Panasonic®

PROGRAMMABLE CONTROLLER

FP3/FP5
SERIAL DATA UNIT
Technical Manual

FP3/FP5 SERIAL DATA UNIT Technical Manual
ACG-M0023-2 '93.11

Matsushita Electric Works, Ltd.

Safety Precautions

Observe the following notices to ensure personal safety or to prevent accidents.
To ensure that you use this product correctly, read this User's Manual thoroughly before use.
Make sure that you fully understand the product and information on safe.
This manual uses two safety flags to indicate different levels of danger.

WARNING

If critical situations that could lead to user's death or serious injury is assumed by mishandling of the product.

-Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
-Do not use this product in areas with inflammable gas. It could lead to an explosion.
-Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

CAUTION

If critical situations that could lead to user's injury or only property damage is assumed by mishandling of the product.

-To prevent abnormal exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assure in these specifications.
-Do not dismantle or remodel the product. It could lead to abnormal exothermic heat or smoke generation.
-Do not touch the terminal while turning on electricity. It could lead to an electric shock..
-Use the external devices to function the emergency stop and interlock circuit.
-Connect the wires or connectors securely.
The loose connection might cause abnormal exothermic heat or smoke generation
-Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It might cause exothermic heat or smoke generation.
-Do not undertake construction (such as connection and disconnection) while the power supply is on.

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CONTENTS

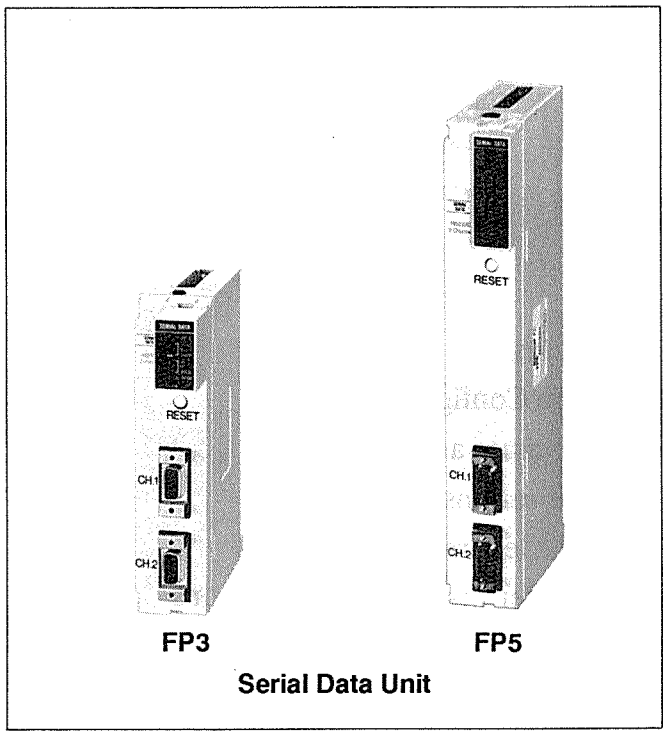
CHAPTER 1

SYSTEM CONFIGURATIONS AND SPECIFICATIONS

"PC" is the abbreviation for Programmable Controller.

1-1. Features

The Serial Data Unit allows data communication with devices having RS232C serial port (for example, Bar-code reader, Display unit, Printer) with sequence instructions.



FP3 FP5

Serial Data Unit

- **Data transfer accomplished with simple sequence instructions ;**

  The Read instructions (F150 or READ) and Write instructions (F151 or WRITE) are the only instructions needed for data reading and writing, respectively.
  All the rest of the operations are taken care of by the device using the Two ports RAM with CPU, so that the user need not have to write a complex communication control program.

- **Two channels per unit configuration for space saving.**

- **Flexible I/O device selection**

  The unit can connect to either input-only or output-only devices or input/output devices.

- **Large number of points available**

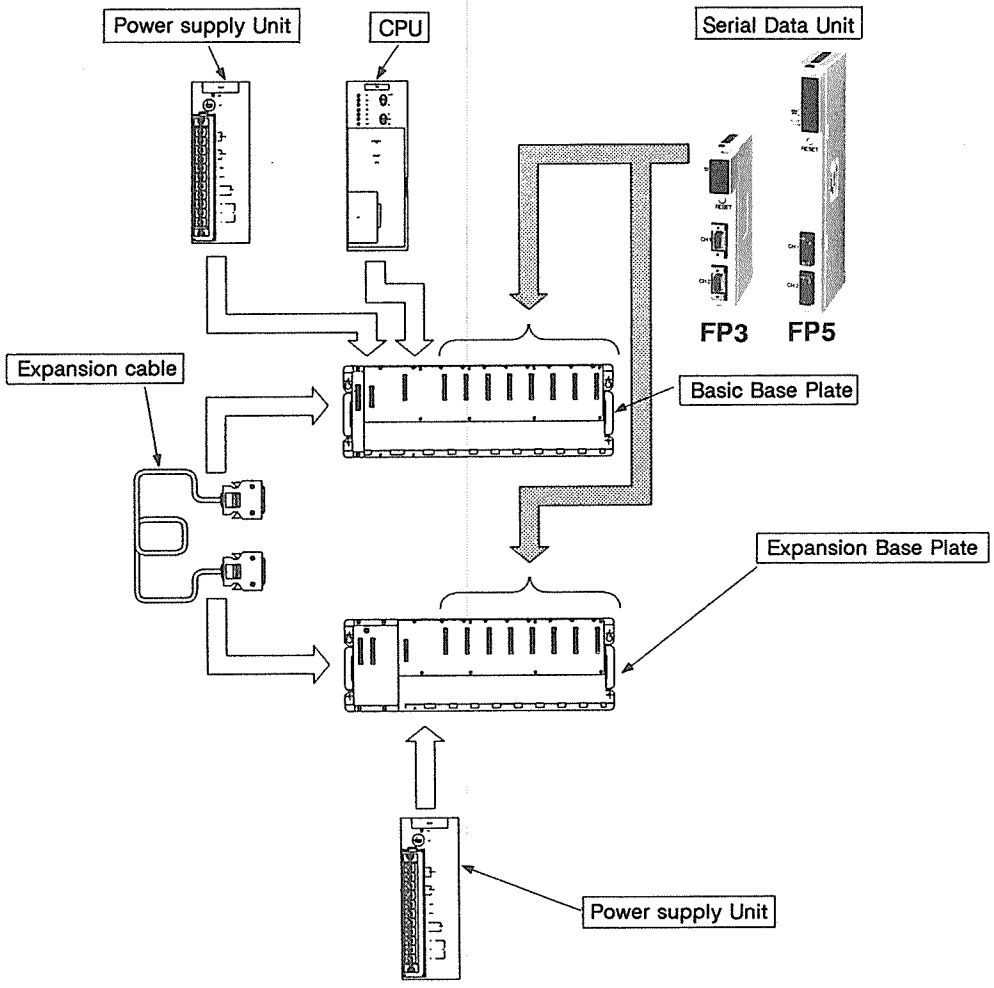
  Devices requiring up to 48 channels can be connected per CPU.

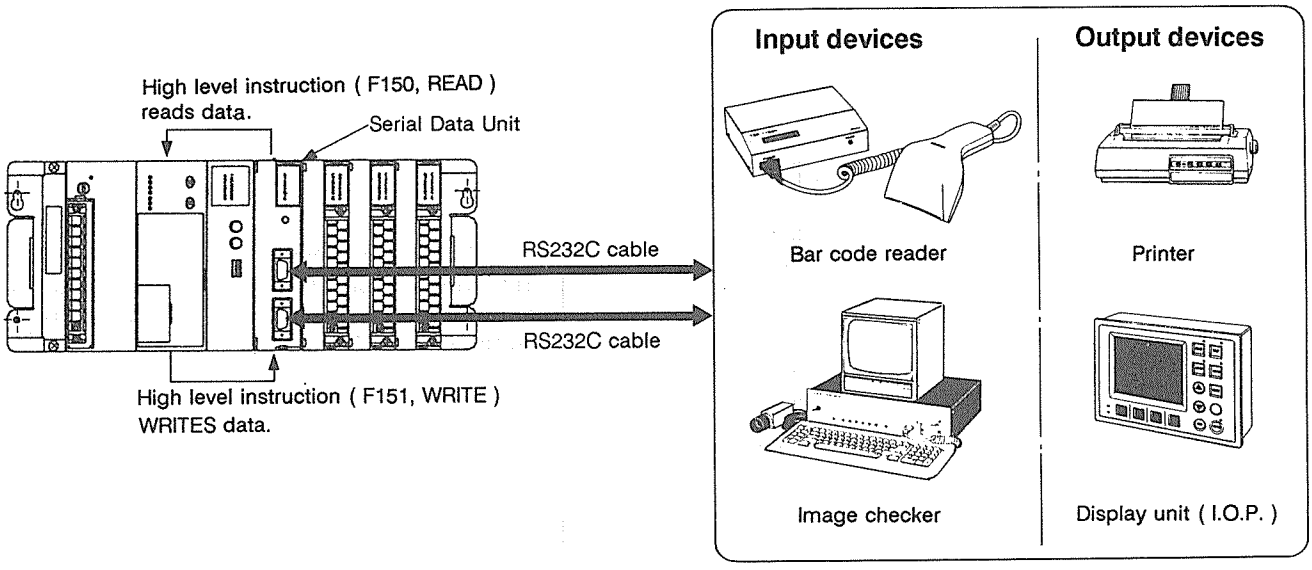
- **As many as 500 bytes of data can be transferred at one time.**

1-2. System Configuration

A sample system configurations are shown in the figure below.

The Serial Data Unit can be mounted at any location regardless of the basic base plate and expansion base plate.
However, the number of units that can be mounted is limited by the power supply capacity.
Refer to page 14, Section 1-6, 2. Mounting Method, for further information.
For further information on the Power supply Unit, CPU and Base plate, refer to Hardware Technical Manual.

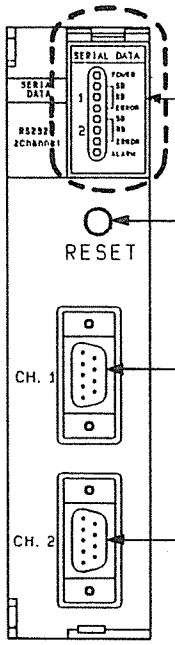




1-3. Part Names and Functions

Front panel

FP3 Type



Operating Mode Indicator LEDs

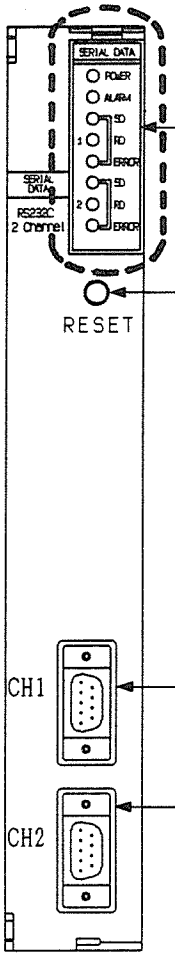
Reset Switch :

Used to forcibly resets only the unit.

RS232C Interface Connectors :

Each of the two serial port connectors has nine pins.
(Refer to page 16, Section 2-1. RS232C Interface Wiring, for further information.)

FP5 Type



Operating Mode Indicator LEDs

Reset Switch :

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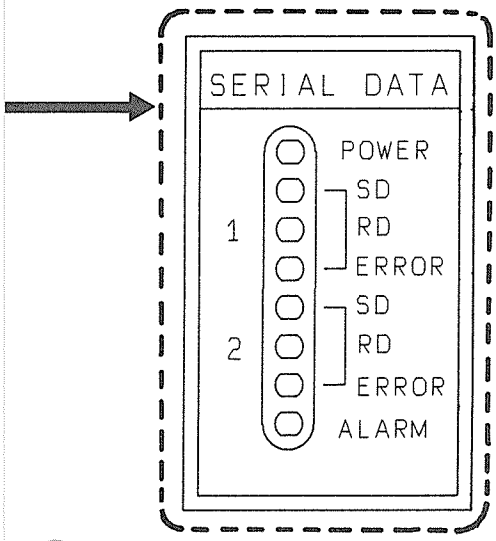
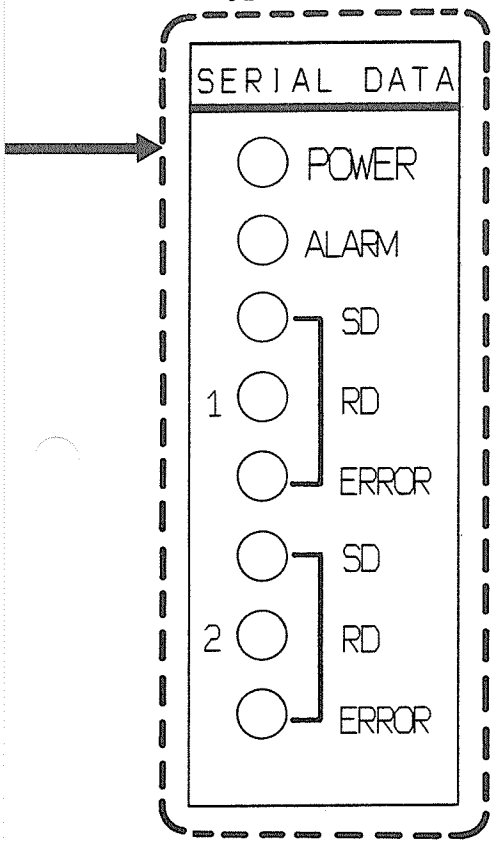
FP3 Type



FP5 Type



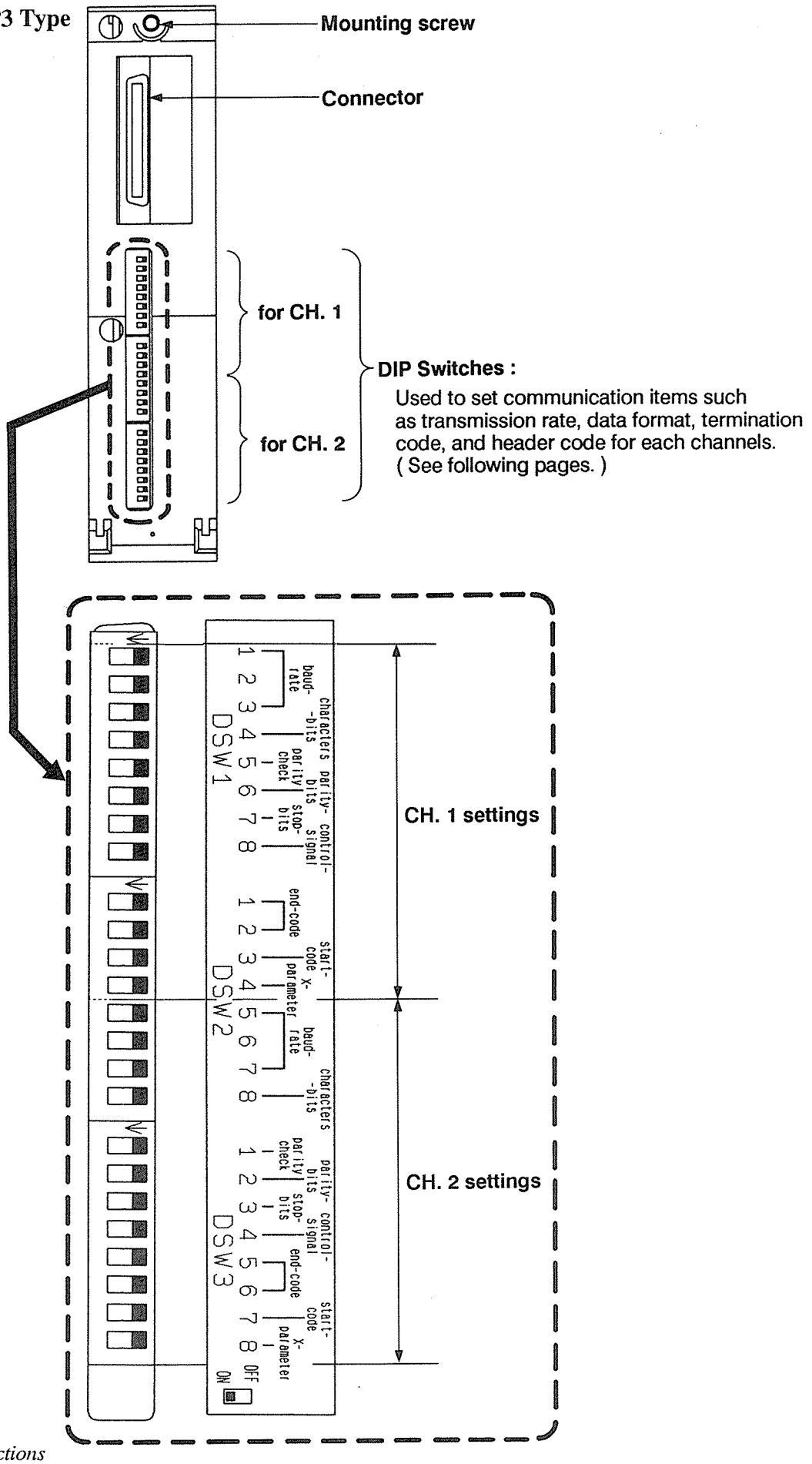
Operating Mode Indicator LEDs

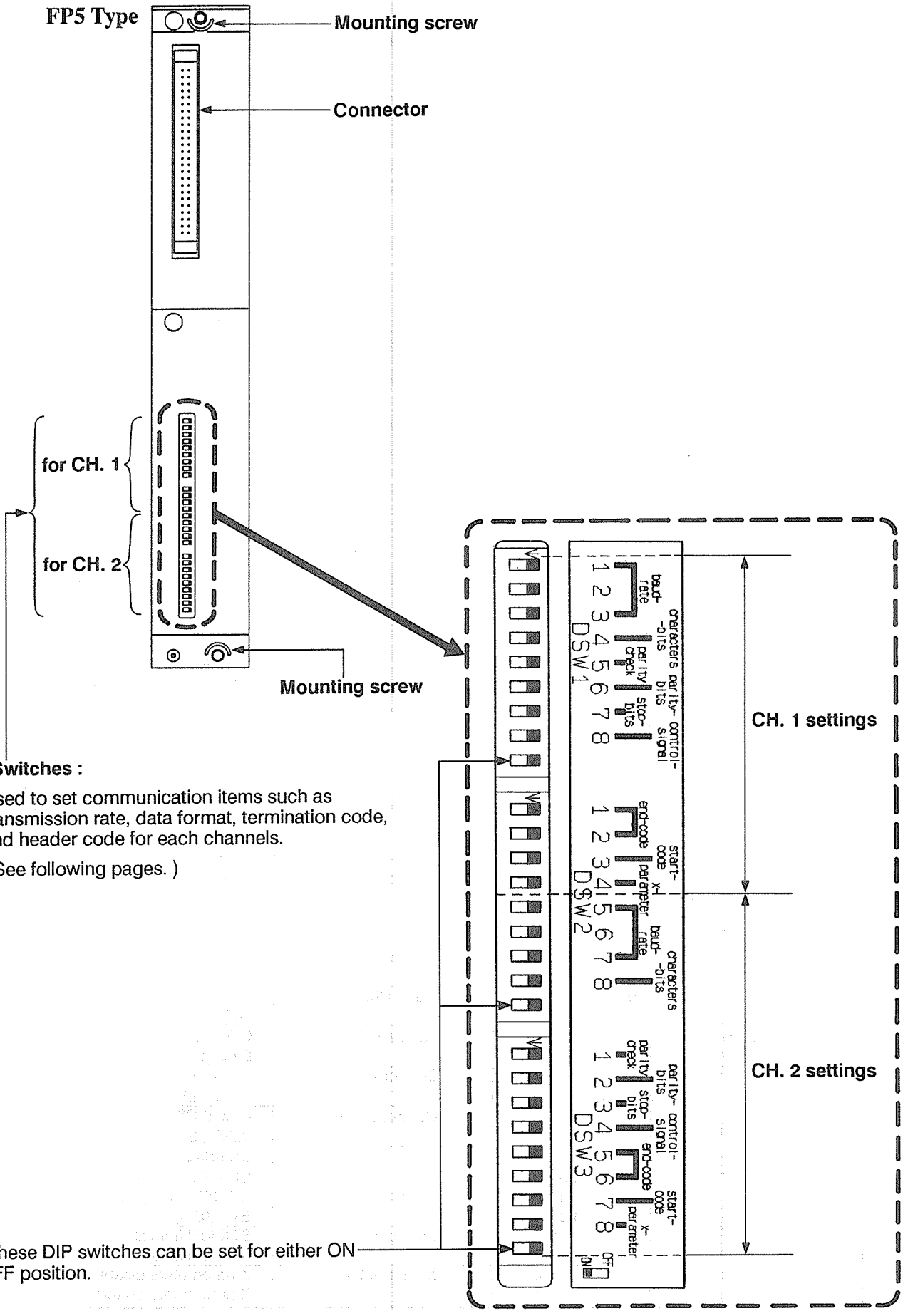
LED Indicator		Function
POWER (green)		● : ON (Unit operating) ○ : OFF (Power OFF)
CH 1	SD: Send data monitor (green)	▨ : Flashing (Sending) ○ : OFF (No send data)
	RD: Receive data monitor (green)	▨ : Flashing (Receiving) ○ : OFF (No receive data)
	ERROR: Communication error (red)	● : ON (Communication error generated) ○ : OFF (Turns OFF when normal frame is received)
CH 2	SD:Send data monitor (green)	▨ : Flashing (Sending) ○ : OFF (No send data)
	RD:Receive data monitor (green)	▨ : Flashing (Receiving) ○ : OFF (No receive data)
	ERROR:Communication error (red)	● : ON (Communication error generated) ○ : OFF (Turns OFF when normal frame is received)
ALARM (red)		● : ON (Unit error) ● If the LED turns ON due to a watch dog timer error, pressing the reset switch turns it OFF. ● This operation will clear the data within the Serial Data Unit. ○ : OFF (Turns OFF in the absence of errors)

- The ERROR LED turns ON when a parity or framing error is generated.
  During receiving : When a parity or framing error is generated
  During sending : When the end code is missing.
- When a normal frame is received or sent (write to Two Ports RAM), the ERROR LED turns OFF.

■ **Rear panel**

FP3 Type




FP5 Type
Mounting screw
Connector
for CH. 1
for CH. 2
Mounting screw
DIP Switches :
Used to set communication items such as transmission rate, data format, termination code, and header code for each channels.
(See following pages.)
CH. 1 settings
CH. 2 settings
The these DIP switches can be set for either ON or OFF position.
DSW1
DSW2
DSW3
baud-rate
characters
parity-bits
control-signal
stop-bits
end-code
start-code
x-parameter
ON
OFF

DIP Switch Settings

Note :

The DIP switch " OFF " position is represented as " 0 " and " ON " position is " 1 ".

DIP switch

OFF position 0

ON position 1

	Switch position		Function	
	DSW 1	DSW 2		
	1 2 3 4 5 6 7 8	1 2 3 4		
CH. 1 Settings	0 0 0		———	Optional setting
	1 0 0		Baud rate	19,200 bps
	0 1 0			9,600 bps
	1 1 0			4,800 bps
	0 0 1			2,400 bps
	1 0 1			1,200 bps
	0 1 1			600 bps
	1 1 1			300 bps
	0		Character bits	7 - bit
	1			8 - bit
	0		Parity Check	Invalid
	1			Valid
	0		Parity bits	Odd parity
	1			Even parity
	0		Stop bits	1 - bit
	1			2 - bit
	0		Control signal	Invalid CS, CD.
	1			Valid CS, CD.
		0 0	End code	Set using Two ports RAM (1 byte)
		1 0		CR (0DH) code
		0 1		CR (0DH) LF (0AH) code
		1 1		ETX (03H)
		0	Start code	STX (02H) invalid
		1		STX (02H) valid
		0	X parameters	X parameters disabled
		1		X parameters enabled

	Switch position		Function	
	DSW 2	DSW 3		
	5 6 7 8	1 2 3 4 5 6 7 8		
CH. 2 Settings	0 0 0		———	Optional setting
	1 0 0		Baud rate	19,200 bps
	0 1 0			9,600 bps
	1 1 0			4,800 bps
	0 0 1			2,400 bps
	1 0 1			1,200 bps
	0 1 1			600 bps
	1 1 1			300 bps
	0		Character bits	7 - bit
	1			8 - bit
		0	Parity Check	Invalid
		1		Valid
		0	Parity bits	Odd parity
		1		Even parity
		0	Stop bits	1 - bit
		1		2 - bit
		0	Control signal	Invalid CS, CD.
		1		Valid CS, CD.
		0 0	End code	Set using Two ports RAM (1 byte)
		1 0		CR (0DH) code
		0 1		CR (0DH) LF (0AH) code
		1 1		ETX (03H)
		0	Start code	STX (02H) invalid
		1		STX (02H) valid
		0	X parameters	X parameters disabled
		1		X parameters enabled

Notes :

The parity setting becomes invalid when the parity check is disabled.
The control signal determines either CS (Clear to Send) and CD (Carrier Detector) enable or disable.
For use with data flow devices such as a personal computer, control signal set to disable.
The terminal and start codes specify the end and start of one communication frame.
Communication is controlled with the X parameter, X-ON (11H) and X-OFF (13H).
During normal use, set this to disabled.

Example DIP switch settings

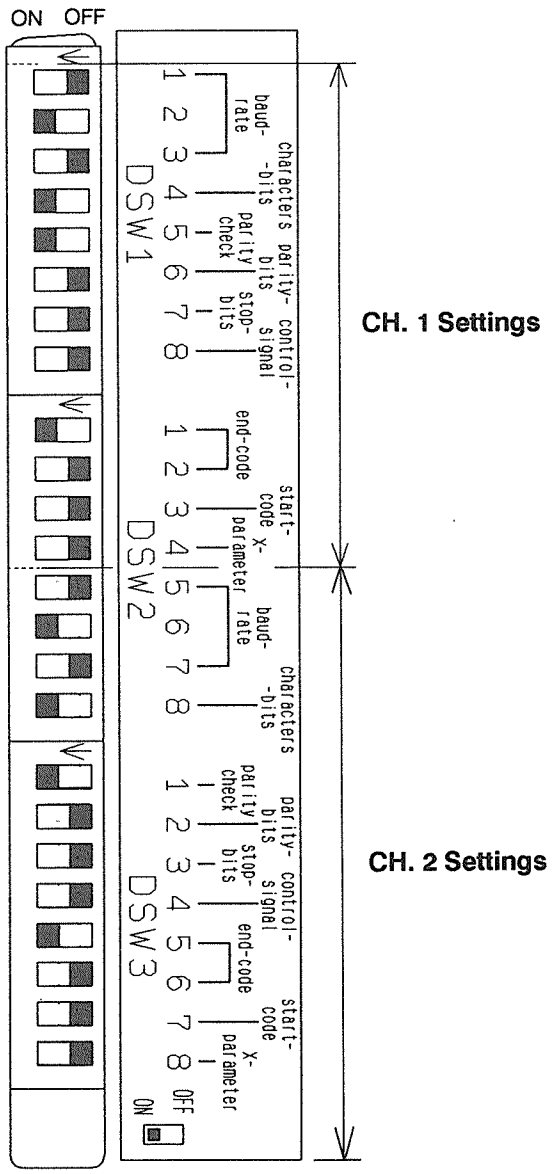
- **Setting conditions for CH. 1**

Baud rate	: 9600 bps
Character bits	: 8-bit
Parity check	: Valid
Parity bits	: Odd parity
Stop bit	: 1-bit
Control signal	: Invalid
End code	: CR
Start code	: Invalid
X parameters	: disabled

- **Setting conditions for CH. 2**

Baud rate	: 9600 bps
Character bits	: 8-bit
Parity check	: Valid
Parity bits	: Odd parity
Stop bit	: 1-bit
Control signal	: Invalid
End code	: CR
Start code	: Invalid
X parameters	: disabled

DIP switch (for FP3 Type)



1-4. Specifications

1. General Specifications

Item	Specifications
Ambient operating temperature :	0 °C to 55 °C (32 °F to 131 °F)
Ambient storage temperature :	–20 °C to +70 °C (–4 °F to +158 °F)
Ambient operating humidity :	30 % to 85 % RH (non-condensing)
Ambient storage humidity :	30 % to 85 % RH (non-condensing)
Vibration resistance :	10 Hz to 55 Hz, 1 cycle per minute, double amplitude 0.75 mm (0.03 in), 10 min on 3 axes
Shock resistance :	98 m/s^2 or more, four times on 3 axes
Noise resistance :	1000 V, 50 ns, with pulse width 1 μs (based on in-house measurements)
Operating condition :	Free of corrosive gases and excessive dust
Internal current consumption (at 5 V DC) :	100 mA or less
Weight :	Approx. 250 g / 8.8 ozs (for FP3 Type) Approx. 360 g / 12.7 ozs (for FP5 Type)

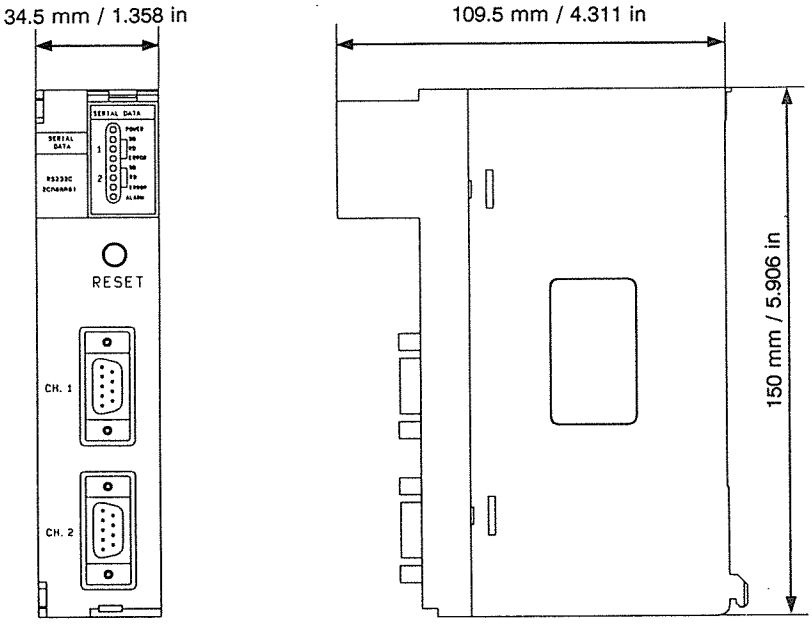
2. Performance Specifications

Item	Specifications
Interface:	Two RS232C serial ports
Transmission rate :	300/600/1200/2400/4800/9600/19200bps
Communication method:	Half duplex
Synchronization method:	Start-stop asynchronous
Transmission distance:	15 m / 50 ft Maximum
Transmission code:	ASCII
Transmission data format: Stop bits: Parity check: Character bits :	 1-bit / 2-bit Invalid / Valid (Odd parity / Even parity) 7-bit / 8-bit
Data transmission sequence:	Bit 0 first, on a character unit
Unit of transmission :	Message to the end code (variable length)
Message length :	500 bytes per frame Maximum (including start and end codes)
Interface with CPU :	Two ports RAM interface (data can be read and written with " F150 and F151, READ and WRITE) instructions
Number of I/O points occupied :	16 inputs, 16 outputs
End code :	Select from CR, CR + LF, and ETX or specify any code on two ports RAM.
Start code :	Invalid / valid
X-ON / X-OFF control :	Invalid / valid
Other special control functions:	End code-less transmission mode (controlled by sequence instructions) Software reset (controlled by sequence instructions)

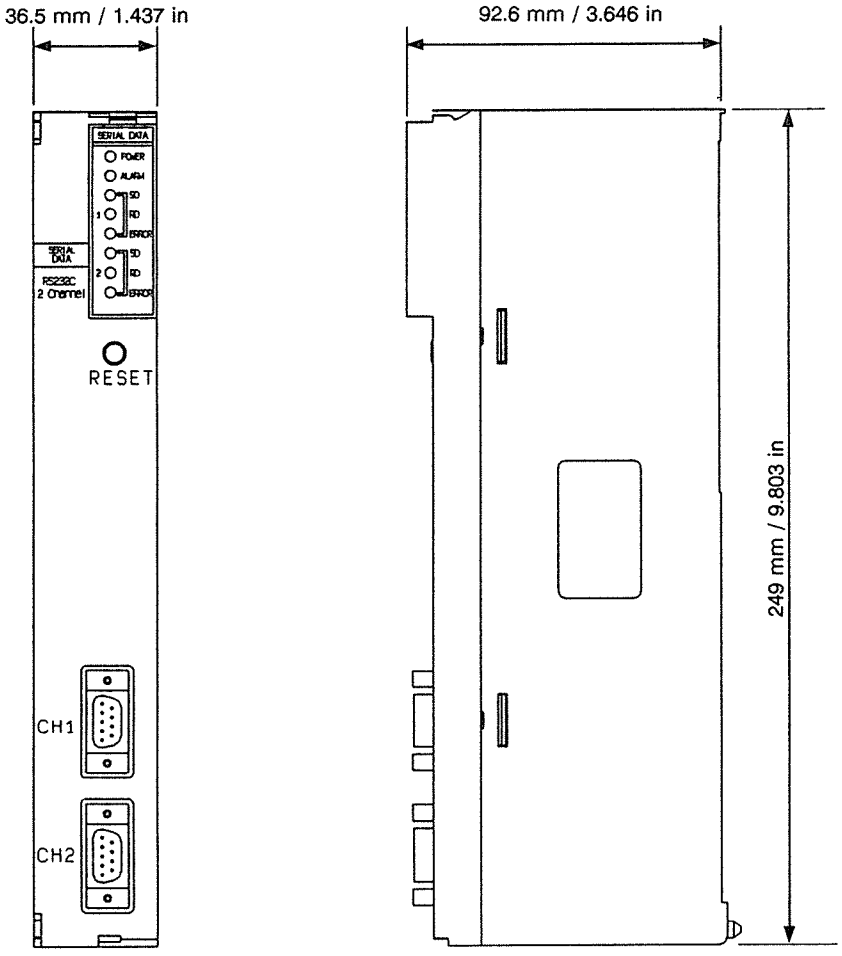
- Setting the I/O through peripheral devices:
  When setting the Input / Output points through the NPST-GR (Programming support tool), register 32 points in order of 16 SX, 16 SY.

1-5. Dimensions

FP3 Type



FP5 Type



1-6. Mounting

1. Mounting Environment

The serial data unit should be used within the specified ratings.
It should be used in a place where it will not be exposed to :

- Temperature extremes outside the range of 0°C to 55°C (32°F to 131°F)
  For board mounting, carefully plan ventilation to ensure adequate heat dissipation.
  Do not install the instrument right above a heat generating body.
- Relative humidity outside the range of 30 % to 85 % RH.
- Sudden temperature change causing dew condensation.
- Inflammable or corrosive gas.
- Excessive airbone dust or iron particles.
- Benzyne, paint thinner, alcohol or other organic solvents or strong alkaline solutions of ammonia or caustic soda.
- Excessive vibration or shock.
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges.
- Water splashes.
- Direct sunlight.

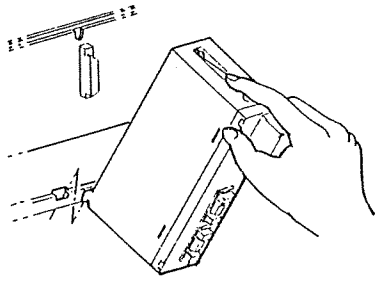
Operating Notes

- Mount and remove the Serial Data Unit with all power OFF.
- Use the Serial Data Unit with it firmly secured to the base plate.
- Be sure not let pieces of wire fall into the unit when wiring.
- Do not touch the connectors on the rear of the unit.
- Doing so will cause device damage from poor connections or static electricity.
- Do not drop or strike the Serial Data Unit's case since it is made of plastic.

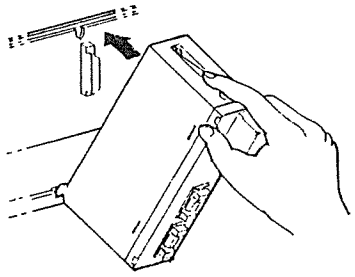
2. Mounting Method

Before mounting each unit, remove the connector cover on the base plate.

1. Fit the unit tabs into the unit holes on the base plate.

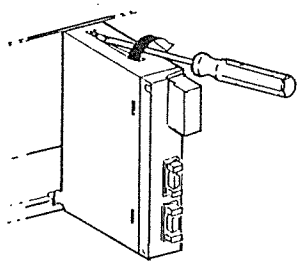


2. Push the unit in the direction of the arrow and mount onto the base plate.



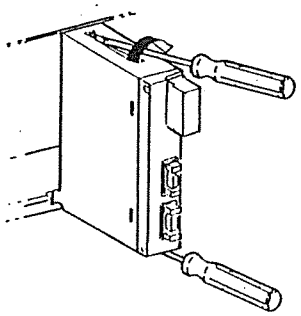
3. After properly mounting the unit to the base plate, secure the mounting screw at the top.

For FP3 Type



After properly mounting the unit to the base plate, secure the mounting screws at the top and bottom.

For FP5 Type



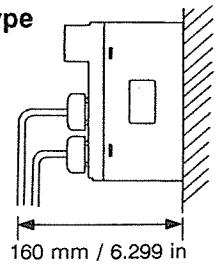
Notes:

- Be sure to remove or mount the serial data unit with the AC power of the power supply unit switched OFF.
- Be careful not to use unreasonable force when attaching the connector on the Serial Data Unit to the connector on the base plate.
- Select a suitable power supply unit and combination of units so that the total consumption current of the units installed on the base plate does not exceed the capacity of the power supply unit. The internal consumption current of the serial data unit is 0.1 A at 5 V. (Refer to Hardware Technical Manual, for further information.)
- Use crossover wiring for the power supply line to the power supply on the expansion base plate and basic base plate. (If a Serial Data Unit is mounted on the expansion base plate, the data within the Serial Data Unit may be destroyed when the power for either the basic base plate or expansion base plate is switched ON and OFF.)

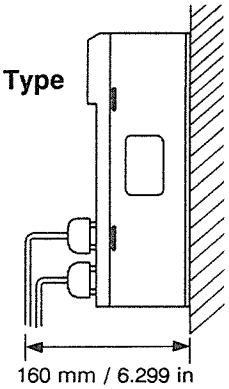
■ Mounting height

For your reference, refer to the figure and note the depth of the control panel when the Serial Data Unit is to be used.

FP3 Type



FP5 Type



CHAPTER 2

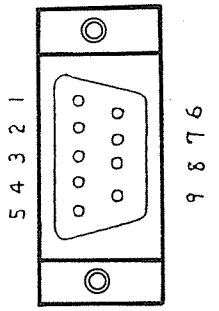
WIRING

"PC" is the abbreviation for Programmable Controller.

2-1. RS232C Interface Wiring

RS232C Interface Specifications

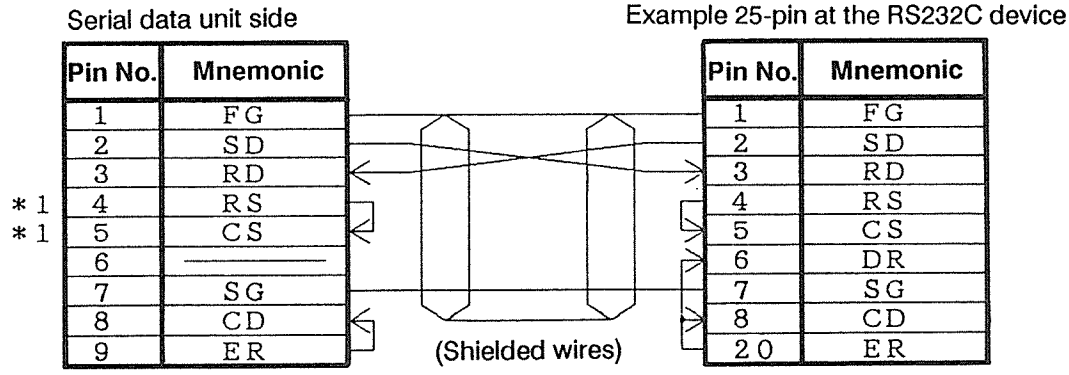
Pin No.	Signal	Mnemonic	Direction DTE	Direction DCE
1	Frame Ground	FG	———	
2	Send Data	SD	→	
3	Receive Data	RD	←	
4	Request to Send	RS	→	
5	Clear to Send	CS	←	
6	———	———	———	
7	Signal Ground	SG		
8	Carrier Detect	CD	←	
9	Equipment Ready	ER	→	



- DTE in the table above refers to the serial data unit.
- Each unit includes two connectors and two connectors covers.

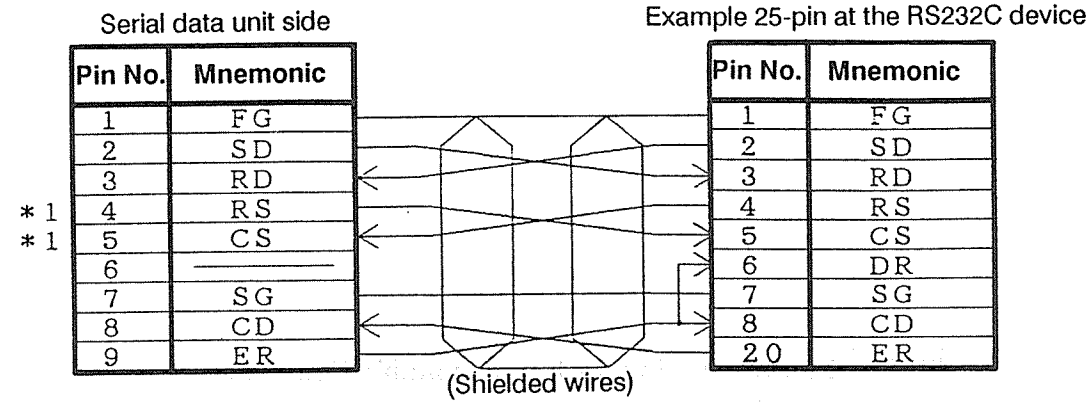
Two types of typical connection diagrams are shown below.
DSW1 No. 8 for CH.1 and DSW3 No. 4 for CH.2 (control signal selection) enable the input of CS and CD at the serial data unit.
These switches permit the control to be enabled or disabled.
RS and ER from the serial data unit remain active at all times regardless of the control signal selection.

3-wire connection without flow control



* 1 It is not necessary to connect the RS and CS signals if DSW1 No. 8 and DSW3 No. 4 (control signal selection) on the serial data unit are both set to OFF.
However, it is recommended that RS, CS, ER and CD be connected as shown above.

RS and ER signal based control with flow control

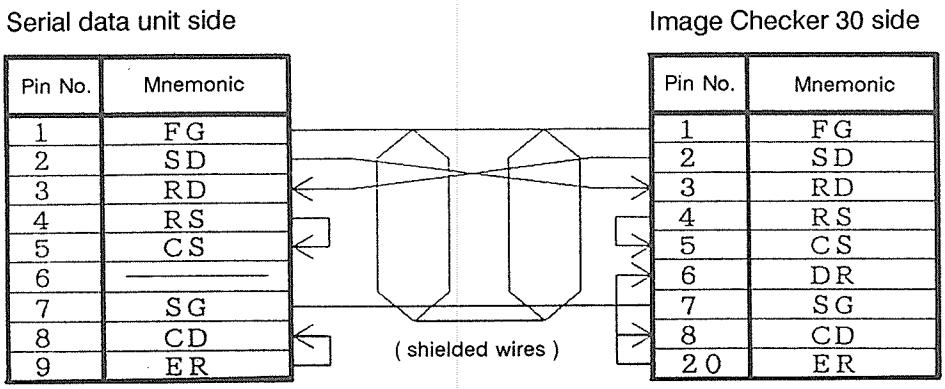


* 1 Set both DSW1 No. 8 and DSW3 No. 4 (control signal selection) to ON.

2-2. Wiring Examples

Examples of actual connections are given below.

Vision system : Image Checker 30



- No flow control, turn off No.8 of DSW1 and No.4 of DSW3.

CHAPTER 3

OPERATION

3-1. Basic Operation

3-2. Programming

1. Allocation of Two ports RAM
2. Input / Output Allocation
3. High Level Instructions (F/P 150, READ / F/P 151, WRITE)
4. Communication timing

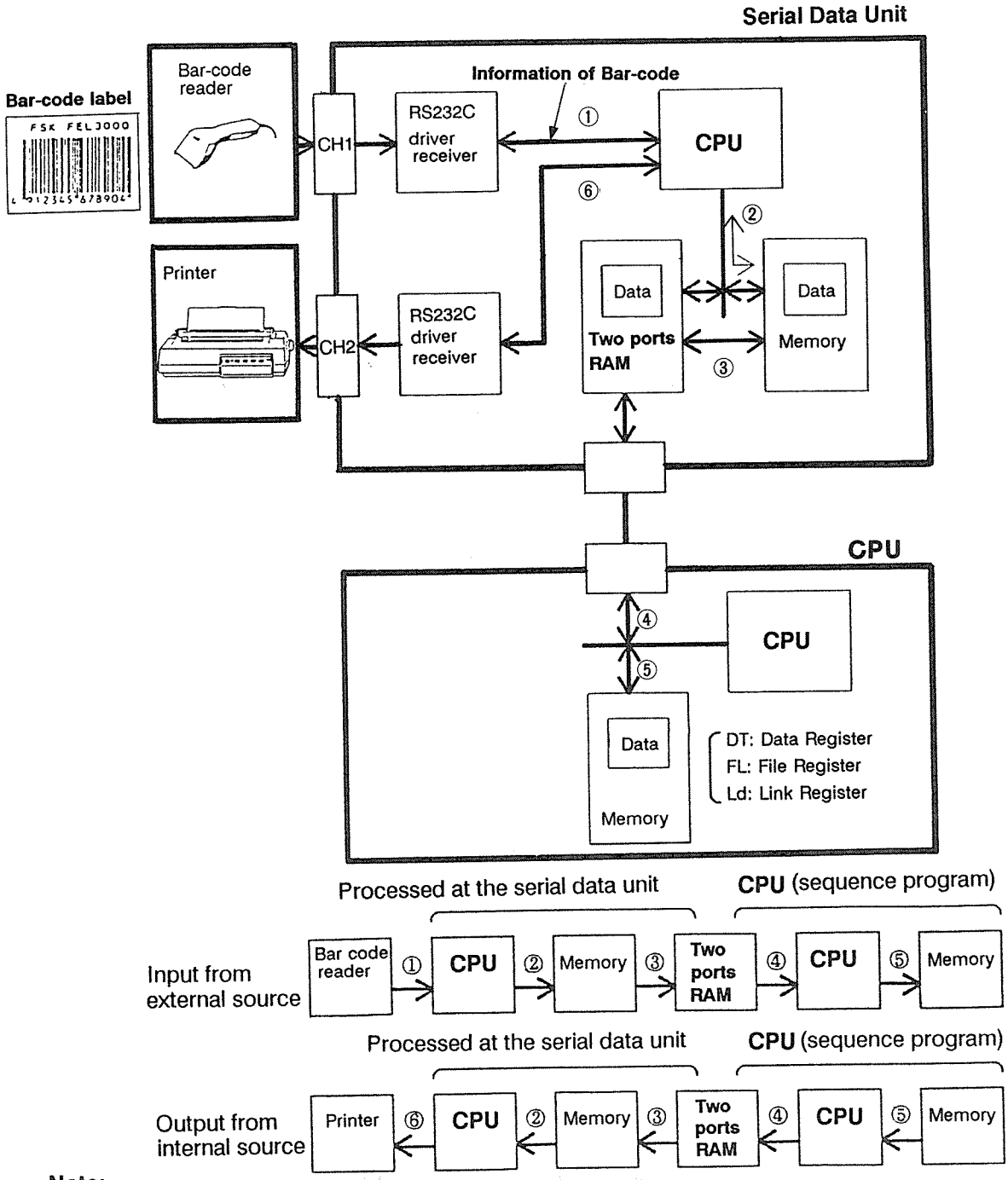
"PC" is the abbreviation for Programmable Controller.

3-1. Basic Operation

- A sequence program is required to operate the serial data unit.
- This unit performs data transfers with the CPU through two ports RAM.
- Data from an external source is written to two ports RAM when the end code is input. In this time, Write the data, including the start code and end code to two ports RAM.
- Data to an external source is output when it is written to two ports RAM.

* Two ports RAM refers to memory that can be read and written by the CPU of both the Serial Data Unit and the CPU.

The data flow example is shown below when a bar-code reader and printer are connected.



Note:

The Serial Data Unit communicates serially regardless of the Programmable Controller's (PC's) mode and the data can be transferred only when the CPU is the RUN mode.

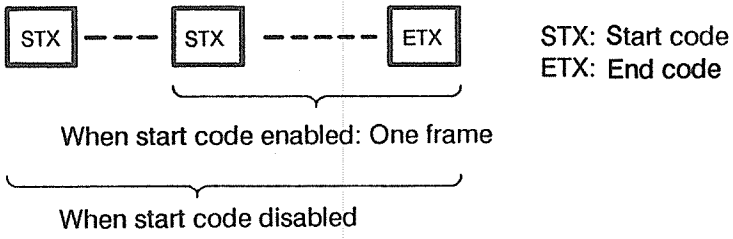
- **Notes on serial data unit operation**

① Since an error during communication is reflected in Receive and send data inputs for CH. 1 or CH. 2 (X4 to XD), it is recommended that the sequence program provide retransmission.
Refer to "②".

If an error in a frame is generated during reception, the frame is completely cleared and the error LED turns ON.
However, if a normal frame is received next, the error LED turns OFF and the frame is processed as a received frame.

② Note that when the Serial Data Unit is operating with the start code enabled, the most recently received start code until the end code is processed as one frame.

Example :

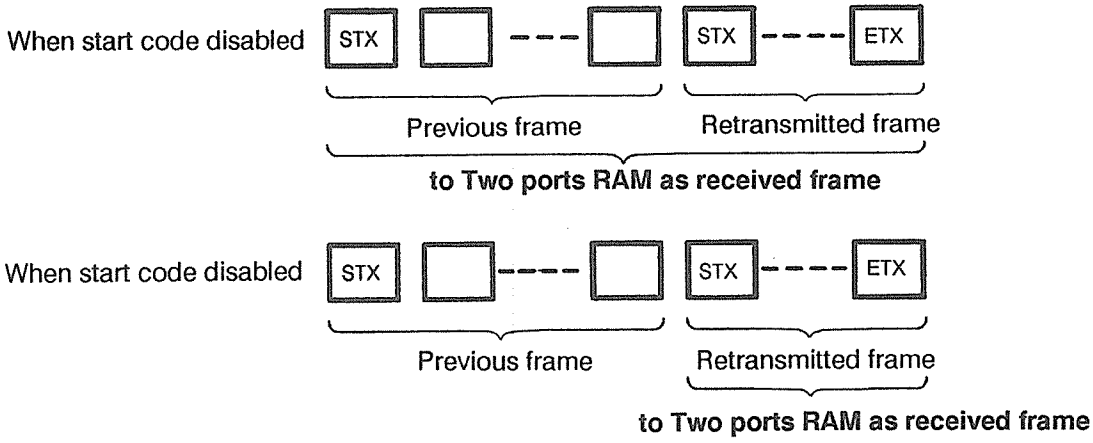


i) If the end code was not received (e.g. due to transmission trouble), the Serial Data Unit continues to wait unit the end code arrives.

ii) The two methods below are available to prevent the Serial Data Unit from waiting continuously.

- Have the remote RS232C device retransmit.
- For a remote RS232C device which cannot retransmit, add a time-out routine to the sequence program and send a request for retransmission to the remote device.

iii) When a retransmission from a remote RS232C device is received, the serial data unit's buffer operates as follows.



Example when the I/O number for the unit allocated from 0 to 1F.

③ A software reset can be used to reset the serial data unit in an emergency.

- Setting Software reset output (Y1D) to ON in the sequence program performs the reset operation.
- It takes the initialization to end approx. 100 ms after the software reset has been accepted.
- After initialization end, the Unit ready indication input (XE) turns ON.

④ Note the following when setting the end code using two ports RAM.
(The end code is read from two ports RAM each time the send or receive processing is executed.)

- During transmission:
  Be sure to specify the end code before requesting a transmission.
- During reception:
  Be sure to specify the end code before the remote RS232C device transmits.

⑤ Turning ON CH. 1 output (Y1E) and CH. 2 output (Y1F) disables transmission of the end code.
(Convenient method when outputting to a printer.)

- Be sure to turn ON CH. 1 output (Y1E) and CH. 2 output (Y1F) before requesting a transmission.

Example when the I/O number for the unit allocated from 0 to 1F.

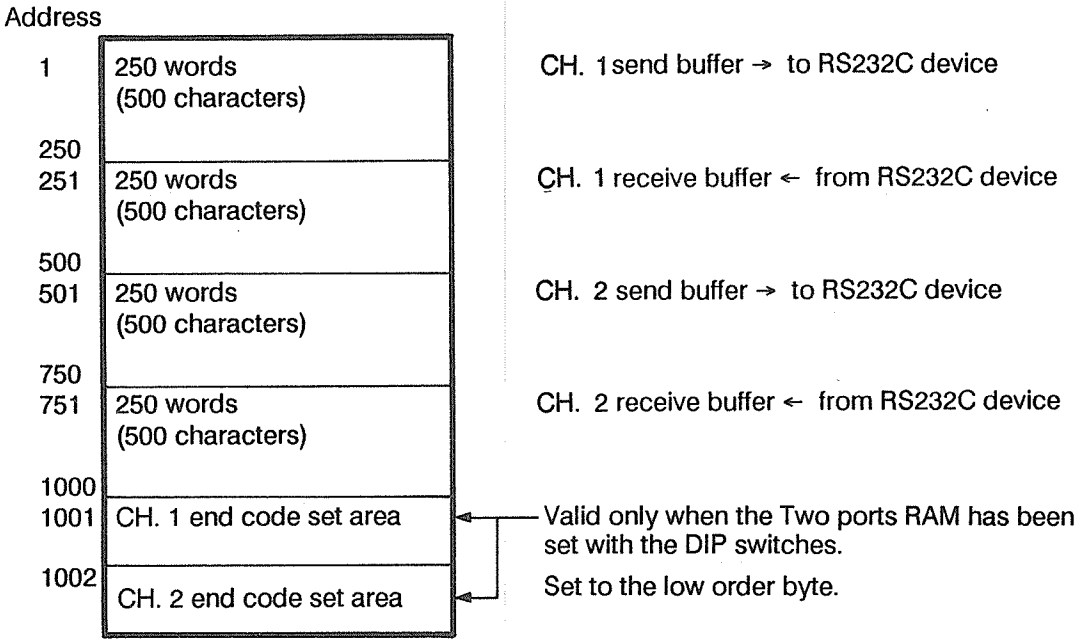
3-2. Programming

1. Allocation of Two ports RAM

- Built into the Serial Data Unit, the two ports RAM can be read and write from the CPU.
- Send and receive areas have already been allocated beforehand in two ports RAM.

  Write and read data using this area.
- Data communications use the ON and OFF states of two points each for X and Y contacts.
  { Refer to page 27, Section 3-2, 3. High Level Instructions (F/P 150, READ / F/P 151, WRITE), for further information. }

Two ports RAM Allocation



- Send buffer area : Area to be set with send data.
- Receive buffer area : Area which stores received data.

Note:

The addresses are shown in a decimal system. For example, address 501 means K501.

2. Input / Output Allocation

The numbers allocated to X and Y are determined by the mounted location of the Serial Data Unit and the number of points of the other I/O units.

The table below shows the Input / Output numbers when the Serial Data Unit is mounted on slot no. 0 of the basic base plate.

① The I/O signals provided by the Serial Data Unit to the CPU are represented as X0 to XF and Y10 to Y1F (16 points each).

The definitions of these I/O signals are given below.

Handshake execution is performed using these I/O signals.

Input signal	Description
X0	For CH.1 transmission X0 turns ON when the serial data unit transmitted the data. * 1
X1	For CH.1 reception X1 turns ON when the normal data received from the device connected to CH.1. * 1
X2	For CH.2 transmission X2 turns ON when the serial data unit transmitted the data. * 1
X3	For CH.2 reception X3 turns ON when the normal data received from the device connected to CH.2. * 1
X4	For CH.1 receive data X4 turns ON only when a framing error occurs in the receive data.
X5	For CH.1 receive data X5 turns ON only when a parity error occurs in the receive data.
X6	For CH.1 receive data X6 turns ON when the buffer full occurs in the receive data.
X7	For CH.1 receive data X7 turns ON when a character bit error occurs in the receive data.
X8	For CH.1 send data X8 turns ON when a character bit error occurs in the send data.
X9	For CH.2 receive data X9 turns ON only when a framing error occurs in the receive data.
XA	For CH.2 receive data XA turns ON only when a parity error occurs in the receive data.
XB	For CH.2 receive data XB turns ON when the buffer full occurs in the receive data.
XC	For CH.2 receive data XC turns ON when a character bit error occurs in the receive data.
XD	For CH.2 send data XD turns ON when a character bit error occurs in the send data.
XE	For serial data unit ready indication XE turns ON when initalization of the Serial Data Unit is completed.
XF	Not used

*1 (Refer to page 31, Section 3-2, 4. Communication timing, for further information.)

- The data error warning signals (X4 to XD) turn OFF when the reset switch on the Serial Data Unit is pressed or when normal data is received.

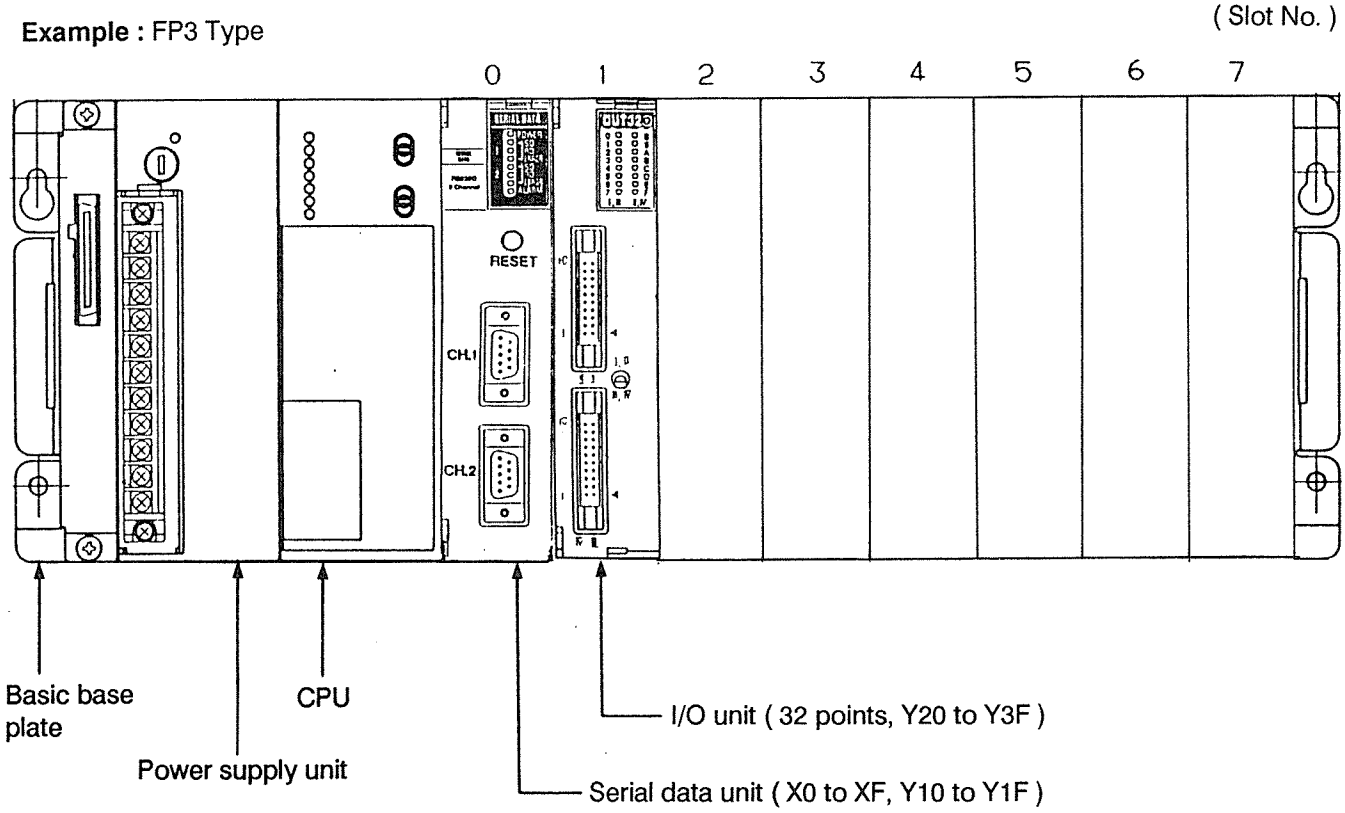
Example when the I/O number for the unit allocated from 0 to 1F.

Output signal	Description
Y10	For CH.1 transmission Turns ON Y10 when send data is written to the two ports RAM. Turn OFF Y10 when X0 turns ON.
Y11	For CH.1 reception Turns ON Y11 when send data is read from the two ports RAM. Turn OFF Y11 when X1 turns OFF.
Y12	For CH.2 transmission Turns ON Y12 when send data is written to the two ports RAM. Turn OFF Y12 when X2 turns ON.
Y13	For CH.2 reception Turns ON Y13 when send data is read from the two ports RAM. Turn OFF Y13 when X3 turns OFF.
Y14 to Y1C	Not used
Y1D	For software reset When Y1D is turned ON, the serial data unit is initialized. After initialization (approx. 100 ms), XE turns ON. Turns OFF Y1D immediately after XE turns ON.
Y1E	For CH. 1 If Y1E is turned ON before requesting a transmission (by turning ON Y10), the end code is not sent.
Y1F	For CH. 2 If Y1F is turned ON before requesting a transmission (by turning ON Y12), the end code is not sent.

Example when the I/O number for the unit allocated from 0 to 1F.

② The below is an example, the Serial Data Unit is mounted to slot no. 0 and the 32-point I/O unit is mounted to slot no. 1.

Example : FP3 Type



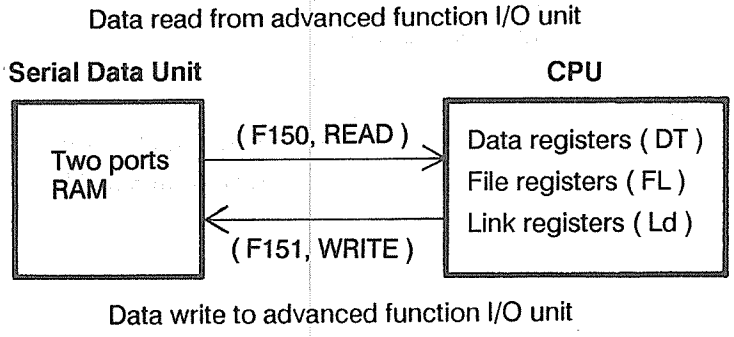
Note:

- Several Serial Data Unit can be mounted on the basic base plate and expansion base plate. However, the number of units that can be mounted is determined by the capacity of the power supply. Therefore, be sure the value of the consumption current at 5 V given in the performance specifications for the Serial Data Unit and the consumption current of the other I/O does not exceed the rated output current at 5 V for the power supply unit.
- When allocating the Input / Output map using the NPST-GR (programming support software), allocate " 16 SX, 16 SY " for the slot to which the Serial Data Unit has been mounted.

3. High Level Instructions (F/P 150, READ / F/P 151, WRITE)

Use the high level instruction for data read (F/P 150 or READ) from and data write (F/P 151 or WRITE) to the advanced function Input / Output Unit in the sequence program for data transfers with two ports RAM within the Serial Data Unit.

Use the ON and OFF states of two points for X and Y contact for data transfer handshaking.



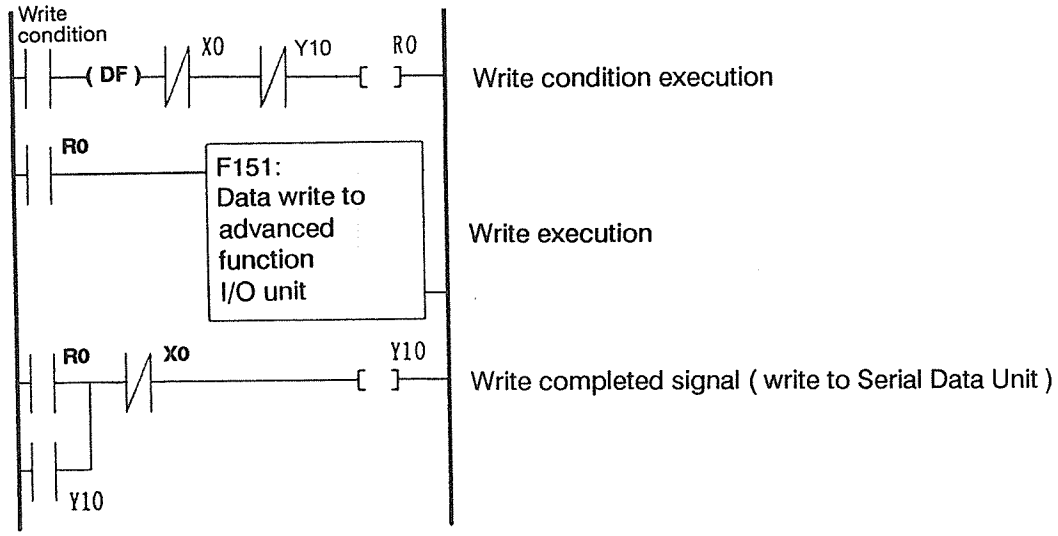
The programs is constituted with the high level instructions and handshaking with the two ports RAM.

For further information on handshake timing, refer to page 31, Section 3-2, 4. Communication timing.

For further information on two ports RAM, refer to page 23, Section 3-2, 1. Allocation of Two ports RAM.

For further information on Input / Output allocation, refer to page 24, Section 3-2, 2. Input / Output Allocation.

Writing

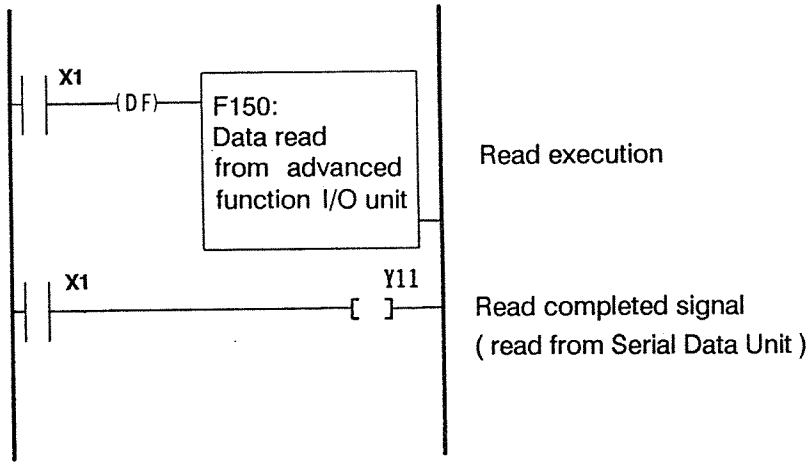


X0 : Transmission input for CH. 1
X0 turns ON when the Serial Data Unit transmitted normal data.

Y10 : Transmission output for CH. 1
Turn ON Y10 when send data is written to the two ports RAM.
Turn OFF Y10 when X0 turns ON.

Example when the I/O number for the unit allocated from 0 to 1F.

Reading



X1 : Reception input for CH. 1
X1 turns ON when normal data received from the device connected to CH. 1.

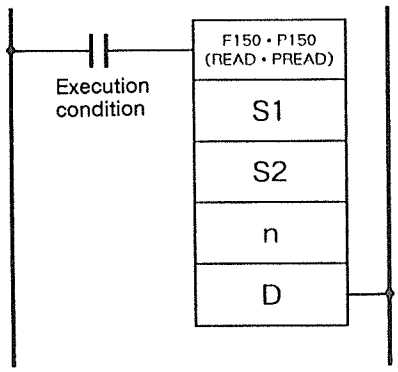
Y11 : Reception output for CH. 1
Turn ON Y11 when send data is read from the two ports RAM.
Turn OFF Y11 when X1 turns OFF.

Example when the I/O number for the unit allocated from 0 to 1F.

(Refer to FP3 / FP5 Programming Manual, for further high level instruction " F/P 150 " and " F/P 151" .)

Data read from Two ports RAM : High level instruction F/P 150, READ

Basic format of instruction



S1 : Slot of advanced I/O unit and bank of advanced I/O unit memory

S2 : Read start address of advanced I/O unit memory (word address)

n : Number of words to be read

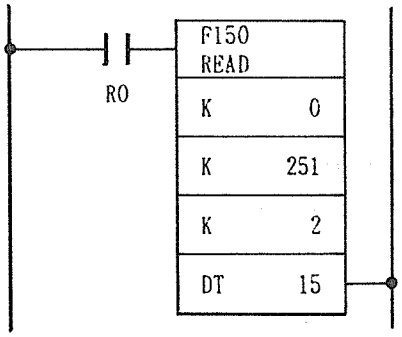
D : Start number of area storing the read data

- **For BASIC Type CPU**

READ % <Slot number : S1> ,< Address : S2> ,< Number of words : n> ,< Address : D>

Data consisting of n words is read from the address specified by S2 in the two ports RAM with in the advanced I/O unit specified by S1, and stored into the area (register) specified by D.

Program example



0th slot

Address 251

2 words

Data register 15

For BASIC Type CPU

```
100 IF SW ( R 0 ) = 0 THEN GOTO 200
110 READ % 0, 251, 2, DT 15
```

Explanation

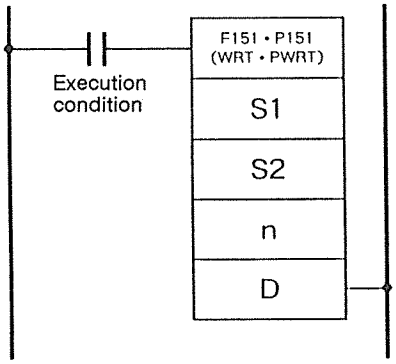
When execution condition (R0) turns ON, 2 words of data from address 251 (CH. 1 receive buffer) of the Serial Data Unit at slot no.0 are read and transferred to the data register (DT15) with in the CPU.

Note:

This instruction executes in word unit. For example, 10-byte data means 5 words.
The address are shown in decimal system and in word unit.
For example, address 500 means K500.

Data write to Two ports RAM : High level instruction F/P 151, WRITE

Basic format of instruction



S1 : Slot of advanced I/O unit and bank of advanced I/O unit memory

S2 : Start area number of write data

n : Number of words to be written

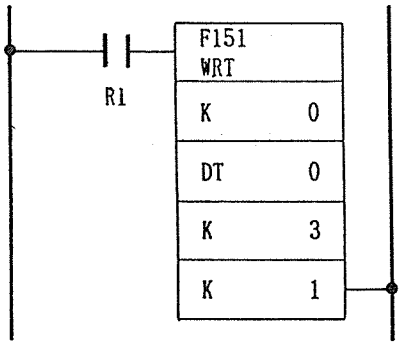
D : Start address for writing the data of the advanced I/O unit

- **For BASIC Type CPU**

  WRITE % <Slot number : S1> , <Address : S2> , <Number of words : n> , <Address : D>

  Data consisting of n words is read from the address specified by S2 is written to the area, starting from the address specified by D in the two ports RAM with in the advanced I/O unit specified by S1.

Program example



For BASIC Type CPU

```
100 IF SW ( R 1 ) = 0 THEN GOTO 200
110 WRITE % 0, DT 0, 3, 1
```

Explanation

When execution condition (R1) turns ON, 3 words of data from data register 0 in the CPU are written to addess 1 (CH. 1 send buffer) of the Serial Data Unit at slot no.0.

Note :

This instruction executes in word unit. For example, 10-byte data means 5 words.
The address are shown in decimal system and in word unit.
For example, address 500 means K500.

4. Communication timing

ON / OFF switching of contacts is used for control so that both transmit and receive operations are executes reliably no matter in which slot location the Serial Data Unit is mounted.
For each channel, two I/O points are used for transmission and two I/O points for reception.

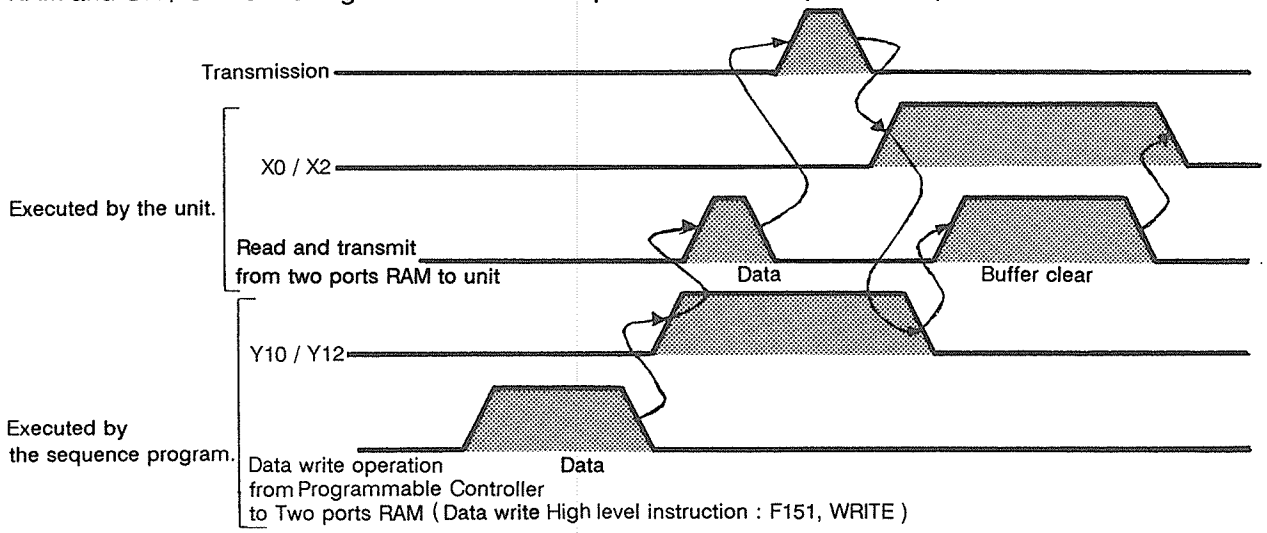
Example : When the unit mounted in slot no. 0

CH. 1	Transmission input for CH. 1 (X0)	Transmission output for CH. 1 (Y10)
	Reception input for CH. 1 (X1)	Reception output for CH. 1 (Y11)
CH. 2	Transmission input for CH. 1 (X2)	Transmission output for CH. 1 (Y12)
	Reception input for CH. 1 (X3)	Reception output for CH. 1 (Y13)

Timig chart when CH. 1 / CH. 2 is used

- When transmitting

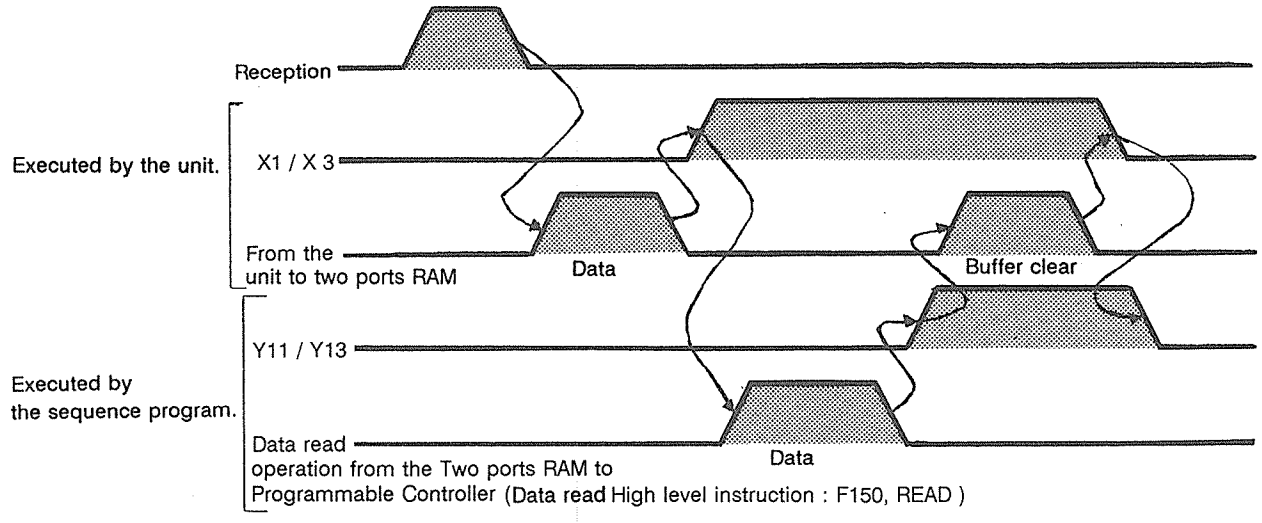
  Use a sequence program to execute the data write operation from Programmable Controller to Two ports RAM and ON / OFF switching of Transmission output CH. 1 / CH. 2 (Y10 / Y12).



The timing for X0 / X2 to turn ON is executed after the end code sent from the unit to the external device,

- When receiving

  Use a sequence program to execute the data read operation from Two ports RAM to Programmable Controller and the ON / OFF switching of Reception output CH. 1 / CH. 2 (Y11 / Y13)



Example when the I/O number for the unit allocated from 0 to 1F.

CHAPTER 4

PROGRAM EXAMPLES

"PC" is the abbreviation for Programmable Controller.

4-1. Self Diagnosis Software

A program example is given which executes the self diagnosis at the Serial Data Unit.

Procedure

1. Data is sent from CH.1 and received by CH. 2. Then the receive data and send data are compared. DT0 data is sent.

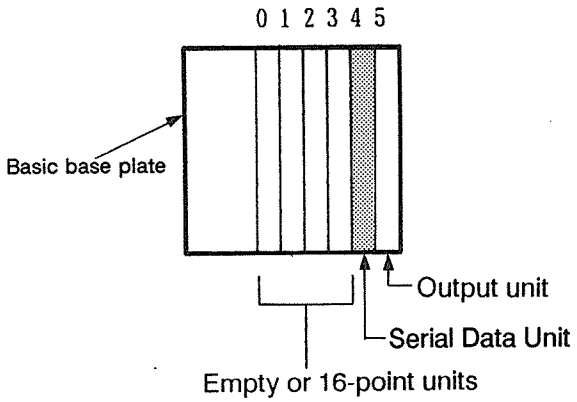
2. Data is sent from CH. 2 and received by CH. 1. Then the receive data and send data are compared. DT10 data is sent.

3. If the result of the comparison is inequality, Y60 is turned ON.

Notes:

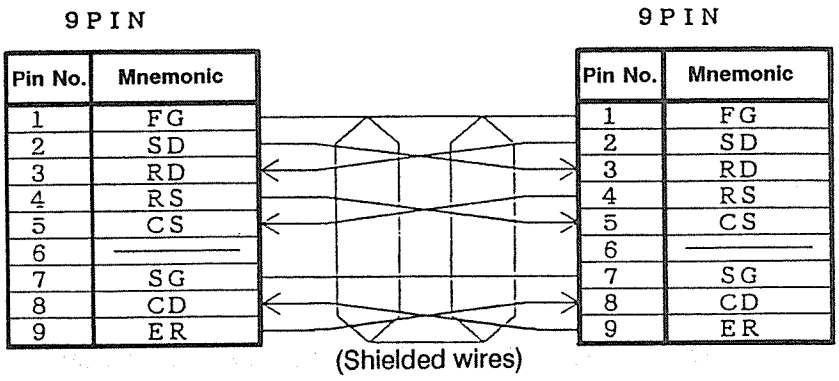
Write 2-bytes data (includes end code " CR ") into DT 0 and DT 10 before program execution.
The data is written using OP8 for the FP programming unit.
For further information on " OP8 " operation instruction, refer to the FP3 & 5 Programming Manual.
Data can also be written using the NPST-GR(programming support software), data monitor function.
Use the same DIP switch settings for both CH. 1 and CH. 2.
(The DIP switch position settings are arbitrary.)

For the sequence program example, mount the Serial Data Unit to slot no.4 on the basic base plate.



CH. 1 and CH. 2 must be connected together using RS232C reverse cable.

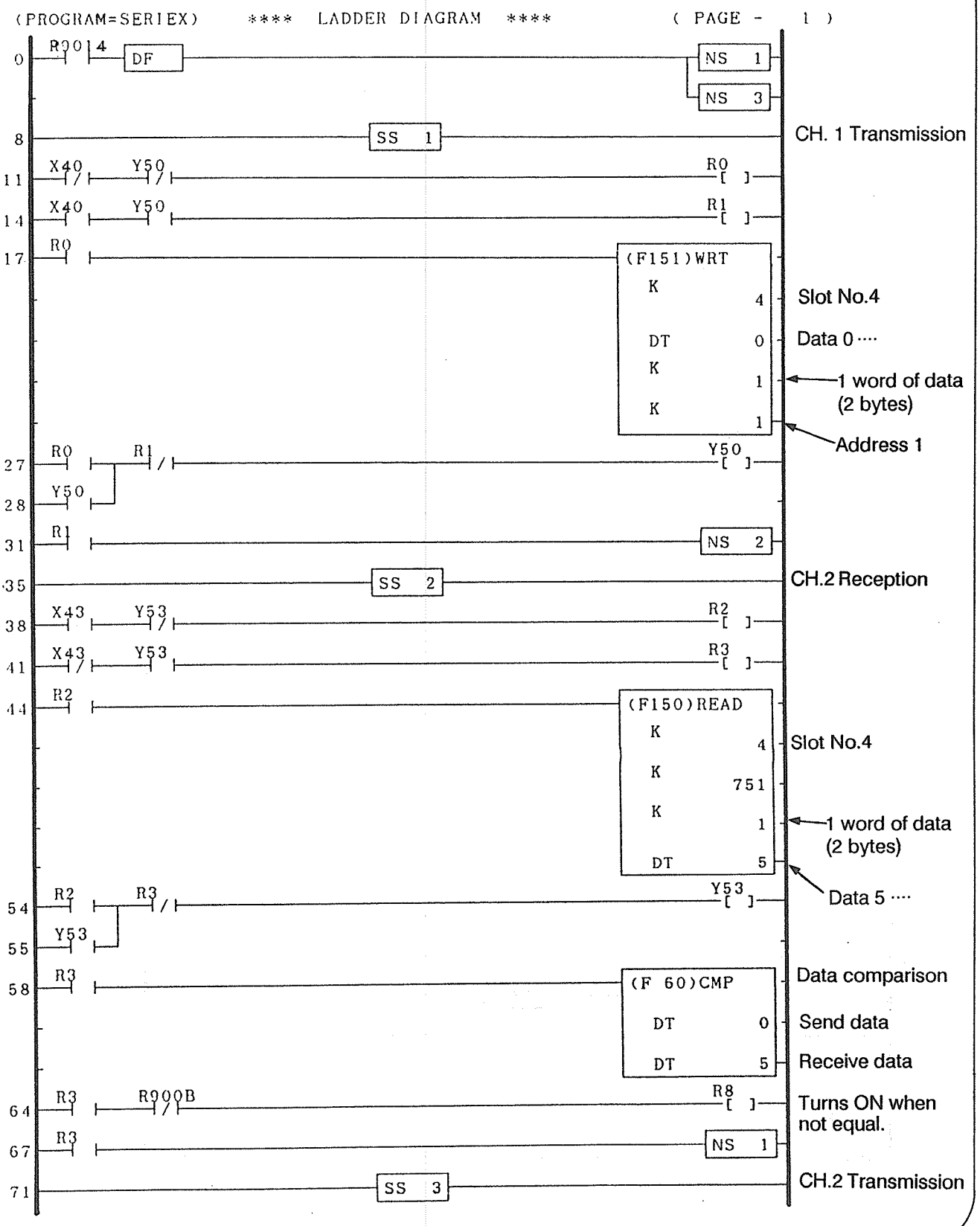
RS232C reverse cable

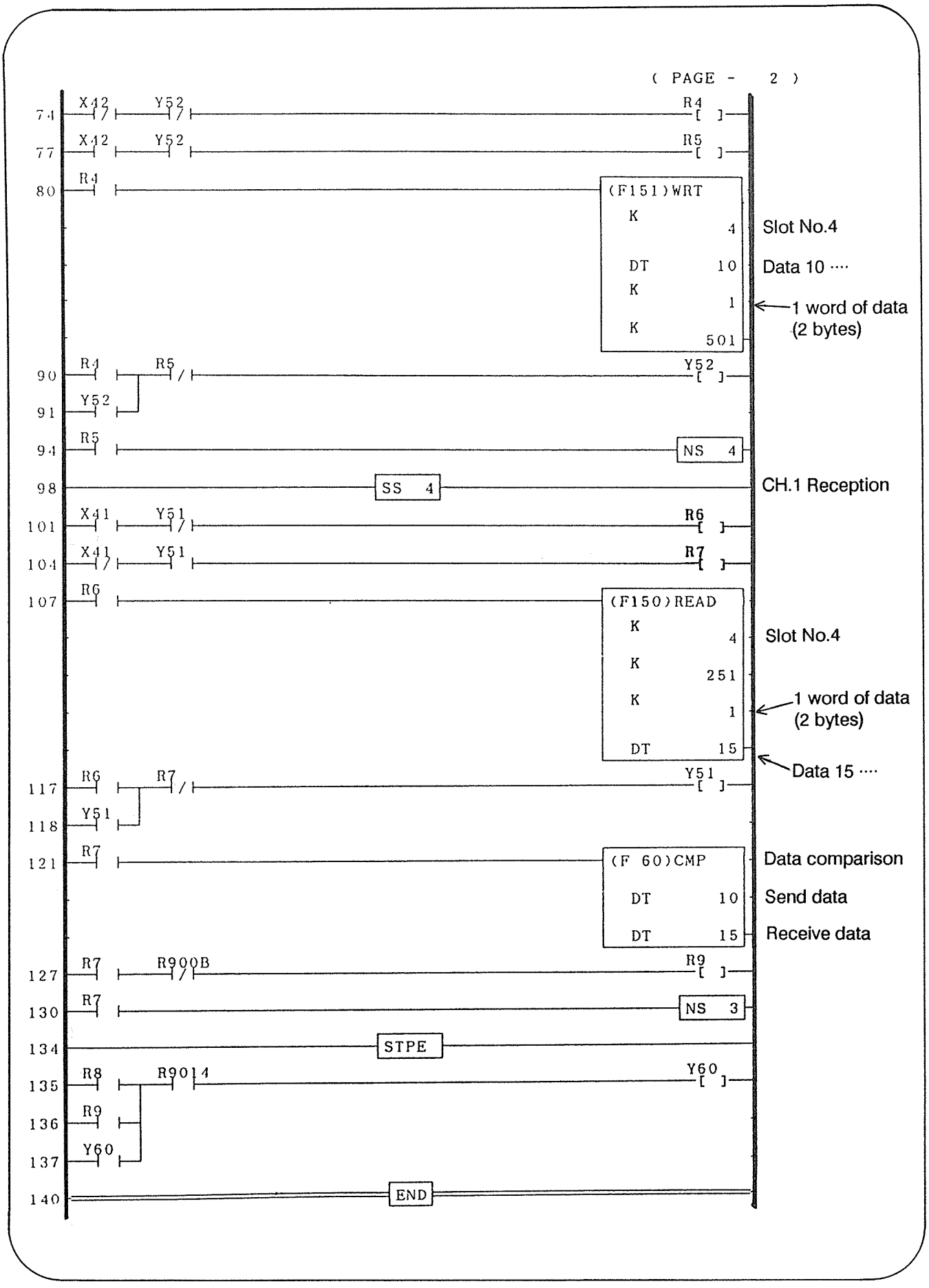


Pin No.	Mnemonic
1	FG
2	SD
3	RD
4	RS
5	CS
6	——
7	SG
8	CD
9	ER

Pin No.	Mnemonic
1	FG
2	SD
3	RD
4	RS
5	CS
6	——
7	SG
8	CD
9	ER

Sequence program : self-check software




(PAGE - 2)
74 X42 Y52 R4
77 X42 Y52 R5
80 R4 (F151)WRT K 4 DT 10 K 1 K 501
Slot No.4
Data 10 ····
1 word of data (2 bytes)
90 R4 R5 Y52
91 Y52
94 R5 NS 4
98 SS 4
CH.1 Reception
101 X41 Y51 R6
104 X41 Y51 R7
107 R6 (F150)READ K 4 K 251 K 1 DT 15
Slot No.4
1 word of data (2 bytes)
Data 15 ····
117 R6 R7 Y51
118 Y51
121 R7 (F 60)CMP DT 10 DT 15
Data comparison
Send data
Receive data
127 R7 R900B R9
130 R7 NS 3
134 STPE
135 R8 R9014 Y60
136 R9
137 Y60
140 END

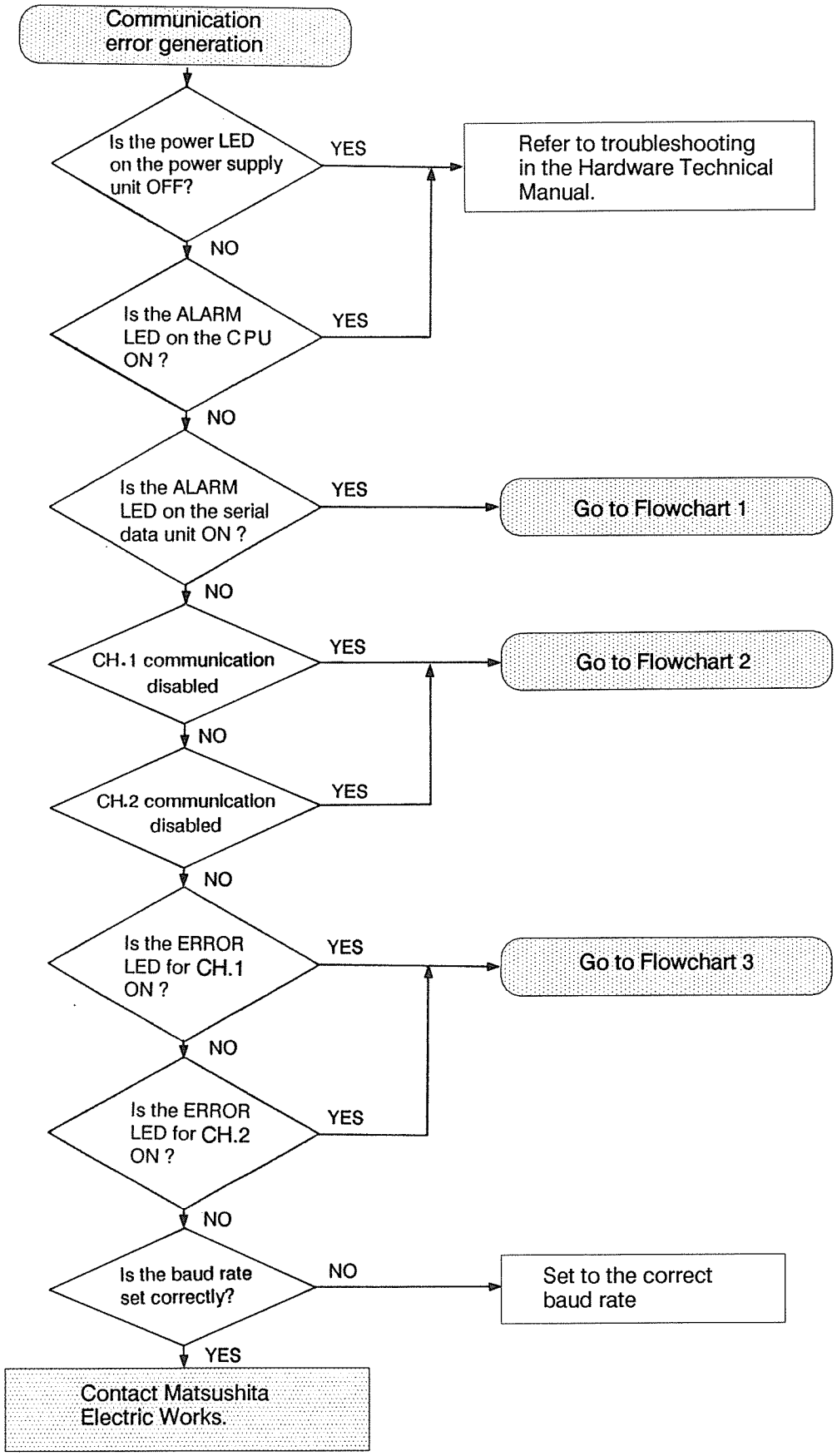
CHAPTER 5

TROUBLESHOOTING

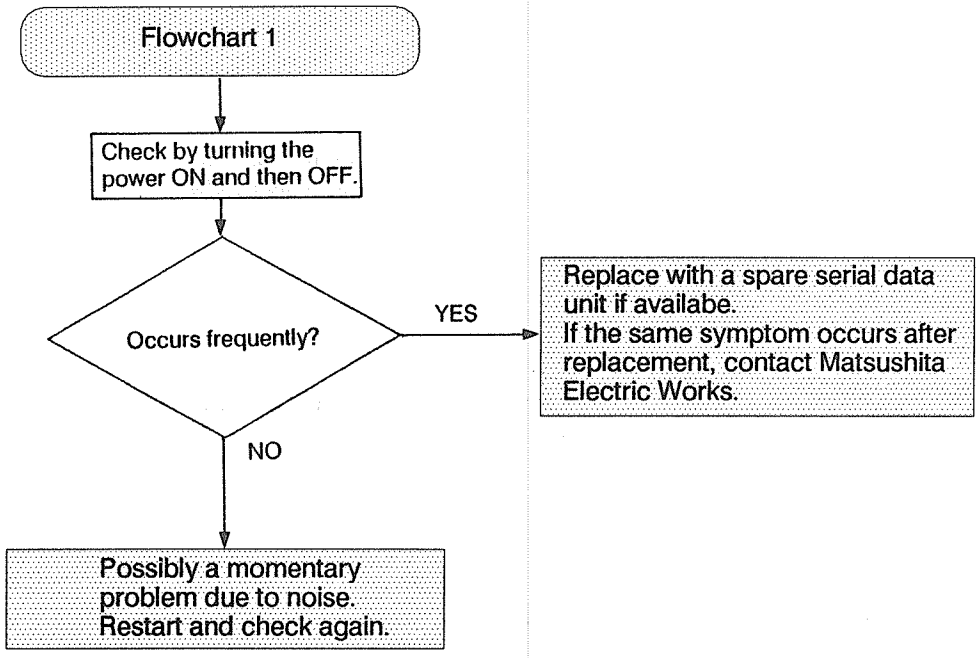
"PC" is the abbreviation for Programmable Controller.

5-1. Troubleshooting

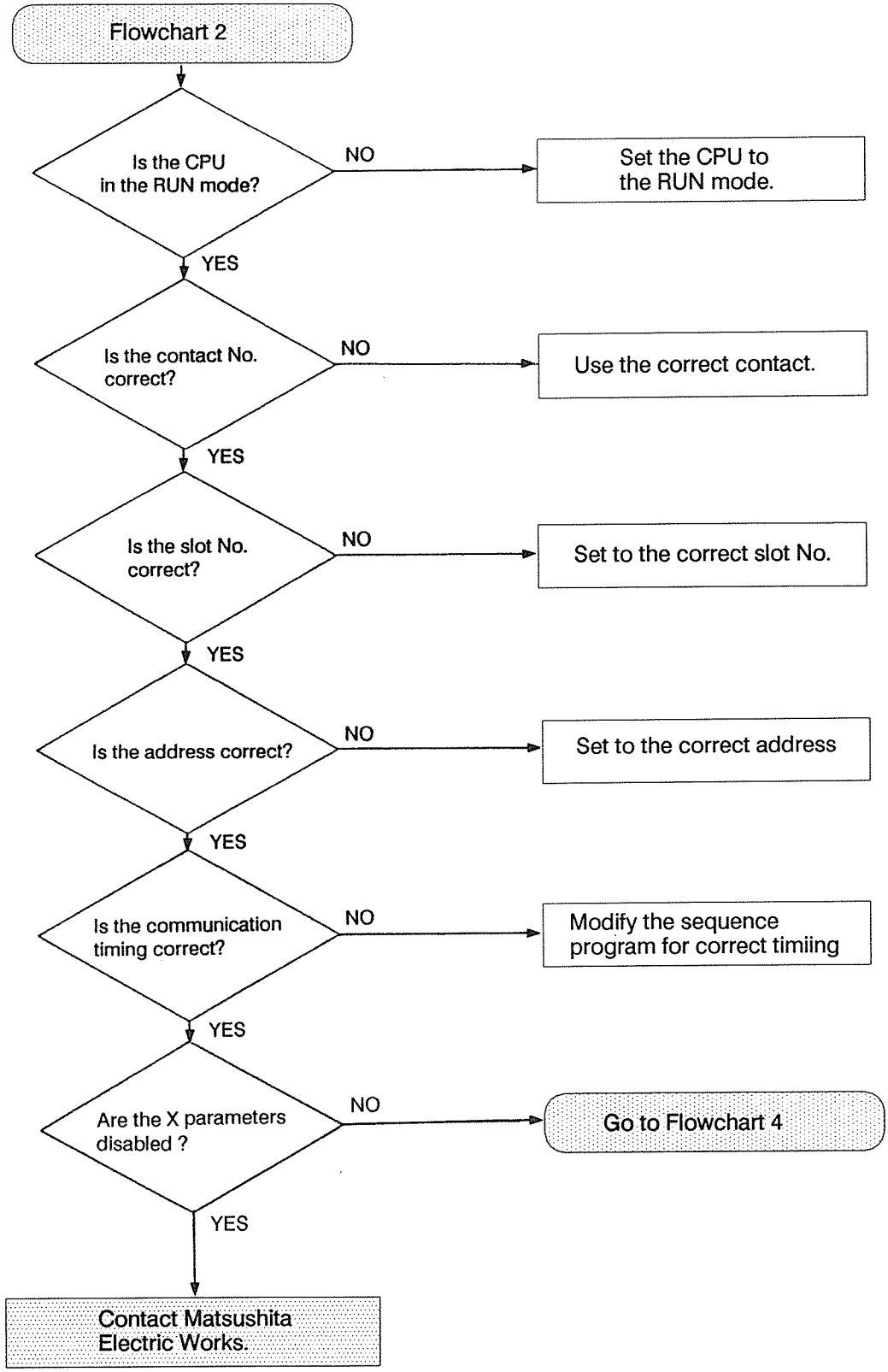
• Main Flowchart



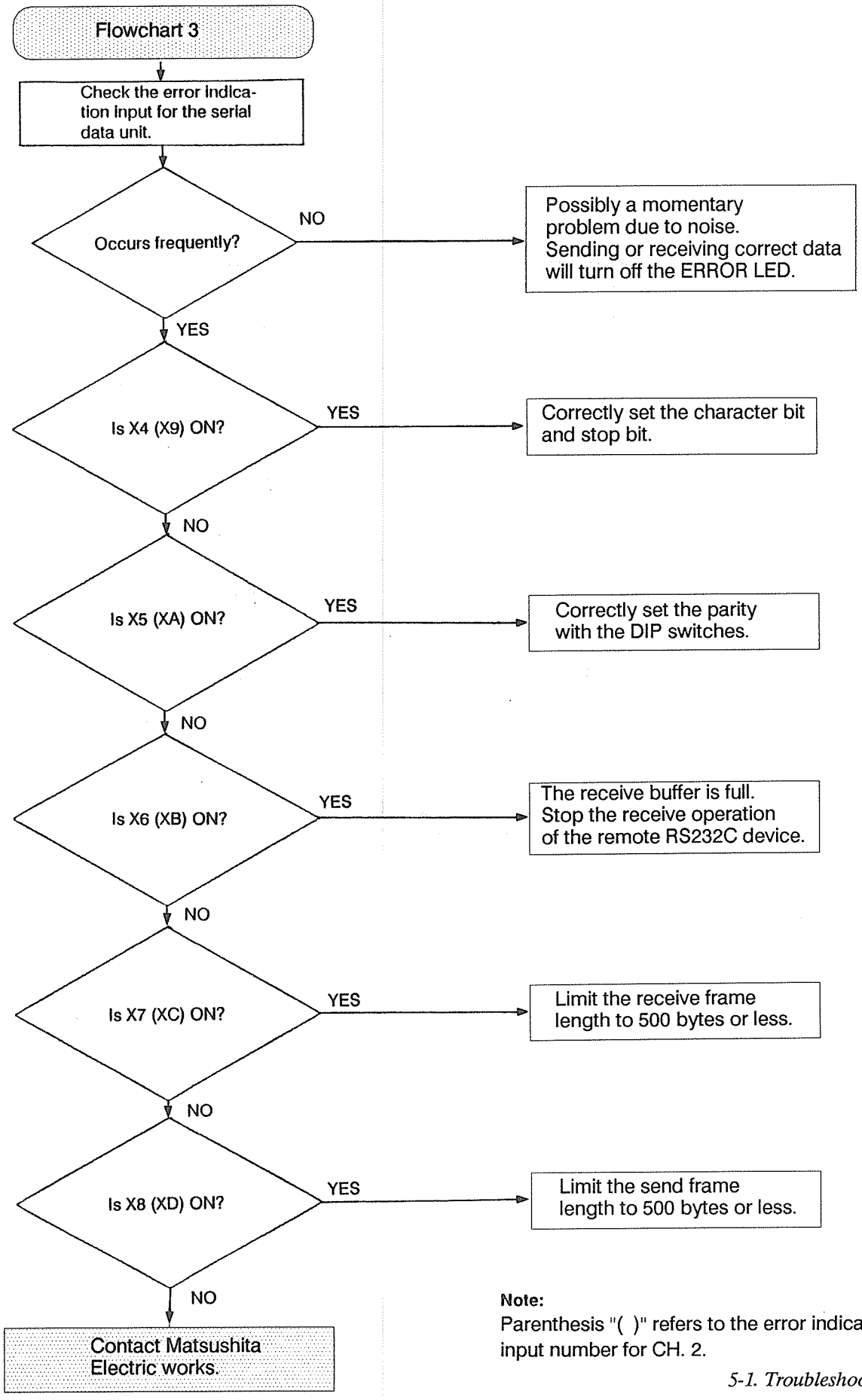
● Flowchart 1 : Follow this flowchart when the ALARM LED lights



● Flowchart 2 : Follow this flowchart when communication disabled

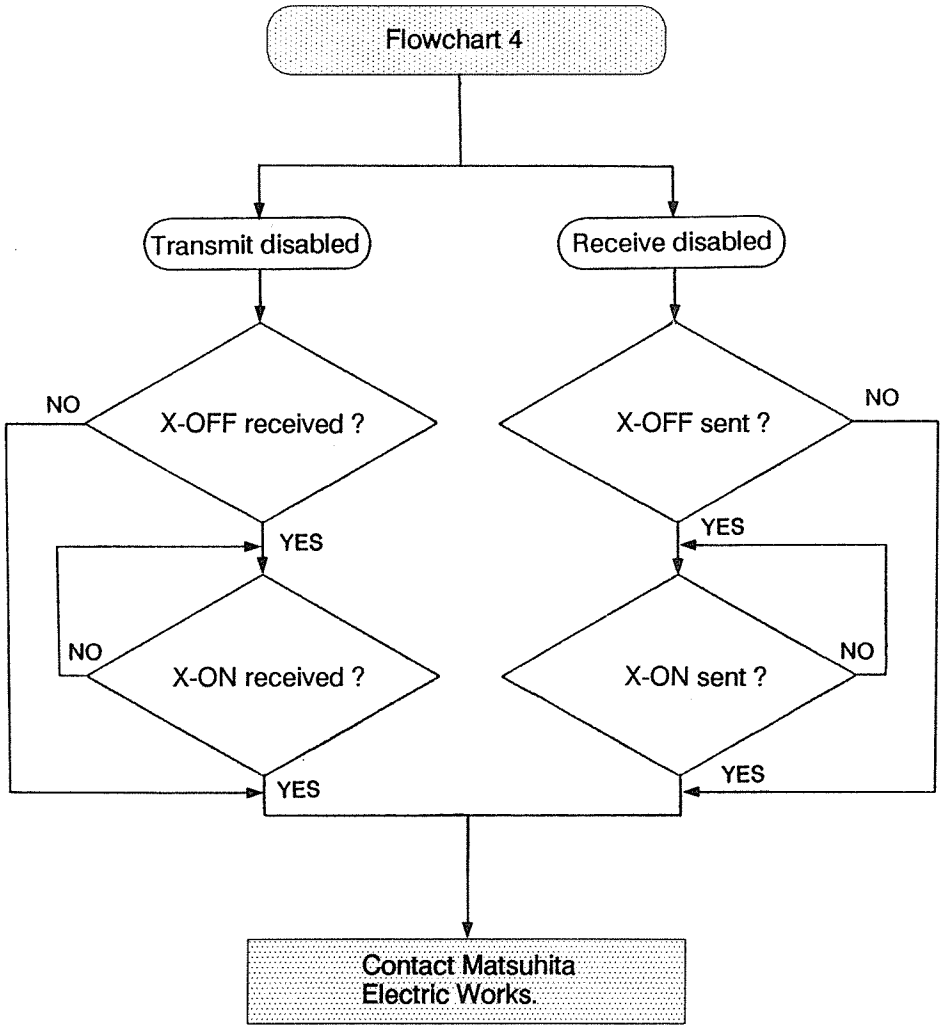


● Flowchart 3 : Follow this flowchart when the ERROR LED lights



Note:
Parenthesis "( )" refers to the error indication input number for CH. 2.

• Flowchart 4 : Follow this flowchart when the X parameters enabled



CHAPTER 6

APPENDIX

6-1. X-ON /X-OFF Control

6-2. ASCII Code

"PC" is the abbreviation for Programmable Controller.

6-1. X-ON /X-OFF Control

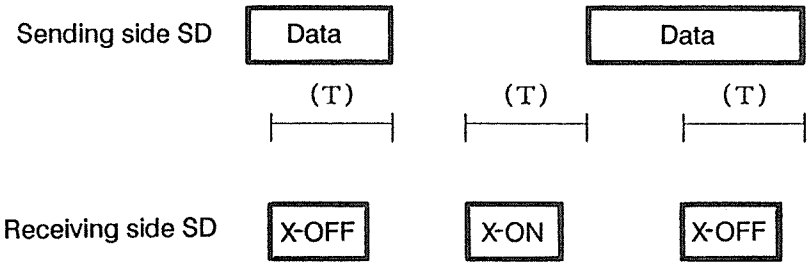
- **Explanation :**

The X-ON / X-OFF control is a typical method used for transmission speed control (by having the sending side wait) in serial transmissions. It is a simple software level procedure.

The transmission speed is fixed in serial transmissions. If the processing speed of the receiving side is sufficient, there is no problem.

However, if it is not, X-OFF is sent to the sending side to pause the data transmission, and when the receiving side is ready to receive, it sends X-ON to the sending side to resume the transmission.

The timing chart for the XON-XOFF control is shown in the figure below.



Since the processing at the sending side is usually software process, time " T " is required to start or pause the transmission after X-ON or X-OFF is received and the time is not always the save long.
Therefore, it is necessary to take into account the variation in time " T " by issuing X-OFF before the buffer becomes full and issuing X-ON before the buffer becomes empty.

- **X-ON / X-OFF Control at the Serial Data Unit**

The X-ON / X-OFF control is enabled by setting DIP switch " DSW2 no.4 (for CH. 1) and DSW3 no.8 (for CH. 2) to ON position.

The timing for the output of X-OFF and X-ON from the Serial Data Unit to the connected device is described for when the Serial Data Unit has been enabled for X-ON / X-OFF control.

X-OFF : Output when the remaining capacity of the receive buffer (total capacity 500 bytes) reaches 1/4 (125 bytes).

X-ON : Output when 3/4 (375 bytes) of the remaining capacity of the receive buffer is restored after XOFF is output.

There is no delay after X-OFF or X-ON is received from the connected device and before the data transmission pauses or resumes (because the pause and resume processes are performed whithin the interrupt process).
Note that regardless of the baud rate, 3 characters are sent before the transmission pauses after X-OFF is received.

6-2. ASCII Code

				b_7	0	0	0	0	1	1	1	1
				b_6	0	0	1	1	0	0	1	1
				b_5	0	1	0	1	0	1	0	1
b_7	b_6	b_5	b_4	b_3	b_2	b_1	R \ C	0	1	2	3	4	5	6	7
			0	0	0	0	0	NUL	DLE	SPACE	0	@	P	`	p
			0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
			0	0	1	0	2	STX	DC2	"	2	B	R	b	r
			0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
			0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
			0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
			0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
			0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
			1	0	0	0	8	BS	CAN	(	8	H	X	h	x
			1	0	0	1	9	HT	EM	)	9	I	Y	i	y
			1	0	1	0	A	LF	SUB	*	:	J	Z	j	z
			1	0	1	1	B	VT	ESC	+	;	K	[	k	{
			1	1	0	0	C	FF	FS	,	<	L	\	l	|
			1	1	0	1	D	CR	GS	-	=	M	]	m	}
			1	1	1	0	E	SO	RS	.	>	N	^	n	~
			1	1	1	1	F	SI	US	/	?	O	_	o	DEL

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Matsushita Electric Works, Ltd.

Automation Controls Company

■ Head Office: 1048, Kadoma, Kadoma-shi, Osaka 571-8686, Japan
■ Telephone: +81-6-6908-1050
■ Facsimile: +81-6-6908-5781

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