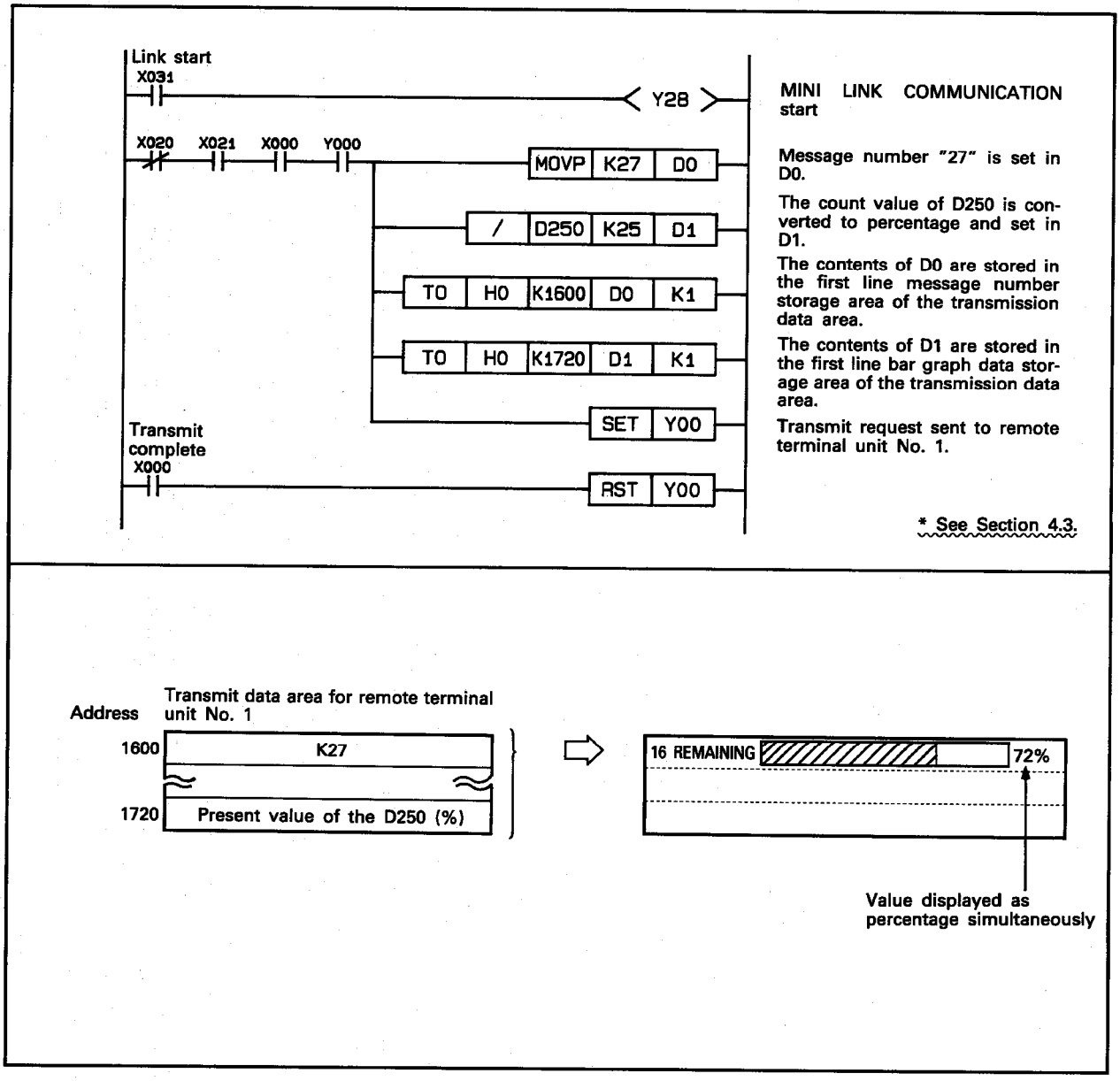



1) The message number of the fixed message that is to be selected from those stored in the message ROM and displayed is written to the transmission data area for remote terminal by the TO instruction.
2) The present value of word device of the PC CPU is converted to percentage (BIN) and written to the transmission data area for remote terminal by the TO instruction.
3) The transmission request flag for the master module is set ON by a signal from the PC CPU.
When the transmit request flag is set ON, the message corresponding to the message number stored in the transmission data area is read from the message ROM and output to the operating box.
The percent value of the word device stored in the transmission data area for remote terminal is simultaneously output to the operating box.

(2) Program example

The following example displays a fixed message and the present value of a designated device as a bar graph and percentage on the first line of the LCD display unit of operating box that is designated as remote terminal number "1".

〈Conditions〉 Receive data area head address : 1100
Transmission data area head address : 1600
Display message number : 27
No. 23 message : Display Mode 5 (message + bar graph)
Designated device : D250 (minimum value: 0; maximum value: 2500)

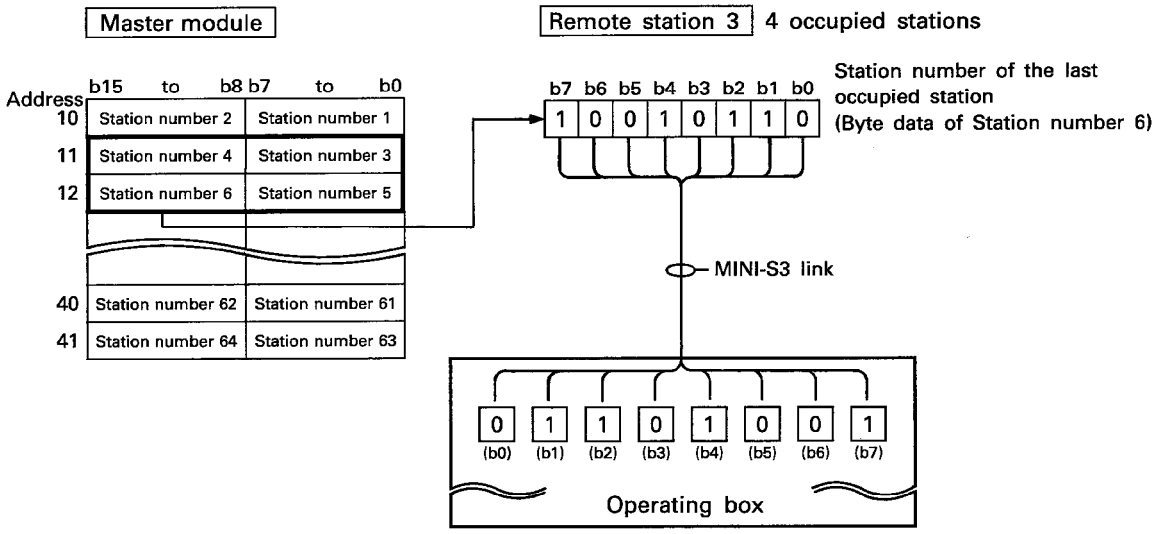


## 5. DISPLAYING TO THE LEDS

### 5.1 LED Display Function

The operating box provides 8 LEDs that display the ON/OFF bit pattern of data that is written to the corresponding station number location of transmission data storage area for batch refresh in the master module.

〈Example〉 The following diagram shows an example of the operating box that has been designated as station number 3.

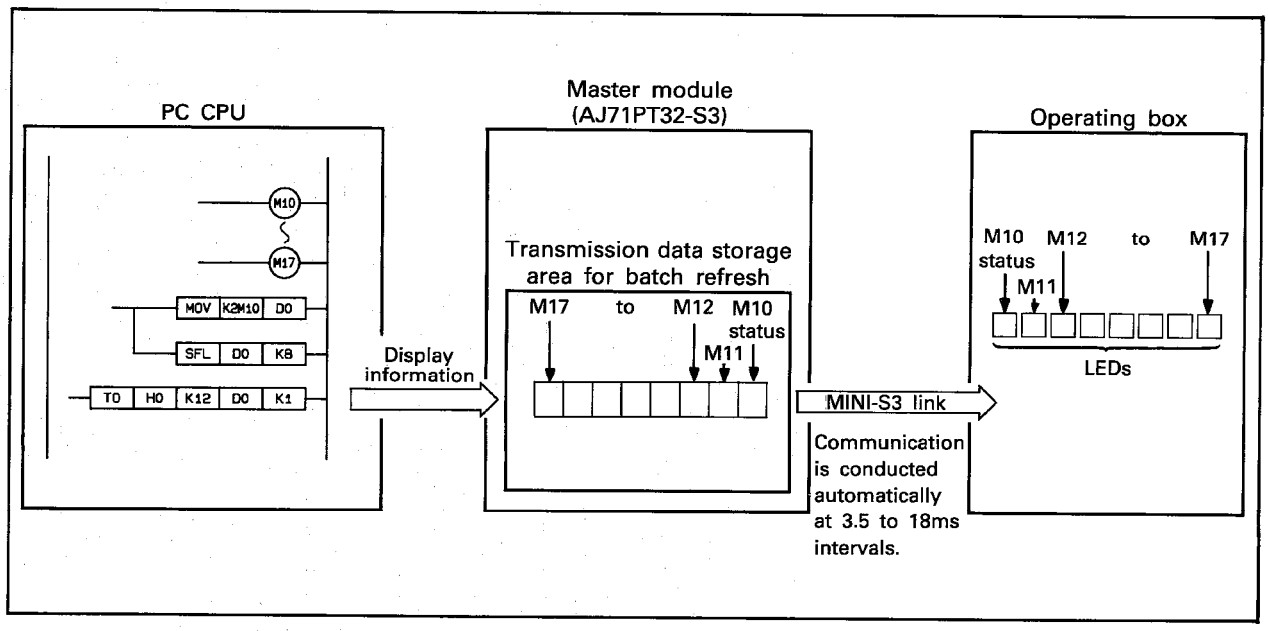





IB (NA) 66218-A

## 5.2 Display Procedure

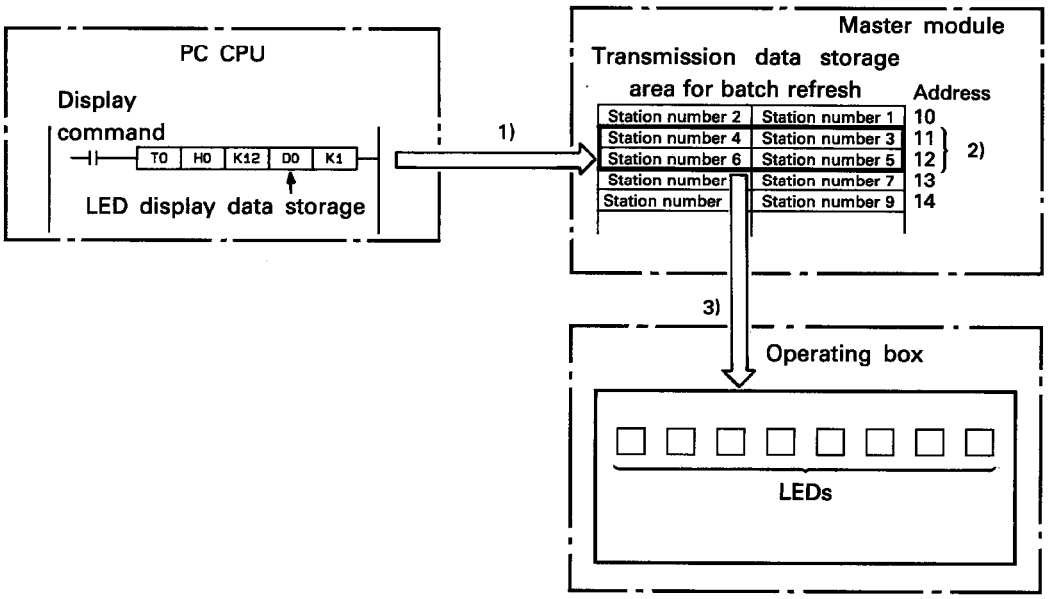
To display the data using the LEDs on the operating box, write the ON/OFF data of the bit pattern to the address area, corresponding to the designated station number of the operating box, in the transmission data storage area for batch refresh in the master module.
When the ON/OFF bit pattern data is written to the transmission data storage area, the data is then transmitted automatically to the operating box at 3.5 to 18ms intervals and displayed on the LEDs.
The LED display corresponds to each bit of the transmission data storage area of the master module.
When a "1" is written to a bit in the transmission data storage area, the LED corresponding to that bit lights. When a "0" is written to a bit in the transmission data storage area, the LED corresponding to that bit extinguishes.
For further information concerning the transmission of I/O signals between the master module and operating box and the transmission data storage area for batch refresh, see Sections 7.4 and 7.5, respectively.



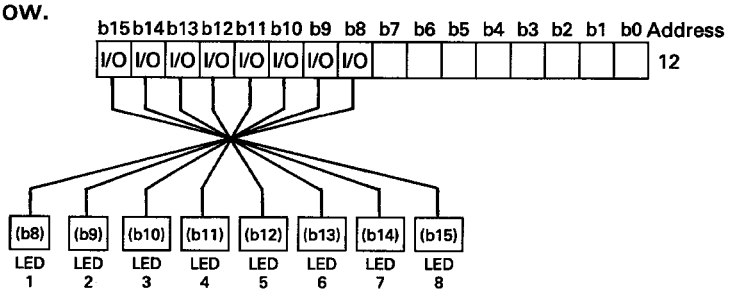
## 5.3 LED Display Program Example

The following section describes the programming for the display of the ON/OFF data that is written to the transmission data storage area for batch refresh of the master module.

(1) Processing




1) LED display ON/OFF data is written to the corresponding station number location of transmission data storage area for batch refresh by the TO instruction.
2) The transmission data storage area for batch refresh is configured in two bytes per address. Since one byte is required for one station, two stations are located in every address.
   Each operating box occupies four stations, and the display data storage area for the LED is contained in the last station number location of the occupied station.
   When the operating box remote I/O station number is set to Station 3 as shown in the diagram above, the LED display data is written to the area for Station number 6.
3) The display data written to the transmission data storage area for batch refresh is automatically transmitted to the operating box at 3.5 to 18ms intervals turning the LEDs ON and OFF.
   The relationship between the pattern of the ON/OFF data stored in the transmission data storage area for batch refresh and the display of the same by the LEDs is shown below.

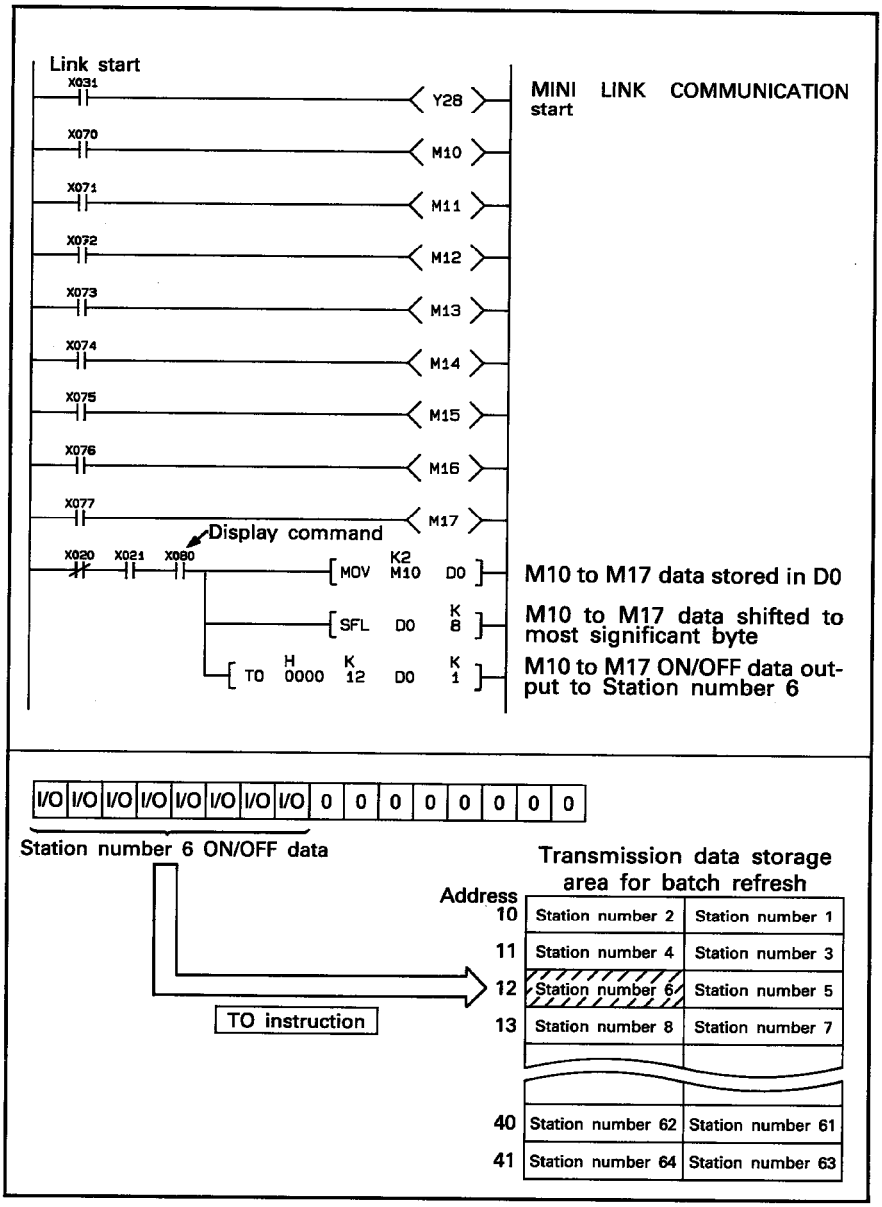





IB (NA) 66218-A

(2) Program example

The following is an example of a program that outputs the ON/OFF data of M10 to M17 to the LEDs when the station number of the operating box is 3.

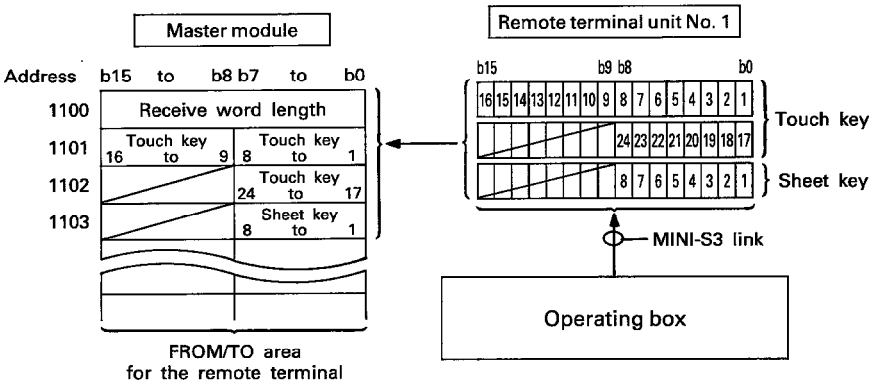


# 6. INPUT USING THE TOUCH KEYS AND SHEET KEYS

## 6.1 Key Input Function

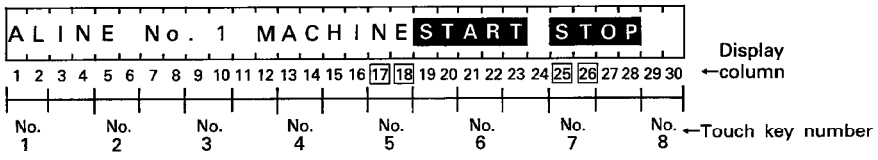
The operating box is provided with 24 touch keys and 8 sheet keys. The status of the input data can be read because the data input from the keys is stored in the transmission data area for remote terminal of the master module.

〈Example〉 The following diagram shows an example for operating box, the station number of which is 3 and which is set to remote terminal number "1". In this example, the transmission data area range is set to default values.




The touch keys located on the screen of the LCD can be used as "hot buttons" in the display message for switching purposes. Each line of the LCD display unit contains 8 touch keys. The location of a key which can be input is registered the message ROM corresponding to the message when the message is registered to the same ROM.

〈Example〉




Touch keys 5 and 7 are made "hot" by designating the key underline for columns 17 and 18 (Touch Key 5), and 25 and 26(Touch Key 7) when registering a message which is created using the SW[ ]GP-MINIP.

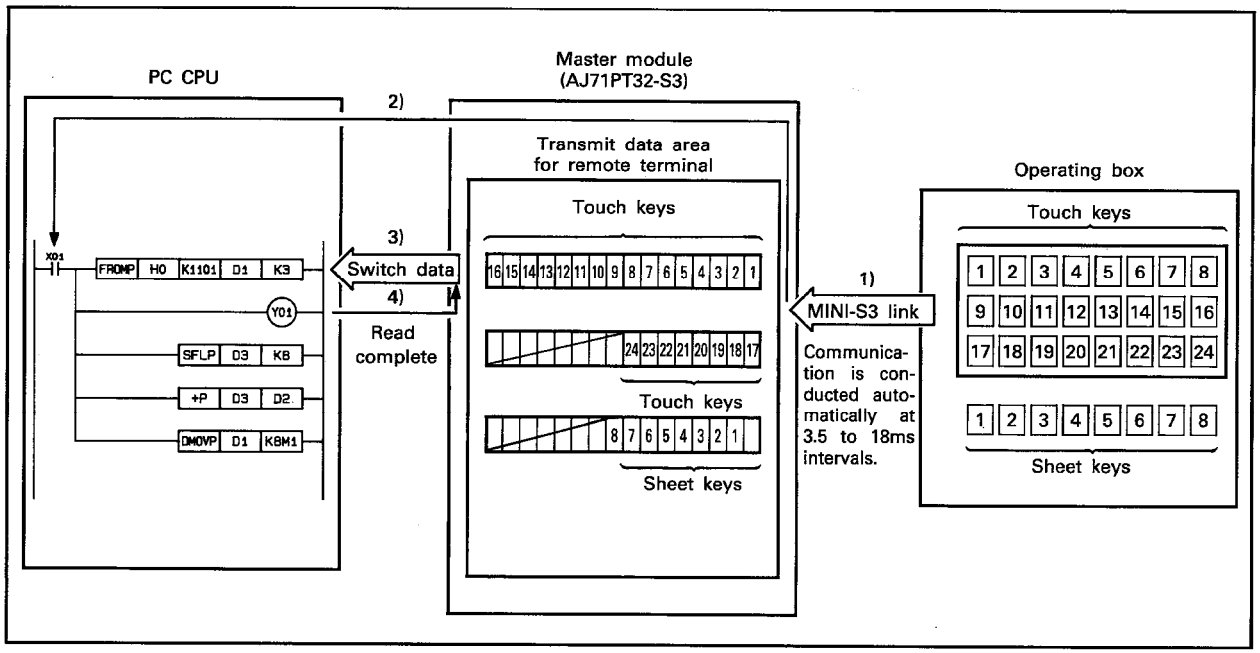
The same method can be used to install hot buttons for each message where and when needed.

Although in the above example, "START" and "STOP" are shown in inverse display mode, both blinking and normal display modes may be used as well.

## 6.2 Input Procedure

To read the data input using the touch keys and sheet keys of the operating box, read the ON/OFF data of the bit pattern in the receive data area of the remote terminal number that corresponds to the transmission data area for the remote terminal of the master module with the FROM instruction in the sequence program.

The correspondence between the designated operating box station number and the remote terminal number is set by the initial data setting of the SW□GP-MINIP and registered to the link data ROM. The ROM is then installed in the master module. For further information concerning the transmission of I/O signals between the master module and operating box and the transmission data storage area for batch refresh, see Sections 7.4 and 7.5, respectively.




1) Key input data from the operating box is received automatically and continually in the master module at 3.5 to 18ms intervals. Whenever the status of a key is set to ON or OFF, the corresponding bit located in the remote terminal receive data area is set to "0" or "1".

2) Whenever the status of a bit located in the remote terminal receive data area changes to "0" or "1", the master module sets the read request flag to ON.
While the read request flag is set to ON, all subsequent key input data is ignored by the master module until the read complete flag is set by the PC CPU.

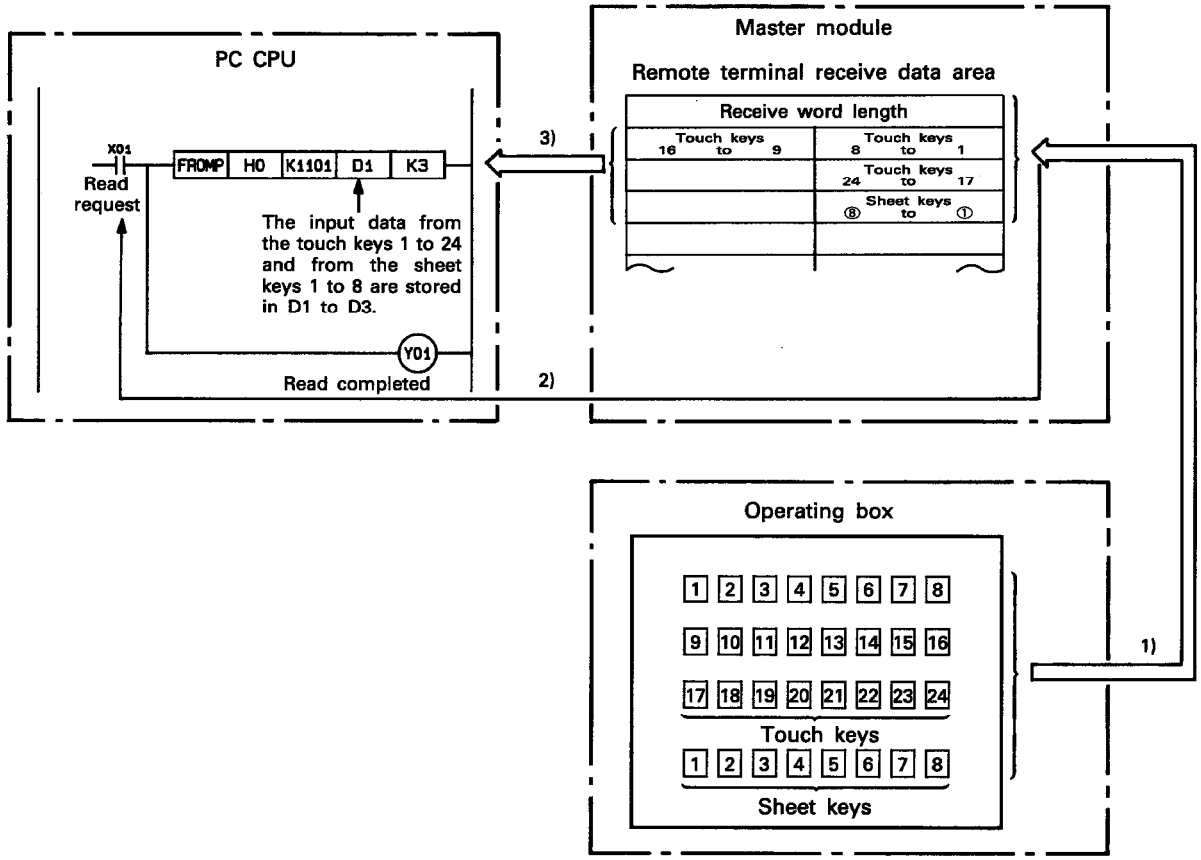
3) When the PC CPU received a read request flag from the master module, the key input data is read from the remote terminal receive data area when the FROM instruction is executed.

4) After the reading of the data is completed, the PC CPU returns a read complete flag to the master module.

## 6.3 Example of a Key Input Program

The following section describes the programming for the reading of ON/OFF data received from the touch keys and sheet keys. Key input is processed in the manner shown below.

(1) Processing




1) Touch key and sheet key input data from the operating box is stored automatically in the remote terminal receive data area of master module at 3.5 to 18ms intervals.

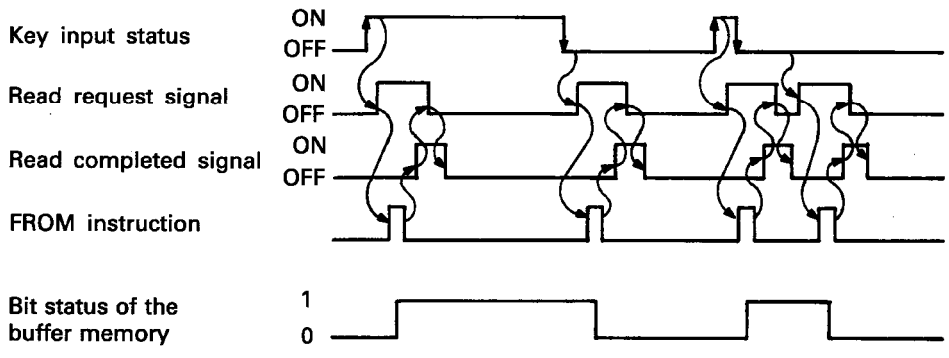
2) Whenever the status of a bit corresponding to a key in the remote terminal receive data area is set to ON or OFF, the master module sets the read request flag to ON.

*Once the read request flag is set to ON, any subsequent key input data from the operating box is not written to the receive data area and discarded until the read complete signal is returned.

3) The PC CPU reads key input data from the remote terminal receive data area after the read request flag is set to ON and the FROM instruction executed.



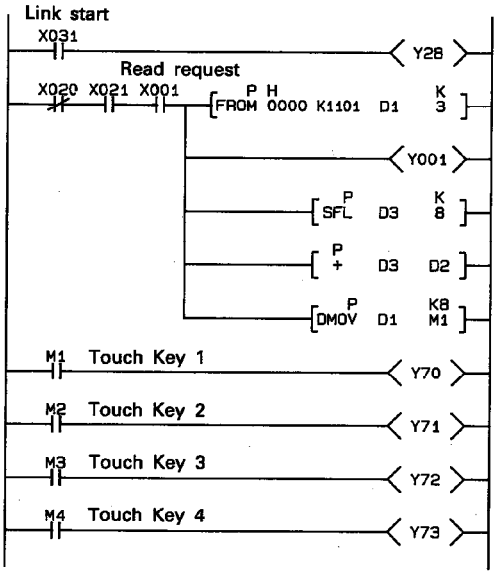
IB (NA) 66218-A




The read request signal is set to on when the key input status goes from OFF to ON or from ON to OFF.

(2) Program example

The following is an example of a program that reads data output by touch keys 1 to 24 to M1 to M24 and the output of sheet keys 1 to 8 to M25 to M32 when operating box has been designated as Remote Terminal 1.




MINI LINK COMMUNICATION start

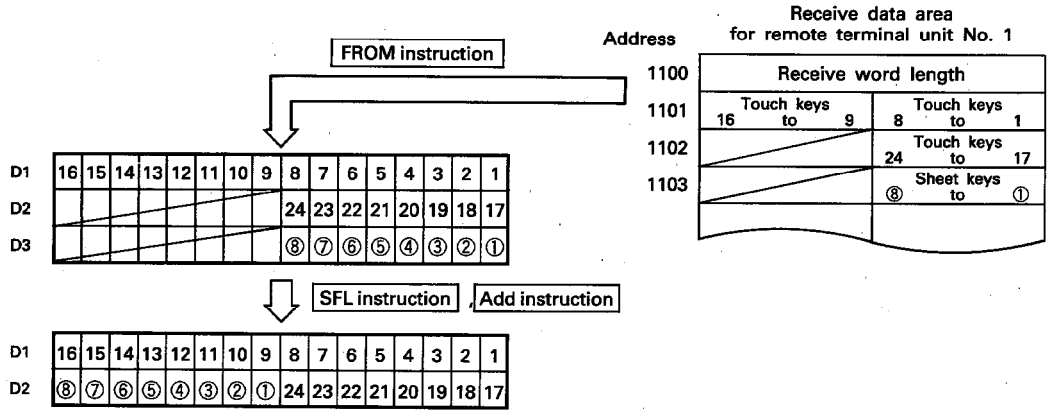
Data (3 words) is read from the receive data area of remote terminal unit No. 1.

Read completed

Contents of D3 shifted 8 bits to the left.

Contents of D2 and D3 are added and stored in D2.

Contents of D1 and D2 are divided and read to M1 to M32.






IB (NA) 66218-A

# 7. SPECIFICATIONS

## 7.1 General Specifications

<table>
<tr><th>Item</th><th colspan="5">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="5">0 to 55°C *2(0 to 50°C)</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">−20 to 75°C *2(−20 to 60°C)</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="5">10 to 90%RH, non-condensing *2(35 to 90%RH)</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90%RH, non-condensing *2(35 to 90%RH)</td></tr>
<tr><td rowspan="3">Vibration resistance</td><td rowspan="3">Conforms to *3JIS C 0911</td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep Count</td></tr>
<tr><td>10 to 55Hz</td><td>——</td><td>0.075mm (0.003inch)</td><td rowspan="2">10 times *1(1 octave/minute)</td></tr>
<tr><td>55 to 150Hz</td><td>1g</td><td>——</td></tr>
<tr><td>Shock resistance</td><td colspan="5">Conforms to JIS C 0912 (10g × 3 times in 3 directions)</td></tr>
<tr><td>Noise durability</td><td colspan="5">By noise simulator of 1500Vpp noise voltage,<br>1 μs noise width and 25 to 60Hz noise frequency</td></tr>
<tr><td>Dielectric withstand voltage</td><td colspan="5">1500V AC for 1 minute across AC external terminals and ground<br>500V AC for 1 minute across DC external terminals and ground</td></tr>
<tr><td>Insulation resistance</td><td colspan="5">5MΩ or larger by 500V DC insulation resistance tester across<br>AC external terminals and ground</td></tr>
<tr><td>Grounding</td><td colspan="5">Class 3 grounding; grounding is not required when it is impossible.</td></tr>
<tr><td>Operating ambience</td><td colspan="5">Free of corrosive gases. Dust should be minimal.</td></tr>
<tr><td>Cooling method</td><td colspan="5">Self-cooling</td></tr>
</table>

**Table 7.1 General Specifications**

**REMARKS**

*1: One octave marked *1 indicates a change from the initial frequency to double or half frequency. For example, any of the changes from 10Hz to 20Hz, from 20Hz to 40Hz, from 40Hz to 20Hz, and from 20Hz to 10Hz are referred to as one octave.

*2: General specifications for the LCD display section of the AJ35T-OPB-P1 and AJ35PT-OPB-M1 operating boxes.

*3: JIS
Japanese Industrial Standard

## 7.2 Operating Box Specifications

### 7.2.1 Mount type operating box specifications

| Item | | | AJ35T-OPB-M1 | |
|---|---|---|---|---|
| | | | Optical data link | Twisted-pair data link |
| LCD panel | Display | Display elements | Dot matrix LCD STN type (with EL back light) | |
| | | Number of dots | 60 × 256 dots | |
| | | Number of characters per screen | 90 (3 lines by 30 characters, each character 8 × 20 dots) | |
| | | Displayable characters | ANK 192 (alphanumeric, special characters, user-defined characters) | |
| | | Creation of character generation ROM | Created by the A6GPP using the SW□GP-MINIP | |
| | | Screen display functions | Message display (Reverse, blinking), bar graph display, device comment display, device value display | |
| | Touch key section | Touch detection | Transparent electrode | |
| | | Touch mode | Key ON/OFF change mode | |
| | | Number of touch keys | 24 (3 lines of 8 keys each) | |
| | | Key area size | 20 × 16 dots | |
| | | Key number layout | No.1 No.2 No.3 No.4 No.5 No.6 No.7 No.8<br>No.9 No.10 No.11 No.12 No.13 No.14 No.15 No.16<br>No.17 No.18 No.19 No.20 No.21 No.22 No.23 No.24 | |
| Output LEDs | | | 8 LEDs, data transmitted from the master module is displayed | |
| Sheet keys | | | 8 keys, input data can be read by the master module | |
| Occupied stations | | | 4 | |
| Power supply voltage | | | 15.6 to 31.2V DC | |
| Supply current | | | 170mA (24V) | |
| Weight kg (lb) | | | 1.0 (2.2) | |

**Table 7.2 AJ35PT-OPB-M1 Specifications**

**REMARKS**

The mount type operating box is mounted to a panel and is connected to the MINI-S3 link using either optical fiber or twisted-pair cables.

### 7.2.2 Portable type operating box specifications

| Item | | | AJ35T-OPB-P1 | |
|---|---|---|---|---|
| | | | Optical data link | Twisted-pair data link |
| LCD panel | Display | Display elements | Dot matrix LCD STN type (with EL back light) | |
| | | Number of dots | 60 × 256 dots | |
| | | Number of characters per screen | 90 (3 lines by 30 characters, each character 8 × 20 dots) | |
| | | Displayable characters | ANK 192 (alphanumeric, special characters, user-defined characters) | |
| | | Creation of character generation ROM | Created by the A6GPP using the SW□GP-MINIP | |
| | | Screen display functions | Message display (Reverse, blinking), bar graph display, device comment display, device value display | |
| | Touch key section | Touch detection | Transparent electrode | |
| | | Touch mode | Key ON/OFF change mode | |
| | | Number of touch keys | 24 (3 lines of 8 keys each) | |
| | | Key area size | 20 × 16 dots | |
| | | Key number layout | No.1 No.2 No.3 No.4 No.5 No.6 No.7 No.8<br>No.9 No.10 No.11 No.12 No.13 No.14 No.15 No.16<br>No.17 No.18 No.19 No.20 No.21 No.22 No.23 No.24 | |
| Output LEDs | | | 8 LEDs, data transmitted from the master module is displayed | |
| Sheet keys | | | 8 keys, input data can be read by the master module | |
| Occupied stations | | | 4 | |
| Power supply voltage | | | 15.6 to 31.2V DC | |
| Supply current | | | 170mA (24V) | |
| Weight kg (lb) | | | 1.1 (2.42) | |

**Table 7.3 AJ35T-OPB-P1 Specifications**

**REMARKS**

The portable type operating box can be connected to or removed from the MINI-S3 LINK-S3 at will via a joint box. It can be connected only using twisted-pair cables.

## 7.3 Joint Box Specifications

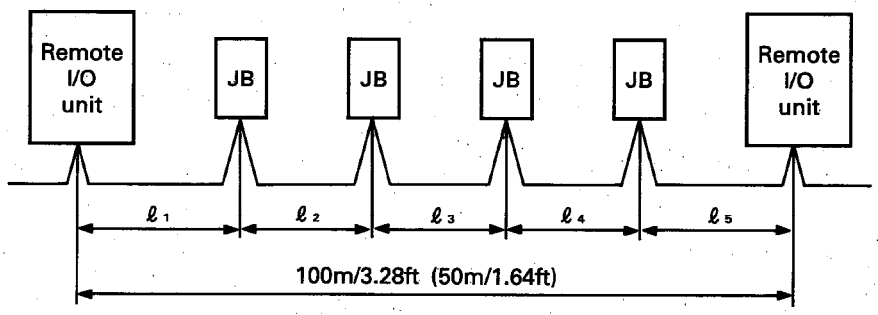
Table 7.4 shows the specifications for the AJ35T-JB and AJ35T-JBR joint boxes.

| Item | AJ35T-JB | AJ35T-JBR |
|---|---|---|
| Unit power supply voltage | 15.6 to 31.2V DC | |
| Unit supply current | 47mA | |
| Maximum transmission distance between stations | {100m/3.28ft (50m/1.64ft)}/(n+1) *1<br>n: number of joint boxes between remote I/O stations | 100m/3.28ft (50m/1.64ft) *1 |
| Weight kg (lb) | 0.8 (1.76) | |

**Table 7.4 AJ35T-JB and AJ35T-JBR Specifications**

*1: Maximum transmission distance between stations

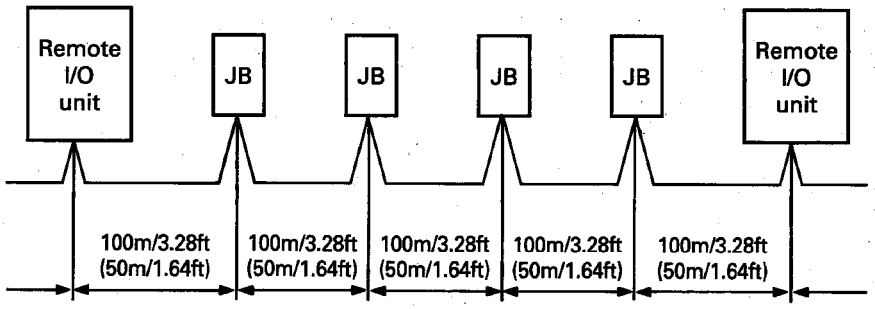
(1) AJ35T-JB




$\ell_1+\ell_2+\ell_3+\ell_4+\ell_5 \leqq$ 100m/3.28ft (50m/1.64ft)

50m (1.64ft): 0.2mm$^2$ (0.0003inch$^2$) or more to less than 0.5mm$^2$ (0.0008inch$^2$)
100m (3.28ft): 0.5mm$^2$ (0.0008inch$^2$) or more

(2) AJ35T-JBR




50m (1.64ft): 0.2mm$^2$ (0.0003inch$^2$) or more to less than 0.5mm$^2$ (0.0008inch$^2$)
100m (3.28ft): 0.5mm$^2$ (0.0008inch$^2$) or more



IB (NA) 66218-A

## 7.4 List of I/O Signals

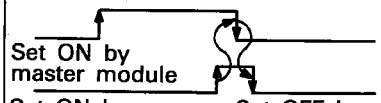
Table 7.5 shows the I/O signals of the PC CPU input from and output to the master module.
The I/O signals shown below are used when a building block type I/O module CPU is used and it is installed in slot No. 0 of the base unit.

| Device No. | Signal | | Device No. | Signal | |
|---|---|---|---|---|---|
| X00 | For remote terminal unit No. 1 | Transmit complete | Y00 | For remote terminal unit No. 1 | Transmit request |
| X01 | | Read request | Y01 | | Read complete |
| X02 | For remote terminal unit No. 2 | Transmit complete | Y02 | For remote terminal unit No. 2 | Transmit request |
| X03 | | Read request | Y03 | | Read complete |
| X04 | For remote terminal unit No. 3 | Transmit complete | Y04 | For remote terminal unit No. 3 | Transmit request |
| X05 | | Read request | Y05 | | Read complete |
| X06 | For remote terminal unit No. 4 | Transmit complete | Y06 | For remote terminal unit No. 4 | Transmit request |
| X07 | | Read request | Y07 | | Read complete |
| X08 | For remote terminal unit No. 5 | Transmit complete | Y08 | For remote terminal unit No. 5 | Transmit request |
| X09 | | Read request | Y09 | | Read complete |
| X0A | For remote terminal unit No. 6 | Transmit complete | Y0A | For remote terminal unit No. 6 | Transmit request |
| X0B | | Read request | Y0B | | Read complete |
| X0C | For remote terminal unit No. 7 | Transmit complete | Y0C | For remote terminal unit No. 7 | Transmit request |
| X0D | | Read request | Y0D | | Read complete |
| X0E | For remote terminal unit No. 8 | Transmit complete | Y0E | For remote terminal unit No. 8 | Transmit request |
| X0F | | Read request | Y0F | | Read complete |
| X10 | For remote terminal unit No. 9 | Transmit complete | Y10 | For remote terminal unit No. 9 | Transmit request |
| X11 | | Read request | Y11 | | Read complete |
| X12 | For remote terminal unit No. 10 | Transmit complete | Y12 | For remote terminal unit No. 10 | Transmit request |
| X13 | | Read request | Y13 | | Read complete |
| X14 | For remote terminal unit No. 11 | Transmit complete | Y14 | For remote terminal unit No. 11 | Transmit request |
| X15 | | Read request | Y15 | | Read complete |
| X16 | For remote terminal unit No. 12 | Transmit complete | Y16 | For remote terminal unit No. 12 | Transmit request |
| X17 | | Read request | Y17 | | Read complete |
| X18 | For remote terminal unit No. 13 | Transmit complete | Y18 | For remote terminal unit No. 13 | Transmit request |
| X19 | | Read request | Y19 | | Read complete |
| X1A | For remote terminal unit No. 14 | Transmit complete | Y1A | For remote terminal unit No. 14 | Transmit request |
| X1B | | Read request | Y1B | | Read complete |
| X1C to X1F | Reserved | | Y1C to Y22 | Reserved | |
| X20 | Hardware fault | | Y23 | Receive data clear request (Not used in operating box) | |
| X21 | MINI-S3 link communicating | | Y24 | Remote terminal unit error detection clear | |
| X22 | Reserved | | Y25 to Y27 | Reserved | |
| X23 | Receive data clear completion (Not used in operating box) | | | | |
| X24 | Remote terminal unit error detection | | Y28 | MINI-S3 link communication start | |
| X25 | Test mode | | Y29 | Reserved | |
| X26 | MINI-S3 link error detection | | Y2A | FROM/TO instruction response designation | |
| X27 | MINI-S3 link communication error | | Y2B | Faulty station data clear designation | |
| X28 | User ROM error detection | | Y2C | Switching buffer memory channel | |
| X29 to X2F | Reserved | | Y2D | Error reset | |
| | | | Y2E to Y2F | Reserved | |

**Table 7.5 List of I/O Signals (for 48 occupied I/O points)**

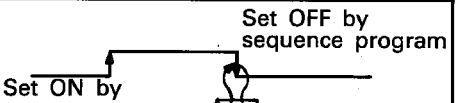
**(1) Transmit request signal to the operating box**
**(Y00, Y02, Y04, Y06, Y08, Y0A, Y0C, Y0E, Y10, Y12, Y14, Y16, Y18, Y1A)**
**Transmit complete signal to the operating box**
**(X00, X02, X04, X06, X08, X0A, X0C, X0E, X10, X12, X14, X16, X18, X1A)**

Display data starts being transmitted from the PC CPU to the LCD of the operating box after the data is first written to the transmission data area of the transmit data area for remote terminal and the transmit request signal is set to ON by the sequence program.
When all of the transmission data has been transmitted, the transmit complete signal is set to ON.
Once the transmit complete signal is set to ON, the transmit request signal is set to OFF by the sequence program.
Even if the transmit request signal is set to OFF before the transmit complete signal is set to ON, the transmit complete signal will be set to ON if the transmission completes.

| | Signal | Timing |
|---|---|---|
| Operating box<br>↓<br>PC CPU | X01<br>(read request)<br><br>Y01<br>(Read completed) |  |

**(2) Read request signal from the operating box**
**(X01, X03, X05, X07, X09, X0B, B0D, B0F, X11, X13, X15, X17, X19, X1B)**
**Read completed signal from the operating box**
**(Y01, Y03, Y05, Y07, Y09, Y0B, Y0D, Y0F, Y11, Y13, Y15, Y17, Y19, Y1B)**

When data is input from the touch keys or sheet keys of the operating box and stored in the receive data area of the transmit data area for remote terminal, the read request signal is set to ON.
When the read request signal is set to ON, data input by the keys can be read using the FROM instruction.
After the data has been read and the read complete signal set to ON by the sequence program, the read request signal is set to OFF.

| | Signal | Timing |
|---|---|---|
| PC CPU<br>↓<br>Operating box | Y00<br>(Transmit request)<br><br>X00<br>(Transmit complete) |  |

**(3) Hardware fault (X20)**

(a) On indicates that the master module mode setting switch has been set to any of 6 to 9 or a hardware fault has occurred.

(b) Used as an interlock for the FROM / TO instruction to the master module.

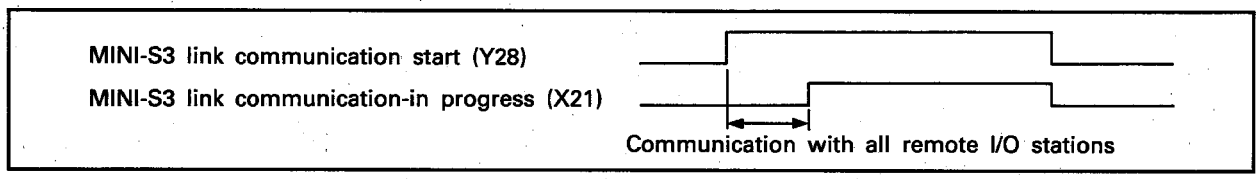
**(4) MINI-S3 link communication (X21)**

(a) Switched on when the MINI-S3 link communication start signal (Y28) is set to ON and the communication check between all remote stations and the master module has completed without error.

(b) Switched OFF when Y28 is switched OFF.

(c) OFF indicates that a data communication stop error has occurred.

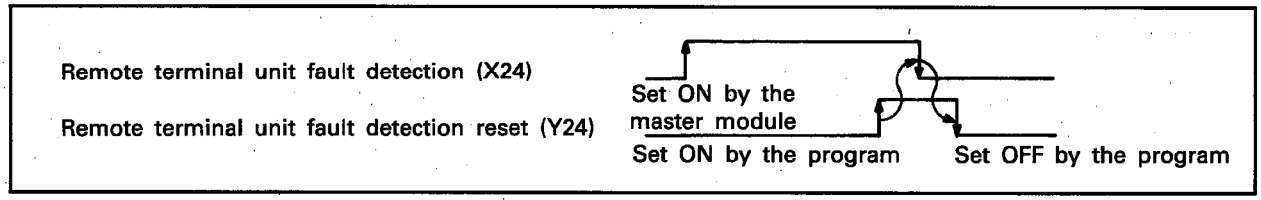
(d) Used as an interlock for data transfer to and from the master module.




**(5) Remote terminal unit fault detection (X24)**
**Remote terminal unit fault detection reset signal (Y24)**

(a) When the data in the transmission data area for remote terminal is outside the setting range or when the transmit request signal is set to ON without writing the setting data to the transmission data area, the remote terminal unit fault detection (X24) is set to ON.

(b) When the remote terminal unit fault detection reset (Y24) is set to ON, the remote terminal unit fault detection (X24) is set to OFF.
It is also set to off when the fault reset signal (Y2D) is set to ON.




**(6) Test mode (X25)**

The test mode is set to ON when the power is applied with the operation mode setting switch is set to 3, 4, or 5.



IB (NA) 66218-A

**(7) MINI-S3 link error detection (X26) ····· Communication continued**

The MINI-S3 link error detection (X26) is set to ON when an error is detected in the remote station receive data by the master module.

(a) The MINI-S3 link error detection (X26) operates in the following manner depending on the setting of the operation mode switch. (See the AJ71PT32-S3 User's Manual.)
- Automatic online return mode
  The MINI-S3 link error detection (X26) is set back to OFF after the MINI-S3 link error detection (X26) is set to ON and data link operation returns to normal.
- Automatic online return OFF
  Once an error is detected and the MINI-S3 link error detection (X26) is set to ON, it remains ON.

(b) The corresponding error code is stored to buffer memory address 108 when the MINI-S3 link error detection (X26) is switched ON.

**(8) MINI-S3 link communication error (X27) ····· Communication stopped**

The MINI-S3 link communication error (X27) is set to ON when communication between the master station and the remote stations cannot be performed.

(a) X27 is switched ON when:
- Any remote station power supply is turned OFF
- Any data link cable is broken
- A communication error has occurred with the mode setting specified for communication stop at the time of online error detection (mode = 2).

(b) The corresponding error code is stored to buffer memory address 107 when the MINI-S3 link communication error (X27) is switched ON.

(c) When the automatic online return mode is set (mode = 0), and the unit returns to the data link, the MINI-S3 link communication error is set to OFF.

**(9) User ROM error detection (X28)**

The user ROM error detection (X28) is set to ON for one of the following causes.
- The initial data ROM installed in the master module is faulty.
- The data stored in the initial data ROM is faulty.
- The message ROM installed in the master module is faulty.
- The data stored in the message ROM is faulty.
- The initial data ROM is installed in the operating box but the message ROM is not.

The user ROM error detection (X28) is reset to off when the erring contents have been corrected or when the message ROM is installed and the PC CPU once again restarted.

**(10) MINI-S3 link communication start (Y28)**

(a) I/O refresh begins when the MINI-S3 link communication start (Y28) is set to ON.

(b) MINI-S3 link communication-in-progress (X21) is set to ON when communication with all of the remote stations occurs normally.

(c) The receive data area (Addresses 70 to 210, 598 to 855) of the buffer memory is cleared when the MINI-S3 link communication start (Y28) is set to ON.

**(11) FROM / TO instruction response designation (Y2A)**

This command determines the priority of access to the master module buffer memory.

(a) When the FROM / TO instructions response designation (Y2A) is off, I/O refresh processing is given priority.

(b) When the FROM / TO instructions response designation (Y2A) is on, the PC CPU FROM / TO instructions are given priority.

(c) Chart 7.6 shows the effects resulting from the ON and OFF states of the FROM / TO instructions response designation (Y2A).

| Item \ FROM / TO Instruction Response Designation (Y2A) | OFF | ON |
|---|---|---|
| Access to buffer memory | Priority given to master module. | Priority given to PC CPU's FROM/TO instruction. |
| Receive (input) data read from several stations by one FROM instruction | The receive data refreshed at the same timing can be read. | The receive data refreshed at different timings may be read. |
| FROM / TO instruction processing time | There is a delay of (0.3ms + 0.2ms × (number of partial refresh stations connected)) max. | No delay |

**Table 7.6 FROM/TO Instruction Response Designation**

### (12) Faulty station data clear designation (Y2B)

The faulty station data clear setting (Y2B) specifies whether or not the data in which an error occurred should be cleard from the receive data area of a remote station.
The faulty station data clear setting (Y2B) does not effect the transmission of data by faulty stations.

| Faulty Station Data Clear Designation (Y2B) / Master Module Buffer Memory | OFF | ON |
|---|---|---|
| Transmission data for batch refresh (addresses 10 to 41) | — | — |
| Transmission data for batch refresh (addresses 110 to 141) | Data at occurrence of communication error is retained. | All points are switched OFF. |
| Transmission data for partial refresh (addresses 300 to ) | — | — |
| Transmission data for partial refresh (addresses 600 to ) | Data at occurrence of communication error is retained. | All points are switched OFF. |

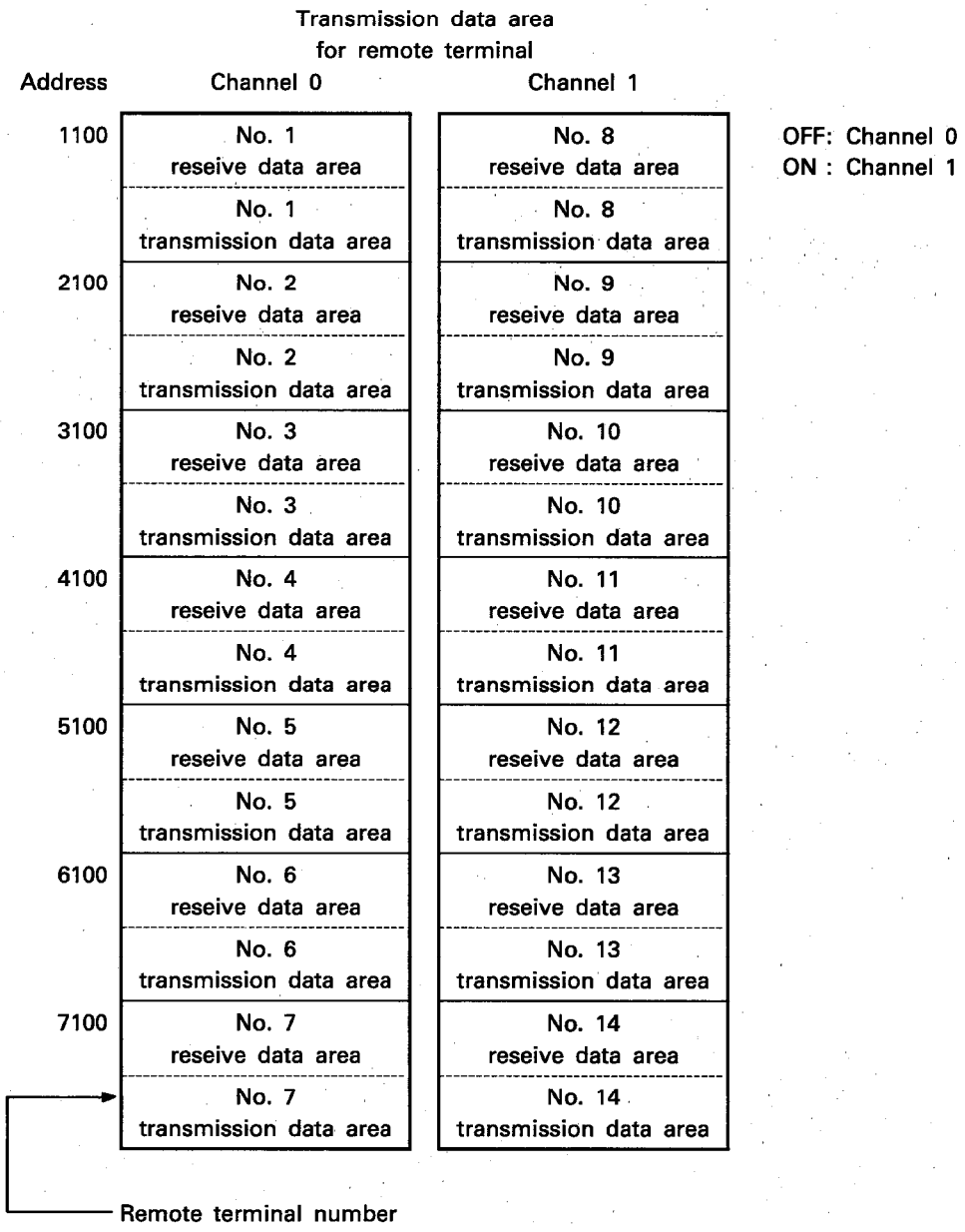
**Table 7.7 Faulty Station Data Clear Designation**

**POINT**

**It is recommended that the operation mode setting switch be set to the automatic online return OFF mode when the faulty station data clear setting is set to ON.**

### (13) Buffer memory channel switch (Y2C)

As shown in the diagram below, the communication data area for remote terminal (addresses 1100 to 8099) is shared by remote terminals No. 1 to 7 and No. 8 to 14 from the perspective of the PC CPU. The PC CPU accesses the transmission data area for remote terminal by switching channels.






IB (NA) 66218-A

**(14) Error reset signal (Y2D)**

The error reset signal (Y2D) is used to reset the MINI-S3 link error detection (X26) or MINI-S3 link communication error (X27).

(a) The error can be reset by setting the error reset signal (Y2D) from OFF to ON when the MINI-S3 link communication start signal (Y28) is OFF.

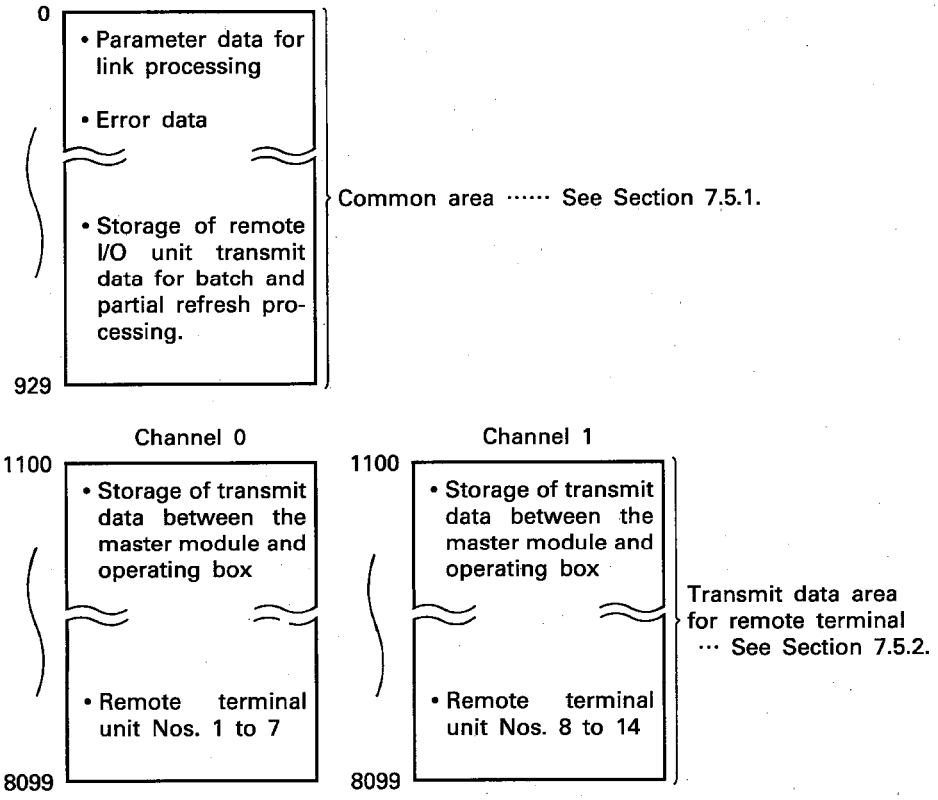
(b) When the error reset signal (Y2D) is set from OFF to ON, the following addresses are cleared: buffer memory communication error code (address 107), error detection code (address 108), and remote terminal unit number (addresses 196 to 210). Addresses 196 to 210 store error data received from an RS-232C interface module located in the remote terminal unit and, therefore, these addresses are not used when only the operating box is used.

(c) When the error reset signal (Y2D) is set from OFF to ON, the MINI-S3 link error detection (X26), MINI-S3 link communication error (X27), and the remote terminal unit error detection (X24) are set to OFF.
The remote terminal unit error detection (X24) is an input signal that is set to ON when an error is detected from the RS-232C interface module and, therefore, this address is not used when only the operating box is used.

(d) ERR. LED reset
When the error reset signal (Y2D) is set ON, the corresponding error indicator LEDs (ERR. LOOP LED, ERR. REM LED) are turned OFF.

## 7.5 Buffer Memory

A buffer memory is provided in the master module for storing data transmitted between the master module and each of the remote stations in the MINI-S3 link. (No battery backup is provided.) The following diagram of the buffer memory shows that it is divided into two major areas.




Switching between the two channels of the transmit data area for remote terminal is conducted by turning ON/OFF the buffer memory channel designation signal (Y2C).

OFF ····· Channel 0
ON ····· Channel 1

### 7.5.1 Common area

The following diagram shows how the common area of the buffer memory is alloted to store various kinds of data such as parameter data, error data, and remote station transmit data for batch and partial refresh remote stations.

| Address (Decimal) | | Description | |
|---|---|---|---|
| 0 | Number of remote I/O stations | Define the remote I/O station range for I/O refresh. | Can be accessed by the PC CPU. |
| 1 | Number of retries | Define the number of retries at occurrence of communication error. | |
| 4 | Line error check | Used to check error location | |
| | | Reserved | |
| 10 ∫ 41 | Transmission data for batch refresh | Stores data output to batch refresh type remote I/O stations. | |
| | | Reserved | |
| 70 ∫ 77 | Remote I/O station card data | Stores I/O unit types used as remote I/O stations. | Only read from the PC CPU. |
| | | Reserved | |
| 90 ∫ 93 | Accumulative faulty station detection | Stores faulty station numbers until reset by the sequence program. | Can be accessed by the PC CPU. |
| | | Reserved | |
| 100 ∫ 103 | Faulty station detection | Stores the most recent faulty station numbers. | |
| | | Reserved | |
| 107 | Communication error code | Stores the reason why X27 (MINI-S3 link communication error) has been switched on. | |
| 108 | Error detection code | Latches the ON/OFF state of X6 (MINI-S3 link error detection). | |
| | | Reserved | |
| 110 ∫ 141 | Receive data for batch refresh | Stores the input data to batch refresh type remote I/O stations. | Only read from the PC CPU. |
| | | Reserved | |
| 160 | Line error retry counter | Stores the number of retries made when communication cannot be made with all remote I/O stations due to line error. | |
| 161 ∫ 192 | Retry counter | Stores the number of retries made to the faulty station. | |
| 195 | Remote terminal unit faulty station detection | When the remote terminal unit error detection signal (X24) is set to on, the corresponding bit is set to "1". | |
| 196 ∫ 210 | Remote terminal unit error number | When a remote terminal unit error detection (X24) is set to on, the corresponding error number is stored here. | |
| | | Reserved | |
| 250 ∫ 282 | Partial refresh station | Write the partial refresh type remote I/O station numbers and the numbers of digits specified (numbers of partial refresh times). | |
| | | Reserved | |
| 300 ∫ 555 | Transmission data for partial refresh | Stores data output to partial refresh type remote I/O stations. | Can be accessed by the PC CPU. |
| | | Reserved | |
| 598 | Accumulative input error detection | Holds the partial refresh input data receive error until reset by the sequence program. | |
| 599 | Input faulty station detection | Stores the partial refresh input data receive error. | |
| 600 ∫ 855 | Receive data for partial refresh | Stores input data to partial refresh type remote I/O stations. | Only read from the PC CPU. |
| | | Reserved | |
| 858 | Receive data clear specification | Specifies if received data should be cleared when an error occurs in a piece of equipment external to the RS-232C. | |
| 859 | Receive data clear specification | When a receive data clear station is designated, this specifies whether only the receive buffer memory of the master module is to be cleared or whether the master module and the receive buffer of the RS-232C unit is to be cleared as well. | Can be accessed by the PC CPU. |
| 860 ∫ 929 | Parameter area | Sets parameters required for conduct data communication between the RS-232C and external equipment in no-protocol. | |
| | | Reserved | |

For further information concerning each range in the common area, see the section on the buffer memory contained in the AJ71PT32-S3 MELSECNET/MINI-S3 Master Module User's Manual.

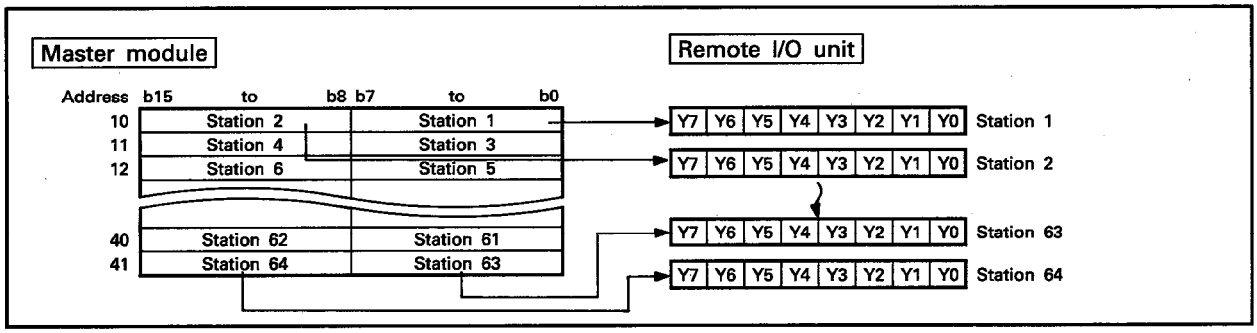
**(1) Line error check (address 4)**

The line error check setting aids in locating line faults by lighting the remote station RUN LED lamps up to the location where the fault has occurred.
For further information, see the AJ71PT32-S3 MELSECNET/MINI-S3 Master Module User's Manual.

**(2) Transmission data for batch refresh (addresses 10 to 41)**

(a) The output data to the LEDs of the operating box is stored in this area and written to the location of the last station number of the occupied station.

(b) The following diagram shows how the buffer memory is allocated.




(c) Batch refresh transmission data area is made up of 8 bits per remote station as shown below.

| bn+7 | bn+6 | bn+5 | bn+4 | bn+3 | bn+2 | bn+1 | bn+0 |
|---|---|---|---|---|---|---|---|
| Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |

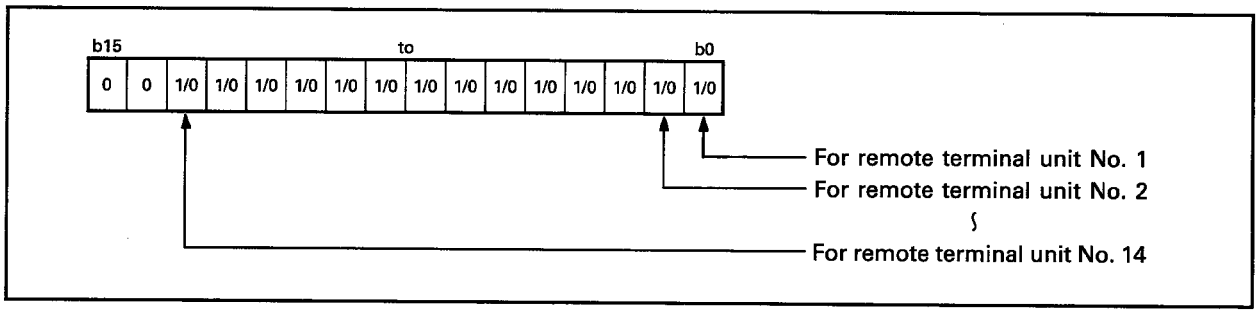
1: ON
0: OFF

*: Value "n" depends on the remote I/O station number.
b0 to b7 for odd-numbered stations 1, 3 ····· 63
b8 to b15 for even-numbered stations 2, 4 ····· 64

### (3) Remote terminal unit faulty station detection (address 195)

(a) When the remote terminal unit error detection (X24) is set to on the corresponding station bit is set to "1".

(b) When the remote terminal unit error detection reset (Y24) is set to on, the corresponding station bit is set to "0".

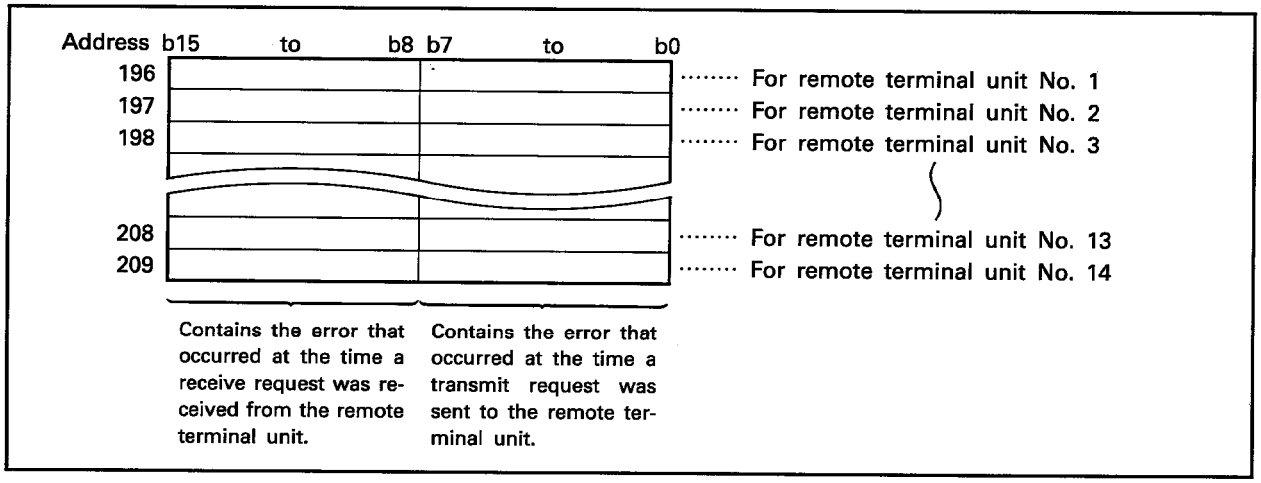



### (4) Remote terminal unit error number (addresses 196 to 209)

(a) When the remote terminal unit error detection (X24) is set to ON, the error number is stored at these addresses.

(b) The stored error number is cleared when the MINI-S3 link communication start signal (Y28) or the error reset signal (Y2D) is set to ON.

(c) For information concerning the content of the error numbers, see Appendix 1, Remote Terminal Unit Error No. List.




**REMARKS**

The following precautions should be taken related to areas of the buffer memory other than those discussed above in (1) to (3) above.

- Retry count (address 1) — Ensure that the retry count set in this address is at least "2" when the AJ35T-OPB-P1 portable type operating box is connected to the AJ35T-JBR joint box.
- Receive data area for batch refreshing (addresses 110 to 141) — Input data from the touch keys and sheet keys of the operating box is not stored in this area. It is stored in the receive data area of the transmission data area for remote terminal.

### 7.5.2 Transmission data area for remote terminal

The transmission data area for remote terminal is configured for the output of display data to the operating box LCD and the key input from the touch keys and sheet keys as shown in the diagram below.

Transmission data area for remote terminal

| Address | Channel 0 | Channel 1 |
|---|---|---|
| 1100 | No. 1 reseive data area | No. 8 reseive data area |
| | No. 1 transmission data area | No. 8 transmission data area |
| 2100 | No. 2 reseive data area | No. 9 reseive data area |
| | No. 2 transmission data area | No. 9 transmission data area |
| 3100 | No. 3 reseive data area | No. 10 reseive data area |
| | No. 3 transmission data area | No. 10 transmission data area |
| 4100 | No. 4 reseive data area | No. 11 reseive data area |
| | No. 4 transmission data area | No. 11 transmission data area |
| 5100 | No. 5 reseive data area | No. 12 reseive data area |
| | No. 5 transmission data area | No. 12 transmission data area |
| 6100 | No. 6 reseive data area | No. 13 reseive data area |
| | No. 6 transmission data area | No. 13 transmission data area |
| 7100 | No. 7 reseive data area | No. 14 reseive data area |
| | No. 7 transmission data area | No. 14 transmission data area |

Remote terminal number

(1) Teh transmission data area is fixed for each remote terminal number as shown in the diagram on the left.

(2) Teh size of receive data area and transmission data area can be changed as needed within the range of addresses assigned to each remote terminal.
The desired range can be specified by setting the head addresses of the receive data area and the transmission data area.
(Default values:
Receive data area = 500 words
Transmission data area = 500 words)

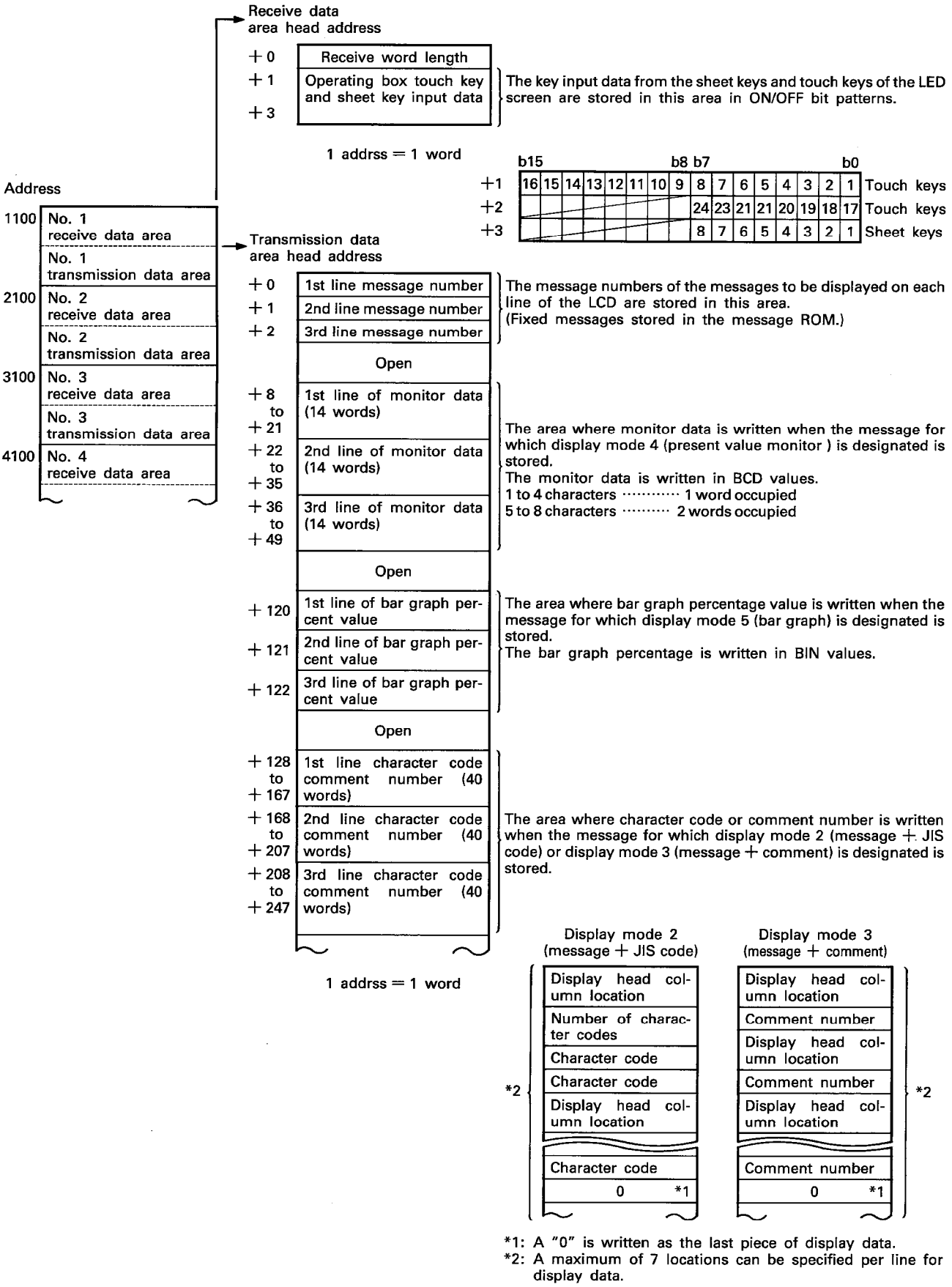
(3) Set the station number of operating box corresponding to each remote terminal number.
[Example]
For remote terminal unit No. 1 = Station 2
For remote terminal unit No. 2 = Station 9
For remote terminal unit No. 3 = Station 15

(4) The settings in (2) and (3) are set using the SW□GP-MINIP link data settings which are written to the link data ROM and installed in the master module.
For further information concerning link data settings, see the SW□GP-MINIP Operating Manual.

1 address = 1 word (2 bytes)

* For information concerning the assignment of transmission data area for each remote terminal number, see the following page.

The assignment of transmission data area for each remote terminal number is shown below.




*1: A "0" is written as the last piece of display data.
*2: A maximum of 7 locations can be specified per line for display data.

### 7.6 Reasons for Slow Response Time of Display and Key Input Data

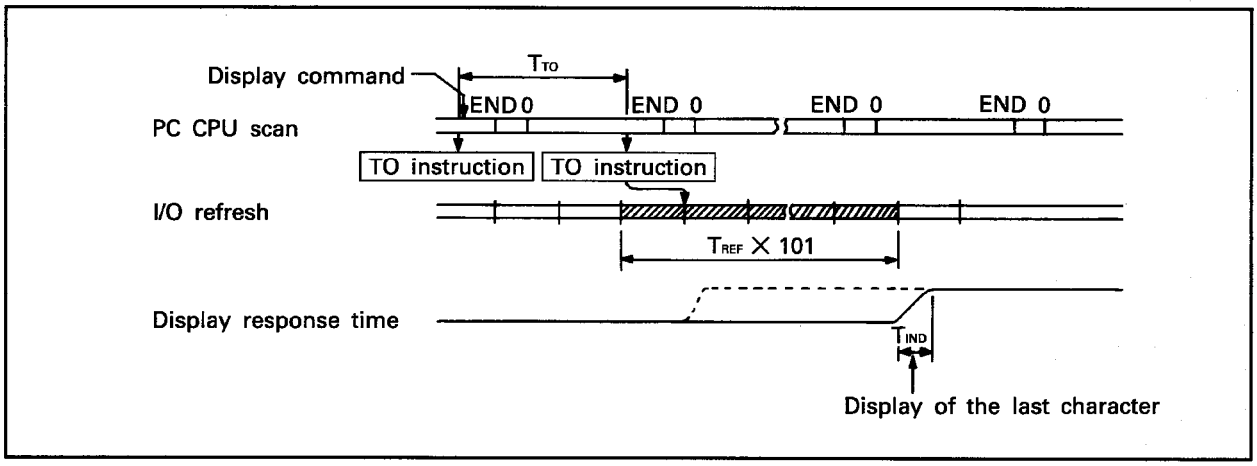
The following section provides an explanation for the slow response times that occurs with the display data and key input of the operating box in the MINI-S3 link.

(1) The following are reasons for the delay that occurs in the output of data to the LED of the operating box by the PC CPU.

(a) The time ($T_{TO}$) required for the TO instruction to complete writing the display data for the operating box LED to the transmit data area of remote terminal.
For example, when one TO instruction is executed in one scan of a sequence program, the maximum delay of one scan occurs.

(b) MINI-S3 link I/O refresh time ($T_{REF}$)
100 I/O refresh cycles are required to transmit all display characters. Also to start transmitting the characters causes a maximum delay of one I/O refresh.
In all, a delay of the I/O refresh time × 101 occurs.

(c) Operating box display response time ($T_{IND}$)
The operating box display response delay time is the time between the point that the operating box receives display data and the time that it is displayed on the LCD.




〈Example〉

PC CPU scan time ($T_{TO}$): 50ms
I/O refresh time ($T_{REF}$):4ms
LCD response time ($T_{IND}$): 0.n (small enough to be ignored)

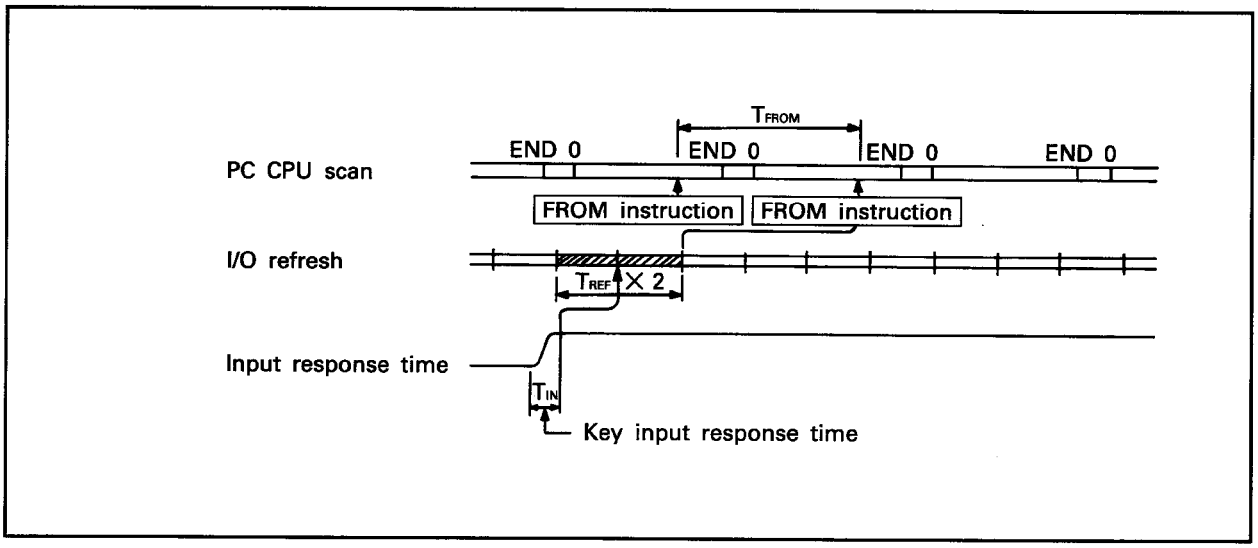
Maximum display response time = $T_{TO} + T_{REF} \times 101 + T_{IND}$
= 50 + × 101 + 0
= 454ms

(2) The following are reasons for the delay that occurs between the input of data by the touch keys and sheet keys of the operating box and the time that it is input to the PC CPU.

(a) Operating box key input response time ($T_{IN}$)
The operating box key input response time ($T_{IN}$) is the amount of time that is required between the point that a key is pressed and the point the key input data is output.

(b) MINI-S3 link I/O refresh time ($T_{REF}$)
Only one key can input data in a single I/O refresh cycle. Also to start transmitting the input data causes a maximum delay of one I/O refresh.

(c) The time ($T_{FROM}$) that is required for the FROM instruction to complete reading to the PC CPU the keyed data input that is transmitted from the operating box and stored in the remote terminal receive data area of the master module.




〈Example〉

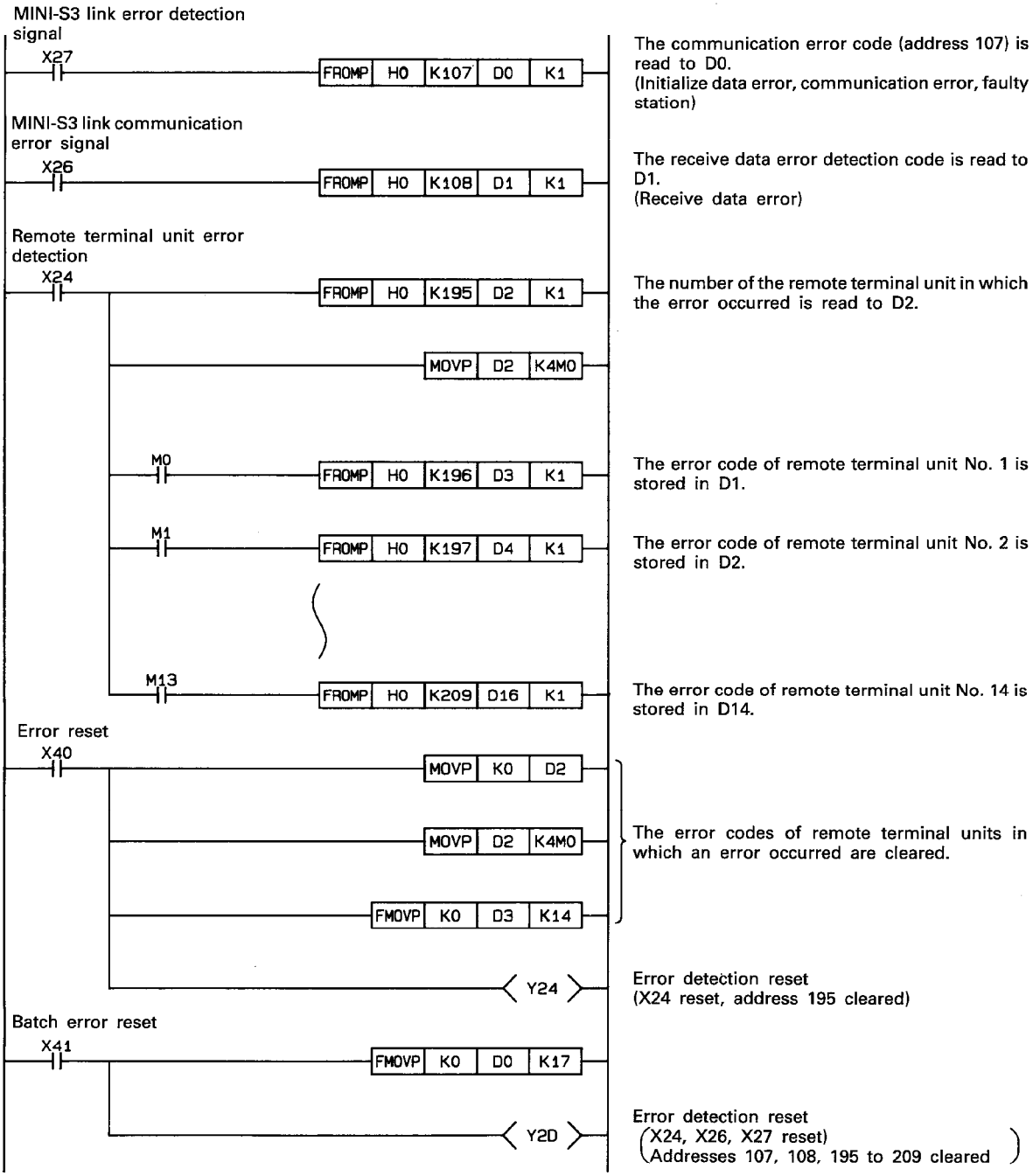
Key input response time($T_{IN}$): 0.n (small enough to be ignored)
I/O refresh time ($T_{REF}$): 4ms
PC CPU scan time ($T_{FROM}$): 50ms

Maximum display response time $= T_{IN} + T_{REF} \times 2 + T_{FROM}$
$= 0 + 4 \times 2 + 50$
$= 58$ms

## 8. TROUBLESHOOTING

### 8.1 Remote Terminal Unit Error Detection Program

The program shown below can be used to read various kinds of error data including remote terminal unit fault signal, communication error, and data error.






IB (NA) 66218-A

## 8.2 Table of Error Codes for Errors Occurring During Remote Terminal Unit Communication

When an error occurs during communication between remote terminal units and the master module, the remote terminal unit error detection ($X_{(N+24)}$) is set to ON, and the faulty station and the error code listed in the table below are stored in addresses 195, and 196 to 209 respectively of the buffer memory.

The following table lists the error codes that are stored in buffer memory addresses 196 to 209 and describes their meaning and the appropriate measures to be taken.

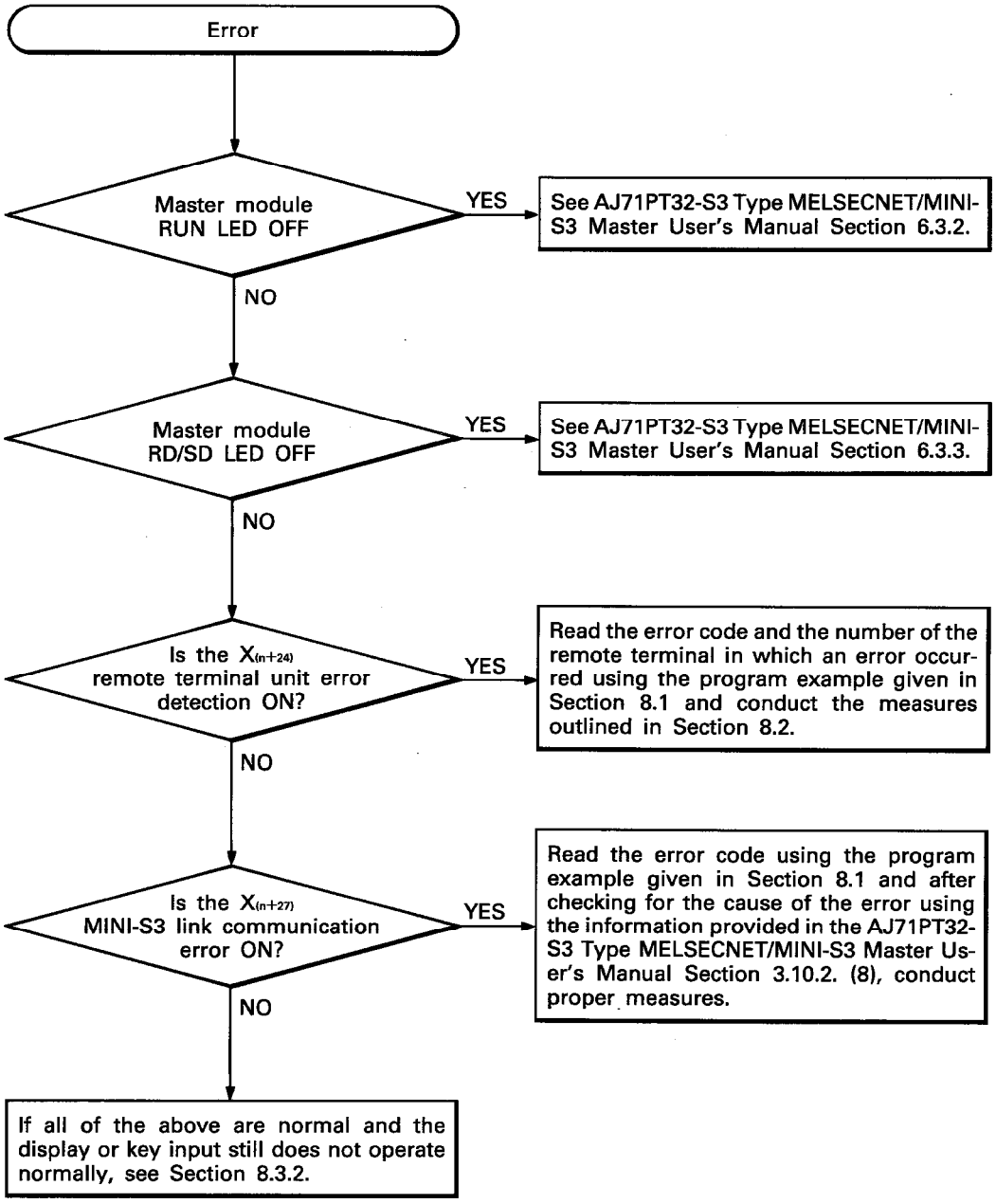
| Error Code (decimal) | Error Name | Error Content | Processing |
|---|---|---|---|
| 1 | Data setting error | An error exists in the data set in a remote terminal transmission data area. | See Section 7.5.2, and set the correct data. |
| * 2 | Bar-code read error | An error occurred due to the bar-code reader connected to the AJ35PTF-R2 being unable to read bar-code. | See the manual for the bar-code reader being used and take appropriate action. |
| * 3 | ID card access error | An error occurred while an ID card controller is connected to the AJ35PTF-R2 due to one of the following causes.<br>• A battery is not installed in the ID card, or the battery is low. | • See the manual for the ID card controller being used and install or replace the battery. |
| | | • An ID card was not present when a data read request was made, or the data could not be read. | • Set the timing, location, and position of the ID card so that the ID card data can be read correctly when a read request is made. |
| | | • Commands from the master module to the ID card controller are not transmitted in the proper format. | • Noise may be a possible cause of the error. Attempt communication one more time. If the error occurs again, use the troubleshooting procedures outlined in the AJ35PTF-R2 RS-232C Interface User's Manual. |
| * 4 | ID card battery error | An error occurred while an ID card controller is connected to the AJ35PTF-R2 due to the lack of a battery in the ID card, or to its being low. (Read data is stored correctly in the buffer memory.) | See the manual for the ID card controller being used and install or replace the battery. |
| * 5 | ID card data receive error | An error occurred while an ID card controller was connected to the AJ35PTF-R2 due to response data not being transmitted to the master module in the proper format in response to a read request command from the master module. | • Noise may be a possible cause of the error. Attempt communication one more time. If the error occurs again, use the troubleshooting procedures outlined in the AJ35PTF-R2 RS-232C Interface User's Manual. |
| 8 | Transmit data area setting error | An error occurred because the number of bytes set for the transmit data portion of the communication data area used for the remote terminal units is less than the specified number of bytes. | See the relevant remote terminal unit user's manual and set the required number of bytes for transmission data in the transmission data area. |
| 9 | Communication error | An error occurred in communication between the master module and remote terminal units. | Noise or a faulty remote terminal unit may be possible causes of the error. See Section 6.3.1 and take appropriate action. |
| 10 | Transmit data area setting error | An error occurred because the number of bytes set for the receive data portion of the communication data area used for the remote terminal units is less than the specified number of bytes. | See the relevant remote terminal unit user's manual and set the required number of bytes for transmission data in the transmission data area. |

Error codes *2 to 5 are related to errors occurring when the AJ35PTF-R2 RS-232C interface unit is used and have no relationship when only the operating box is used.

## 8.3 Troubleshooting

For information on PC CPU unit troubleshooting, see the corresponding CPU User's Manual.

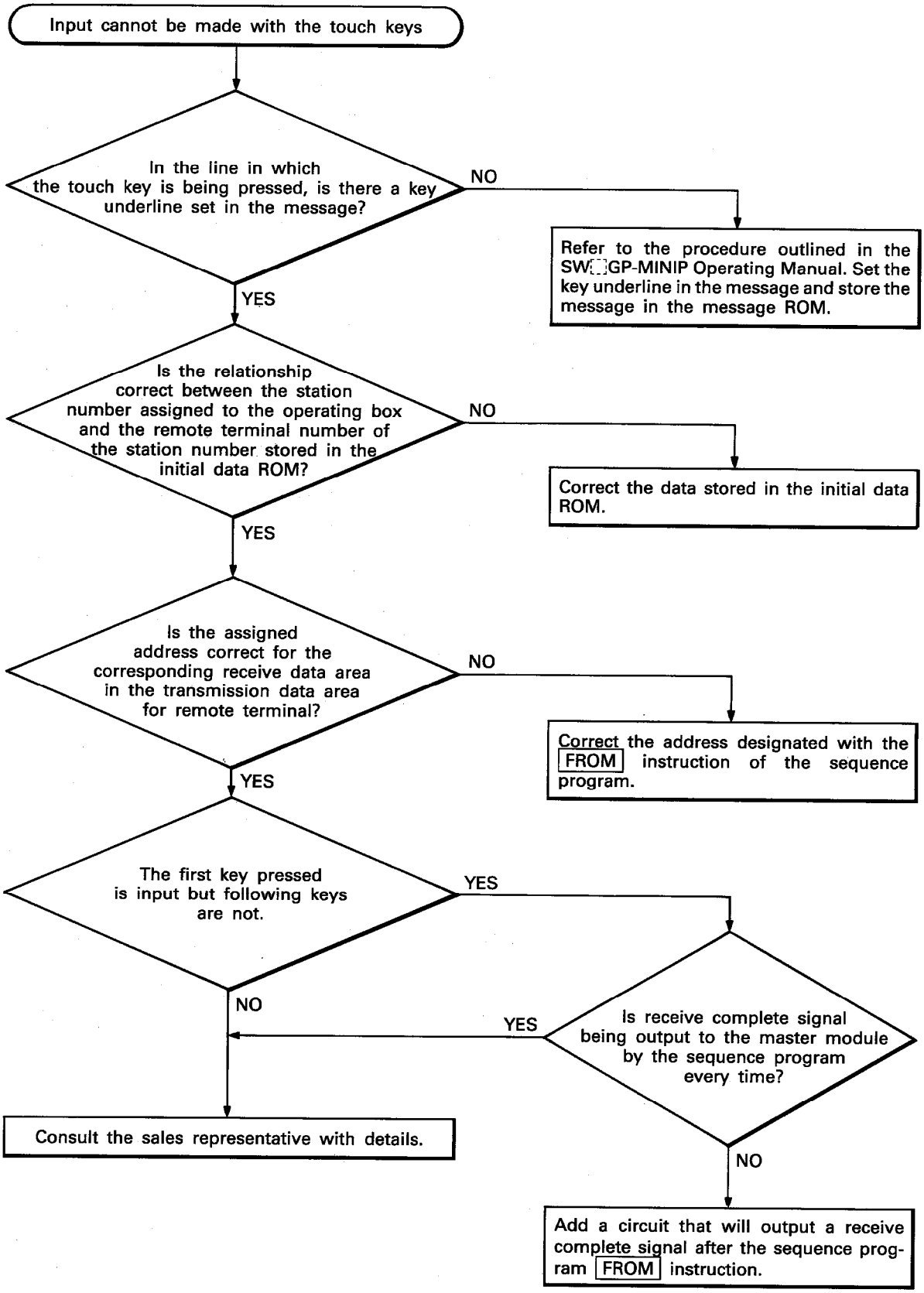
### 8.3.1 General troubleshooting flowchart



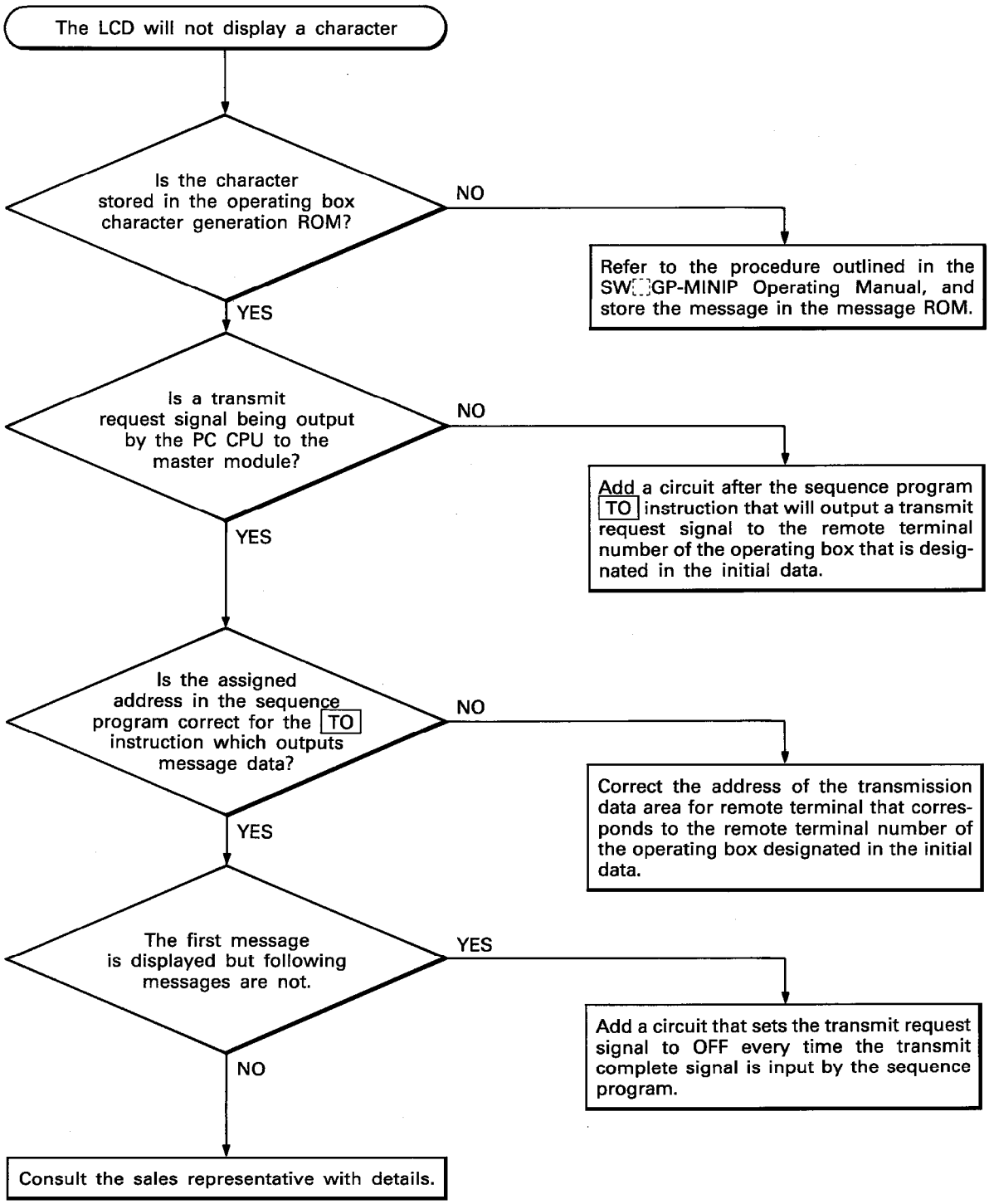



IB (NA) 66218-A

### 8.3.2 Input can not be made with the touch keys

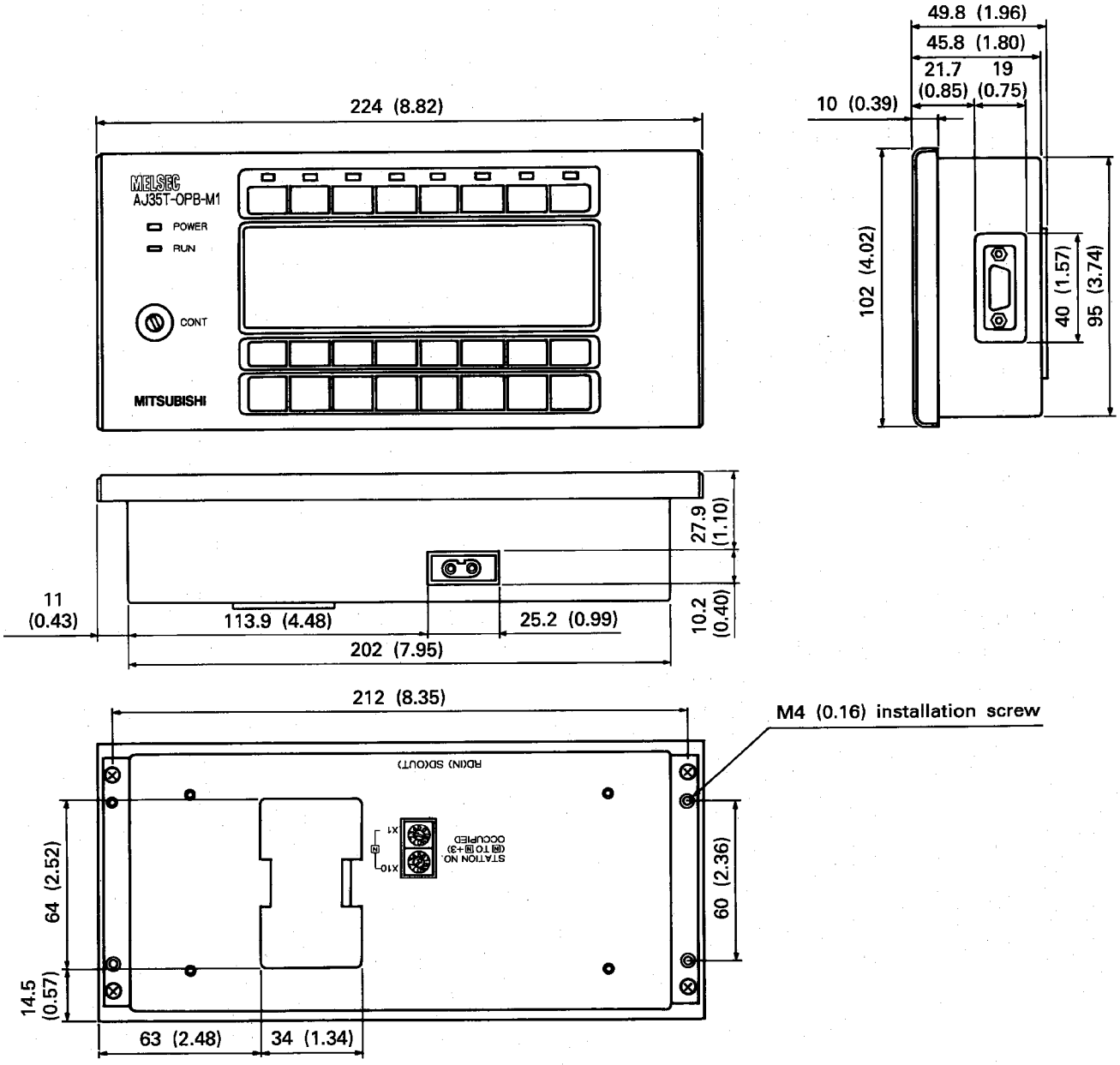


### 8.3.3 The LCD will not display a character



## APPENDICES

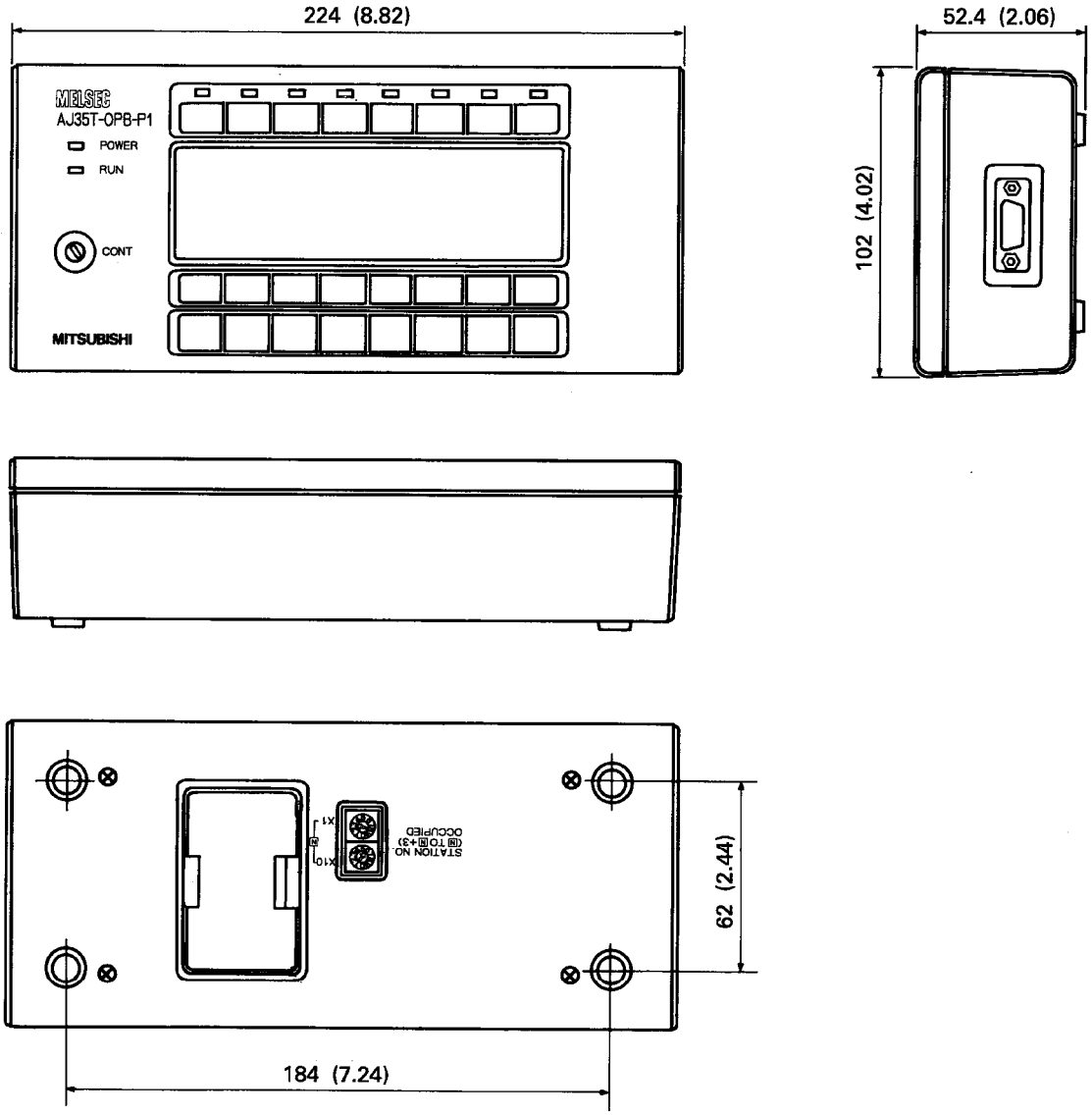
## APPENDIX 1 AJ35PT-OPB-M1 Dimension Diagrams




Unit: mm (inch)

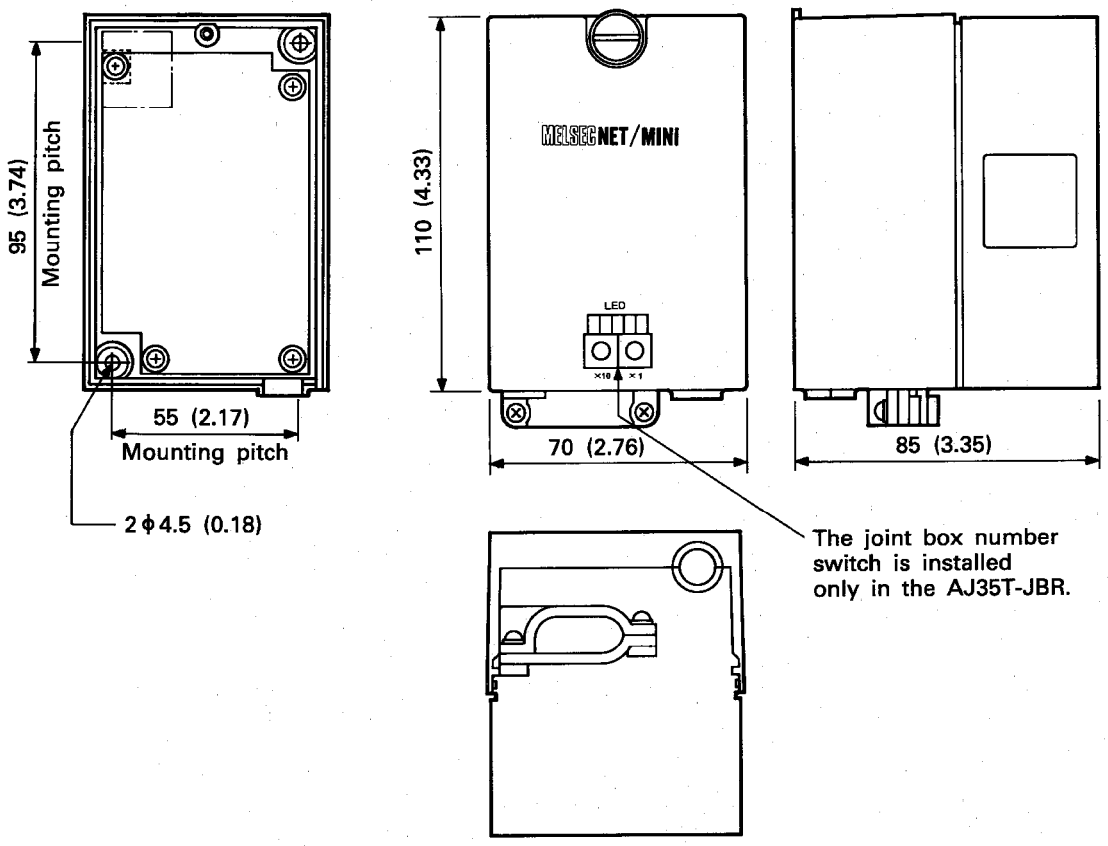
APP

## APPENDIX 2 AJ35T-OPB-P1 Dimension Diagrams




Unit: mm (inch)

## APPENDIX 3 AJ35T-JB and AJ35T-JBR Dimension Diagrams




Unit: mm (inch)

**IMPORTANT**

**The components on the printed circuit boards will be damaged by static electricity, so avoid handling them directly. If it is necessary to handle them take the following precautions.**

**(1) Ground human body and work bench.**

**(2) Do not touch the conductive areas of the printed circuit board and its electrical parts with any non-grounded tools etc.**

Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

Owing to the very great variety in possible applications of this equipment, you must satisfy yourself as to its suitability for your specific application.

# Operating boxes
# type AJ35PT-OPB-M1/AJ35T-OPB-P1

# User's Manual

| | |
|---|---|
| MODEL | AJ35PT-OPB-M1/P1E |
| MODEL CODE | 13J770 |
| IB(NA)66218-A(8911)MEE | |

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100-8310 TELEX : J24532 CABLE MELCO TOKYO
NAGOYA WORKS : 1-14 , YADA-MINAMI 5 , HIGASHI-KU, NAGOYA , JAPAN