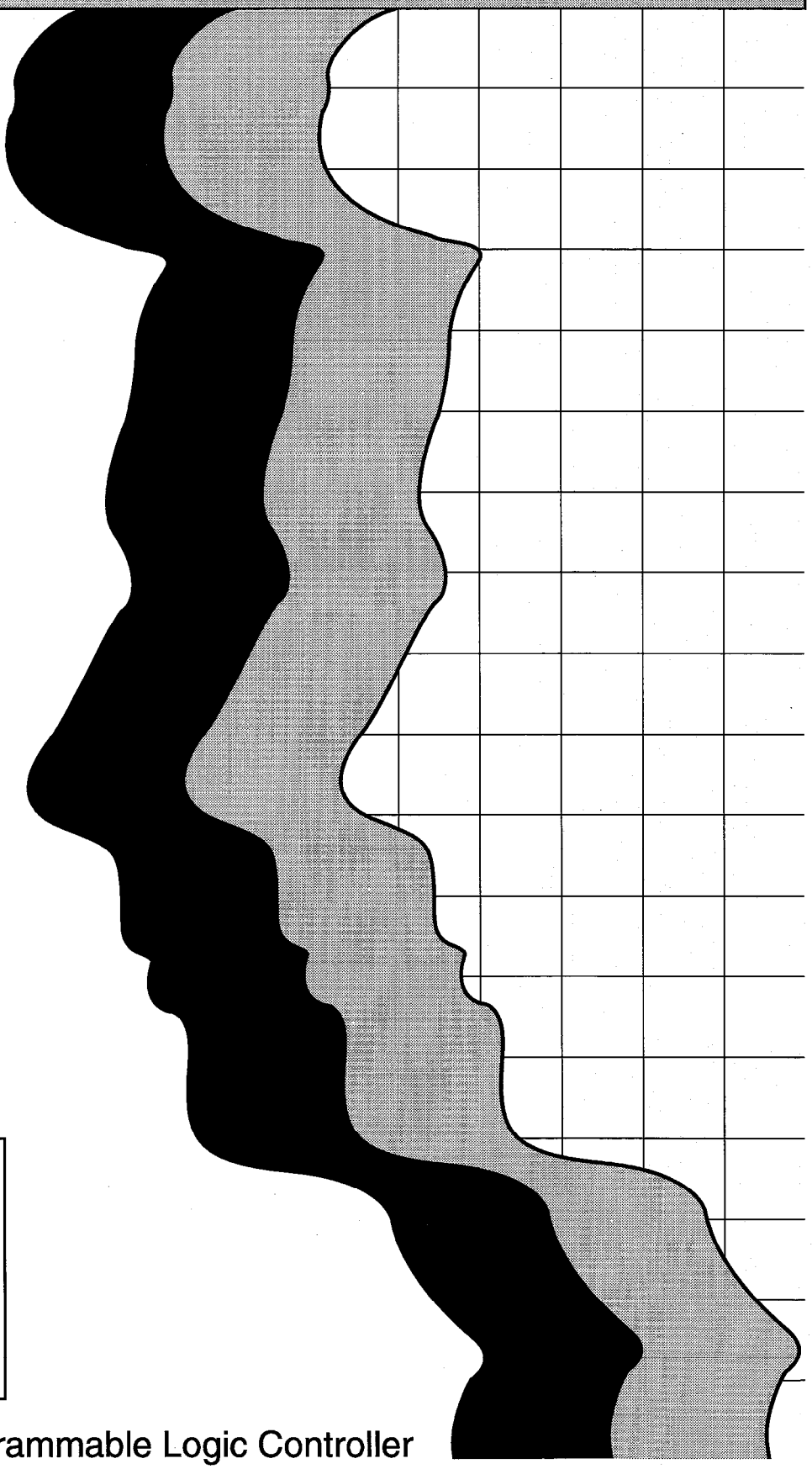
MITSUBISHI

# Multidrop link unit type AJ71C22

# User's Manual



MELSEC

Mitsubishi Programmable Logic Controller

# Safety Precautions

**(Please Be Sure to Read Before Using)**

We ask that before you use the MELSEC-A/QnA Series PC that you carefully read the manual that comes with this product and the related manuals that are introduced by this manual and that you pay sufficient attention to safety and use this product correctly.

This manual divides safety precautions into two ranks: dangerous and warning.

| | |
|---|---|
| ⚠DANGER | **Here incorrect use creates a dangerous situation that could result in death or serious injury.** |
| ⚠CAUTION | **Here incorrect use creates a dangerous situation that could result in somewhat serious or light injuries and that could damage the product.** |

Depending on the situation, items marked with warning could result in more serious consequences.

In any case, it is important to follow the directions for usage.

Take good care of the manual that comes with the product so that it can be read when necessary and be sure it is always available to the end user.

## ⚠DANGER

### [Precautions Relating To Design]

- Install a safety circuit external to the PC that keeps the entire system safe even when there are problems with the external power supply or the PC main unit.

  Otherwise, trouble could result from erroneous output or erroneous operation.

  (1) Outside the PC, construct mechanical damage preventing interlock circuits such as emergency stop, protective circuits, positioning upper and lower limit switches and interlocking forward/reverse operations.

  (2) When the PC detects the following problems, it will stop calculation and turn off all output.

  - The power supply unit has an over current protection unit and over voltage protection unit.
  - The PC CPUs self diagnostic functions, such as the watchdog timer error, detect problems. In addition, all output will be turned on when there are problems that the PC CPU cannot detect, such as in the I/O controller. Build a fail safe circuit exterior to the PC that will make sure the equipment operates safely at such times.

  Refer to the CPU unit's user manual for example fail safe circuits.

  (3) Output could be left on or off when there is trouble in the output unit's relay or transistor. So build an external monitoring circuit that will monitor any single output that could cause serious trouble.

- Build a circuit that turns on the external power supply when the PC main unit power is turned on. If the external power supply is turned on first, it could result in erroneous output or erroneous operation.

## ⚠DANGER

### [Design Precautions]

- When there are communication problems with the data link, the communication problem station will enter the following condition.

  (1) For the data link data, the data prior to the communication error will be held.

  (2) The MELSECNET (II, /B, /10) remote I/O station will turn all output off.

  (3) The MELSECNET/MINI-S3 remote I/O station will hold the output or turn all output off depending on the E.C. mode setting.

  Refer to the data link manuals regarding the method for setting the communication problem station and the operation state when there are communication problems.

  Build an interlock circuit into the PC program that will make sure the system operates safely by using the communication state information. Not doing so could result in erroneous output or erroneous operation.

## ⚠CAUTION

### [Design Precautions]

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.

  They should be installed 100mm (4 inch) or more from each other.

  Not doing so could result in noise that would cause erroneous operation.

  If you try to use the MOV instruction to read a file register R that is outside the range, the file register data will become $FFFF_H$. Using this data in this form will cause a malfunction. Be sure to design the sequence program without using a file register outside the range. Refer to the Programming Manual for detailed instructions.

## ⚠CAUTION

### [Installation Precautions]

- Use the PC in an environment that meets the general specifications contained in this manual. Using this PC in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.
- Do not touch the electronic parts or the unit conducting area. It may cause erroneous operation or failure.
- Install so that the pegs on the bottom of the unit fit securely into the base unit peg holes. Tighten the unit terminal screw by the specified torque. Not installing the unit correctly or tightening the screws to the terminal base could result in erroneous operation, damage, or pieces of the product falling.
- When installing more cables, be sure that the base unit and the unit connectors are installed correctly. After installation, check them for looseness. Poor connections could result in erroneous input and erroneous output.
- Correctly connect the memory card installation connector to the memory card. After installation, check to be sure the connection is not loose. A poor connection could result in erroneous operation.

## ⚠DANGER

### [Wiring Precautions]

- Completely turn off the external power when installing or placing wiring. Not completely turning off all power could result in electric shock or damage to the product.
- When turning on the power or operating the unit after installation or wiring work, be sure that the unit's terminal covers are correctly attached. Not attaching the terminal covers could result in electric shock.

## ⚠CAUTION

### [Wiring Precautions]

- Be sure to ground the FG terminals and LG terminals with a special PC ground of Type III or above. Not doing so could result in electric shock or erroneous operation.
- When wiring in the PC, be sure that it is done correctly by checking the product's rated voltage and the terminal layout. Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.
- Do not connect multiple power supply units in parallel. Doing so could cause overheating, fire, or damage to the power supply unit.
- Tighten the terminal screws with the specified torque. If the terminal screws are loose, it could result in short circuits, fire, or erroneous operation.
- Be sure there are no foreign substances such as sawdust or wiring debris inside the unit. Such debris could cause fires, damage, or erroneous operation.
- External connections shall be crimped or pressure welded with the specified tools, or correctly soldered. For information regarding the crimping and pressure welding tools, refer to the I/O unit's user manual. Imperfect connections could result in short circuit, fires, or erroneous operation.

## ⚠DANGER

### [Startup And Maintenance Precautions]

- Do not touch the terminals while power is on. Doing so could cause shock or erroneous operation.
- Correctly connect the battery. Also, do not charge, disassemble, heat, place in fire, short circuit, or solder the battery. Mishandling of a battery can cause overheating or cracks which could result in injury and fires.
- Turn the power off when cleaning the unit or tightening the terminal screws. Conducting these operations when the power is on could result in electric shock.

## ⚠CAUTION

### [Startup and Maintenance Precautions]

- Before conducting operations such as changing the program while the unit is operating, force output, run, stop, pause, etc., be sure to thoroughly read the manual and take due consideration for safety. Operation mistakes could cause damage to the equipment and other problems.
- Do not disassemble or modify the units. Doing so could cause trouble, erroneous operation, injury, or fire.
- Turn the power off when removing a unit. Trying to remove the unit while the power is on could damage the unit or result in erroneous operation.
- Only use specified fuses to replace burnt out fuses. Using fuses with too high capacity or using electric wires instead of the correct fuses could result in fires.

## ⚠CAUTION

### [Disposal Precautions]

- When disposing of this product, treat it as industrial waste.

# 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.

**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.

## REVISIONS

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## 1. INTRODUCTION

This manual gives specifications, handling and programming procedures for the AJ71C22 multidrop module.

The AJ71C22 allows communication of up to 256 points of ON/OFF data with a maximum of four MELSEC-A Series stations multidropped on the RS-422 interface. The AJ71C22 may be used for distances up to 500m and the following units may be used as slave stations:

A0J2C214 link module (local)
A0J2C25 remote I/O unit (remote I/O)

**IMPORTANT**

**The AJ71C22 may be connected with up to four MELSEC-A Series slave stations, known as stations 1 to 4. The AJ71C22 may also be connected with specialized equipment manufactured by other companies bringing the total number of slave stations to eight (i. e. Four MELSEC-A Series stations plus 4 others).**
**This manual covers use of the AJ71C22 with MELSEC-A Series equipment only and references to stations 5 to 8 (i. e. those manufactured by other companies) may be ignored.**



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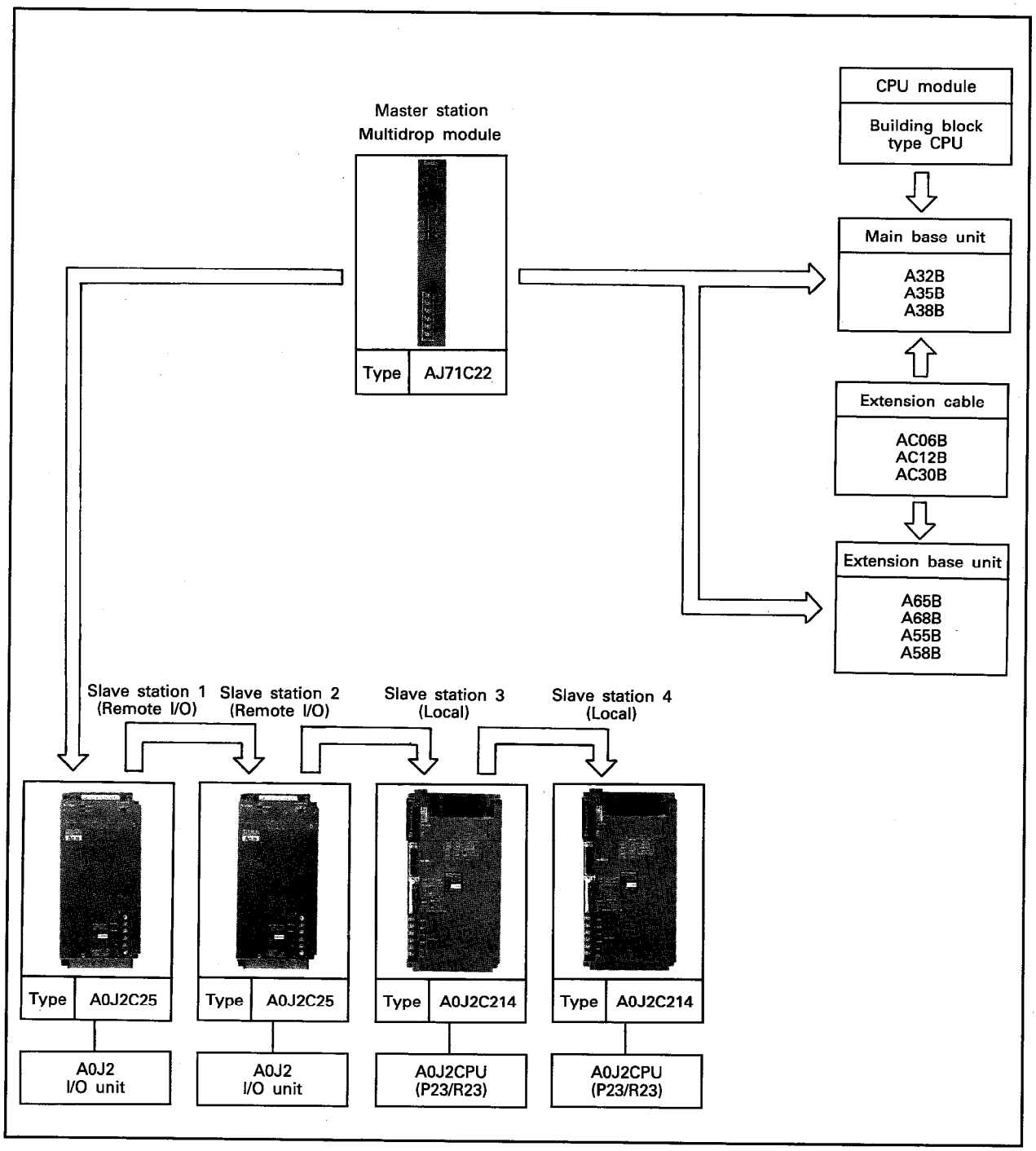
# 2. SYSTEM CONFIGURATION

## 2.1 Overall Configuration



## 2.2 Applicable A-Series Systems

(1) The AJ71C22 can be used with the following CPU units:

| | |
|---|---|
| A1(E)(P21/R21)CPU | A1NCPU(P21/R21) |
| A2(E)(P21/R21)CPU | A2NCPU(P21/R21) |
| A3(E)(P21/R21)CPU | A3NCPU(P21/R21) |
| A3H(P21/R21)CPU | |

(2) The AJ71C22 can be used in any base unit I/O slot with the following exceptions:

(a) Base units without power supplies (i.e. A55B and A58B extension bases). Where this is unavoidable, ensure that the main base unit power supply has sufficient current capacity after taking into account the volt drop over the length of the extension cable. For further details, refer to the relevant CPU User's Manual.

(b) The final slot of the seventh extension base in an A3(E)CPU system if:

① I/O allocation has been made.
② X/Y data link allocation has been made.

(c) A maximum of two AJ71C22s may be used per CPU system. When the AJ71C22 is used with any of the following units, only one AJ71C22 can be used:

① AJ71C24-S3 computer link module
② AD51E intelligent communication module

(d) In a data link system, the AJ71C22 cannot be used in a remote I/O station.

(3) A maximum of four MELSEC-A Series slave stations can be connected to the AJ71C22. The A0J2C214s may be used as local stations and the A0J2C25 as remote I/O stations 1 to 4.

# 3. SPECIFICATIONS

## 3.1 General Specifications

| Item | Specifications | | | | |
|---|---|---|---|---|---|
| Operating ambient temperature | 0 to 55°C | | | | |
| Storage ambient temperature | −20 to 75°C | | | | |
| Operating ambient humidity | 10 to 90%RH, no condensation | | | | |
| Storage ambient humidity | 10 to 90%RH, no condensation | | | | |
| Vibration resistance | Conforms to JIS C 0911 | **Frequency** | **Acceleration** | **Amplitude** | **Sweep Count** |
| | | 10 to 55Hz | —— | 0.075mm | 10 times *(1 octave/minute) |
| | | 55 to 150Hz | 1g | —— | |
| Shock resistance | Conforms to JIS C0912 (10g x 3 times in 3 directions) | | | | |
| Noise durability | By noise simulator 1500Vpp noise voltage, 1μs noise width and 25 to 60Hz noise frequency | | | | |
| Dielectric withstand voltage | 1500V AC for 1 minute across AC external terminals and ground | | | | |
| Insulation resistance | 5MΩ or larger by 500V DC insulation resistance tester across batch of AC external terminals and ground | | | | |
| Operating ambience | To be free from corrosive gases. Dust should be minimal. | | | | |
| Cooling method | Self-cooling | | | | |

**Table 3.1 General Specifications**

**REMARKS**

One octave marked * 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 20Hz to 10Hz are referred to as one octave.

## 3.2 Performance Specifications

### 3.2.1 Performance specifications

| Item | | Specifications | |
|---|---|---|---|
| Link points | Total number of link points | 256 inputs/outputs (total of 4 MELSEC-A Series stations) | |
| | Link points per station | Max. 128 inputs and Max. 128 outputs | |
| Number of stations | | Max. 4 MELSEC-A Series slaves to one AJ71C22 | |
| Overall distance | | Max. 500m | |
| Transmission interface | | Conforms to EIA. RS-422. | |
| Number of interfaces | | 1 | |
| Slave station | A0J2C214 A0J2C25 | Inputs | Max. 128 inputs per station |
| | | Outputs | Max. 128 outputs per station |
| External connection | | Terminal block (M4 x 0.7 (metric thread) screws) | |
| Recommended cable | | See Section 3.2.4 | |
| Number of I/O points occupied | | 32 | |
| Current consumption | | 5V DC, 1.4A | |
| Weight kg (lb) | | 0.6 (1.32) | |
| Size mm (inch) | | 250 (9.84) (H) x 37.5 (1.48) (W) x 120 (4.72) (D) | |

### 3.2.2 Transmission specifications

| Item | | Specifications |
|---|---|---|
| Synchronization | | Asynchronous |
| Communication | | Half duplex |
| Communication speed (BPS) | | 38,400 |
| Data format | Start bit | 1 bit |
| | Data length | 7 bits |
| | Parity bit | Even |
| | Stop bit | 1 bit |
| Transmission code | | ASCII |
| Error detection | | Parity check (vertical parity) |
| | | BCC (block check character) check (horizontal parity) |
| | | Overrun error check |
| | | Framing error check |
| | | Time check |
| | | Received data check |
| Protocol | | Dedicated |

### 3.2.3 RS-422 interface specifications

The RS-422 interface (terminal block) is used for data communication with the slave stations. For wiring, see Section 4.7.

| Terminal Block | Signal | Block Diagram | Signal Direction |
|---|---|---|---|
| SDA | Send data (SDA) | (+) resistor 330Ω (−) | To slave |
| SDB | Send data (SDB) | | |
| RDA | Receive data (RDA) | (+) resistor 330Ω (−) | From slave |
| RDB | Receive data (RDB) | | |
| SG | Signal ground (SG) | | |
| FG | Frame ground (FG) | | |

### 3.2.4 RS-422 cable specifications

Any cable conforming to the following specifications can be used for RS-422 connection.

| Item | Specifications |
|---|---|
| Type | Shielded cable |
| Number of pins | 3 pairs |
| Conductor resistance (20°C) | 88.0Ω/km max. |
| Insulation resistance | 10,000MΩ·km max. |
| Dielectric strength | 500V DC, 1 minute |
| Electrostatic capacity (1KHz) | 60nF/km max. on average |
| Characteristic impedance (100KHz) | 110±10Ω |

## 3.3 Function List

| Item | Function |
|---|---|
| Data communication | (1) Bit data is transferred to and from a maximum of 4 MELSEC-A Series slave stations via the RS-422 interface.<br>(2) Maximum number of bits transferred:<br>Total of 256 inputs/outputs for all slave stations and up to 128 inputs, 128 outputs per station<br>The following may be specified for the network:<br>a) Sequence of communication with slave stations<br>b) Priority order of slave station data<br>c) Number of bits communicated with each slave station |
| Communication data monitoring | 1 Byte of communication data can be monitored as selected. |
| Unit loopback test | Self check |

### 3.4 Buffer Memory

The AJ71C22 has a buffer memory for communication with the PC CPU.

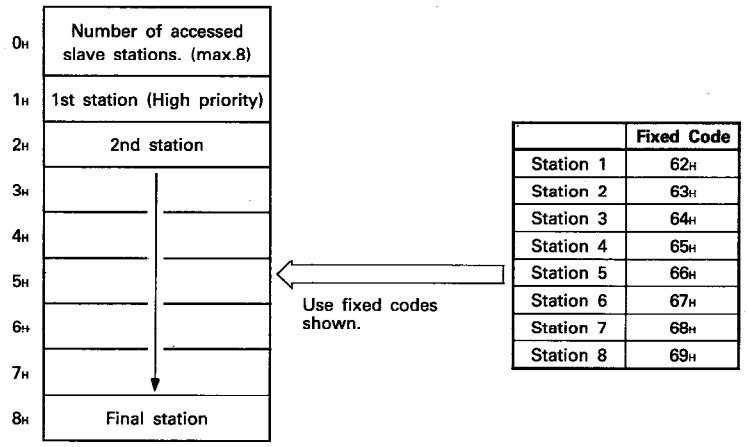
| | | |
|---|---|---|
| 0H | Number of slave station | ⇨ Set between 1 and 8*. |
| 1H ∫ 8H | Transmission priority | ⇨ See Section 3.4.1. |
| 9H ∫ 10H | Number of bits received | ⇨ See Section 3.4.2 |
| 11H ∫ 18H | Number of bits transmitted | |
| | (Reserved) | |
| 20H ∫ 3FH | Receive data | ⇨ See Section 3.4.3. |
| 40H ∫ 5FH | transmit data | |
| 60H | Error code | ⇨ For error codes, see Section 7.1. |
| 61H ∫ 7FFH | Work area (may be used freely) | |

**POINT**

1. *** When using MELSEC-A Series slave stations only, this may be set between 1 and 4.**
2. **After an error is removed, the error code at address 60H is not reset to "0" unless the PC is powered down and up or reset.**
   **The error code is overwritten by the most recent error.**

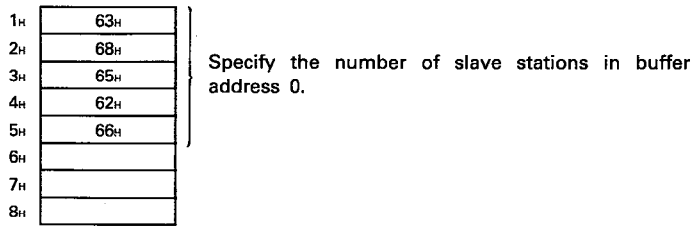
### 3.4.1 Number of slave stations and transmission priority definition

Specify the number of slave stations to be accessed and their corresponding communication priority. The number of slave stations is specified at buffer address $0_H$ and the priority order in addresses $1_H$ to $8_H$.




| | Fixed Code |
|---|---|
| Station 1 | $62_H$ |
| Station 2 | $63_H$ |
| Station 3 | $64_H$ |
| Station 4 | $65_H$ |
| Station 5 | $66_H$ |
| Station 6 | $67_H$ |
| Station 7 | $68_H$ |
| Station 8 | $69_H$ |

Example: Specify slave station communication priority as: stations 2, 7, 4, 1, 5




**POINT**

**(1) The "number of accessed slave stations" determines the maximum number of slave stations which may be accessed.**
**If further stations are specified in the priority list, these are ignored.**

**(2) Error code "33" is written to address $60_H$ if:**

**a) The same station number is repeated;**
**b) The specified number of slave stations is greater than the number set in the priority list (e.g. 5 stations specified at address $0_H$, but only three stations listed in addresses $1_H$ to $3_H$.**
**c) Any code other than $62_H$ to $69_H$ has been used in the priority list.**

**(3) When MELSEC-A Series slave stations only are being used, the maximum number of accessed slave stations is limited to 4 (The other 4 stations may be specialized equipment only, not available from Mitsubishi).**

### 3.4.2 Number of bits received and number of bits transmitted

Specifies the number of bits used for transmit and receive data communication. Specify the number of receive bits at addresses $9_H$ to $10_H$ and the number of transmit bits at addresses $11_H$ to $18_H$. Note the following restrictions:

① The total number of receive plus transmit bits for all stations must not exceed 256.
② The maximum number of bits received at any station must not exceed 128.
③ The maximum number of bits transmitted from any station must not exceed 128.
④ Communication data must be specified in batches of 8 bits.

| | | |
|---|---|---|
| $9_H$ | Station 1 area | Number of bits of input data (Bits received) |
| $A_H$ | Station 2 area | |
| $B_H$ | Station 3 area | |
| $C_H$ | Station 4 area | |
| $D_H$ | Station 5 area | |
| $E_H$ | Station 6 area | |
| $F_H$ | Station 7 area | |
| $10_H$ | Station 8 area | |
| $11_H$ | Station 1 area | Number of bits of output data (Bits transmitted) |
| $12_H$ | Station 2 area | |
| $13_H$ | Station 3 area | |
| $14_H$ | Station 4 area | |
| $15_H$ | Station 5 area | |
| $16_H$ | Station 6 area | |
| $17_H$ | Station 7 area | |
| $18_H$ | Station 8 area | |

**POINT**

**If the Communication data setting is not a multiple of 8, error code "33" is written to buffer address $60_H$.**

Example:

(Stations 1, 2 = A0J2C25, station 4 = A0J2C214)

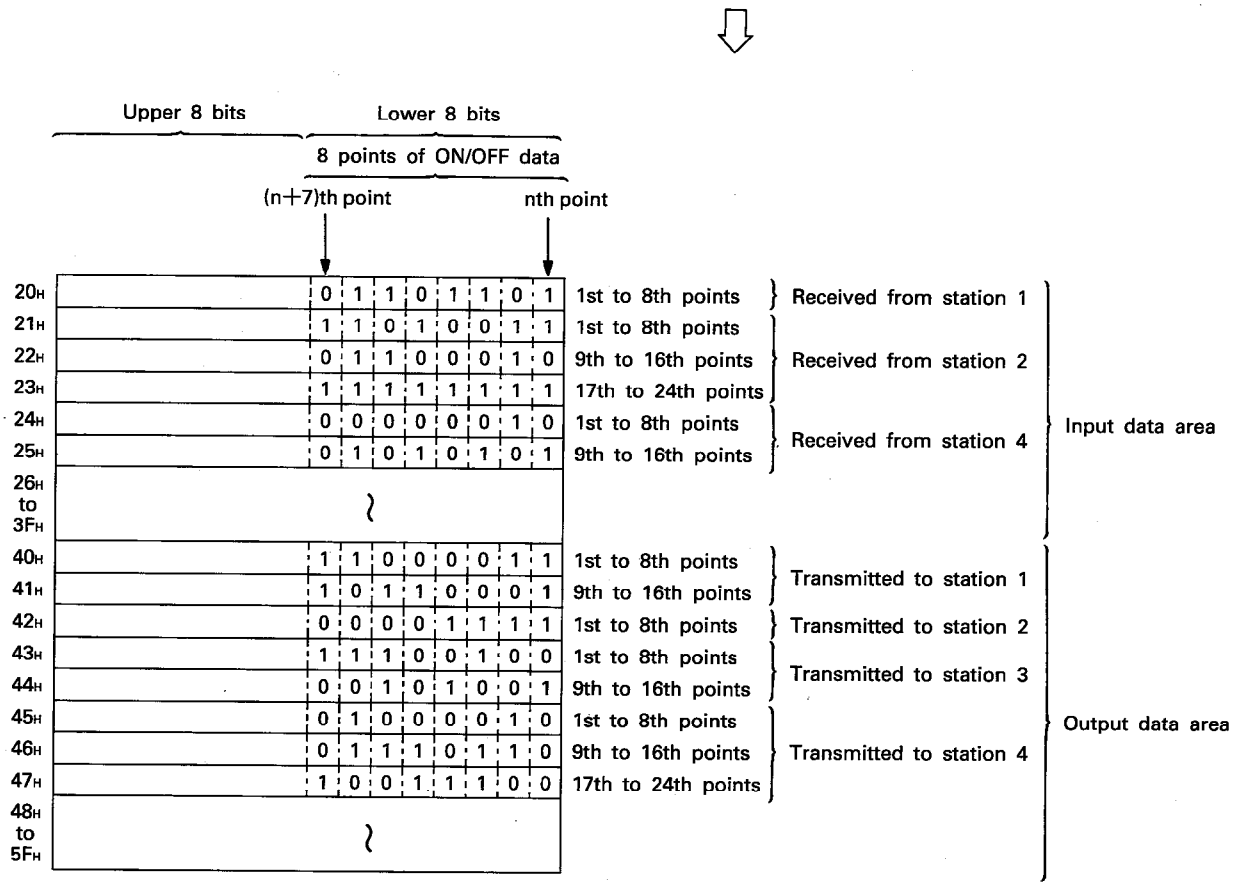
| AJ71C22 | Station 1 | Station 2 | Station 4 |
|---|---|---|---|
| Receive (bits) | 8 | 24 | 16 |
| Transmit (bits) | 16 | 8 | 16 |

| | | |
|---|---|---|
| $9_H$ | 8 | Bits received |
| $A_H$ | 24 | |
| $B_H$ | 0 | |
| $C_H$ | 16 | |
| $D_H$ | 0 | |
| $E_H$ | 0 | |
| $F_H$ | 0 | |
| $10_H$ | 0 | |
| $11_H$ | 16 | Bits transmitted |
| $12_H$ | 8 | |
| $13_H$ | 0 | |
| $14_H$ | 16 | |
| $15_H$ | 0 | |
| $16_H$ | 0 | |
| $17_H$ | 0 | |
| $18_H$ | 0 | |

### 3.4.3 Receive and transmit data

Communication data between the master and slave stations is written to the lower 8 bits of buffer addresses $20_H$ to $5F_H$. Received data is written addresses $20_H$ to $3F_H$. Data for transmission is written to addresses $40_H$ to $5F_H$ and then sent to slave stations automatically.
This data area must be assigned to slave stations in order of station numbers (ignoring the transmission priority) in accordance with the number of bits specified for communication, starting at address $20_H$ or $40_H$. This is illustrated in the following example:

| AJ71C22 | Station 1 | Station 2 | Station 3 | Station 4 |
|---|---|---|---|---|
| Receive (bits) | 8 | 24 | 0 | 16 |
| Transmit (bits) | 16 | 8 | 16 | 24 |

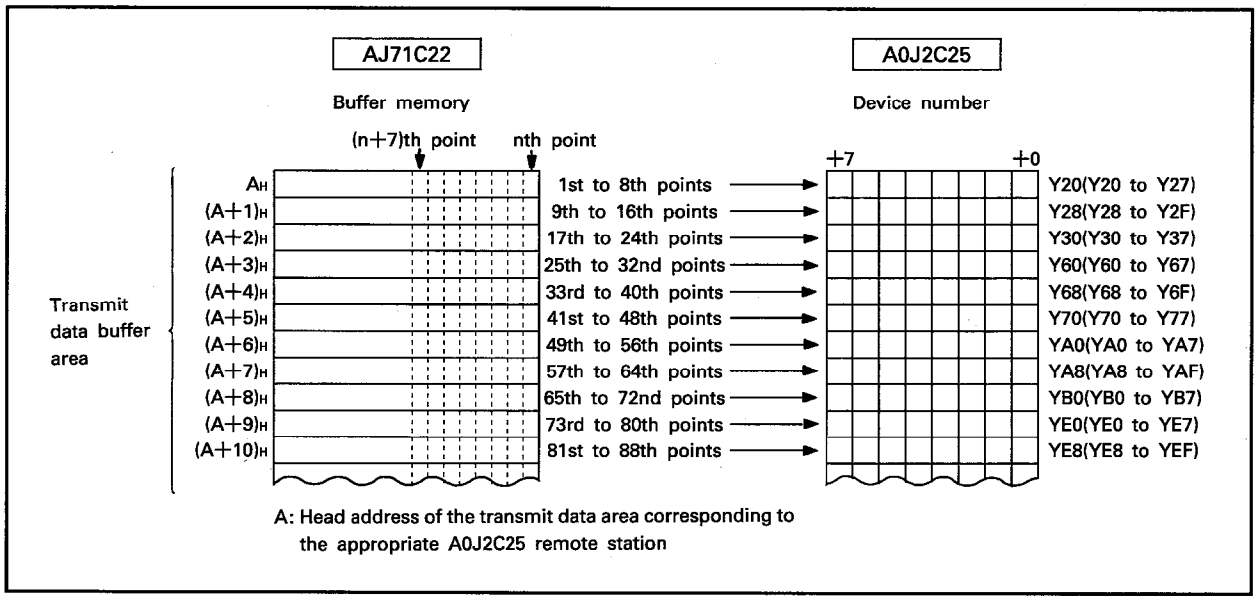


## 3.5 Data Communication with Slave Stations

### 3.5.1 Communication with A0J2C25

(1) Data transmission from AJ71C22 to A0J2C25

Bits transmitted from the AJ71C22 buffer correspond to A0J2C25 outputs (Y) as indicated below.

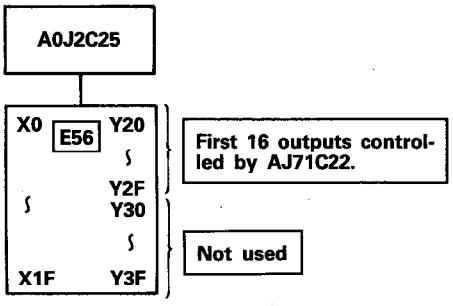



Writing ON/OFF data to the relevant C214 transmission buffer data bits switches the corresponding A0J2C25 outputs (Y) on or off, (e.g. "1" written to bit 0 (1st point) of address $A_H$, switches Y20 on at the A0J2C25 station).

**POINT**

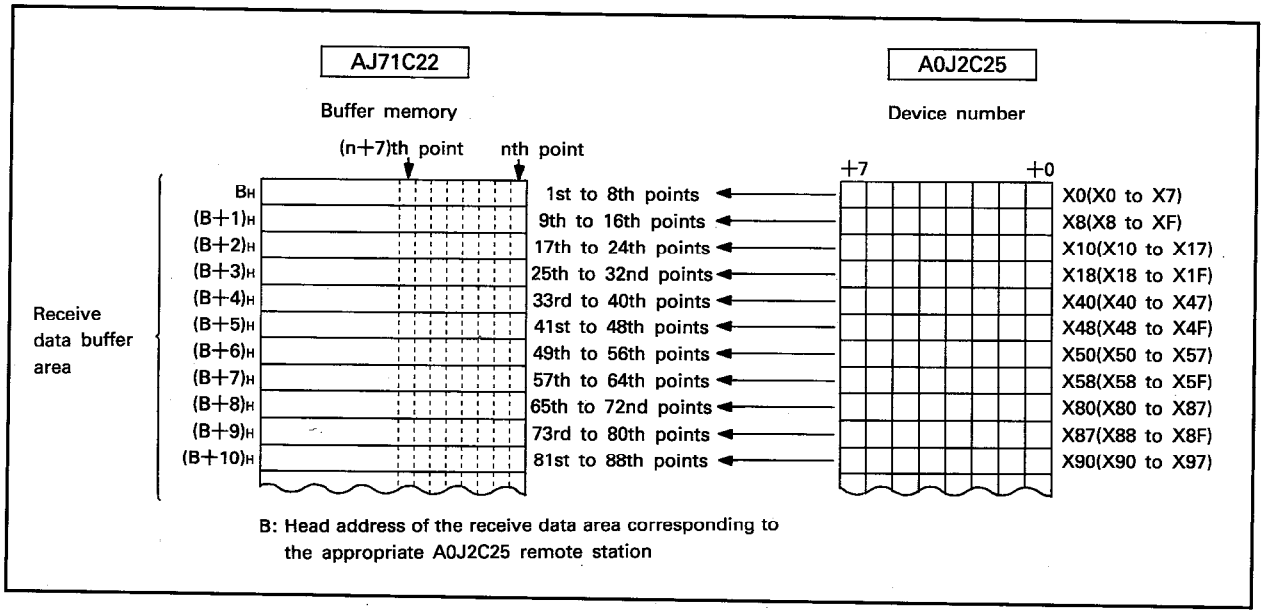
**The number of bits communicated between the AJ71C22 and the A0J2C25 is dictated by the number specified in the AJ71C22 and is independent of the actual I/O module connected to the A0J2C25.**

**Example: Transmission data set to 16 points**



(2) Data received from A0J2C25 by AJ71C22

Bits received by the AJ71C22 buffer memory correspond to A0J2C25 inputs (X) as shown below.

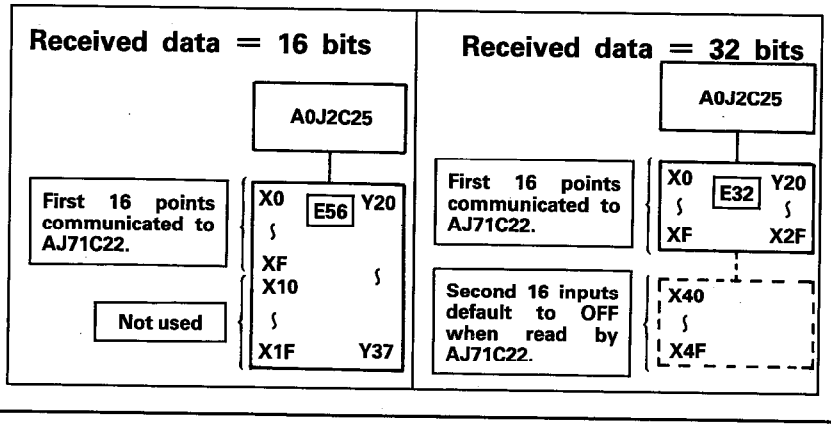



During data receiving, the corresponding AJ71C22 buffer bits are switched on (1)/off (0) by the A0J2C25 inputs (X), e.g. when X1 in the A0J2C25 station turns on, AJ71C22 address $B_H$, bit 1 (2nd point) is set to 1.

**POINT**

**The number of inputs communicated between the A0J2C25 and the AJ71C22 is dictated by the number specified in the AJ71C22 and is independent of the actual I/O module connected to the A0J2C25.**

**Example:**

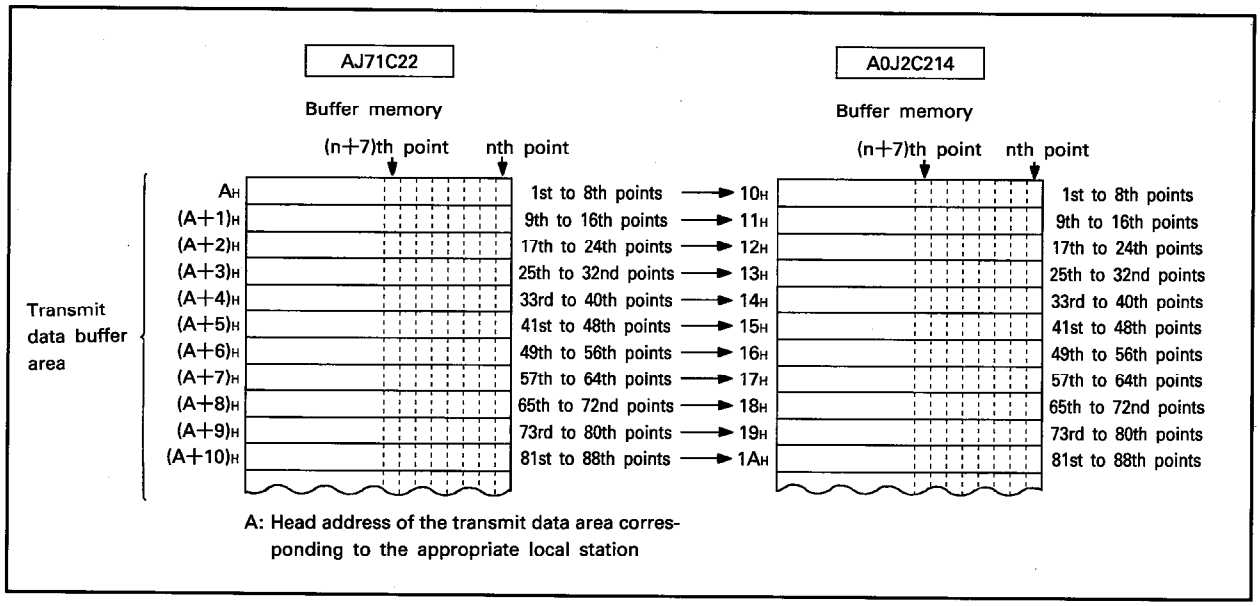


### 3.5.2 Communication with A0J2C214

For information on the A0J2C214 buffer memory, see the A0J2C214 Multidrop function User's Manual.

(1) Data transmitted from AJ71C22 to A0J2C214

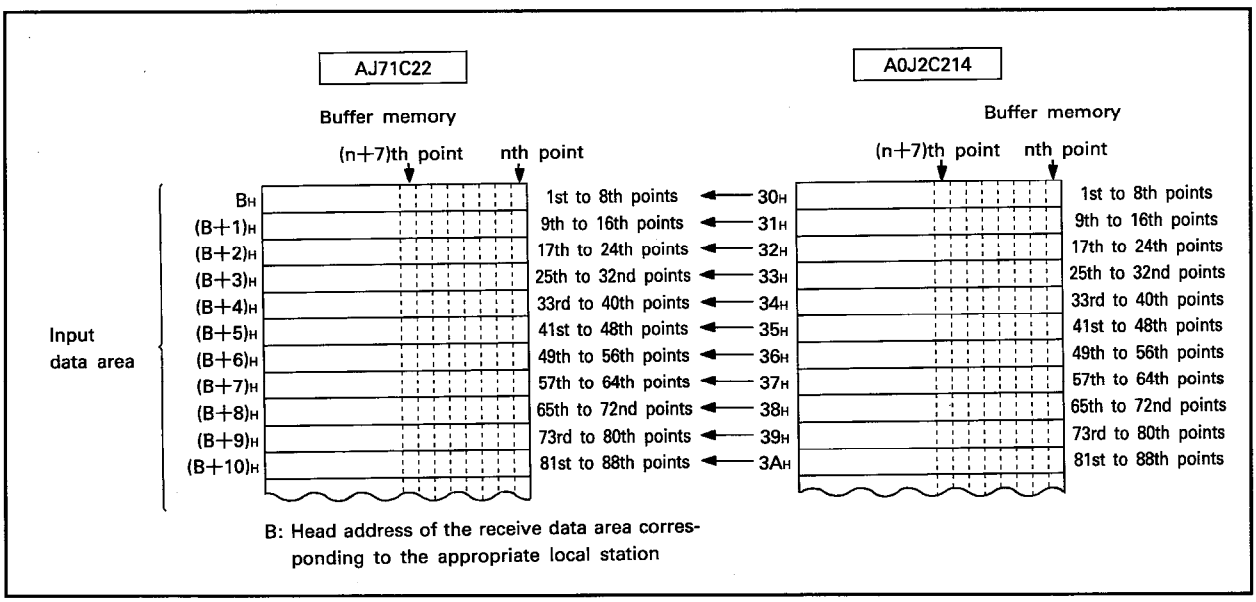
For data transmission from the AJ71C22 to the A0J2C214, the AJ71C22 buffer bits correspond to the A0J2C214 buffer bits as shown below.




Writing ON/OFF data to master buffer bits switches the corresponding local buffer bits on/off. (e.g. "1" written to bit 0 of the master C214 buffer address $A_H$, switches bit 0 of the appropriate local C214 buffer address $10_H$ "on")

(2) Data received by AJ71C22 from A0J2C214

When receiving data from a local station, the master buffer bits correspond to the local station buffer bits as shown below:




Writing ON/OFF data to local buffer bits switches the corresponding master buffer bits on/off. (e.g. "1" written to bit 0 of the local C214 buffer address 30H, switches bit 0 of the master C214 buffer address BH "on")

### 3.6 I/O signals between PC CPU and AJ71C22

The AJ71C22 PC CPU I/O numbers are listed below. The actual device number will depend on the I/O unit position.
The device numbers indicated assume that the AJ71C22 has been loaded in slot 0 of the main base unit.

| Signal direction: AJ71C22 to PC CPU | | Signal direction: PC CPU to AJ71C22 | |
|---|---|---|---|
| **Device number** | **Description** | **Device number** | **Description** |
| X0 | During data transmission sequence<br>(1) On during normal data transmission sequence.<br>(2) Off indicates pre-transmission sequence or an error. (See Section 5.2.2.) | Y10 | AJ71C22 start signal<br>(1) Switched on to start up the AJ71C22 and kept on during operation.<br>(2) Switched off to stop transmission. (See Section 5.2.) |
| X1 | Pre-transmission sequence error<br>(1) On indicates an error during pre-transmission sequence.<br>(2) Switched off when Y11 is turned on. (See Section 5.2.1.) | Y11 | Error reset signal<br>Used to switch off X1 or X2. (See Section 5.2.1 and 5.2.2.) |
| X2 | Data transmission sequence error<br>(1) On indicates an error during data transmission sequence.<br>(2) Switched off when Y11 is turned on. (See Section 5.2.2.) | Y12 to Y1F | Reserved |
| X3 to XC | Reserved | | |
| XD | WDT (watch dog timer) error<br>Switched on when the AJ71C22 WDT times out. | | |
| XE | Reserved | | |
| XF | | | |

**POINT**

**(1) Y0 to YF corresponding to X0 to XF may be used as internal relays.**

**(2) I/O signals marked "Reserved" cannot be used.**

# 4. HANDLING

## 4.1 Handling Instructions

(1) Protect the AJ71C22 from impact.

(2) Do not touch the printed circuit board.

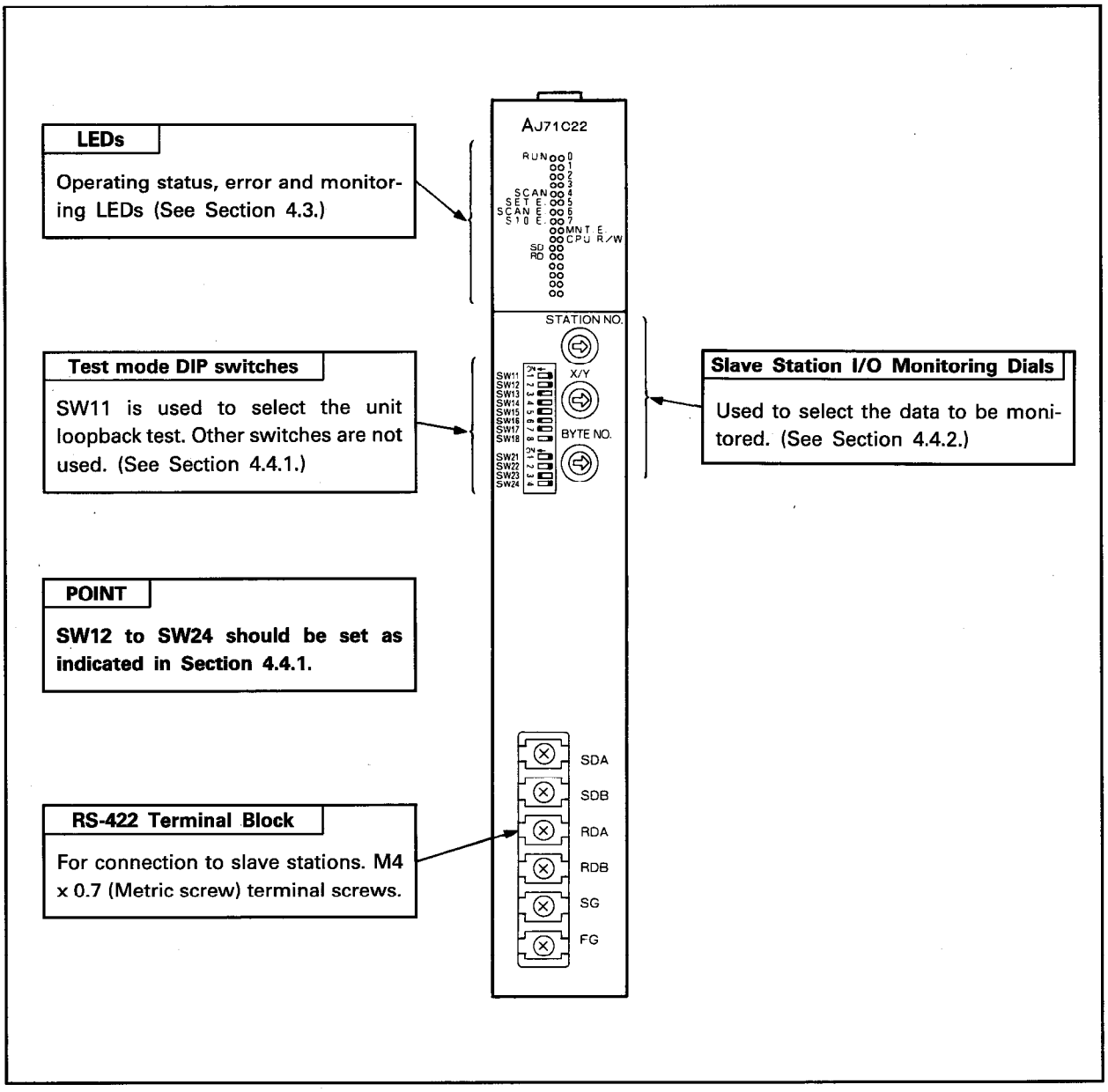
(3) Do not allow conductive debris to enter the unit.

(4) Tighten terminal screws as indicated below:

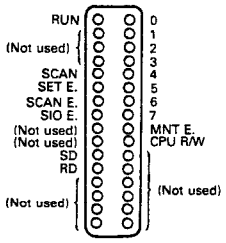
| Screw | Tightening Torque kg · cm (lb · inch) |
|---|---|
| RS-422 terminal screw | 8 (6.93) to 14 (12.13) |
| Unit mounting screw (usually not required) | 8 (6.93) to 12 (10.39) |

(5) To load the unit onto the base, hook the two lower hooks into the cut out and gently swing the unit into place. Ensure that the top latch engages. To remove the unit, press the top latch and swing the unit out before removing from the base unit.

## 4.2 Nomenclature



## 4.3 LEDs

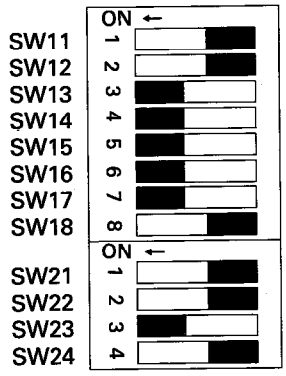
| LED Area | LED | Meaning of LED | LED ON | LED OFF | Initial State of LED |
|---|---|---|---|---|---|
|  | RUN | Normal run | Normal | WDT error | ON |
| | SCAN | Data transmission sequence | | Stand by | OFF |
| | SET E. | Pre-transmission sequence error | Error | Normal | OFF |
| | SCAN E. | Data transmission sequence error | Error | Normal | OFF |
| | SIO E. | RS-422 communication error by loopback self-check | Error | Normal | OFF |
| | SD | RS-422 data communication | Transmitting | Stand by or error | OFF |
| | RD | | Receiving | Stand by or error | OFF |
| | 0 | Slave I/O monitoring (See Section 4.4.2) | On indicates that the corresponding bit is 1 and off indicates the bit is 0. | | OFF |
| | 1 | | | | |
| | 2 | | | | |
| | 3 | | | | to |
| | 4 | | | | |
| | 5 | | | | |
| | 6 | | | | |
| | 7 | | | | OFF |
| | MNT E. | Slave I/O monitoring error | Error | Normal | OFF |
| | CPU R/W | Communication status with CPU | Flickers during communication (Off during communication with CPU) | | ON |

**REMARKS**

For further information on the error indicator LEDs, see Section 7.2. These LEDs are switched off by the error reset signal (Y11).

## 4.4 Settings

### 4.4.1 DIP switches

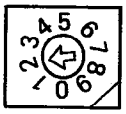
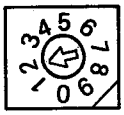
| DIP Switch Area | Switch Number | Switch | Switch Position | | Remarks |
|---|---|---|---|---|---|
| | | | ON | OFF | |
|  (Factory setting) | SW11 | Loopback self-check | Testing | Normal transmission | SW11 should be set to OFF during normal operation. See Section 4.5. |
| | SW12 | These switches should be set as shown on the left to ensure normal transmission. | | | |
| | SW13 | | | | |
| | SW14 | | | | |
| | SW15 | | | | |
| | SW16 | | | | |
| | SW17 | | | | |
| | SW18 | | | | |
| | SW21 | | | | |
| | SW22 | | | | |
| | SW23 | | | | |
| | SW24 | | | | |

**POINT**

**The PC CPU should be reset after changing the DIP switch setting.**

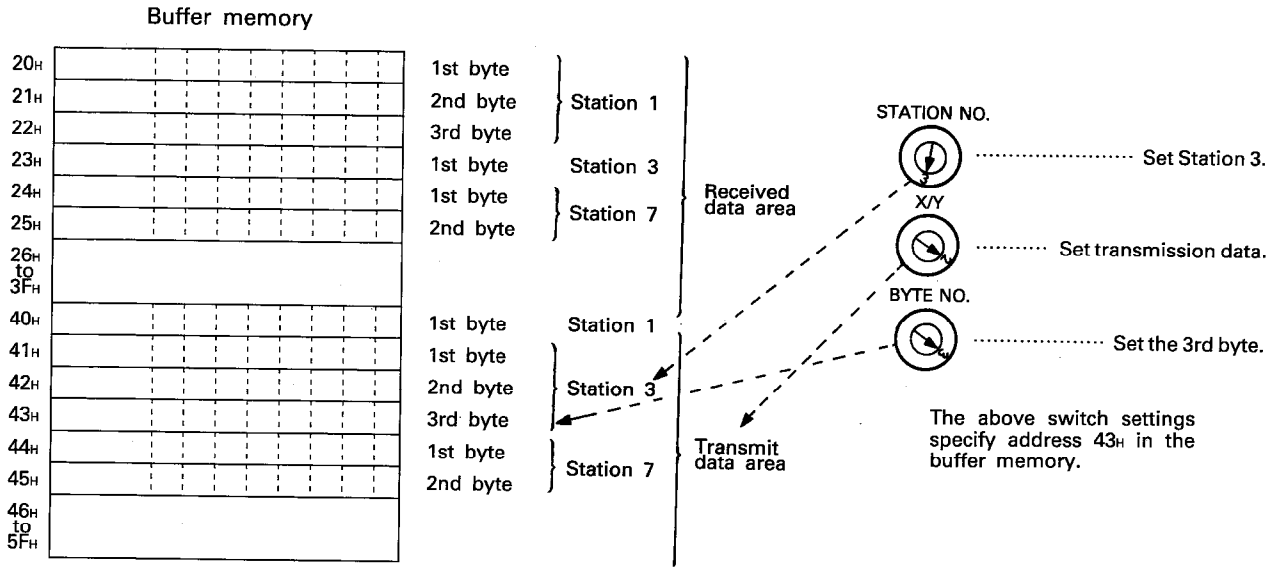
### 4.4.2 Dial settings

(1) Settings

<table>
<tr><th>Switch</th><th>Description</th><th>Remarks</th></tr>
<tr><td>STATION NO.<br>  </td><td>Set the slave station to be monitored.<br><table><tr><th>Setting</th><th>Application</th></tr><tr><td>0</td><td>(Not used)</td></tr><tr><td>1</td><td>Station 1</td></tr><tr><td>2</td><td>Station 2</td></tr><tr><td>3</td><td>Station 3</td></tr><tr><td>4</td><td>Station 4</td></tr><tr><td>5</td><td>Station 5</td></tr><tr><td>6</td><td>Station 6</td></tr><tr><td>7</td><td>Station 7</td></tr><tr><td>8</td><td>Station 8</td></tr><tr><td>9</td><td>(Not used)</td></tr></table></td><td>In "Not used" mode or when transmission priority has not been set to the selected station, the MNT. E LED is lit and LEDs 0 to 7 go off.</td></tr>
<tr><td>X/Y<br>  </td><td>Select data to be monitored.<br><table><tr><th>Setting</th><th>Application</th></tr><tr><td>0</td><td>(Not used)</td></tr><tr><td>1</td><td>Data received from the slave</td></tr><tr><td>2</td><td>Data transmitted to the slave</td></tr><tr><td>3<br>to<br>9</td><td>(Not used)</td></tr></table></td><td>In "Not used" mode, the MNT. E LED is lit and LEDs 0 to 7 go off.</td></tr>
<tr><td>BYTE NO.<br> </td><td>Set the byte (8 points) of the relevant slave station communication data to be monitored.<br><table><tr><th>Setting</th><th>Application</th></tr><tr><td>1</td><td>1st byte (1st to 8th points)</td></tr><tr><td>2</td><td>2nd byte (9th to 16th points)</td></tr><tr><td>3</td><td>3rd byte (17th to 24th points)</td></tr><tr><td>4</td><td>4th byte (25th to 32nd points)</td></tr><tr><td>5</td><td>5th byte (33rd to 40th points)</td></tr><tr><td>6</td><td>6th byte (41st to 48th points)</td></tr><tr><td>7</td><td>7th byte (49th to 56th points)</td></tr><tr><td>8</td><td>8th byte (57th to 64th points)</td></tr><tr><td>9</td><td>9th byte (65th to 72nd points)</td></tr><tr><td>A</td><td>10th byte (73rd to 80th points)</td></tr><tr><td>B</td><td>11th byte (81st to 88th points)</td></tr><tr><td>C</td><td>12th byte (89th to 96th points)</td></tr><tr><td>D</td><td>13th byte (97th to 104th points)</td></tr><tr><td>E</td><td>14th byte (105th to 112th points)</td></tr><tr><td>F</td><td>15th byte (113th to 120th points)</td></tr><tr><td>0</td><td>16th byte (121st to 128th points)</td></tr></table></td><td>If the set value exceeds the communication data point setting, the MNT. E LED is lit and LEDs 0 to 7 go off.</td></tr>
</table>

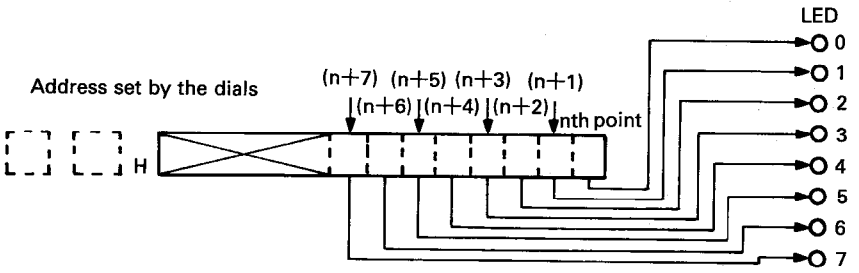
Example:

Receive and transmit data areas are assigned in the buffer memory as shown:



(2) Monitoring status

LEDs 0 to 7 indicate the ON/OFF status of each bit in a specified byte.




The LEDs corresponding to bits containing 1 are switched on.

**POINT**

**(1) The I/O data to be monitored changes as the dial is moved. There is no need to reset the CPU when the specified byte is changed.**

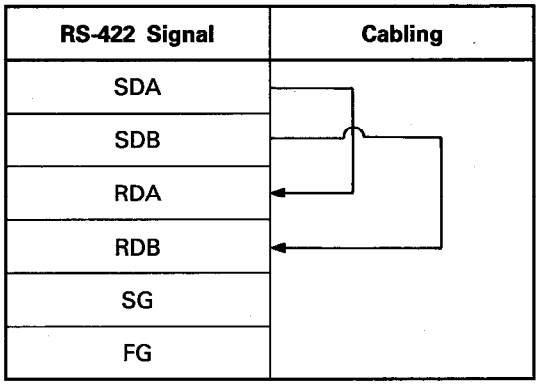
**(2) The MNT. E LED indicates that any dial has been set to an invalid position.**

### 4.5 Unit Loopback Test

Checks the communication status of the AJ71C22 RS-422 interface.

(1) Pre-test procedure

① Set SW11 to ON.
② Wire the RS-422 interface as shown below.

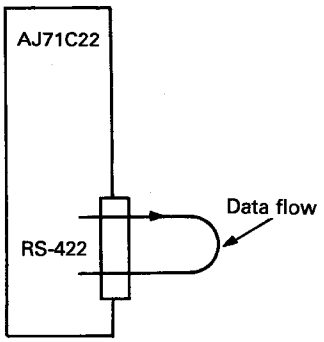



③ Reset the PC CPU.

*Note: For this test, the slave station number, transmission precedence, I/O data points, etc. need not be specified and the PC CPU may be in RUN or STOP mode.*

(2) Test

Data transmitted from terminals SDA and SDB is received by RDA and RDB, and the received data is checked against the transmitted data.




(3) Result

If communication is normal, the SIO E. LED remains off and the SD and RD LEDs flicker.
If communication is faulty, the SIO E. LED is lit to indicate that a) the cabling is not as specified above or any cable is broken or b) the AJ71C22 hardware is faulty.

### 4.6 Wiring Instructions

For reliable operation, protect all wiring against noise.

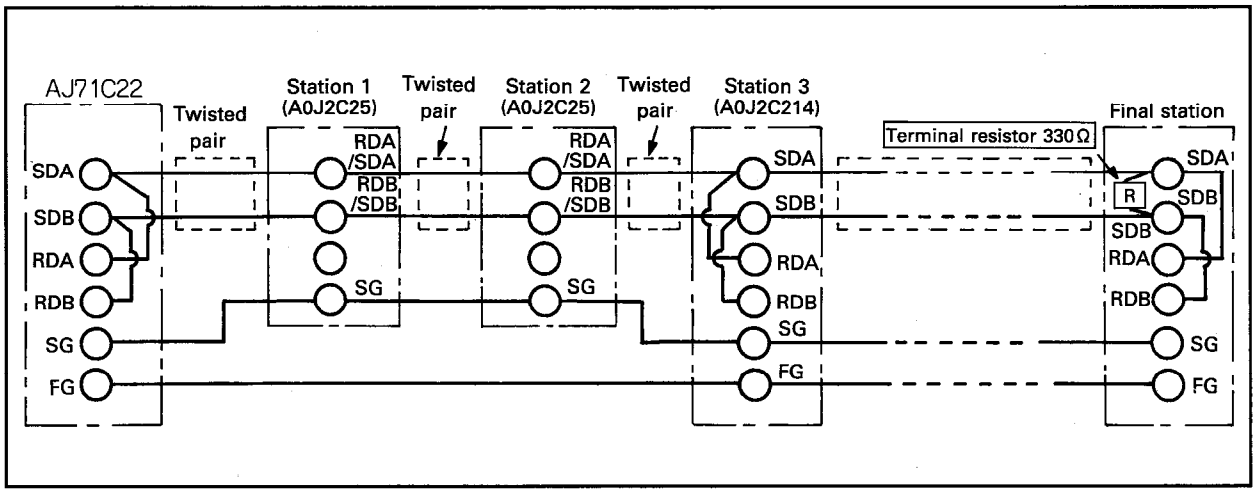
(1) Keep cables carrying data at least 100mm (3.94 inch) away from main circuit wiring, high voltage cables and normal PC input and output wiring.

(2) Ground shield wires or cable shields at one point only.

(3) Use M4 solderless terminals for connection to the RS-422 terminal block (Terminal screw diameter = 4mm (0.16inch)).

## 4.7 RS-422 Wiring and Terminal Resistor Connection

Connect the AJ71C22 and slave stations as shown below.




(1) The AJ71C22 should be located at the end of the system as shown above.

(2) In the AJ71C22, the SDA terminal must be connected to the RDA terminal and the SDB to the RDB.

(3) The following terminals must be connected between stations:

- SDA (or RDA) and SDA (or RDA)
- SDB (or RDB) and SDB (or RDB)
- SG and SG
- FG and FG (not provided on the A0J2C25)



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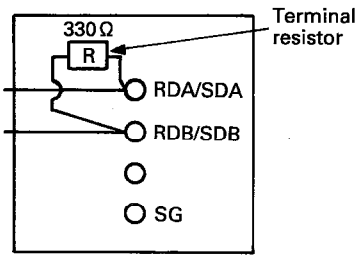
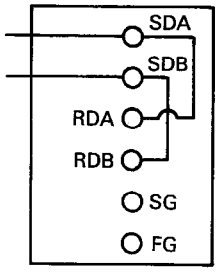
(4) The terminal resistor must be set in the final station as follows:

● A0J2C25




● A0J2C214




Set either of SW22 or SW23 to ON (external connection of resistor not required).

The terminal resistor is used to prevent data communication errors.

**REMARKS**

The terminal resistor is used at the sending and/or receiving port of end stations to protect transmission signals. In the AJ71C22 system, this terminal is required at one port only because the same cable is used for data transmission and receiving.

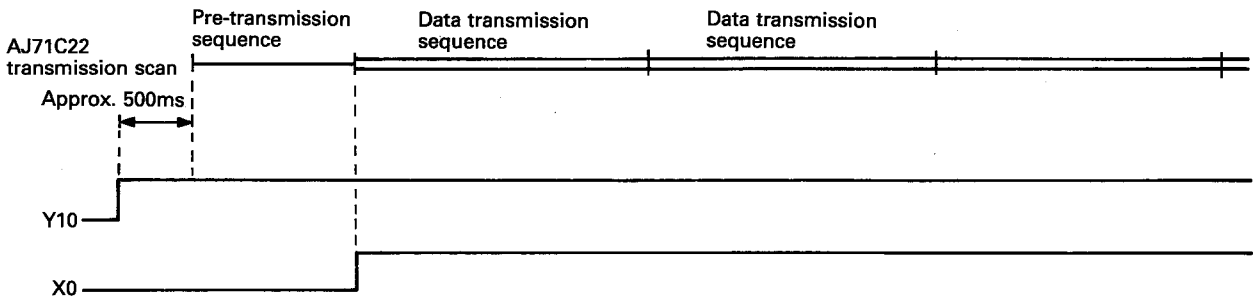
**POINT**

**(1) The AJ71C22 has a built-in terminal resistor.**

**(2) Refer to the appropriate manuals for the A0J2C25 and A0J2C214 station number switch settings, etc..**

# 5. CONTROL

## 5.1 Control Procedure




(1) Approximately 500msec after Y10 is switched on, the pre-transmission sequence checks the link status and I/O points.

(2) When the pre-transmission checks are complete, the data transmission sequence is started automatically and X0 is switched on. I/O data communication cycles are repeated between the master and slave stations in the order specified for the transmission priority.
X0 should be used as an interlock in the sequence program to prevent buffer memory transactions from being processed during the data transmission sequence.



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## 5.2 Error Control

### 5.2.1 Pre-transmission sequence error control

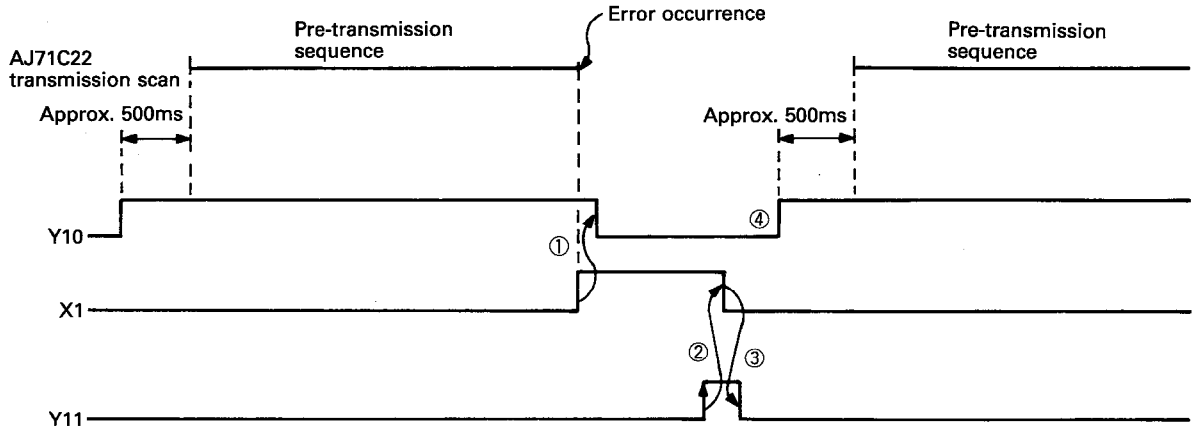
(1) If an error occurs during the pre-transmission sequence, communication with all slave stations is stopped and:

① X1 in the AJ71C22 switches on;
② The SET E. LED is lit;
③ The error code is written to buffer address $60_H$.
(For error codes, see Section 7.1.)

(2) To resume the pre-transmission sequence:

① Switch on Y11 in the sequence program to reset the error. (X1 turns off automatically.)
② Switch on Y10 in the sequence program.

(3) Error and restart control timing chart




① Arrange for the error detection signal (X1) to switch on Y10 in the sequence program.
② Switching Y11 on automatically switches X1 off.
③ X1 switching off causes Y11 to switch off. (part of the sequence program)
④ Switch on Y10 in the sequence program,to restart the pre-transmission sequence.

### 5.2.2 Data transmission sequence error control

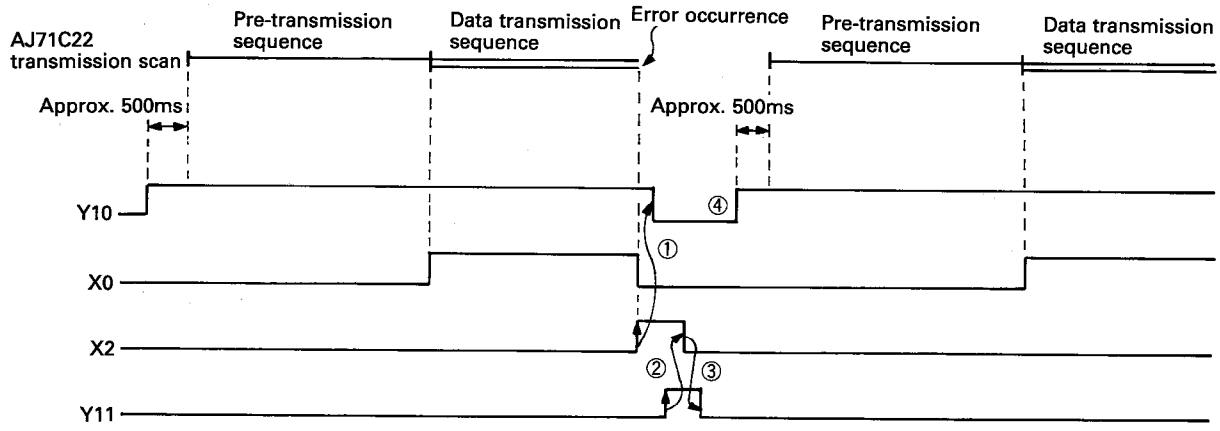
(1) If an error occurs during the data transmission sequence, communication with all slave station is stopped and:

① X2 in the AJ71C22 switches on and X0 off.
② The SCAN LED turns off and the SCAN E. LED is lit.
③ The error code is written to buffer address $60_H$.
(For error codes, see Section 7.1.)

(2) To restart the data transmission sequence:

① Turn on Y11 in the sequence program to reset the error. (X2 turns off automatically.)
② Turn on Y10 in the sequence program to execute the pre-transmission sequence.

(3) Error and restart control timing chart




① Arrange for the error detection signal X2 to switch off Y10 in the sequence program.
② Switching Y11 on automatically switches X2 off.
③ X2 switching off causes Y11 to switch off (part of the sequence program).
④ Switch on Y10 in the sequence program, to restart the pre-transmission sequence.

(4) When a data transmission sequence error occurs;

① The AJ71C22 (master) buffer data remains unchanged.
② The A0J2C214 (slave) buffer data remains unchanged.
③ The A0J2C25 (slave) outputs (Y) are all switched off.



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### 5.3 Transmission Delay Time

During transmission between the AJ71C22 and any slave station, there is a delay until one receives data from the other. The delay time per station can be calculated by the following expression. When there are more than one slave station, the delay times of all stations must be added.

$$\text{Delay time} = \left(\frac{X}{8}\right) \times 0.74 + \left(\frac{Y}{8}\right) \times 0.86 + 6.1 \text{ [msec]}$$

where X = number of data bits received from the corresponding station
Y = number of data bits transmitted to the corresponding station

### 5.4 Transmission Break Detection Time

(1) Slave stations detect that the AJ71C22 has stopped transmission in the order set in the transmission priority, starting at the slave station next to the last station to communicate with the AJ71C22.

Example: When the AJ71C22 stops transmission during communication with station 3 with the transmission precedence set in station order 5, 2, 3, 1 and 7, the transmission break is detected in the following order: station 1, 7, 5, 2, 3.

(2) Times required to detect the transmission break:

① The first station detects the break a maximum of 500msec after the AJ71C22 stops transmission.

② Time for detection between slave stations

$$\frac{10}{38.4} \times \left(6 + \frac{X+Y}{4}\right) + 2 \text{ [msec]}$$

where X = number of data points received at the preceding station
Y = number of data points transmitted at the preceding station

**POINT**

**(1) The A0J2C25 switches all outputs off after detecting a break in transmission.**

**(2) The A0J2C214 buffer data is retained after transmission is stopped.**

**(3) The PC CPU can detect a break in AJ71C22 transmission from the ON/OFF status of X0, X1 and X2.**

# 6. PROGRAMMING

## 6.1 Notes on Programming

(1) The AJ71C22 buffer memory data is initialized by:

① Resetting the PC CPU
② Switching the PC power off

(2) The initial data in the buffer memory is written to the AJ71C22 operating system (OS) after Y10 switches on. Hence data at buffer addresses $0_H$ to $18_H$ cannot be rewritten during the pre-transmission or data transmission sequence.

(3) For transmission delays between the PC CPU and slave stations, see Section 5.3.

(4) For information on the FROM and TO instructions used for data communication with the PC CPU, see the A1(E), A2(E), A3(E)CPU Programming Manual.

## 6.2 Initial Data Write Program

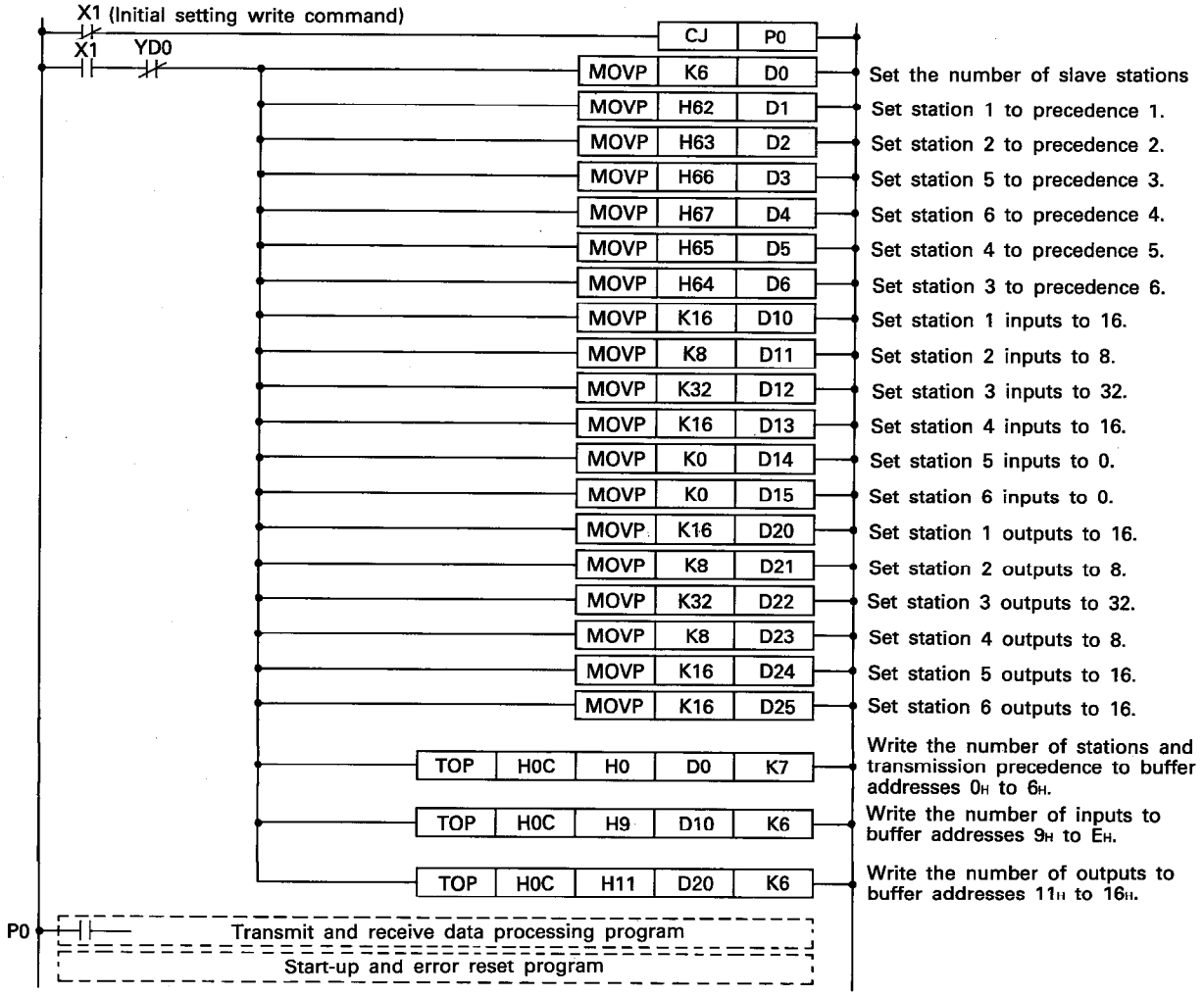
See Section 3.4 for buffer memory addresses.

### PROGRAM CONDITIONS

① AJ71C22 I/O assignment ····· XC0 to XDF, YC0 to YDF
② Number of slave stations ····· 6*
③ Transmission precedence ····· Stations 1, 2, 5, 6, 4, 3
④ Number of bits communicated

| | Station 1 | Station 2 | Station 3 | Station 4 | Station 5 | Station 6 |
|---|---|---|---|---|---|---|
| Received | 16 | 8 | 32 | 16 | 0 | 0 |
| Transmitted | 16 | 8 | 32 | 8 | 16 | 16 |

### PROGRAM EXAMPLE




* This example uses 4 MELSEC-A Series stations (station numbers 1 to 4) as well as two other specialized slave stations (station numbers 5 and 6)



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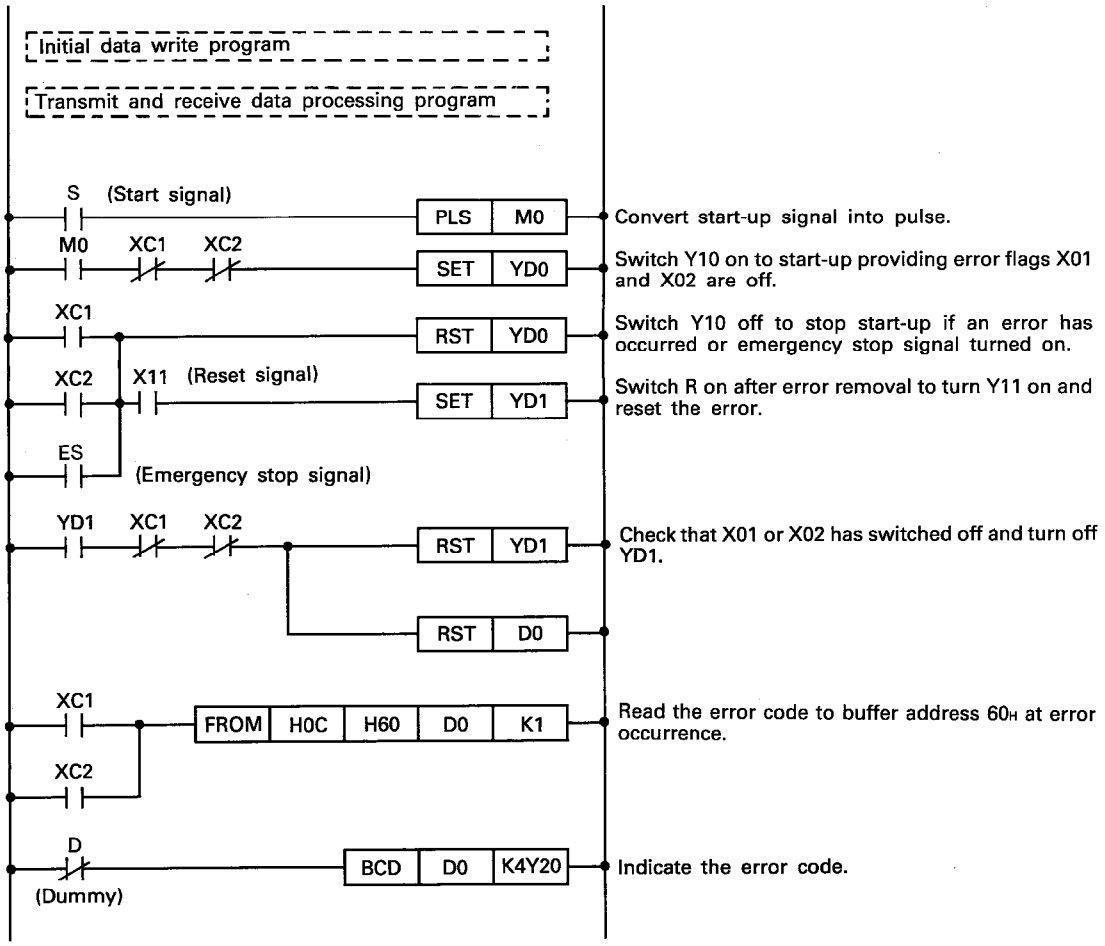
## 6.3 Start-up and Error Reset Program

Assume the AJ71C22 I/O assignment to be XC0 to XDF, YC0 to YDF.



## 6.4 Communication Programs

### 6.4.1 Transmission data write

This program writes data from the PC CPU to the AJ71C22 transmit buffer memory area.

**PROGRAM CONDITIONS**

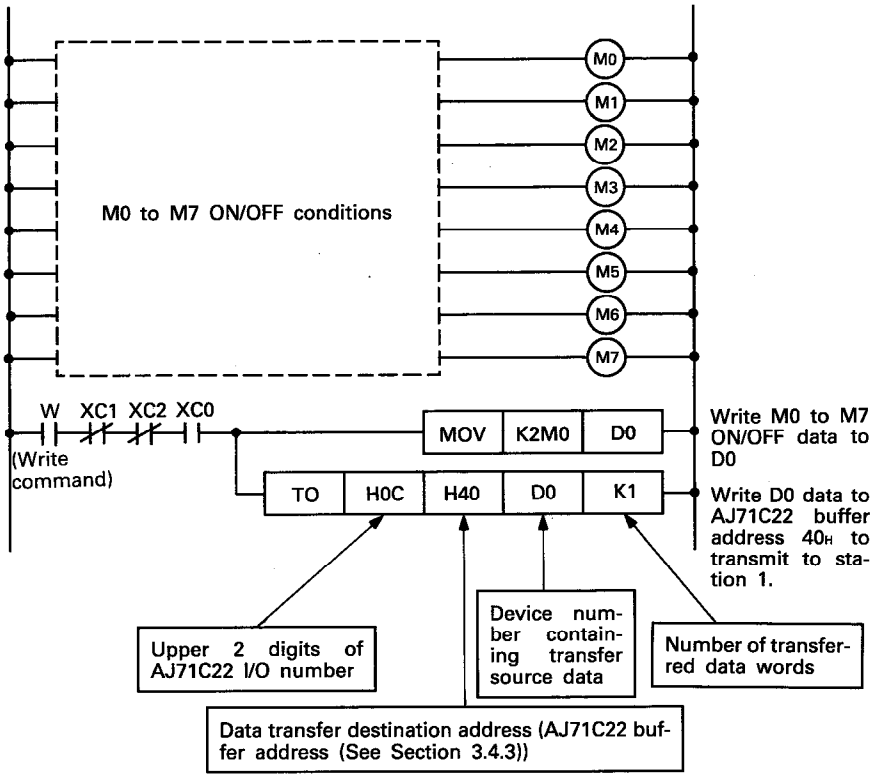
① AJ71C22 I/O assignment ····· XC0 to XDF, YC0 to YDF
② Number of slave stations ····· 3
③ Number of bits per station ·····

| | Station 1 | Station 2 | Station 3 |
|---|---|---|---|
| Outputs | 8 | 16 | 8 |

④ M0 to M7 ON/OFF data is echoed at the 1st to 8th output devices at station 1.

**PROGRAM EXAMPLE**

To control the ON/OFF statuses of outputs at station 1



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**EXPLANATION**

(1) Data is written to the specified addresses (output data area) in the AJ71C22 buffer memory by the TO instruction and is then automatically transmitted from the AJ71C22 to slave stations.

(2) Data transmitted to stations 1 to 3 is written to the following AJ71C22 buffer addresses:

| | |
|---|---|
| Station 1, 1st to 8th output data ····· | Address $40_H$ |
| Station 2, 1st to 8th output data ····· | Address $41_H$ |
| Station 2, 9th to 16th output data ····· | Address $42_H$ |
| Station 3, 1st to 8th output data ····· | Address $43_H$ |

(For further details, see Section 3.4.3.)

### 6.4.2 Receive data read

**PROGRAM CONDITIONS**

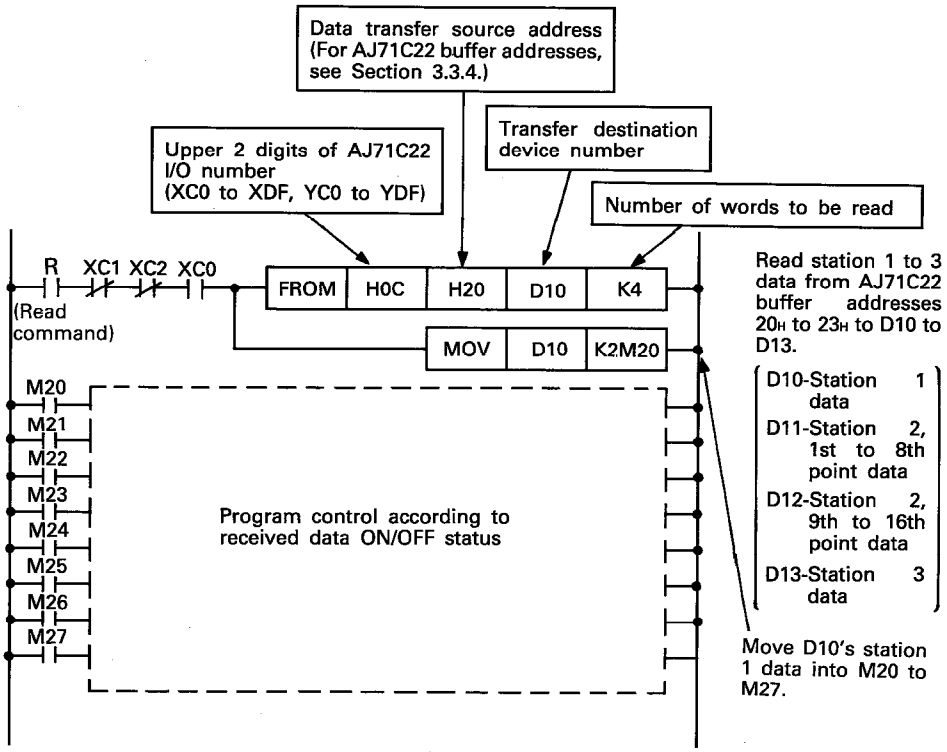
① AJ71C22 I/O assignment ····· XC0 to XDF, YC0 to YDF
② Number of slave stations ····· 3
③ Number of input ·····

| | Station 1 | Station 2 | Station 3 |
|---|---|---|---|
| Outputs | 8 | 16 | 8 |

④ The ON/OFF statuses of 8 bits are read from station 1 to M20 to M27 in the PC CPU.

**PROGRAM EXAMPLE**

To detect and control each point of received ON/OFF data



**EXPLANATION**

(1) Data is automatically written from slave stations to the specified addresses (input data area) in the AJ71C22 buffer memory.
The input data ON/OFF status can therefore be detected by reading the input data from the C214 buffer memory using the FROM instruction.

(2) Data received from stations 1 to 3 is written to the following AJ71C22 buffer addresses:

| | |
|---|---|
| Station 1, 1st to 8th input data ····· | Address $20_H$ |
| Station 2, 1st to 8th input data ····· | Address $21_H$ |
| Station 2, 9th to 16th input data ····· | Address $22_H$ |
| Station 3, 1st to 8th input data ····· | Address $23_H$ |

(For further details, see Section 3.4.3.)

# 7. TROUBLESHOOTING

## 7.1 Error Code List

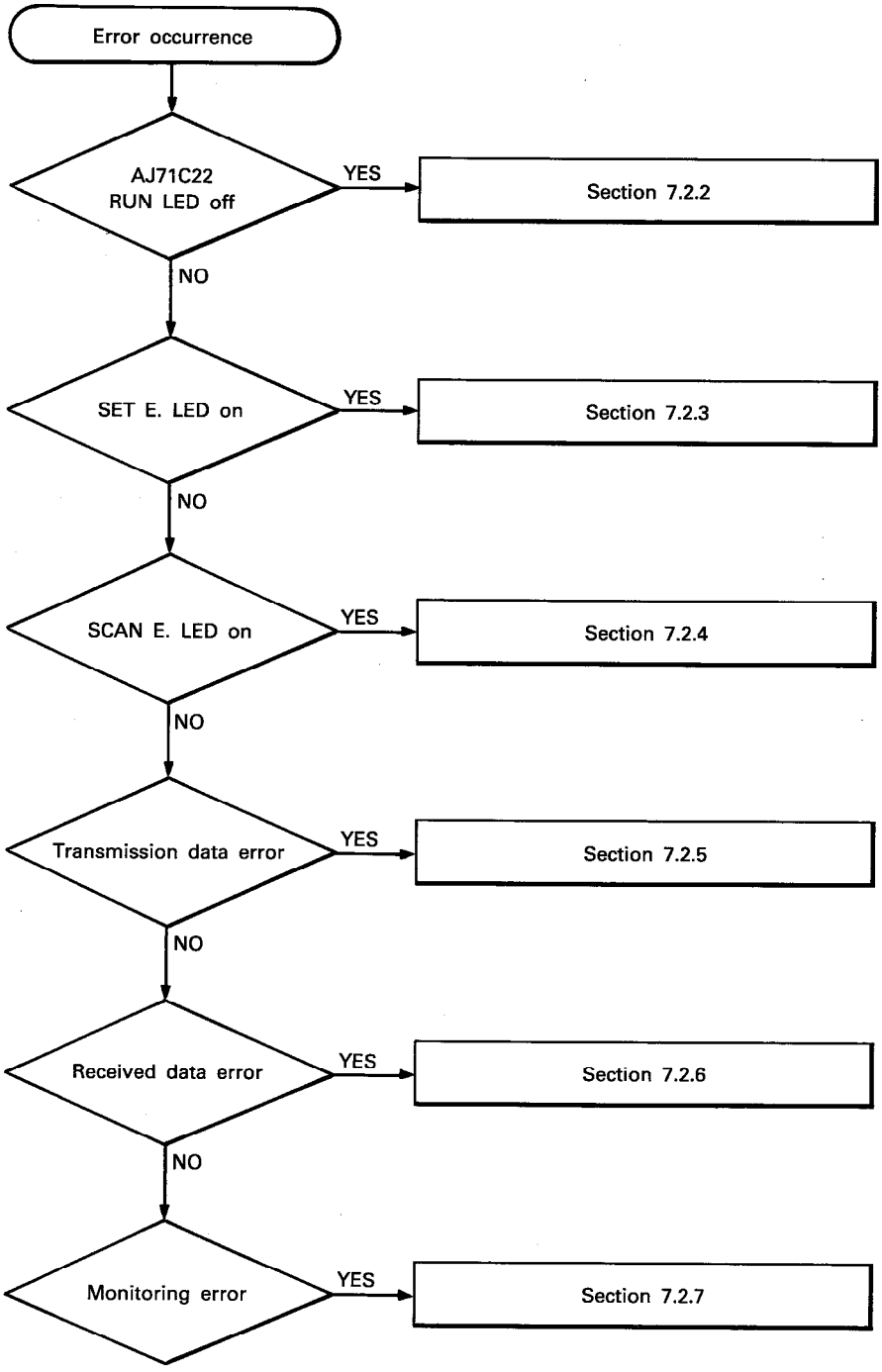
During data transmission between the AJ71C22 and slave stations any of the following error codes are written to buffer address $60_H$ in BIN to define the error.

| Error Code (Decimal) | Description | | | LED | Remedy |
|---|---|---|---|---|---|
| 1 | Pre-transmission sequence | Indicates that any of the following errors has occurred during pre-transmission sequence:<br>• Initial data setting error<br>• DIP switch setting error (See Section 4.4.1)<br>• Cable connection error<br>• Data communication error | During communication with station 1 | SET E. LED lit | 1) Check initial data.<br>2) Check DIP switch.<br>3) Check slave station power.<br>4) Check cable.<br>5) Check terminal resistor. |
| 2 | | | During communication with station 2 | | |
| 3 | | | During communication with station 3 | | |
| 4 | | | During communication with station 4 | | |
| 5 | | | During communication with station 5 | | |
| 6 | | | During communication with station 6 | | |
| 7 | | | During communication with station 7 | | |
| 8 | | | During communication with station 8 | | |
| 9 | | Initial data has not been transferred from the buffer memory to the RS422 interface transmission buffer. | | | 1) Check the number of FROM/TO instructions.<br>2) Hardware fault |
| 17 | Data transmission sequence | Indicates that any of the following errors has occurred during data transmission sequence:<br>• Cable error<br>• Data communication error | During communication with station 1 | SCAN E. LED lit | 1) Check slave station power.<br>2) Check cable. |
| 18 | | | During communication with station 2 | | |
| 19 | | | During communication with station 3 | | |
| 20 | | | During communication with station 4 | | |
| 21 | | | During communication with station 5 | | |
| 22 | | | During communication with station 6 | | |
| 23 | | | During communication with station 7 | | |
| 24 | | | During communication with station 8 | | |
| 25 | | Data cannot be transferred between the buffer memory and the RS422 interface communication buffer. | | | 1) Check the number of FROM/TO instructions.<br>2) Hardware fault |
| 33 | Pre-transmission sequence | Initial data is wrong. | | SET E. LED lit | Check initial data. (See Section 3.4.) |

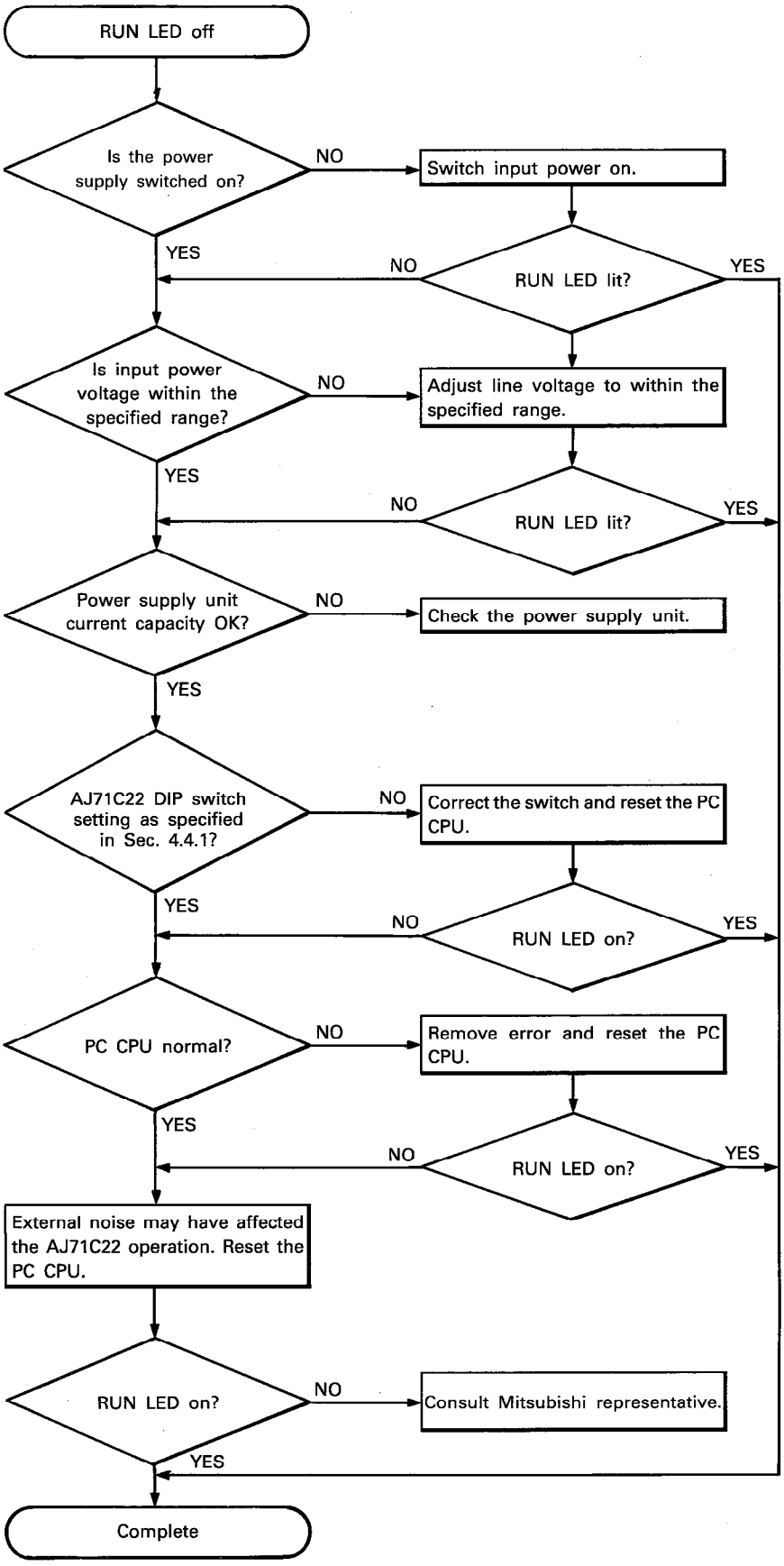
## 7.2 Troubleshooting

This section gives basic fault finding procedures for the AJ71C22. For information on CPU unit troubleshooting, refer to the relevant CPU Unit User's Manual.

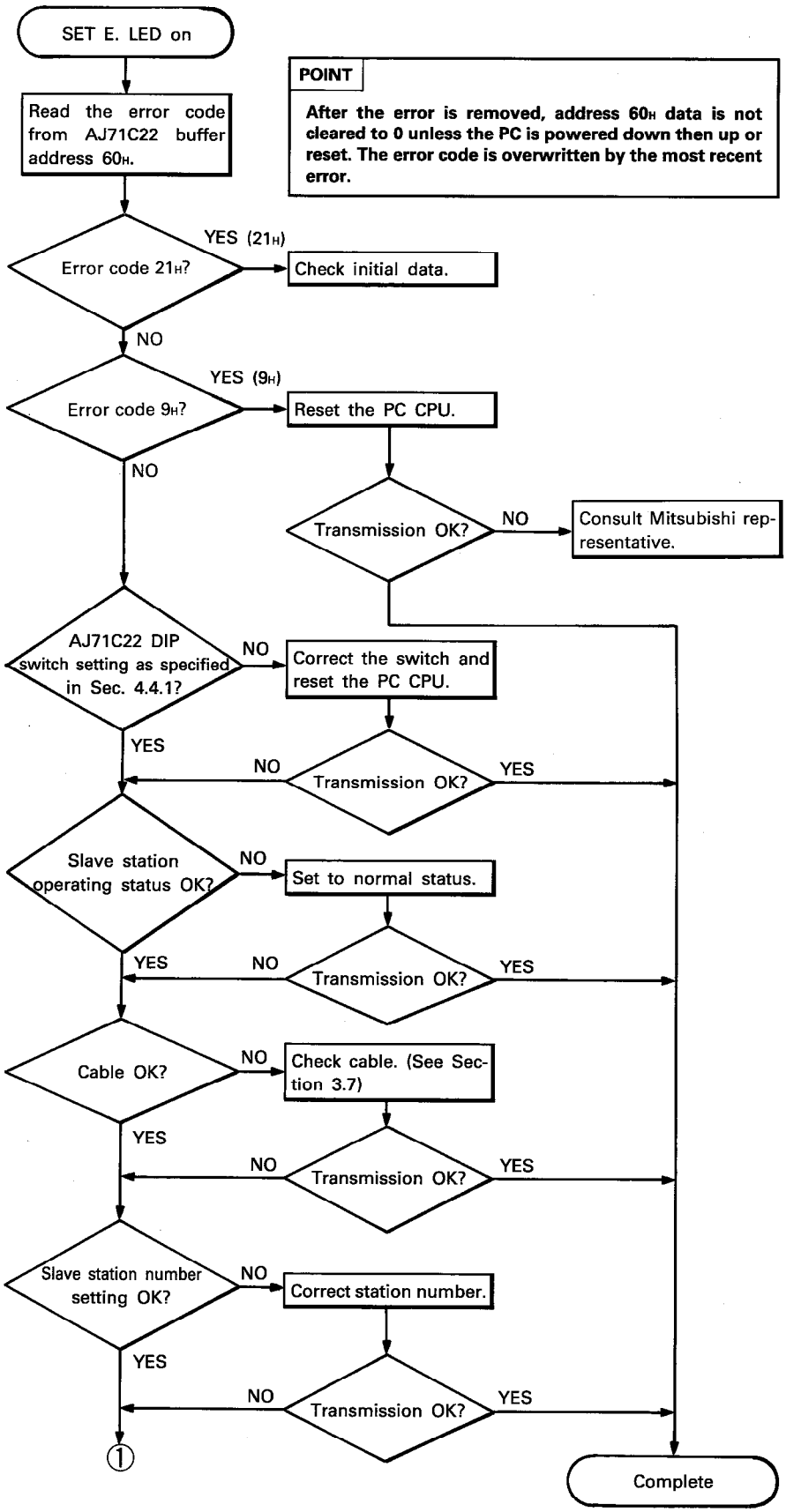
### 7.2.1 General troubleshooting flow chart

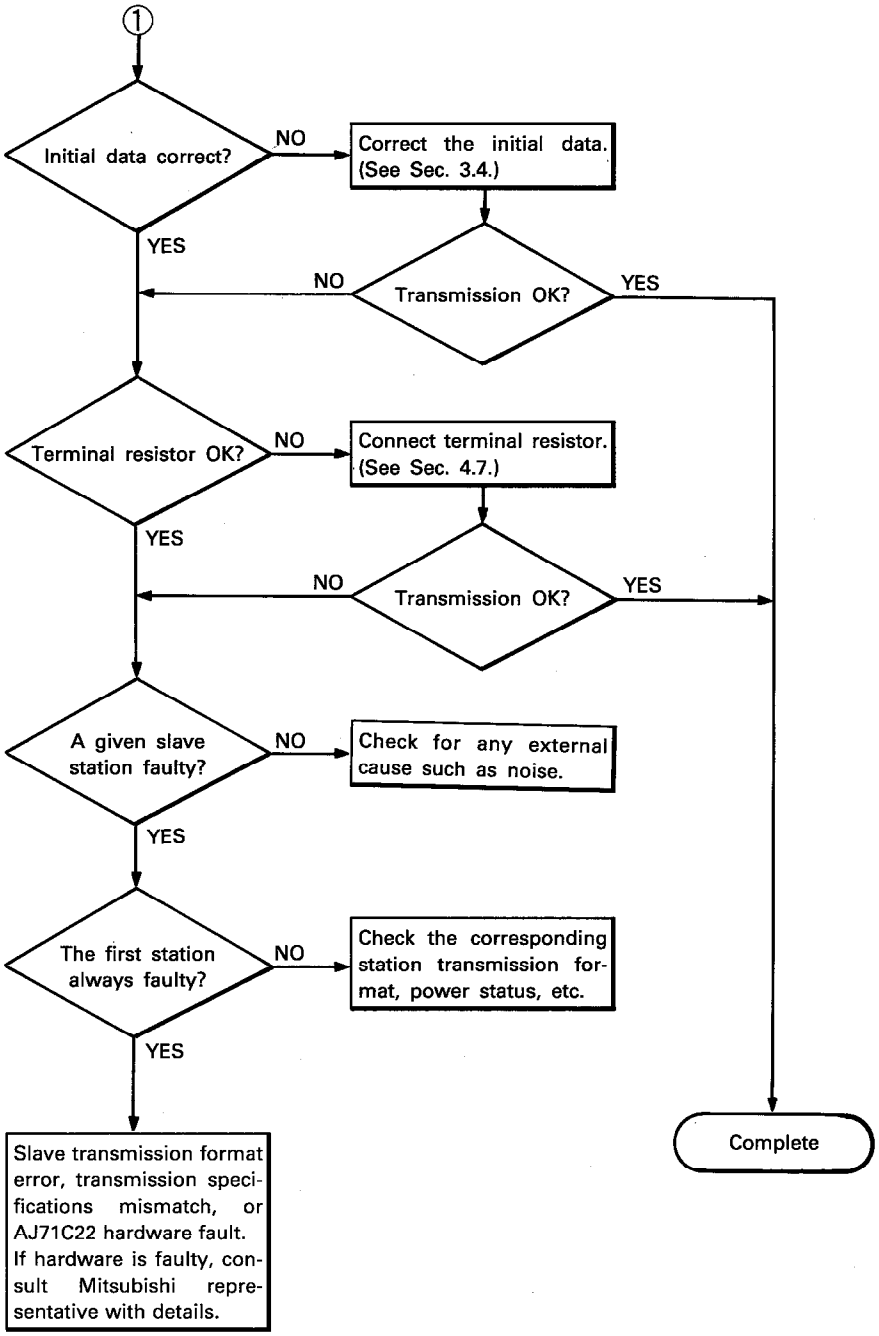


### 7.2.2 RUN LED off

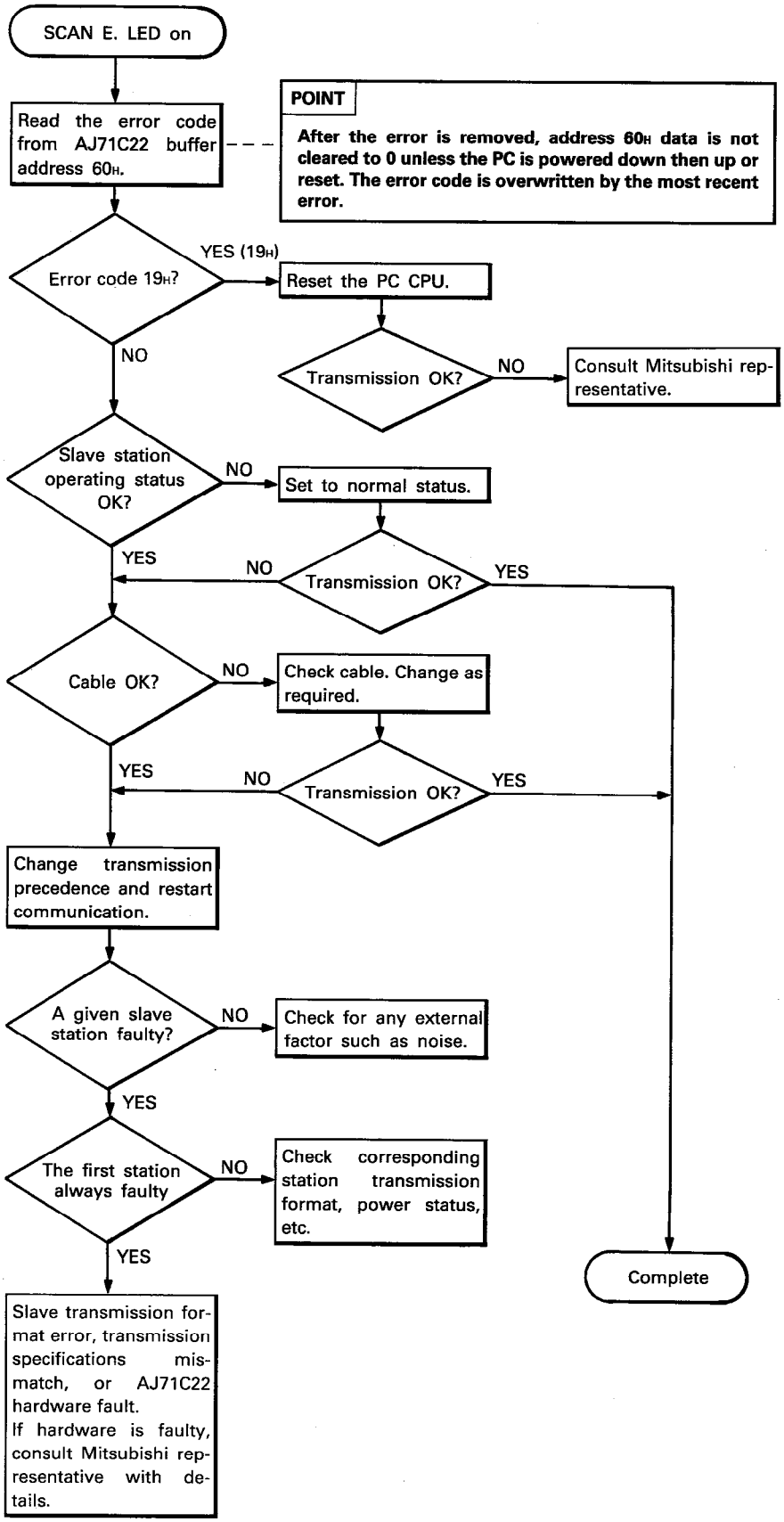


### 7.2.3 SET E. LED lit

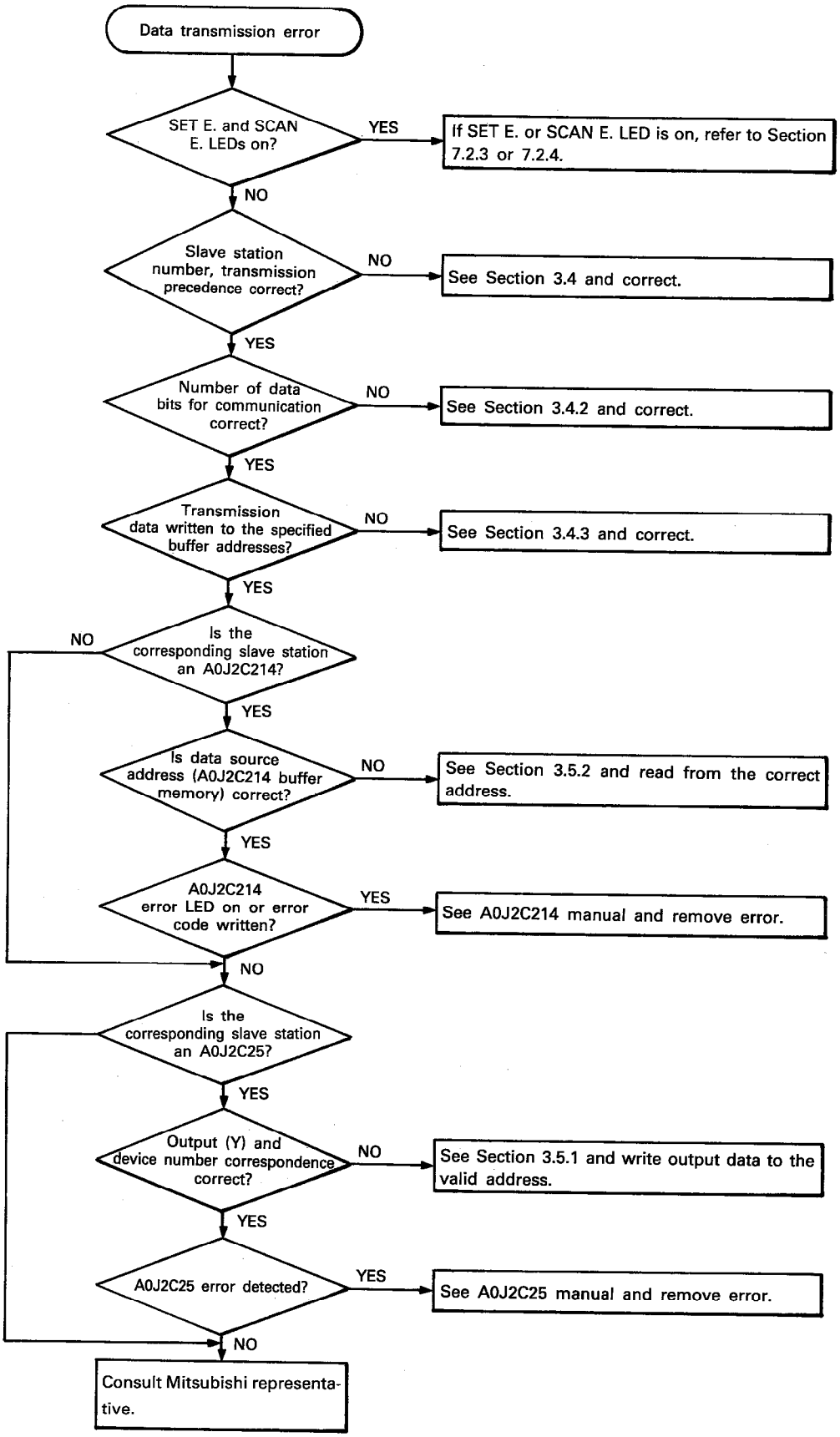



①
Initial data correct?
NO
Correct the initial data. (See Sec. 3.4.)
YES
NO
Transmission OK?
YES
Terminal resistor OK?
NO
Connect terminal resistor. (See Sec. 4.7.)
YES
NO
Transmission OK?
YES
A given slave station faulty?
NO
Check for any external cause such as noise.
YES
The first station always faulty?
NO
Check the corresponding station transmission format, power status, etc.
YES
Slave transmission format error, transmission specifications mismatch, or AJ71C22 hardware fault. If hardware is faulty, consult Mitsubishi representative with details.
Complete

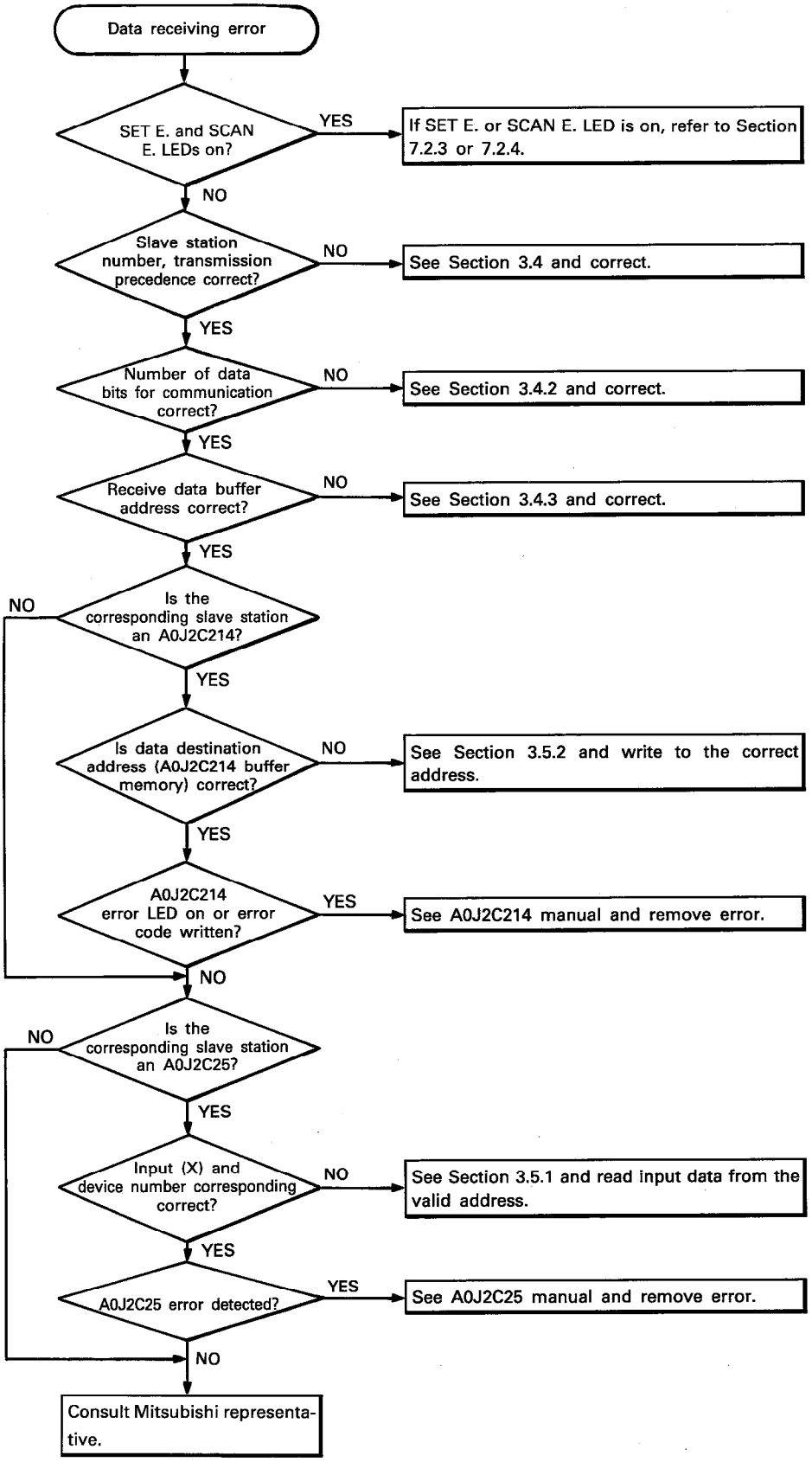
### 7.2.4 SCAN E. LED lit



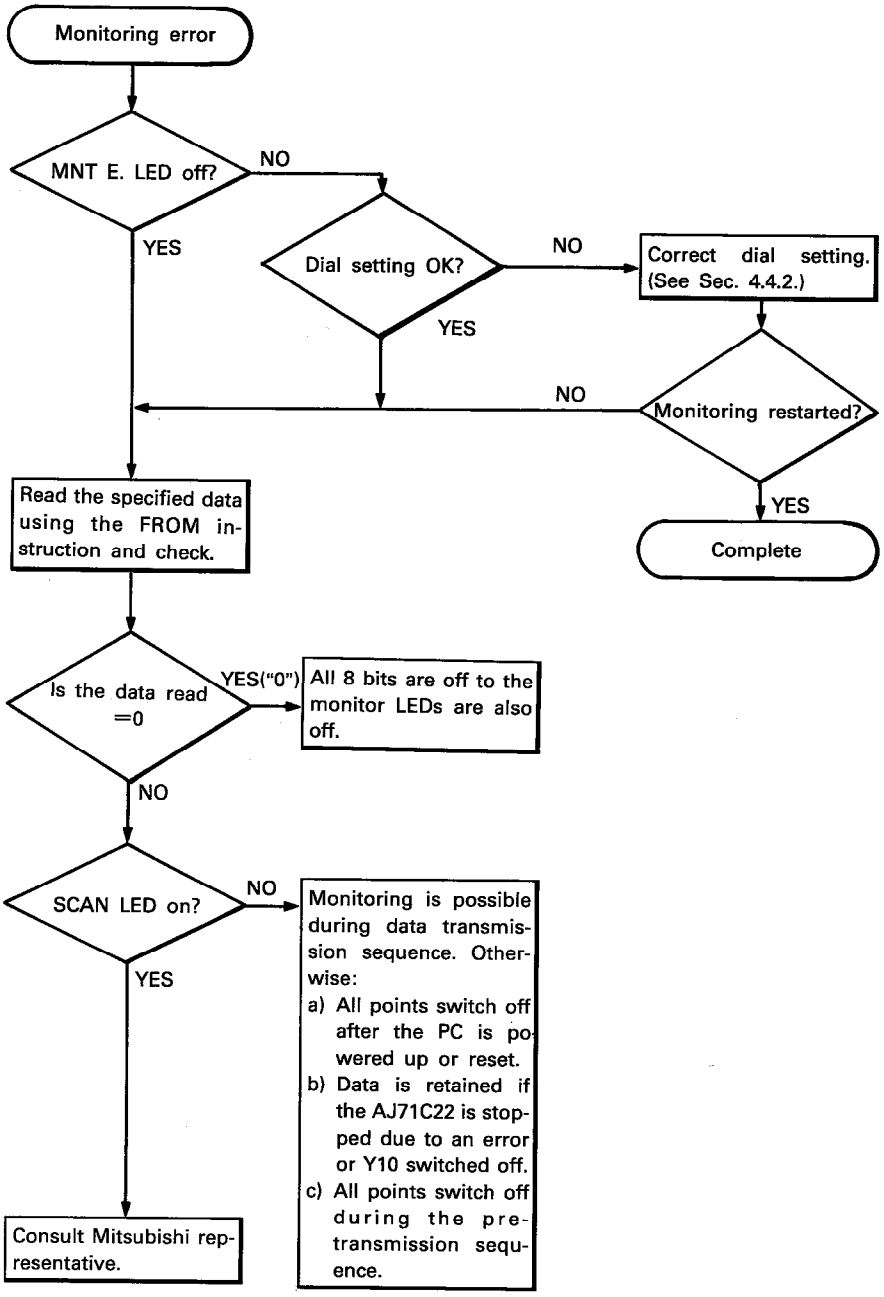
### 7.2.5 Failure of data transmission to slave station



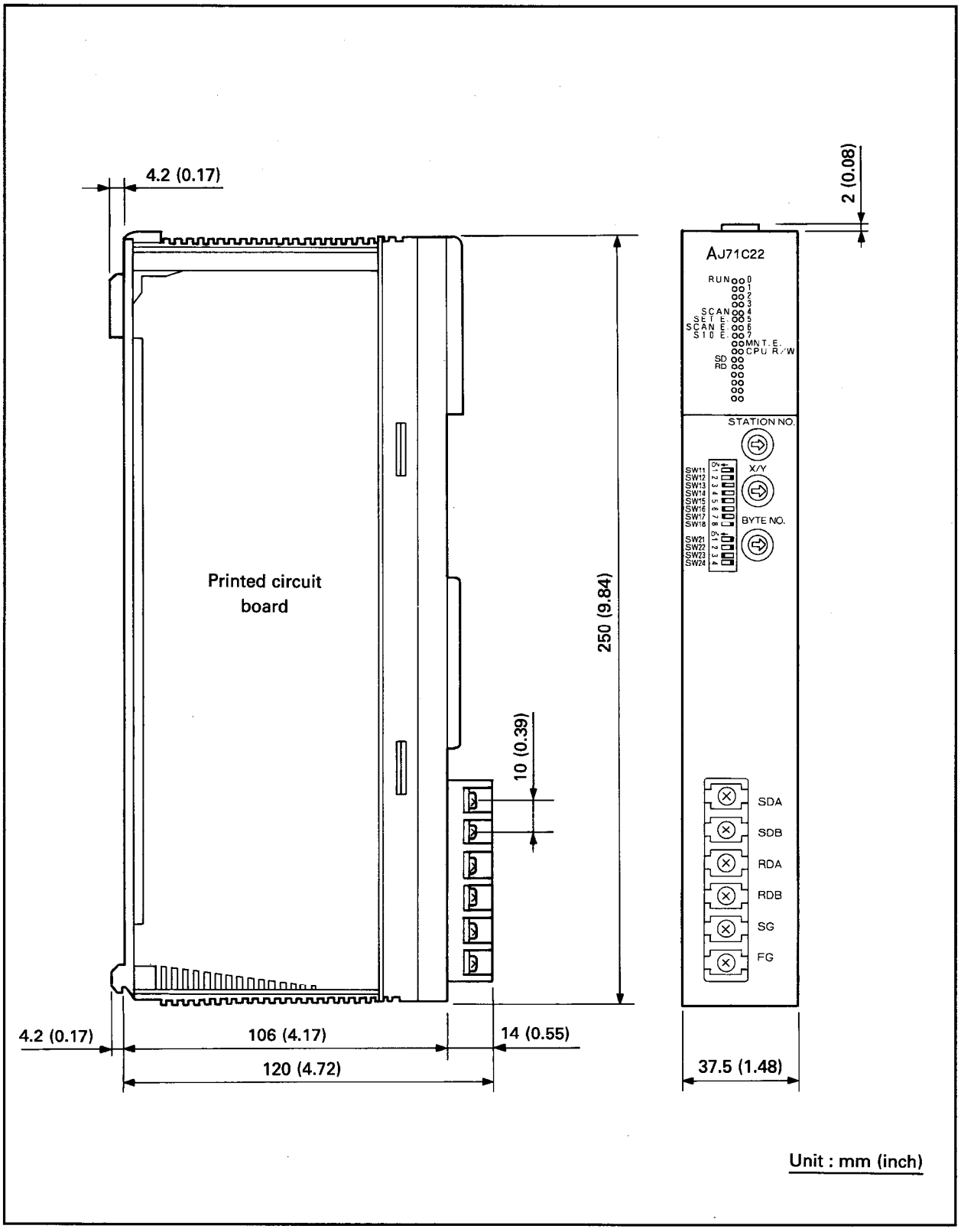
### 7.2.6 Failure to receive data from slave station



### 7.2.7 Monitoring error



## Appendix 1 External View



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# Multidrop link unit type AJ71C22

# User's Manual

| | |
|---|---|
| MODEL | AJ71C22-USERS-E |
| MODEL CODE | 13J631 |
| IB(NA)-66128-B(8811)MEE | |

MITSUBISHI ELECTRIC CORPORATION

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