Instruction Manual

COMPACT CONTROLLER M (CC-M)

TYPE: PDA3

Fuji Electric Co.,Ltd.

INTRODUCTION

We thank you very much for purchasing Fuji Electric's compact controller M (CC-M Type: PDA3).

- Carefully read the instruction manual and sufficiently be familiar with its contents before installing, operating and maintaining the compact controller M. Improper handling may cause accidents or injuries.
- The specifications of compact controller M are subject to change without prior notice for improvement of the product.
- It is strictly forbidden to remodel the compact controller M without permission. We will not be responsible for any accident attributable to such remodeling without permission.
- The person in charge of operating the compact controller M is requested to keep the instruction manual.
- After reading the manual, it must be kept at a place always accessible by personnel in charge of its operation.
- An arrangement must be taken so that the instruction manual will be handed over to the end user.
- The contents of this manual have been prepared carefully. However, it should be noted that Fuji is not responsible for any loss caused indirectly from errors in wiring or missing of information.

Note: Windows 95/98 is the registered trademark of Microsoft Corporation.
Note: Modbus® is the registered trademark of MODICON.
Note: Sandisk and Compact Flash are the trademarks of Sandisk Corporation.
Note: OPTO 22 Interface and SNAP I/O are the registered trademarks of OPTO 22, USA.

Manufacturer	: Fuji Electric Instruments Co., Ltd.
Type	: Described in nameplate on main frame
Date of manufacture	: Described in nameplate on main frame
Product nationality	: Japan

Request

- It is forbidden to transfer a part or the whole of contents of the manual without permission.
- Contents of the manual are subject to change without prior notice.

Issued in Aug., 1999
Rev. 1st edition January, 2000
Rev. 2nd edition July, 2000
Rev. 3rd edition October, 2001

SAFETY PRECAUTIONS

Before use, carefully read the safety precautions for correct operation.

- The precautions concern important matters related to safety. Be sure to observe them. The safety matters are ranked to “DANGER”, “CAUTION”.

Indications and meanings are as follows.

◇! **DANGER**	If the handling is wrong, dangerous situations might occur, causing death or serious injury.
⚠ **CAUTION**	If the handling is wrong, dangerous situations might occur, causing medium or slight degree of injury or physical damage only.

◇! DANGER

- If the fault or anomaly of the device may cause serious accident or troubles to other devices, externally install appropriate emergency stop circuit and protective circuit to avoid accidents.
- The instrument has no power switch nor fuse. Install them if necessary. (Fuse rating 250 V, 2 A)
- For avoiding device breakage and fault, supply a power voltage matching the rating.
- For avoiding electric shock, maloperation and device troubles, do not turn on power until all installation and wiring have ended.
- The instrument is not an intrinsically-safe explosion-proof type. Do not use it in atmosphere of combustible or explosive gases.
- Never disassemble, retouch, remodel nor repair the instrument. Otherwise, abnormal operation, electric shock or fire may occur.
- While turned on, do not touch the terminals. Otherwise, electric shock or maloperation may occur.
- Before engaging or disengaging the module or unit, turn off power. Otherwise, electric shock, maloperation or troubles may occur.
- Periodic maintenance is recommended so that the instrument can be used continuously and safely. Some parts installed on the device have limited service life or are subjected to secular change.
- Do not block the ventilation opening located on the top and bottom of the main unit. Otherwise, fault, abnormal operation, shortened service life or fire may occur.

DANGER

◉ Over-temperature Protection

Any control system should be designed with prior consideration that any part of the system has potential to fail.

In case of temperature controlling, a continuance of heating on should be regarded as the most dangerous state.

The followings are the most probable causes of inducing continuance of heating on:

1) The failure of the controller with heating output constantly on
2) The disengagement of the temperature sensor out from the system
3) The short circuit in the thermocouple wiring
4) Valve or switch contact point outside the system is locked to keep heating on

In any application in which it is apprehended that physical injury or destruction of equipment might occur, we recommend to install an independent safeguard equipment to prevent over-temperature which shut down the heating circuit and for additional safety, we also recommend this equipment to have its own temperature sensor.

The alarm output signal of the controller is not designed to work as protective measures when the controller is in failure condition.

⚠ CAUTION

- Do not use any instrument which is found damaged or deformed when unpacked. Otherwise, fire, maloperation or fault may occur.
- Make sure the product is as specified before use. Otherwise, the product may break or be troubled.
- Do not drop, tip over nor give a shock to the product. Otherwise, the product may break or suffer from a fault.
- Install the device so that dust, wire chip, iron powder or other foreign matters will not enter it. Otherwise, maloperation or fault may occur.
- Periodically make sure terminal screws and setscrews are securely tightened. Use at a loosened status may cause fire or maloperation.
- Before changing the setting while operating, forced output, startup, shutdown or other actions, sufficiently check the safety. Wrong operation may break or trouble the machine.
- During the running, the furnished terminal cover must be put on the terminal block. Otherwise, electric shock or fire may occur.
- For mounting the device, avoid the following place.

  Ambient temperature is beyond 0 to 50ºC (0 to 40ºC at close mounting sidewise).

  Ambient humidity is beyond 5 to 90% RH.

  A condensation occurs.

  Exposed to corrosive gases (particularly, sulfuric gas, ammonia or the like) or combustible gases.

  Vibration or impact is exerted to the main unit.

  Splashed with water, oil, chemical, steam or vapor

  Exposed to dust, salt or iron excessively.

  Inductive disturbance is so excessive as to easily produce electrostatic charge, magnetic field or noise.

  A heat accumulation occurs by radiation heat, etc.
- Install this controller on the panel so as not to apply stress to the case, otherwise it may result in damage to the case.
- If dipped in water, do not use the instrument. Otherwise, there may be a fear of electric leakage, electric shock or fire.
- For connecting a thermocouple input, do not use wires other than specified compensating wires. Otherwise, reading error or abnormal operation may occur.
- For connecting a resistance bulb input, use wires of a resistance which is low enough and uniform between 3 wires. Otherwise, reading error or abnormal operation may occur.
- If noise from the source is excessive, add an insulating transformer and use a noise filter.
- For cleaning the main unit, clean the front panel to use dry cloth, and do not use alcohol, benzine or other organic solvents. Do not directly splash water to the main unit. Otherwise, deterioration, fault, electric leakage, electric shock or fire may occur.
- When discarding the product, handle it as an industrial waste.
- Be sure to carry out grounding. Otherwise, electric shock or maloperation may occur.
- Wiring must be carried out by qualified specialists. Wrong wiring may cause fire, fault or electric shock.

CONTENTS

⚠ **CAUTION** Only an experienced engineer should perform the tasks described in items 4.3, 4.4, 8, 9 and 12.2.

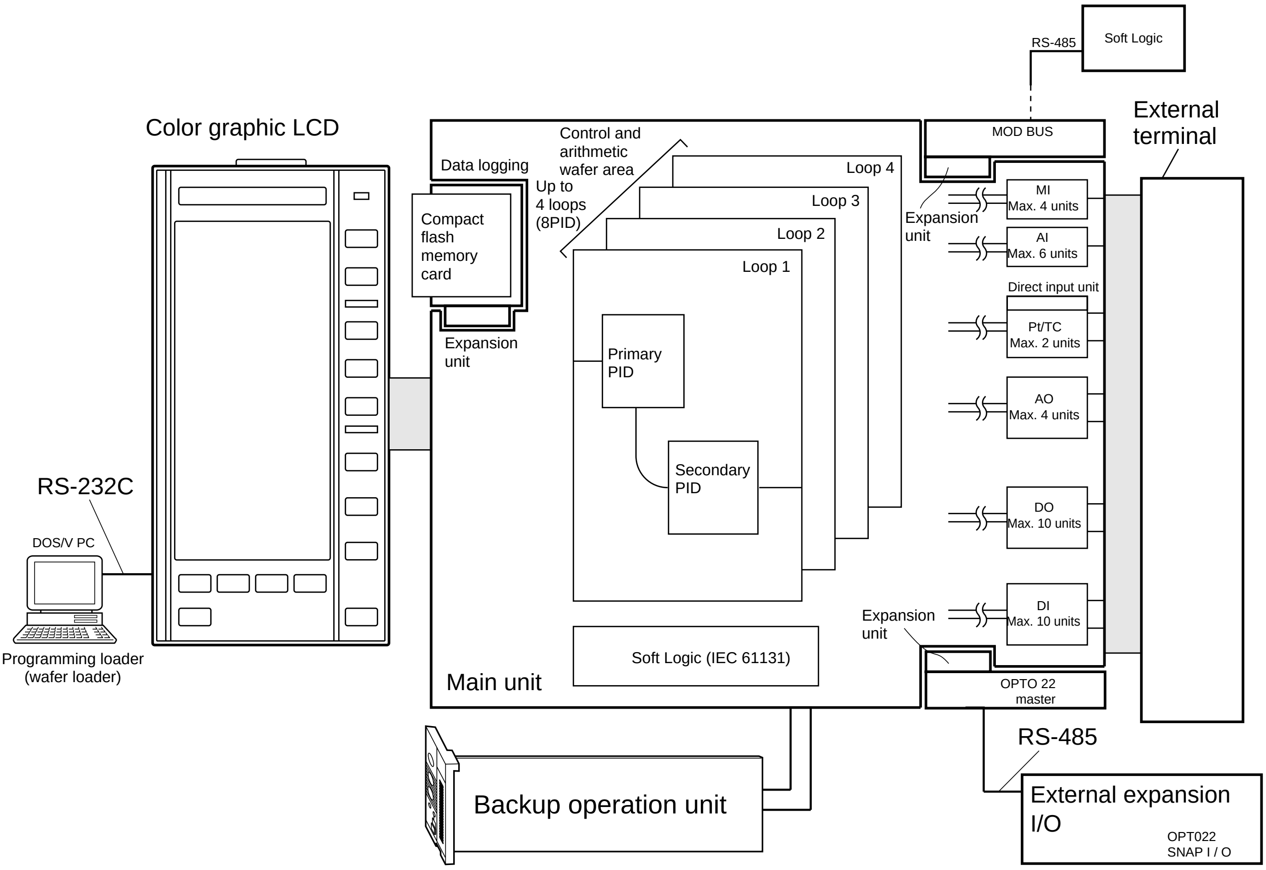
1. GENERAL

The compact controller M (CC-M) is a multi-loop (4 loops max.) process controller.

Using a resistance bulb and thermocouple direct input as an input signal besides a unified signal of 1 to 5 V DC and through abundant control and arithmetic functions, the controller can configure a high cost performance and flexible system.

Soft Logic function, industry standard (Modbus) communicating function, OPTO 22 general purpose I/O link (MISTIC) communication function, memory card (compact flash), data logging function, front loader communication function, hard manual (HMV) unit and other versatile functions can be installed.

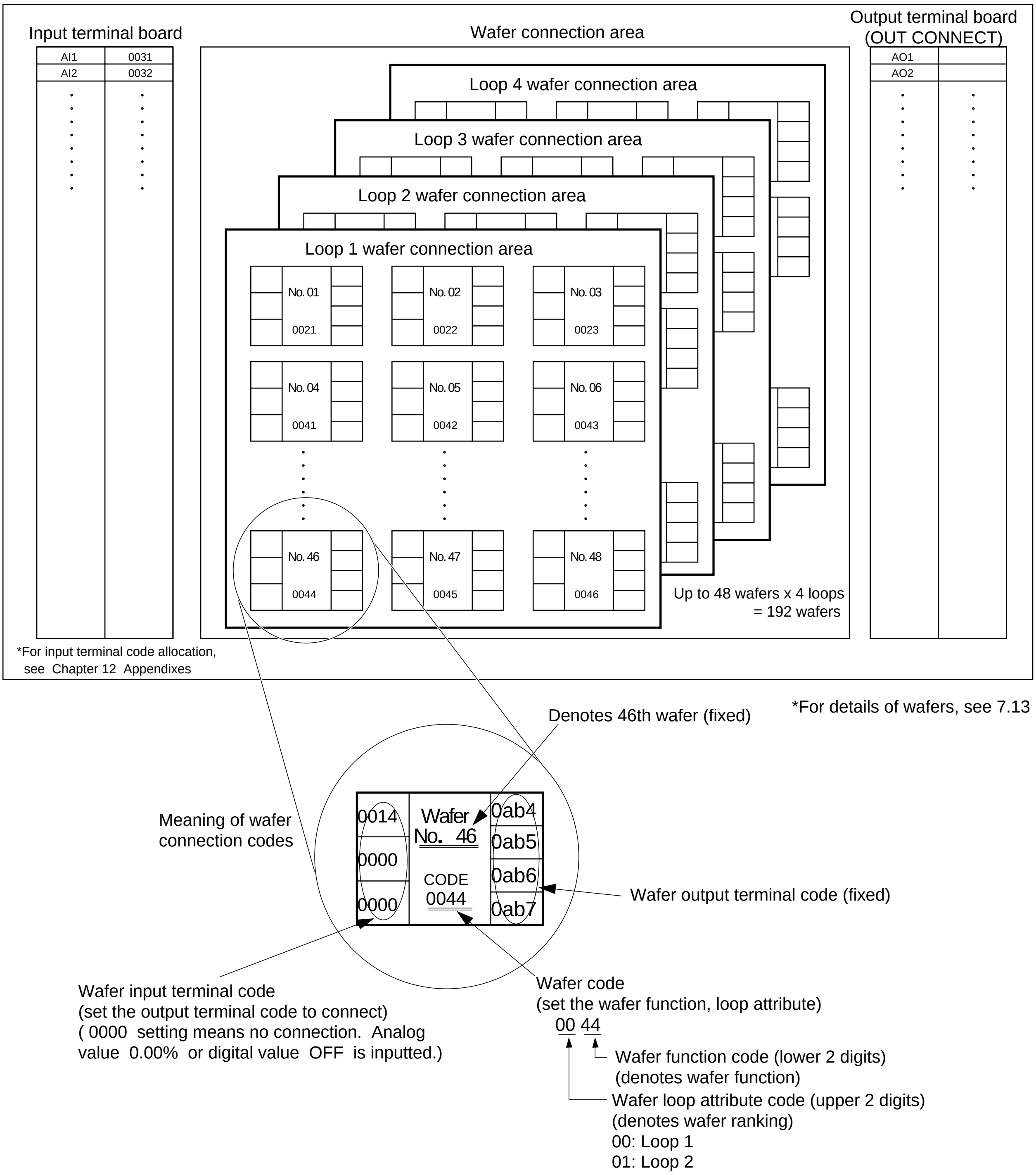
Function principle diagram



The instrument incorporates an independent-image wafer connection area for 4 loops and is provided with a program area for up to (48 wafers x 4 loops = 192 wafers, 8PID). Since the wafer connection is arbitrary between each loop, a control system of several loops is available with a minimum number of input/output points. The loop attribute is expressed by upper 2 digits of wafer code (4 digits) if an attribute for the loop ranking is necessary such as PID computation wafer, and lower 2 digits indicate a wafer function code (see figure below). Wafer function codes for conventional model (CC-S) are retained.

Parameters, wafer connection, etc. can be stored in the incorporated flash memory. Settings can be held when replacing the incorporated battery for memory backup.

Explanatory diagram for wafer connection



*For input terminal code allocation, see Chapter 12 Appendixes

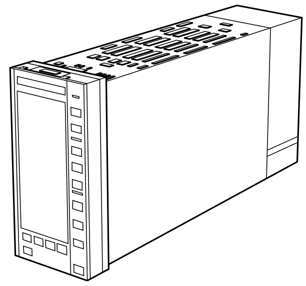
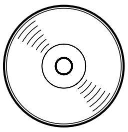
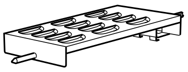
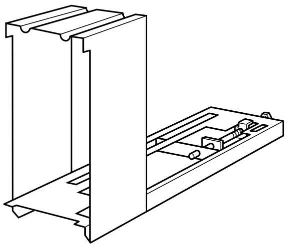
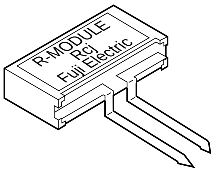
*For details of wafers, see 7.13

2. PACKING LIST

2.1 Checking the delivered equipments

After the product has arrived to you, check the equipments against the following table.

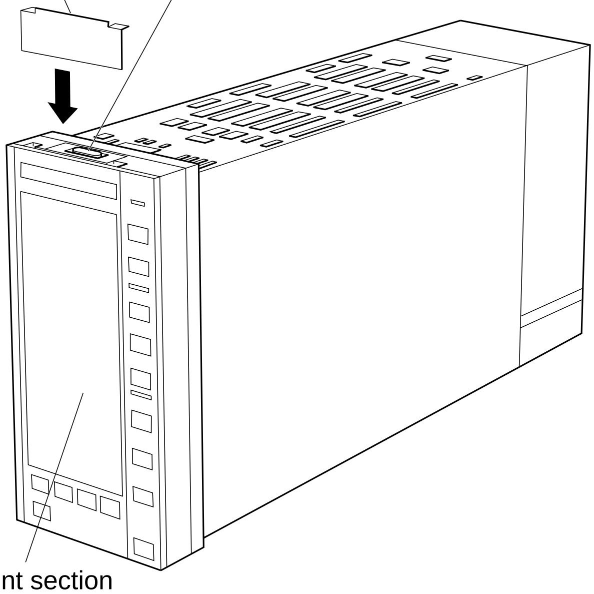
- Do not exert excessive force to the interior when unpacking.
- Take out the main unit from the packing and make sure the front panel case is not cracked and that the case is not cracked nor otherwise abnormal.

<table>
<tr><th colspan="2">Equipment list</th></tr>
<tr>
<td>
Main unit
1 set</td>
<td>Instruction manual on CD-ROM
1 pc

CD-ROM
Manuals contained:
• Instruction manual INP-TN1PDA3-E
• Compact Controller M Introductory Guide INP-TN513316-E</td>
</tr>
<tr>
<td>
Covering fixture
1 pc

Mounting fixture
1 pc</td>
<td>Cold junction compensating resistor (RCJ)


2 pcs
Note)
Provided only if any of the following type is designated as underlined.
Type PDA∗∗∗C</td>
</tr>
</table>

⚹ Supplied instruction manual on CD-ROM has been created in PDF file format. To open the PDF file, Adobe Acrobat Reader version 4.0 or later is required. The CD-ROM contains setup file for Adobe Acrobat Reader version 5.0 (Japanese/English). A latest version can be downloaded from Adobe's homepage, http://www.adobe.com.

2.2 Names of each part

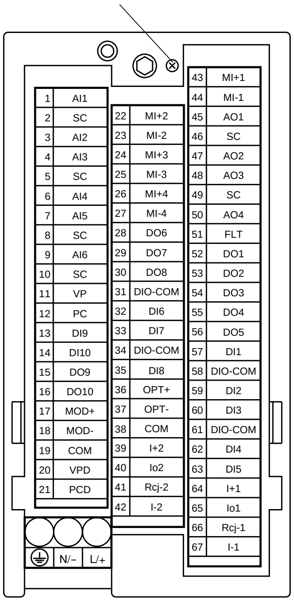


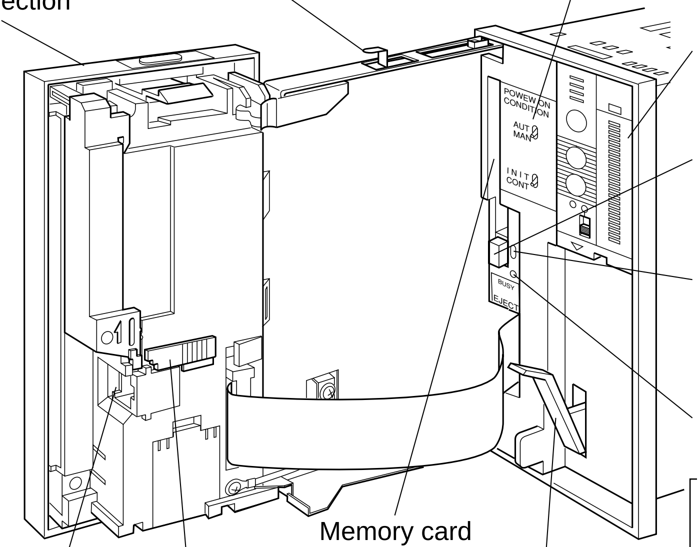
Tag plate
Tag No. is filled in.

Lock button
Kept pressed when pulling out the front section.

Front section

Lock screw for transportation
Tightened before transporting the product.





Power ON condition switch
Sets the operation mode at power ON.
(AUT: AUTO. MAN: Manual.)
(INIT: Initial start. CONT: Continuous start.)
(See section 4.5.)

Internal lock button
Pressed to push in front section.

Front section

Backup operation unit
Installed if 11th digit of type is A, B, C, D, E or F.

Memory card eject button
Pushed in for ejecting the memory card.

Memory card ON/OFF switch
Pushed down for turning off power of the memory card before taking it out.

Memory card BUSY lamp
Lit if memory card is turned on.

Caution:
If the lamp is lit, never take out the memory card. (Otherwise, inside data may be destroyed.)

Memory card insertion opening

Lever
Throwing down the lever this side and pulling it frontward can pull out the main unit.

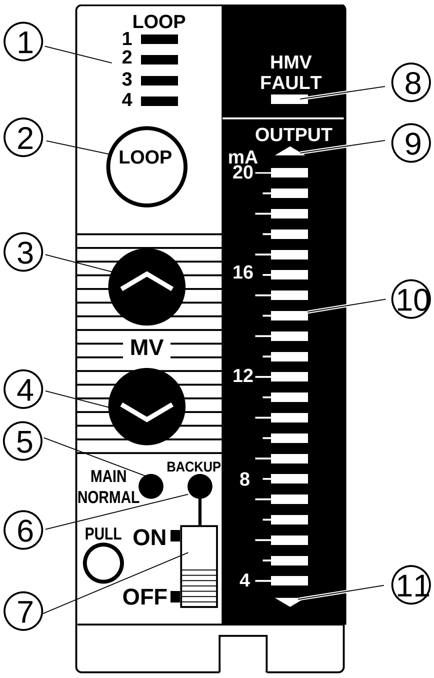
Caution:
Loosen the lock screw for transportation beforehand

Connector for loader
Connected with loader upon removal of cover.

(Engage or disengage the loader cable at status where CC-M mainframe is turned on.)

LCD back light ON/OFF switch
Lights or extinguishes back light.

Backup operation unit (HMV)



(1) General

When CC-M mainframe is troubled or when replacing the main unit, this backup operator can back up the MV.

(2) Description of each part

① Loop display

Indicates MV loop number to display on the output power display unit in ⑨ to ⑪.

② Loop change switch

Each press of this button advances the displayed loop as 1 → 2 → 3 → 4 → 1.

③ MV UP key

Increases MV output.

④ MV Down key

Decreases MV output.

⑤ Main unit normal lamp (green)

Lights in case that the main unit is normal.

⑥ Backup lamp (red)

Lights in case that the backup operation unit output is backing up MV.

⑦ Backup ON/OFF switch

If turned on, causes the backup operation unit backup status.

⑧ HMV abnormal lamp

Lights in case that the operation of the backup operation unit is abnormal. If it is abnormal, an operation by the backup operation unit is not allowed.

⑨ Overrange lamp

Lights when the output power display unit reading is over 20 mA.

⑩ MV bar graph

Monitors MV value being outputted if the backup is turned off or indicates the output MV setting if the backup is turned on.

⑪ Underrange lamp

Lights when the output power display unit reading is below 0 mA.

(3) Replacing procedure for main unit

1) Set the CC-M mainframe to M mode (manual run mode) (all loops).
Stabilize the control object to a safe side.

2) By the 1/2 loop screen indication on the mainframe liquid crystal display and output current bar graph on the backup operator, make sure the MV (manipulated output) value (MV 1 to 4) of CC-M mainframe and loop 1 to 4 output of the backup operation unit coincide with each other.

3) Turn on the ON/OFF switch of the backup operation unit to select a backup run.
At this time, make sure the backup lamp on the front panel of the backup operator is lit and that the mode status is M / HM on 1/2 loop screen indication of the mainframe.
At the same time, properly make sure the process is free from anomalies.

4) Replace (change) the main unit with a new one.

5) Set the parameters of the new main unit the same as for the old one as a preparation for run.

6) Make sure the outputs of loops 1 to 4 of the backup operation unit and manipulated outputs (MV 1 to 4) of the mainframe coincide with each other.
Also make sure the CC-M manframe is free from fault or alarm.
Further make sure the mode status on the main unit is M / HM.

7) Turn off the ON/OFF switch of the backup operation unit .
At this time, make sure the process is free from anomalies properly.

8) Start up the process as usual.

3. CODE SYMBOLS

How to designate type

1	2	3	4	5	6	7	8		9	10	11	12	13		14	15
P	D	A						-						-		

	Description		
	Controller function <4th digit>		
3	Programmable type		
	Control loops <5th digit>		
1	1 loop (1 control output)		
2	2 loops (2 control outputs)		
4	4 loops (4 control outputs)		
	External terminals <6th digit>		
2	Compression terminal		
	Process variable input <7th digit>		
A	1 to 5 V DC		
C	Thermocouple 2-points		
D	Resistance bulb Pt 100 2-points		
1	Revision No. <8th digit>		
	Power source <9th digit>		
A	100 to 240 V AC (Usable range 85 to 264V AC) 50/60HZ		
B	24V DC (Usable range 20 to 30V DC)		
	Operation mode <10th digit>		
C	Cascade-Auto-Manual changeable type		
	Backup operation unit <11th digit>		
Y	None		
A	For 1 loop, 100 to 240 V AC		
B	For 2 loops, 100 to 240 V AC		
C	For 4 loops, 100 to 240 V AC		
D	For 1 loop, 24V DC		
E	For 2 loops, 24V DC		
F	For 4 loops, 24V DC		
	Communication	Memory coard itnerface <12th digit>	
	(Slave)	(Master)	(Memory card interface)
Y	Without	Without	Without
M	Without	Without	With
C	RS485	Without	Without
U	RS485	Without	With
D	RS485	RS485	Without
R	RS485	RS485	With
	Instruction manual <13th digit>		
Y	Without		
D	With CD-ROM (English)		
	Program method <14th digit>		
1	Wafer connection method		
2	Soft Logic method		
	Factory configuration <15th digit>		
0	Without wafer connection		
8	With 48 or less wafer connection		
9	With 49 or more wafer connection (5th digit is “2” or “4”.)		

The CD-ROM contains the programming loader (in Japanese). However, communication cable (Type: PDZL1001) is available as an option.

Separately available items

• PC configuration software			
Soft Logic configurator	English	ZOZ∗C-KDS-WD2A	
• Communication cable for configuration software		PDZL1001	
• Compact Controller M (CC-M) Instruction Manual (English version)		INP-TN1PDA3-E	PDZX5001
• Compact Controller M (CC-M) Introductory Guide (English version)		INP-TN513316-E	PDZX4001
• Instruction manual on CD-ROM (English version) (CC-M Instruction Manual, CC-M Introductory Guide, Programming Loader (Setup))			PDZQ2001
• Mounting fixture			PDZA1001

4. FROM UNPACKING TO RUNNING

This chapter concerns a series of steps until basic controls are available after purchasing the product.

4.1 General

The flow is shown for steps covered by this chapter.

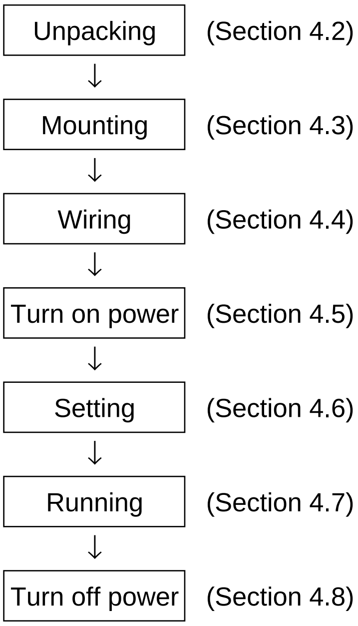


Fig. 4-1 Flowchart from unpacking to running

4.2 Unpacking

(1) Unpacking

Unpack the product paying attention not to exert excessive stresses. Take out the main unit from the box and make sure the front panel is not cracked and that the case is not cracked nor otherwise abnormal. If abnormal, do not use the instrument.

(2) Checking the delivered equipment

Make sure nothing is missing upon checking the delivered equipment against the packing list in Chapter 2.

4.3 Mounting

Warning Task should be performed by experienced engineer only.

(1) Mounting the main unit

For mounting method of the main unit, refer to details in Chapter 8.

(2) Mounting a tag plate

① Pull out upward the furnished tag through the tag insert opening illustrated below. (Hooking by a small flat head screwdriver facilitates the work.)

② Enter the instrument name, etc. on the "tag plate".

③ Put the tag plate in place as illustrated below through the tag plate insert opening provided on the top of front panel.

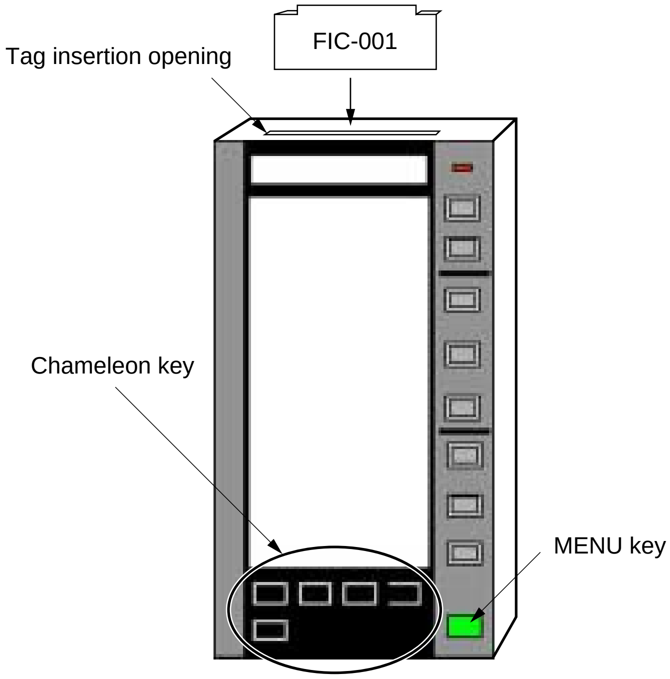


Fig. 4-2 Inserting an indicating tag

4.4 Wiring

(1) Wiring

For wiring method, refer to Chapter 9.

Warning Task should be performed by experienced engineer only.

4.5 Turning on power

(1) Before turning on, doubly make sure the mounting (Chapter 8) and wiring (Chapter 9) have ended without errors.

(2) Set the “POWER ON CONDITION” switch in the main unit panel to a desired startup mode beforehand. (The “POWER ON CONDITION” switch is for setting the operation mode of the main unit when power is turned on.)

Setting the startup mode when power is turned on

(Operation of AUT/MAN switch)

AUT	Starts up in automatic control mode.
MAN	Starts up in manual mode.

(Operation of INIT/CONT switch)

INIT	Starts a computation upon initializing all function computation results (initial start mode).
CONT	Starts a computation resuming last status (continuous start mode)

* For wafer computation initial value when initializing, refer to Chapter 13 Wafer instructions.

(3) Turn on the instrument power.

(4) After turning on, make sure the instrument is at the following status. If the status is different, immediately turn it off to stop operating.

① The TAG number of each LOOP is as shown in Fig. 4-3.

② Unusual sound, smell, etc. are absent.

* If a factory set instrument is turned on, the indication is as shown in ① above. The indication may not necessarily be so if keying has been made thereafter.

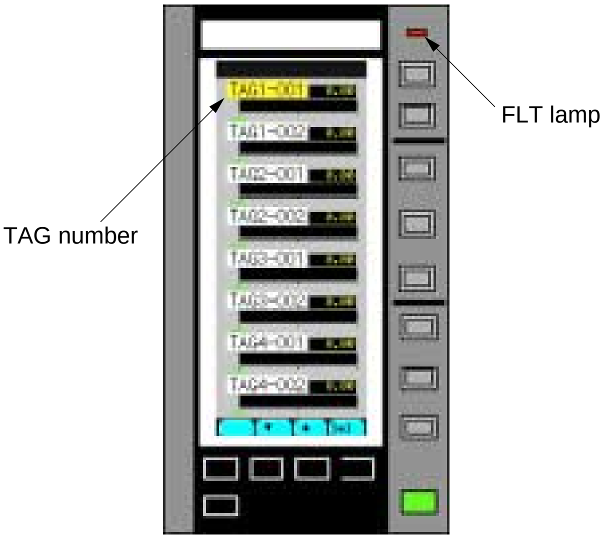


Fig. 4-3 Initial screen after turning on power

4.6 Setting

This section exemplifies setting for operating the CC-M as a cascade control type (PID control + PID control) of 1 LOOP controller.

The following illustration shows names of each front panel key necessary for setting.

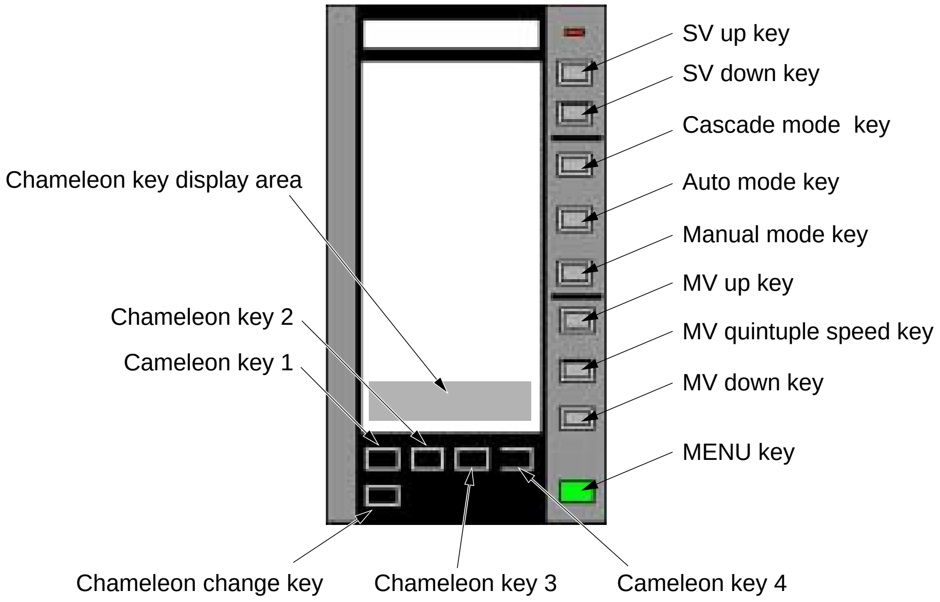
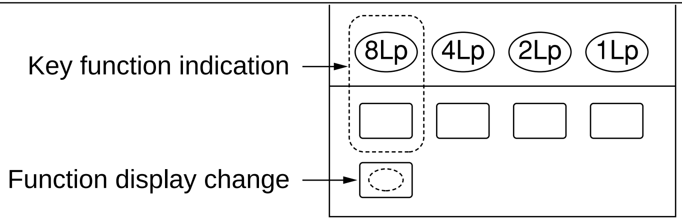


Fig. 4-4

Explanation on chameleon keys

Name	Button	Description
Chameleon change key	◌	Each press changes contents of chameleon key display area and chameleon key function.
Chameleon key 1 Chameleon key 2 Chameleon key 3 Chameleon key 4	☐	Indication on the chameleon display area above each key refers to function of each key.
		

(1) Outline flowchart for setting

The procedure of basic setting follows.

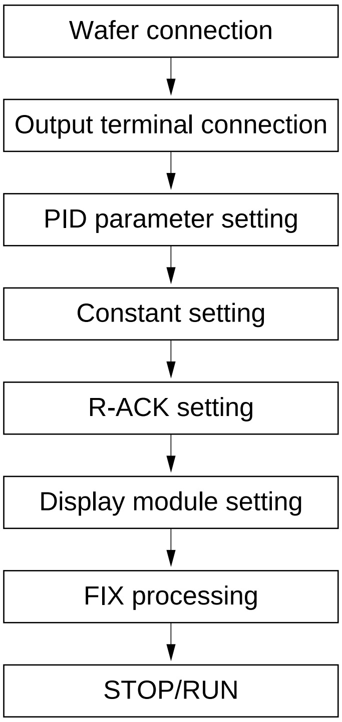


Fig. 4-5 Outline flowchart of basic setting

Description on menu keys

There are 3 kinds (pages) of menu screen. Each press of the MENU key successively selects the next page.

Main functions of each screen

Screen	Function of each screen	MENU item
MENU 1/3	Changes the display of 8/4/2/1 loop monitor screen.	8LOOP 4LOOP 2LOOP 1LOOP
	Changes the display to the tuning screen.	TUNING
	Changes the display to the trend screen.	TREND
	Selects the alarm/fault contents display screen.	ALM/FLT
	Selects the input/output, each loop's operation status display screen.	STATUS
MENU 2/3	Changes the display to the control parameter setting screen.	PARAMETER
	Changes the display to the control and arithmetic constant screen.	CONSTANT
	Changes the display to the linearize parameter screen.	LINEARIZER
	Changes the display to the gain scheduler screen.	GAIN SCHEDULER
	Changes the display to the setting screen for trend display.	TREND SETTING
	Changes the display to the alarm setting screen.	ALARM SETTING
	Selects the display order setting screen for each loop monitor screen.	DISP SETTING
	Selects contrast setting, clock correction, IC card (memory card) operation or user definition unit creation scre	CONTROL PANEL
MENU 3/3	Selects a communication remote control.	SCC
	FIX processing.	FIX
	Runs/stops the wafer computation of each loop.	RUN/STOP
	System definition.	SYSTEM SETTIG
	Configuration.	CONFIGRATION
	Wafer connection	WAFER CONNECT
	Output connection	OUT CONNECT
	Communication setting	COMMUNICATION

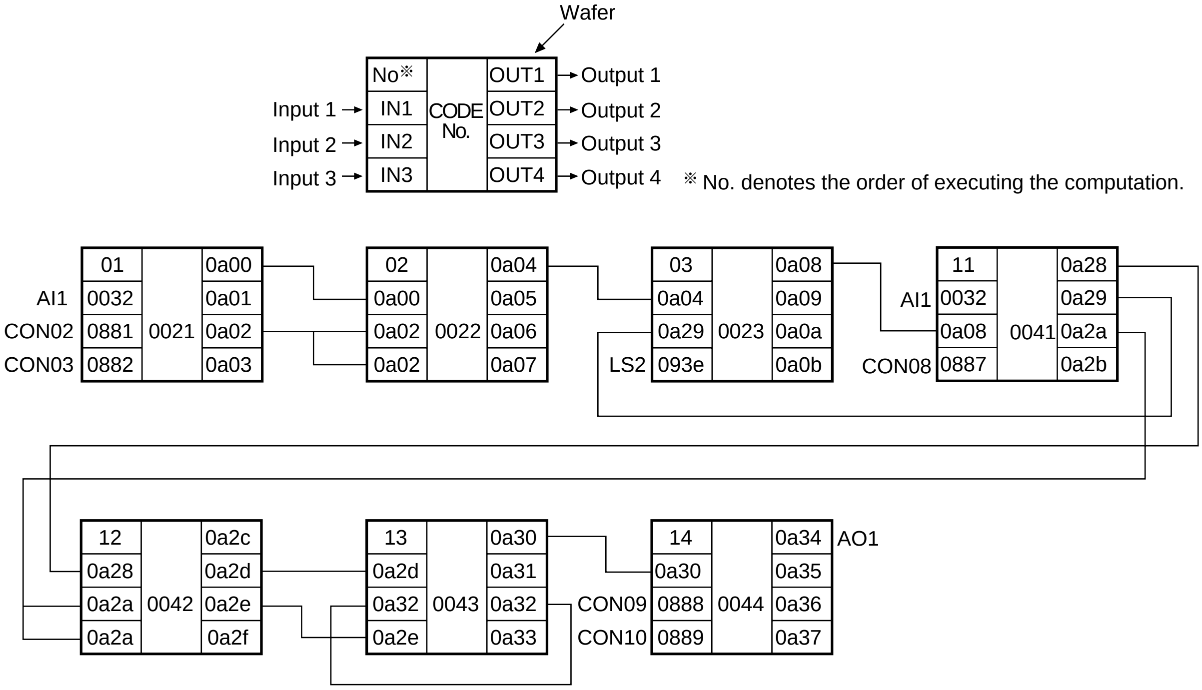
Note) In this section, different parameters are set. If the mainframe is turned off before FIX processing, the selected parameters will be destroyed. Do not turn off power before FIX processing.

(For FIX processing, see (8) FIX processing.)

(2) Wafer connection

On the instrument, for execution of control and arithmetic operation, wafers which are minimum units of control and arithmetic operation are connected (programmed). As an example here, a wafer connection for cascade control is shown (Fig. 4-6). The wafer connection is made by setting the “Wafer CODE No.” and selecting the “Input 1-3 code No.” by front key operation on the wafer connection screen.

Concrete way of setting for wafer connection is explained on following pages.



※ No. denotes the order of executing the computation.

Fig. 4-6 Connection diagram for cascade control wafers

• Wafer connection method

Let us set the cascade control wafer connection shown as example on the preceding page.

① Press the MENU key 3 times to display the MENU 3/3 screen (Fig. 4-7).

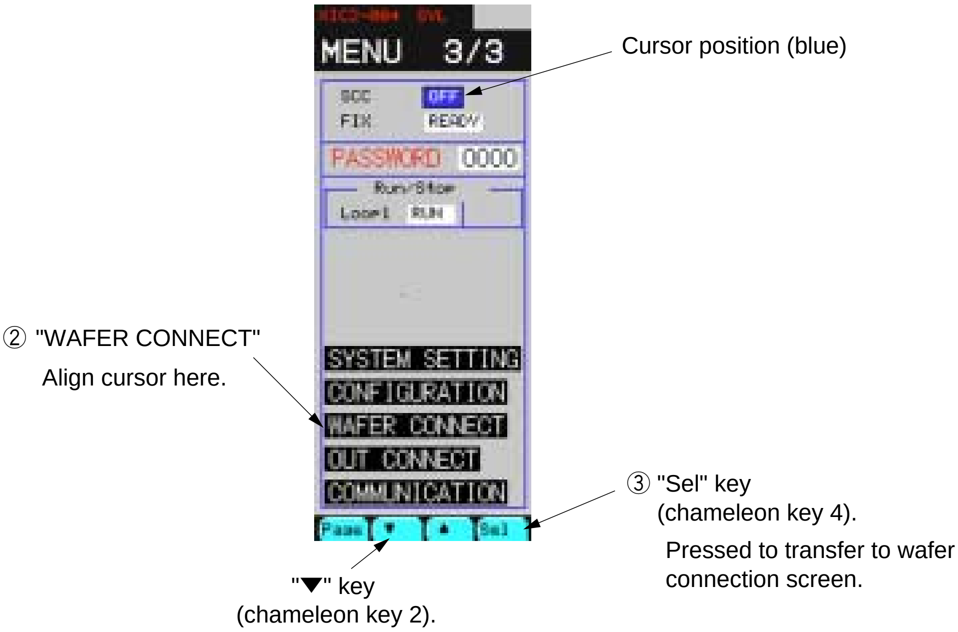


Fig. 4-7 MENU screen

② Press " ▼ " key (chameleon key 2) repeatedly until the blue cursor moves to "WAFER CONNECT".

③ Press the "Sel" key (chameleon key 4) to transfer to the wafer connection screen (Fig. 4-8).

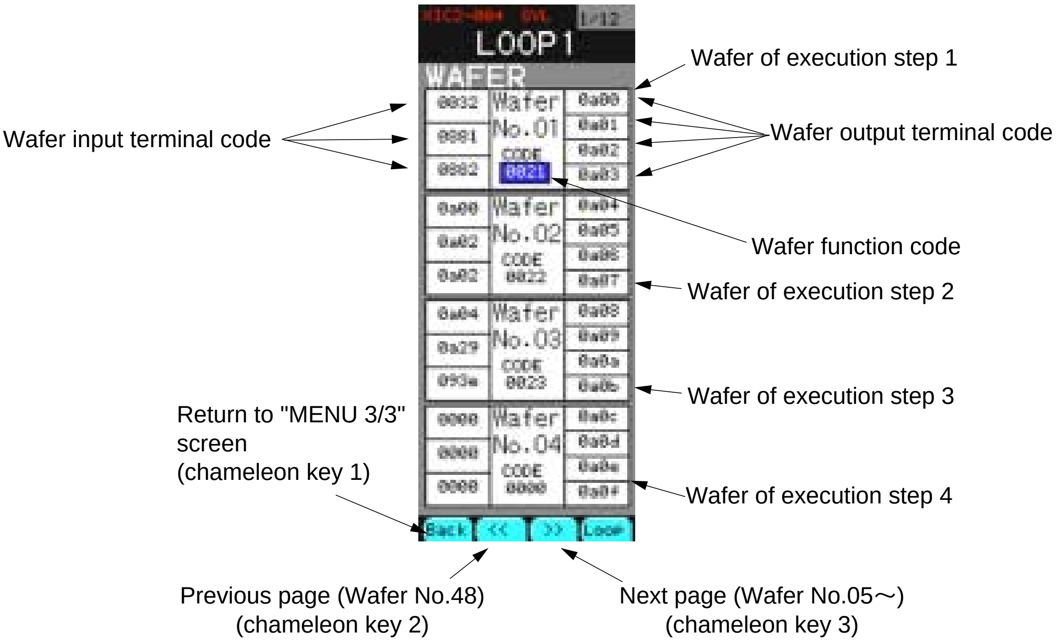
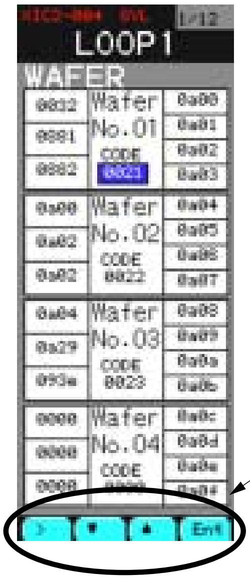


Fig. 4-8 Wafer connection screen

④ Press the chameleon change key ⬭ until chameleon keys shown below appear.



Get this display

Fig. 4-9

⑤ Press “ ▼ ” or “ ▲ ” key for moving the cursor to the 4 digit number under “CODE” of “Wafer No. 01”.

⑥ Press the “Ent” key to turn the cursor yellow.

⑦ Operate “ ＞ ” to move the column and operate “ ▼ ” or “ ▲ ” to increase or decrease the value until “0021” is obtained. (This part is set to 4 hexadecimal digits.)

⑧ Pressing the “Ent” turns the cursor blue and enters the setting.

* In steps ⑤ to ⑧, the wafer function CODE of “Wafer No. 01” has been set.

⑨ Likewise, set the “CODE” and “Input terminal code” for wafers No. 1 to 14.

* Press the chameleon change key ⬭ several times until chameleon keys “ ＜＜ ” and “ ＞＞ ” appear and operate them for changing the page.

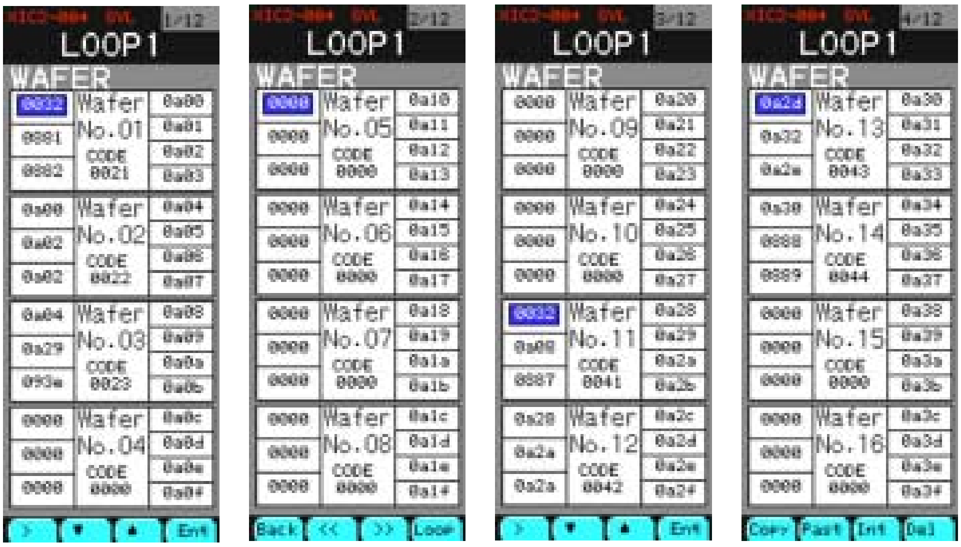


Fig. 4-10 Wafer connection screen

Supplement

Out of “0021” of “CODE”, the lower 2 digits “21” is the code for indicating a wafer function, and the upper 2 digits for indicating an attribute code of a loop for which the wafer is used. (Wafer function code =21 indicates a primary input wafer.)

The loop attribute is as follows.

Wafer function code

Loop 1 ⟶ 0 0 ☐ ☐
Loop 2 0 1 ☐ ☐
Loop 3 0 2 ☐ ☐
Loop 4 0 3 ☐ ☐

Loop attribute code

For some wafers, the number of usable times is limited. Before using such wafers, for computation at which loop to use the wafer must be selected in terms of loop attribute code.

For the number of usable times of wafer and wafer function codes, refer to Chapter 13 “Explanation on wafers”.

(3) Output terminal connection

The output connection must be set before outputting to the controller’s external output the programmed cascade control and arithmetic operation result via the wafer connection stated in the preceding section.

Here, an example is for outputting the secondary MV output “Wafer No. = 14” output 1 to auxiliary analog output AO1.

① Press the MENU key several times until “MENU 3/3” screen appears (Fig. 4-11).

SCC OFF
FIX READY
PASSWORD 0000
Run/Stop
Loop1 RUN

Fig. 4-11 MENU 3/3 screen

② Press “ ▼ ” repeatedly until the cursor is aligned with “OUT CONNECT” and press the “Sel” key to display the “OUT CONNECT” screen (Fig. 4-12).

③ Press “ ▼ ” repeatedly until the cursor is aligned with “AO CONNECT” and press the “Sel” key to display the “AO CONNECT” screen (Fig. 4-13).

④ The cursor is positioned at “CH1”. Press the “Ent” key to turn the cursor yellow.

Operate “ > ”, “ ▼ ” and “ ▲ ” so that “0a34” will be selected and press the “Ent” to enter the setting.

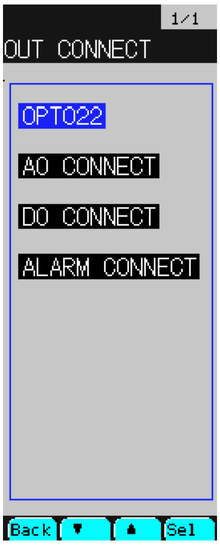
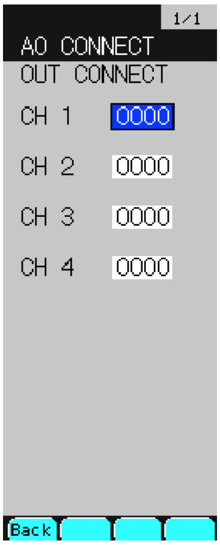


Fig. 4-12



CH 1 0000
CH 2 0000
CH 3 0000
CH 4 0000

Fig. 4-13

The above operation has connected the data of “0a34” of wafer OUT (secondary MV output) to analog output terminal AO1.

(4) Setting the control (PID) parameters

PID control parameters for cascade control are set.

① Press the MENU key for displaying the "MENU 2/3" screen (Fig. 4-14).

② Press " ▼ " key once to move the cursor to "PARAMETER" position.

③ Press the "Sel" key to display the "PARAMETER SET" screen (Fig. 4-15).

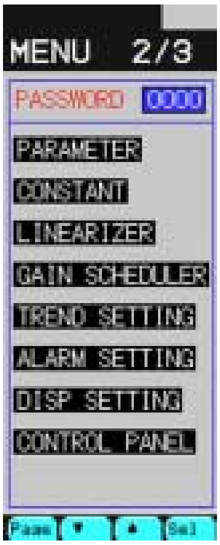


Fig. 4-14

Loop1
1st Mdul PID
2nd Mdul PID

Fig. 4-15

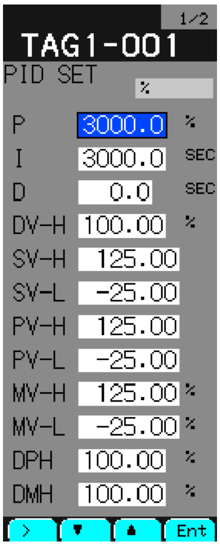
Primary PID parameter setting

④ At a status where the cursor is positioned at "1st Mdul", press the "Sel" key to display the screen in Fig. 4-16.

⑤ Operate chameleon keys so that each parameter will be set the same as in Fig. 4-16 and 4-17.

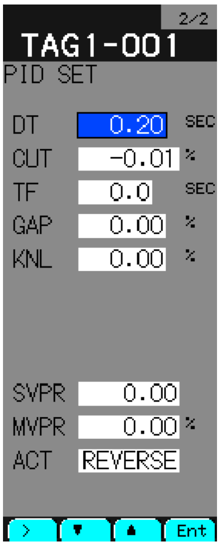
⑥ Upon setting, press the "Chameleon change" key to display the "Back" key on the chameleon key display area.

⑦ Press the "Back" key to resume the "PARAMETER SET" screen.



P 3000.0 %
I 3000.0 SEC
D 0.0 SEC
DV-H 100.00 %
SV-H 125.00
SV-L -25.00
PV-H 125.00
PV-L -25.00
MV-H 125.00 %
MV-L -25.00 %
DPH 100.00 %
DMH 100.00 %

Fig. 4-16



DT 0.20 SEC
CUT -0.01 %
TF 0.0 SEC
GAP 0.00 %
KNL 0.00 %
SVPR 0.00
MVPR 0.00 %
ACT REVERSE

Fig. 4-17

* For details of each parameter, refer to Section 7.3 Parameter setting screen.

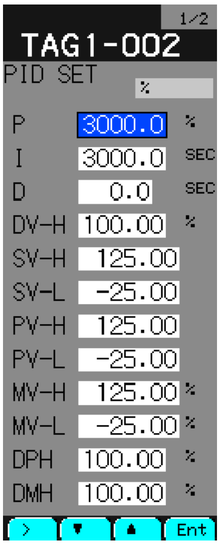
Secondary PID parameter setting

⑧ Align the cursor with “2nd Mdul” position and press the “Sel” key to display the screen in Fig. 4-18.

⑨ Operate chameleon keys so that each parameter will be set the same as in Fig. 4-18 and 4-19.

⑩ Upon setting, press the “Chameleon change” key to display the “Back” key on the chameleon key display area.

⑪ Press the “Back” key to resume the “PARAMETER SET” screen.



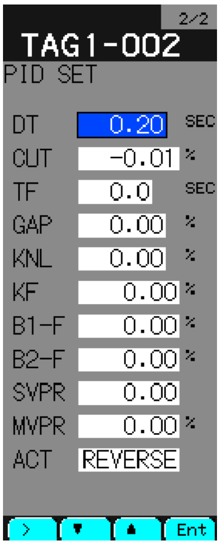
1/2

TAG1-002

PID SET

P	3000.0	%
I	3000.0	SEC
D	0.0	SEC
DV-H	100.00	%
SV-H	125.00	
SV-L	-25.00	
PV-H	125.00	
PV-L	-25.00	
MV-H	125.00	%
MV-L	-25.00	%
DPH	100.00	%
DMH	100.00	%

Fig. 4-18



2/2

TAG1-002

PID SET

DT	0.20	SEC
CUT	-0.01	%
TF	0.0	SEC
GAP	0.00	%
KNL	0.00	%
KF	0.00	%
B1-F	0.00	%
B2-F	0.00	%
SVPR	0.00	
MVPR	0.00	%
ACT	REVERSE	

Fig. 4-19

* For details of each parameter, refer to Section 7.3 Parameter setting screen.

The above procedure completes the setting of primary and secondary PID parameters.

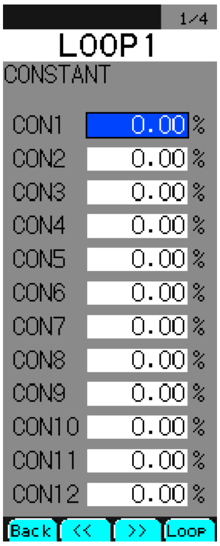
(5) Constant setting

Constant parameters are set. 48 constant parameters CON 01 to 48 can be set by loops.

① Press the MENU key several times until "MENU 2/3" screen appears.

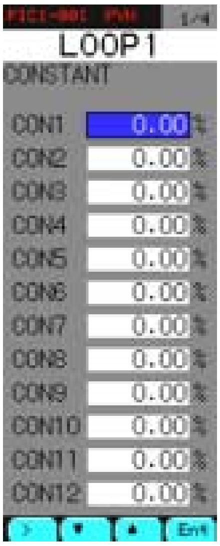
② Press " ▼ " key 2 times to move the cursor to "CONSTANT" position.

③ Pressing the "Sel" key selects the "CONSTANT" screen (Fig. 4-20).



1/4
LOOP1
CONSTANT
CON1 0.00 %
CON2 0.00 %
CON3 0.00 %
CON4 0.00 %
CON5 0.00 %
CON6 0.00 %
CON7 0.00 %
CON8 0.00 %
CON9 0.00 %
CON10 0.00 %
CON11 0.00 %
CON12 0.00 %

Fig. 4-20



1/4
LOOP1
CONSTANT
CON1 0.00 %
CON2 0.00 %
CON3 0.00 %
CON4 0.00 %
CON5 0.00 %
CON6 0.00 %
CON7 0.00 %
CON8 0.00 %
CON9 0.00 %
CON10 0.00 %
CON11 0.00 %
CON12 0.00 %

Fig. 4-20

CON 3 setting

④ Press the chameleon change key for changing the chameleon keys as shown as Fig. 4-20.

⑤ Move the cursor to "CON3" position and press the "Ent" key. The cursor will turn yellow.

⑥ Operating " > ", " ▼ " and " ▲ " select "0.01".

⑦ Press the "Ent" key to enter the setting. The cursor will return blue.

In this example (cascade control wafer connection), constants given in the table below are used.

According to the above example of operation, set the constants in the following table.

CON02	0.00
CON03	0.01
CON04	0.01
CON08	0.01
CON09	0.00
CON10	0.00

(Setting the constants used for exemplified cascade control wafer)

Supplement

① If the chameleon keys are as illustrated on the left figure above, pressing " << " or " >> " key can advance or return the screen. Each press of "Loop" key changes the loop.

(6) R-ACK setting

R-ACK (remote acknowledge) is set to ON. (Unless R-ACK is set to ON, pressing the cascade mode key while running does not cause the cascade mode but a cascade wait status.)

Primary R-ACK setting

① Press the MENU key several times until “MENU 3/3” screen appears.

② Press “ ▼ ” key repeatedly until the cursor is aligned with “OUT CONNECT” and press the “Sel” key.

③ “OUT CONNECT” screen appears (Fig. 4-22).

④ Press “ ▼ ” key for aligning the cursor with “ALARM CONNECT” and press the “Sel” key.

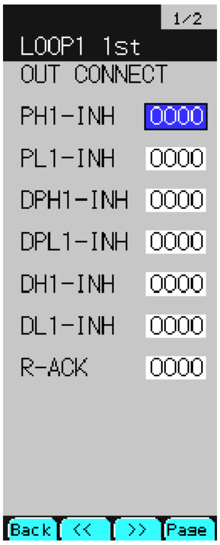
⑤ “LOOP1 1st” screen appears (Fig. 4-23).

⑥ Press the chameleon change key ◌ for selecting “ > ” “ ▼ ” “ ▲ ” “Ent” in the chameleon key display area.

⑦ Likewise, operate “ > ”, “ ▼ ”, “ ▲ ” and “Ent” keys for setting “R-ACK” = “0882” and enter it (Fig. 4-24).

⑧ Press the chameleon change key for selecting “Back” “ << ” “ >> ” “Page”.

Fig. 4-22

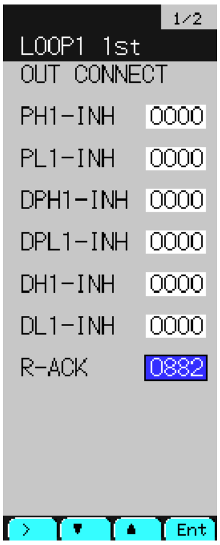


LOOP1 1st

OUT CONNECT

PH1-INH	0000
PL1-INH	0000
DPH1-INH	0000
DPL1-INH	0000
DH1-INH	0000
DL1-INH	0000
R-ACK	0000

Fig. 4-23



LOOP1 1st

OUT CONNECT

PH1-INH	0000
PL1-INH	0000
DPH1-INH	0000
DPL1-INH	0000
DH1-INH	0000
DL1-INH	0000
R-ACK	0882

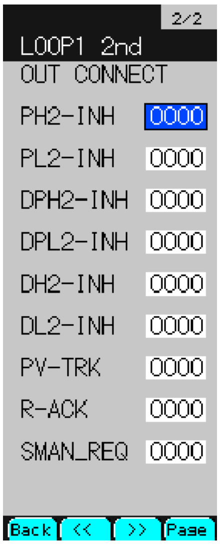
Fig. 4-24

Secondary R-ACK setting

⑨ Press the “Page” to display “LOOP1 2nd” screen. (Fig. 4-25)

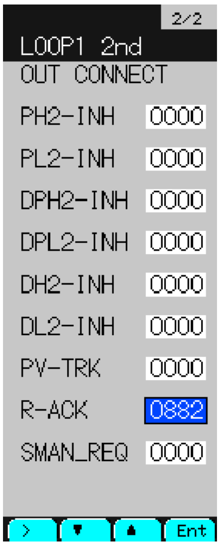
⑩ Press the chameleon change key ⬭ for selecting “ > ” , “ ▼ ”, “ ▲ ” and “Ent” in the chameleon key display area.

⑪ Operate “ > ” , “ ▼ ”, “ ▲ ” and “Ent” keys for setting “R-ACK” = “0882” and enter it (Fig. 4-26).



LOOP1 2nd
OUT CONNECT
PH2-INH 0000
PL2-INH 0000
DPH2-INH 0000
DPL2-INH 0000
DH2-INH 0000
DL2-INH 0000
PV-TRK 0000
R-ACK 0000
SMAN_REQ 0000

Fig. 4-25



LOOP1 2nd
OUT CONNECT
PH2-INH 0000
PL2-INH 0000
DPH2-INH 0000
DPL2-INH 0000
DH2-INH 0000
DL2-INH 0000
PV-TRK 0000
R-ACK 0882
SMAN_REQ 0000

Fig. 4-26

(7) Display module setting

Information displayed on the LOOP screen is set.

Setting flowchart for display module

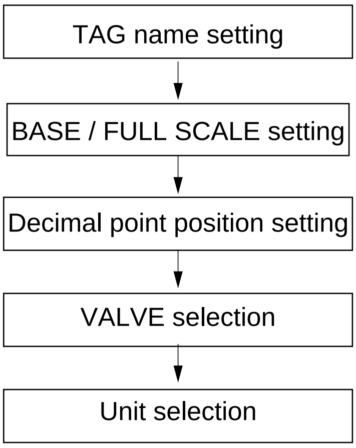


Fig. 4-27

① Press the MENU key to display the "MENU 3/3".

② Press " ▼ " 5 times to move the cursor to "CONFIGURATION".

③ Press the "Sel". "CONFIG" screen will appear (Fig. 4-28).

④ Align the cursor with "MODULE SETTING".

⑤ Press the "Sel" key. "TAG INPUT" screen will appear (Fig. 4-29).

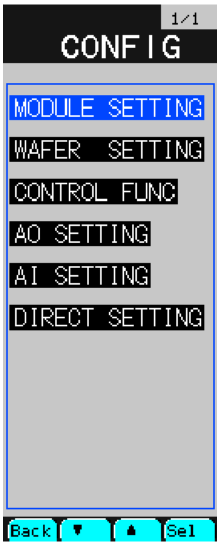


Fig. 4-28

TAG INPUT TAG1-001

BASE SCALE 0

FULL SCALE 10000

D. POINT 2

VALVE open/close

UNIT SETTING %

Fig. 4-29

Primary display setting

Tag number setting

⑥ Make sure “LOOP1 1st” is displayed on the top of screen (Fig. 4-30).
“LOOP1 1st” means primary setting of loop 1.

⑦ Press the “Chameleon change” key ⬭ for displaying “ < ” “ ▼ ” “ ▲ ” “Ent” in the chameleon key display area.

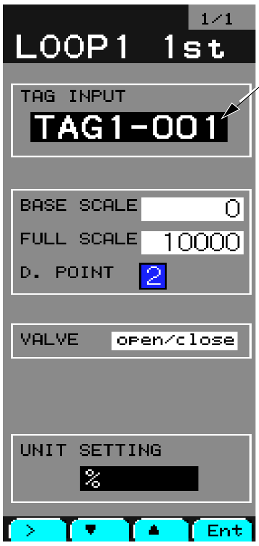
⑧ Align the cursor with the cursor position in the lower left figure.

⑨ Press the “Ent”. “TAG INPUT” screen will appear (Fig. 4-31).

⑩ Operate “ ▼ ”, “ < ” and “ > ” for aligning the cursor with characters to input and press the “Sel” to enter.

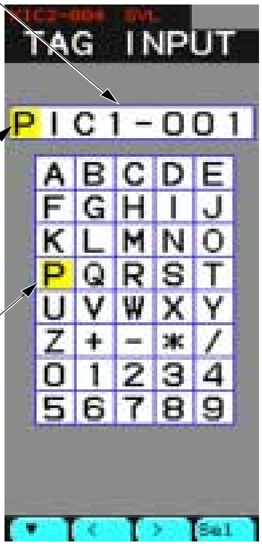
* Here, set the tag character string to “PIC1-001” as an example.

⑪ After entering 8 tag characters, press the chameleon change key for displaying the “Ent” and “Cncl” key.



1/1
LOOP1 1st
TAG INPUT
TAG1-001
BASE SCALE 0
FULL SCALE 10000
D. POINT 2
VALVE open/close
UNIT SETTING
%

Fig. 4-30



TAG INPUT
PIC1-001
A B C D E
F G H I J
K L M N O
P Q R S T
U V W X Y
Z + - ✳ /
0 1 2 3 4
5 6 7 8 9

Fig. 4-31

⑫ Press the “Back” key to resume the initial screen (Fig. 4-30).

BASE/FULL SCALE setting

⑬ Move the cursor to the position of “BASE SCALE”.

⑭ Press the “Ent” key. The cursor will turn yellow.

⑮ Operate “ > ” , “ ▼ ” and “ ▲ ” for selecting “0” and press the “Ent” key to enter.

⑯ Move the cursor to the position of “FULL SCALE”.

⑰ Press the “Ent” key. The cursor will turn yellow.

⑱ Operate“ > ” , “ ▼ ” and “ ▲ ”for selecting “10000” and press the “Ent” to enter.

* For details of BASE/FULL SCALE, refer to Section 7.12.2 “Module setting screen”.

Caution

“BASE SCALE” < “FULL SCALE” must be satisfied when setting each side.

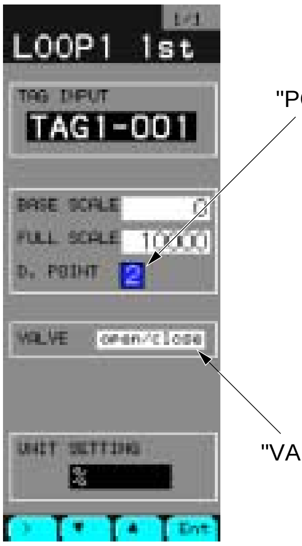
Decimal point position (POSITION) setting

⑲ Move the cursor to “D.POINT” (Fig. 4-32).

⑳ Press the “Ent” key. The cursor will turn yellow.

㉑ Operate “ ▼ ” or “ ▲ ” for selecting “2” and press the “Ent” to enter it.

* For details of POSITION, refer to Section 7.12.2 “Module setting screen”.



LOOP1 1st

TAG INPUT TAG1-001

BASE SCALE 0

FULL SCALE 10000

D. POINT 2

VALVE open/close

UNIT SETTING %

"POSITION" cursor position

"VALVE" cursor position

Fig. 4-32

VALVE selection

㉒ Move the cursor to the position of “VALVE”.

㉓ Press the “Ent” key. The cursor will turn yellow.

㉔ Operate “ ▼ ” or “ ▲ ” for selection out of “open/close” and press the “Ent” to enter it.

* For details of VALVE, refer to Section 7.12.2 “Module setting screen”.

Unit (UNIT SETTING) selection

㉕ Move the cursor to the position of “UNIT SETTING” (Fig. 4-33).

㉖ Press the “Ent” key. The screen will change (Fig. 4-34).

㉗ Using “ < ”, “ ▼ ”, “ ▲ ”, “ > ”, align the blue cursor with “%”. (Pressing “ < ” or “ > ” scrolls the screen.)

㉘ Press the chameleon change key. The chameleon display area becomes as shown in Fig. 4-35.

㉙ Press the “Ent” key. “%” will be entered and the screen in Fig. 4-33 will be resumed.

Cursor position

TAG INPUT TAG1-001

BASE SCALE 0

FULL SCALE 10000

D. POINT 2

VALVE open/close

UNIT SETTING %

Fig. 4-33

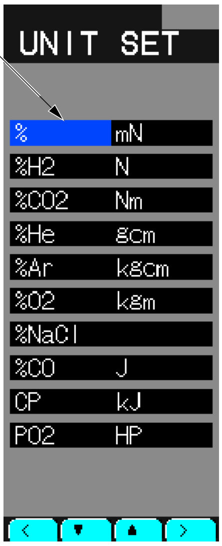


Fig. 4-34

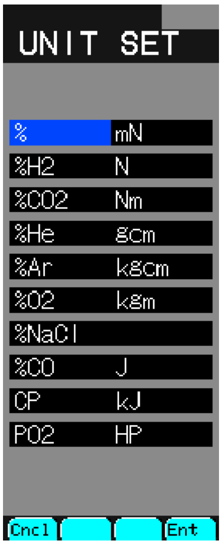


Fig. 4-35

Cursor position for unit selection

Secondary display setting

The explanation here will be made on the supposition that the primary setting has ended and that “LOOP1 1st” is displayed on the top of screen (Fig. 4-36).

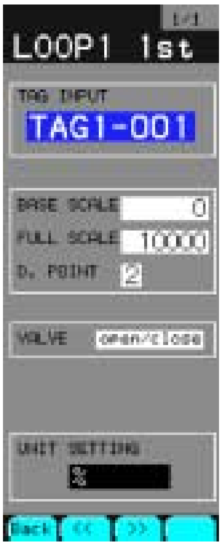
① Press the “Chameleon change” key ⬭ to display “ << “ and “ >> ”.

② Press “ >> ” once. “LOOP1 2nd” screen will appear (Fig. 4-37).

③ The setting method below is the same as “Primary display setting”.

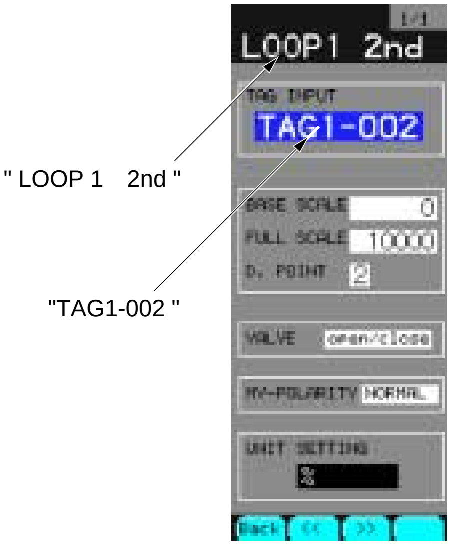
* Set the tag characters to “FIC1 - 002”.

* You can change “LOOP1 1st” in the explanation of “Primary display setting” to read “LOOP1 2nd”.



1/1
LOOP1 1st
TAG INPUT
TAG1-001
BASE SCALE 0
FULL SCALE 10000
D. POINT 2
VALVE open/close
UNIT SETTING
%

Fig. 4-36



1/1
LOOP1 2nd
TAG INPUT
TAG1-002
BASE SCALE 0
FULL SCALE 10000
D. POINT 2
VALVE open/close
MV-POLARITY NORMAL
UNIT SETTING
%

Fig. 4-37

This completes a rough explanation of setting. The following page explains “FIX processing” for saving the selected parameters so that they will not be destroyed by turning off power.

(8) FIX processing

Stores and saves each parameter selected heretofore from the RAM area to the flash ROM area.

FIX processing allows parameters to be stored in the flash ROM, thereby preventing them from disappearing by power failure.

① Press the MENU several times until “MENU 3/3” appears.
② Move the cursor to “READY” of “FIX” (Fig. 4-38).
③ Pressing the “Sel” turns “READY” yellow.
④ Press “▲” to display “WAIT” (Fig. 4-39).

Fig. 4-38

"READY" display

"WAIT" display

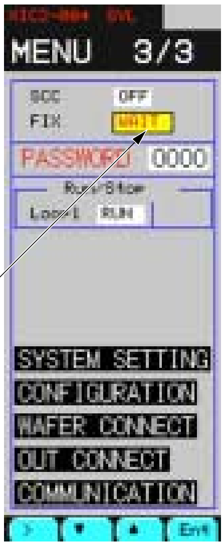


Fig. 4-39

⑤ Press the “Ent” key and wait for several seconds until “WAIT” displayed turns to “READY”.
⑥ The processing has ended if the cursor is blue at the “READY” display (screen on Fig. 4-38 is resumed).

Caution

If, while in FIX (while WAIT is being displayed), the mainframe has been turned off or power failure has occurred, parameters may be destroyed. Power must not be cut while in FIX.

4.7 Running

(1) Outline flowchart of running

A typical running procedure will be shown for cascade control run by 1 LOOP controller.

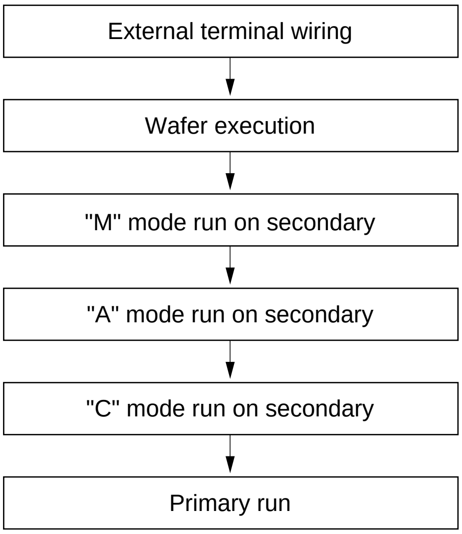


Fig. 4-40 Flowchart of running start procedure

⚠ Caution

The caution is given as an example for you to understand the controller operation.

Prior to actual operation, wafer connection (Item 4.6) and external wiring work should be performed by qualified engineers only.

(2) External terminal wiring

A connection (external wiring) is made for remote run which will be carried out hereafter.

Apply an analog output (AO1) to the analog input (AI1).

① Connect terminal numbers “1” and “45”.

* AO1 output will be applied to AI1 input.

② Connect terminal numbers “2” and “46”.

* Make SC (signal common) common (electrically connected together inside).

Connection diagram

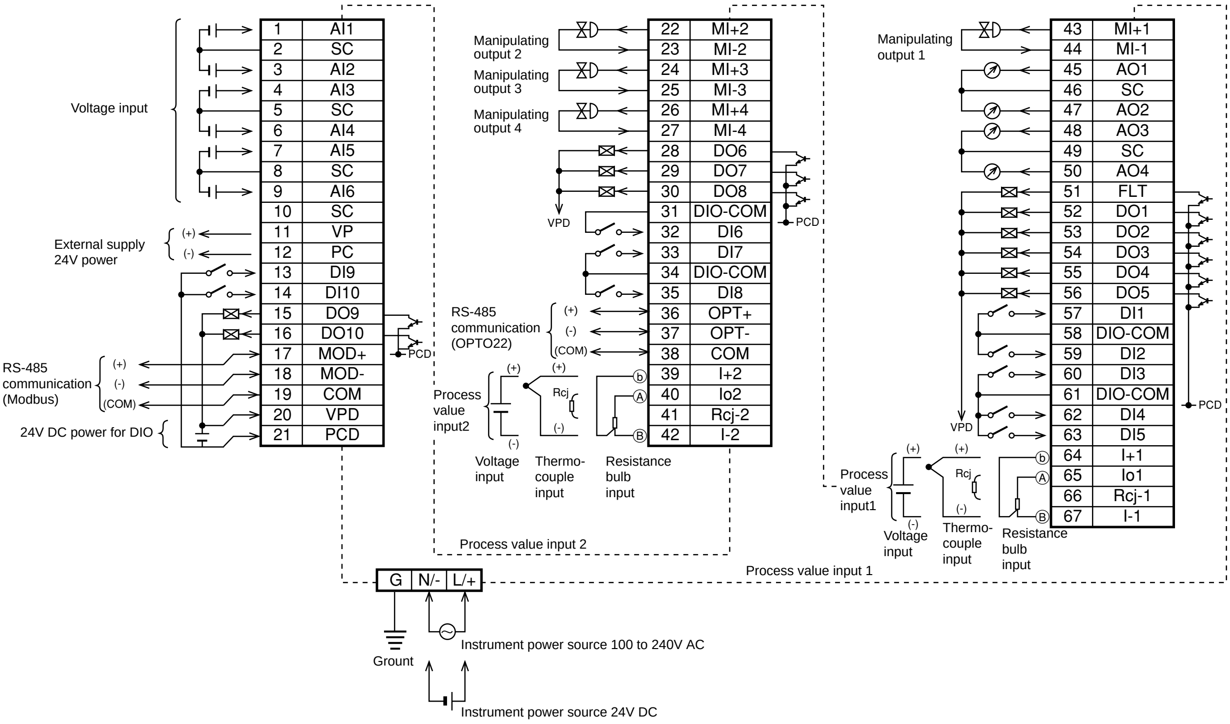


Fig. 4-41 Compression terminal allocation

(3) Wafer execution

The wafer is stopped and run to execute the wafer.

① Press the MENU key several times until “MENU 3/3” screen appears.

② Press “ ▼ ” key 3 times. The cursor (blue) will move to the position of “Loop 1”.

In case of “STOP” display (Fig. 4-43)

③ Press the “Set” key. The cursor will be highlighted yellow.

④ Press “ ▼ ” key. “RUN” will be displayed.

⑤ Press the “Ent” key. The cursor will be highlighted blue.

In case of “Run” display (Fig. 4-44)

⑥ Press the “Sel” key. The cursor will be highlighted yellow.

⑦ Press “ ▼ ” key. “STOP” will be displayed.

⑧ Press the “Ent” key. The cursor will be highlighted blue.

* At this time, the wafer which has been operating is stopped.

⑨ Press the “Sel” key. The cursor will be highlighted yellow.

⑩ Press “ ▼ ” key. “RUN” will be displayed.

⑪ Press the “Ent” key. The cursor will be highlighted blue.

MENU 3/3

SCC OFF

FIX READY

PASSWORD 0000

Run/Stop

Loop1 STOP

Fig. 4-43

MENU 3/3

SCC OFF

FIX READY

PASSWORD 0000

Run/Stop

Loop1 RUN

Fig. 4-44

Caution

- Wafer connection and “OUT CONNECT” setting change are validated only after the change from “STOP” to “RUN” of the wafer.
- In case of CC-M with 2 or 4 control outputs, changing the RUN or STOP command within a single loop produces “WAF STOP” warming but it does not mean fault or anomaly.

(4) Secondary “M” mode run

First, with the secondary in “M” mode run, the secondary MV output is operated.

① Press the MENU key once. “MENU 1/3” screen will appear (Fig. 4-45).

② Press “ ▼ ”key 2 times and then “Sel”. The screen will change (Fig. 4-46).

③ Press “ >> ” once. The yellow frame on the left half will move to the right half of the screen (secondary operation will be available.)

④ Press the M key. “M” will light (Fig. 4-47).

⑤ Operate “MV-UP” or “MV-DOWN” key so as to obtain a desired MV output value.

Fig. 4-45

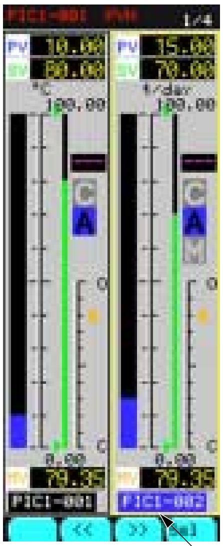


Fig. 4-46

Loop encircled by yellow frame is operated by keying.

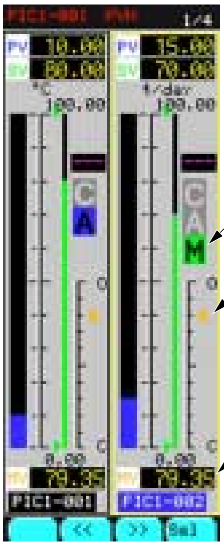


Fig. 4-47

M mode status display

MV output pointer

MV output value

Caution

Unlike conventional models where MV output displayed is a read-back value of actual output, this model displays an output setpoint.

(5) Secondary “A” mode run

The secondary is run in “A” mode and SV is operated.

① Hold down the Ⓐ key several seconds. “A” will light (Fig. 4-48).

② Using the “SV-UP” and “SV-DOWN” keys, operate the secondary SV.
(It is necessary for input 3 of wafer “41” to be set “1”.)

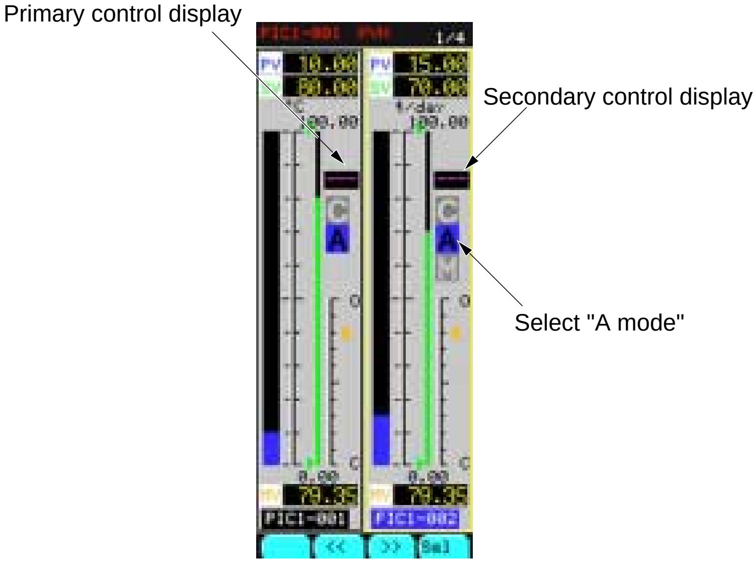


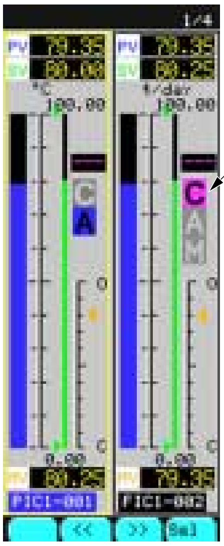
Fig. 4-48

* The operation corresponds to local automatic run on the secondary.

(6) Secondary “R” mode run

The secondary is run in “Cascade” mode and the primary and secondary are connected.

① Hold down the “Cascade” mode key several seconds. “C” will light (Fig. 4-49). If “C” blinks here, “R-ACK” secondary setting may be wrong. Recheck it.



Change to "Cascade mode"

Fig. 4-49

(7) Primary run

A primary SV control allows (primary + secondary) control.

① Press “ ＜＜ ” once. The yellow frame will move to the left (above figure) (primary operation becomes available).

② Operate “SV-UP” or “SV-DOWN” key for adjusting the primary SV to a desired value.

* Changing the primary SV provides a cascade control.

4.8 Turning off power

(1) Precautions when turning off power

When power is turned off, the digital output is OFF, the analog output is 0 [V] or 0 [mA] and parameters once fixed and stored in the flash ROM is held.

(2) Power failure

In case of power failure, data on the memory can be held by the backup battery. If it is within power down time setting (see 7.11.1), continuous start is available. If beyond, the operation is resumed as initial start.

On the instrument, the high limit of time where continuous start is available is set. If the high limit is exceeded, the operation is forcibly according to initial start.

On the instrument, the operation after power recovery can be set beforehand by “POWER ON CONDITION SW” in the front indication panel.

Setting of POWER ON CONDITION SW

(Operation of AUT/MAN switch)

AUT	Resumes in automatic control mode.
MAN	Resumes in manual mode.

(Operation of INIT/CONT switch)

INIT	Resumes a computation upon initializing all function computation results (initial start mode).
CONT	Starts a computation resuming last status (continuous start mode).

Caution

Special care should be taken when setting the power down time (see 7.11.1).

Setting of a long time in excess of 5 minutes may lead the process to a critical condition due to missing of the process and the holding value in the controller. It is recommended that the power down time be set within 5 minutes.

5. BASIC OPERATION

5.1 Configuration of screen

This controller provides various screens on the liquid crystal display. Manipulating the Chameleon keys arranged at each screen and the Operation keys at the right of the front panel (Fig. 5-1) allow you to perform various functions. The display screen consists of 4 screens such as the Operation screen, Menu screen, Monitor screen and Setting screen. (For details, refer to Chapters 6 and 7).

On each screen, the Alarm window and Chameleon keys are displayed.

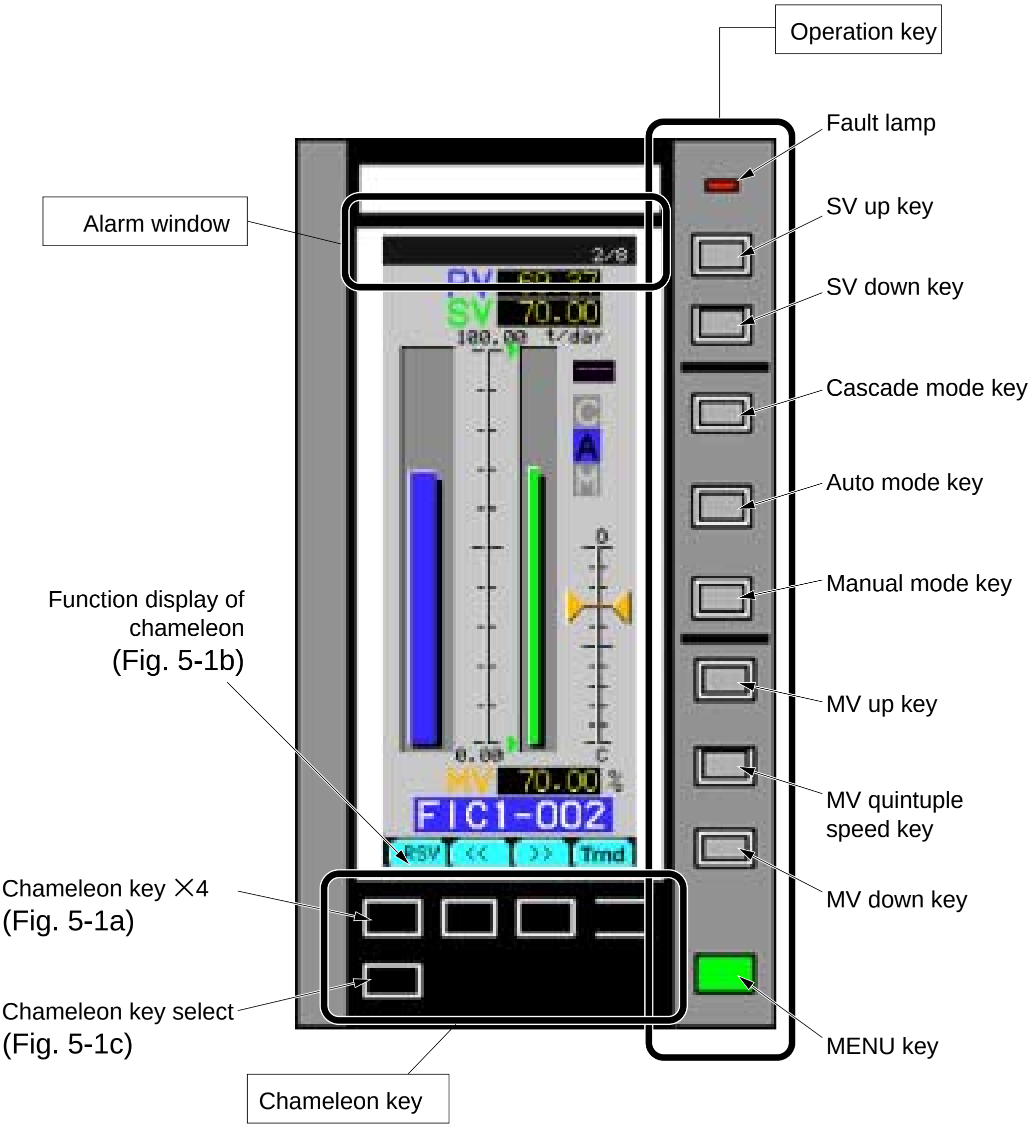


Fig. 5-1 Names of each part

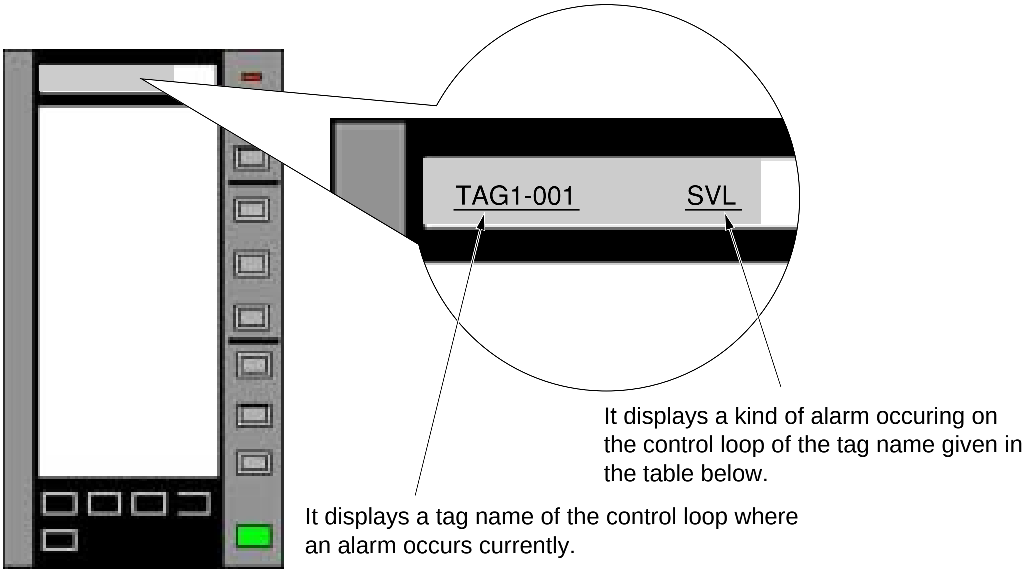
5.1.1 Alarm window

(1) Function

The Alarm window is used to display currently occurring alarms sequentially. (Fig. 5-2)

It is displayed at the top of each screen except on the Alarm Monitor screen.

(2) Contents of display



It displays a kind of alarm occuring on the control loop of the tag name given in the table below.

It displays a tag name of the control loop where an alarm occurs currently.

Fig. 5-2 Alarm window

Display	Contents
DMV	Manipulated output change rate alarm
MVL	Manipulated output lower limit alarm (-25.00 to 125.00%)
MVH	Manipulated output upper limit alarm (-25.00 to 125.00%)
DVL	Deviation lower limit alarm (0.00 to 100.00%)
DVH	Deviation upper limit alarm (0.00 to 100.00%)
DPL	Process value change rate lower limit alarm (0.00 to 100.00%)
DPH	Process value change rate upper limit alarm (0.00 to 100.00%)
PVL	Process value lower limit alarm (the setting range may vary depending on the industrial value).
PVH	Process value upper limit alarm (the setting range may vary depending on the industrial value).
SVL	Set value lower limit alarm (the setting range may vary depending on the industrial value).
SVH	Set value upper limit alarm (the setting range may vary depending on the industrial value).

5.1.2 Chameleon keys

For the Chameleon keys, refer to Item 5.2.3.

5.2 Key operation

This controller is operated by the Operation keys and MENU keys arranged at the right side of the front panel and Chameleon keys for configuration at the bottom of the front panel as shown in Fig. 5-1.

5.2.1 Description of MENU key

By pressing the MENU key at the lower-right of the front panel, the Menu screen can be displayed regardless of other displayed screens. However, if you press this key when any of the Menu screens (MENU 1/3, MENU 2/3 and MENU 3/3) is displayed, the MENU screen is switched to another one. When pressing this key on any screen other than the MENU screen, the MENU 1/3 screen is displayed. To call the MENU screen immediately, press this MENU key.

5.2.2 Description of Operation keys

The Operation keys as shown in Fig. 5.1 allows you to perform "Selection of operation mode", "SV setting" and "MV setting" for the controller.

(1) Operation Select Mode key

This key is used to select the operation modes (cascade mode, auto mode and manual mode). The currently running operation mode is highlighted on the LOOP screen for easy recognization.

C (Cascade mode) : Cascade operation mode by the primary block controller or external signal of the set value
A (Auto mode) : Automatic operation mode
M (Manual mode) : Manual operation mode

Note) The primary block controller has no manual operation mode. The "M" key is not valid for the primary block controller.

(2) SV setting key

This key is used to change the set value (SV).

SV
∧ (SV UP key) : Increase of SV (about 40 sec at full stroke)
∨ (SV DOWN key) : Decrease of SV (about 40 sec at full stroke)

Note) Pressing the UP and DOWN keys at the same time does not change the set value. The time required for changing the set value is about 40 sec. at the full stroke.

(3) MV setting key

This key enables you to manipulate the control output (MV) manually during the manual operation (in the Manual mode). This key is ineffective in the other modes.

MV
∧ (MV UP key) : Increase of MV
◇ (MV quintuple speed key) : By pressing the MV UP key or MV DOWN key at the same time, the operation speed of MV is accelerated.
∨ (MV DOWN key): Decrease of MV

Note) Pressing the UP and DOWN keys at the same time, does not change the MV value.

5.2.3 Description of chameleon keys

This controller provides the chameleon keys for easy operation. Functions of the chameleon keys (x 4 keys) as shown in Fig. 5-1a correspond to those which are displayed at the top of each key. Such function can be changed by pressing this chameleon select key as shown in Fig. 5-1c, and thus the chameleon key function is also changed at the same time. Functions for each screen are allocated by the chameleon keys. Configuration involving entry of numerical values and change of the display screen, etcetera can be carried out by the chameleon keys.

5.2.4 Example of using chameleon keys

Each key has the following functions as viewed from the left.

Example 1) Chameleon key on 8 LOOP display screen (Page 1)

Page 1

	▼	▲	Sel

▼ : Down movement of the cursor selected

▲ : Up movement of the cursor selected

Sel : Jumping of the tag selected to 1 LOOP display screen

Example 2) Chameleon keys on 8 LOOP display screen (Page 2)

Note) Pressing the Chameleon Select key (Fig. 5-1c) can change the display given in Example 1) to the following display.

Page 2

Back	4Lp	2Lp	1Lp

Back : To return to MENU 1/3

4Lp : To jump the selected tag to 4 LOOP display screen.

2Lp : To jump the selected tag to 2 LOOP display screen.

1Lp : To jump the selected tag to 1 LOOP display screen.

5.3 Example of operation on screen

Basic operation of this controller is explained according to the following examples.

Example) Set 100.00 for the constant CON03, and then display 8 LOOP display screen.

1) Pressing the MENU key allows MENU 1/3 to be displayed.
   When MENU 2/3 or 3/3 is already displayed, press the MENU key several times to display MENU 1/3.
2) To move to the constant setting screen, press the MENU key to move to MENU 2/3.
   Press the chameleon key of "Page" to display the MENU 2/3.

Page	▼	▲	Sel

3) On the MENU 2/3, press the chameleon keys (" ▼ " or " ▲ ") and point the cursor to "CONSTANT", and in which condition, press the chameleon key of "Sel" to display constant setting screen.
4) On the constant setting screen, the contents of the chameleon key are changed and the meaning of the key is also changed.

Back	<<	>>	LOOP

Back : To return to MENU 2/3
\>> : To return to LOOP.
<< : To send to LOOP.
Loop : To change LOOP.

Constants cannot be set in this condition. Press the chameleon select key once to display the following chameleon key.

>	▼	▲	Ent

Note that the function of the chameleon key may differ depending on the setting mode and item movement mode.

(Function of chameleon key in the movement mode)

\> : Changes to the setting mode.
▼ : Move the selection of item down.
▲ : Move the selection of item up.
Ent : Change to the setting mode.
Note) The cursor is displayed in blue in the setting mode.

(Function of chameleon key in the setting mode)

\> : Selection of set value digit.
▼ : Set value down.
▲ : Set value up.
Ent : Registry of setting data and selection of movement mode.
Note) The cursor will turn yellow in the setting mode. A digit entered by the UP or DOWN key is displayed at the left-most of the red characters.

5) To set CON3, press “ ▼ ” or “ ▲ ” chameleon key and then point the cursor to CON3. Press the " > " chameleon key, and the cursor will turn yellow (in the set mode). Enter 100.00 by using “ > ” “ ▼ ” or “ ▲ ” chameleon key. Then, press the "Ent" chameleon key. Now, setting is completed.

   Note) To set numerical values you entered, be sure to press the "Ent" chameleon key.

6) After setting is completed, 8 LOOP screen is displayed. To display the 8 LOOP screen, the screen should be moved to MENU 1/3 by pressing the MENU key. But, the screen will not be switched to MENU 1/3 even by pressing the following keys.

>	▼	▲	Sel

Press the chameleon key once, and then press the following chameleon key again.

Back	<<	>>	LOOP

Press the "Back" chameleon key to display MENU 2/3.

Page	▼	▲	Sel

On the MENU screen, the following chameleon keys are displayed. To display MENU 1/3, press the "Page" chameleon key or the MENU key twice. After confirming that the cursor points at the "8 LOOP", press the "Sel" key to display the "8 LOOP" screen.

6. OPERATION ON SCREEN

6.1 8 loop display screen

(1) Description of screen

Data for 8 modules are displayed.

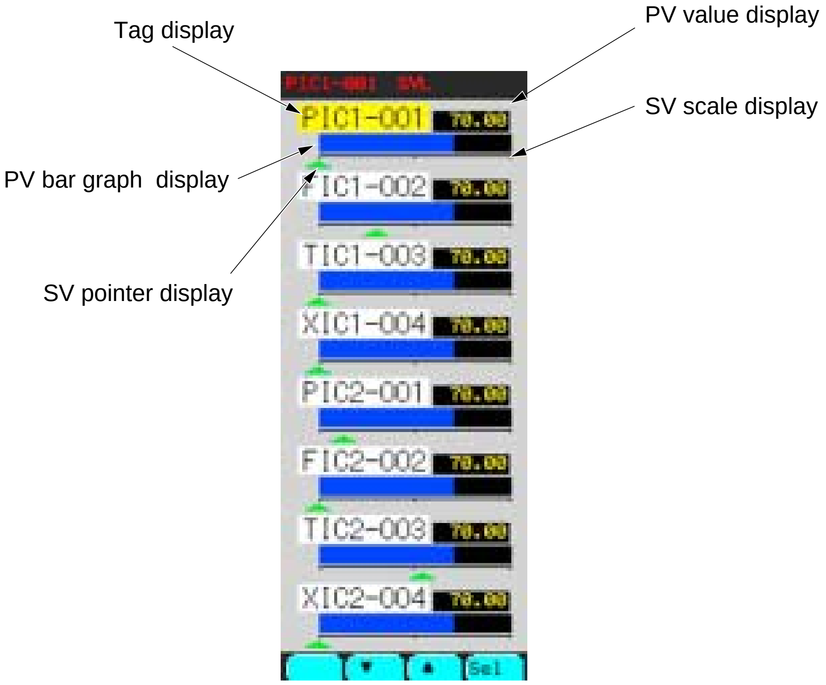


Fig. 6-1 8 LOOP screen

(2) Description of chameleon key

Page 1

	▼	▲	Sel

▼ : To move the cursor downward.

▲ : To move the cursor upward

Sel : To jump to the 1LOOP screen corresponding to the tag where the cursor is placed.

Page 2

Back	4Lp	2Lp	1Lp

Back : To return to MENU 1/3

4Lp : To jump to the 4LOOP screen of the tag corresponding to the cursor is placed.

2Lp : To jump to the 2LOOP screen of the tag corresponding to the cursor is placed.

1Lp : To jump to the 1LOOP screen of the tag corresponding to the cursor is placed.

(3) Description of 8 Loop display screen (Fig. 6-1)

Table 6-1

Displayed item	Function	Meaning of display	Unit
Tag display	The tags set in each module are displayed.	———	———
PV value display	The PV value is displayed with numerical values. Note) Up to 6 digits including decimal point and sign.	———	Industrial value
PV bar graph display	The PV value is displayed with a bar graph. When the alarm set on the alarm setting screen (Section 7.8) occurs, the bar graph is displayed in red.	———	Industrial value
SV pointer display	The SV value is displayed with a pointer.	———	Industrial value
SV scale display	The SV value is displayed with a scale.	———	Industrial value

(4) Function of 8LOOP display screen

Enable

It allows you to jump to any of 4LOOP, 2LOOP and 1LOOP screens corresponding to the tag selected by the cursor.

Disable

It does not change the SV, MV and control mode.

Caution

It can change the arrangement order of the bar graph display on the 8LOOP SETTING screen by selecting DISP SETTING from the Menu 2/3. (For details, see 7.9.5).

6.2 4LOOP display screen

(1) Description of screen

Data for 4 modules are displayed on a single screen as follows:

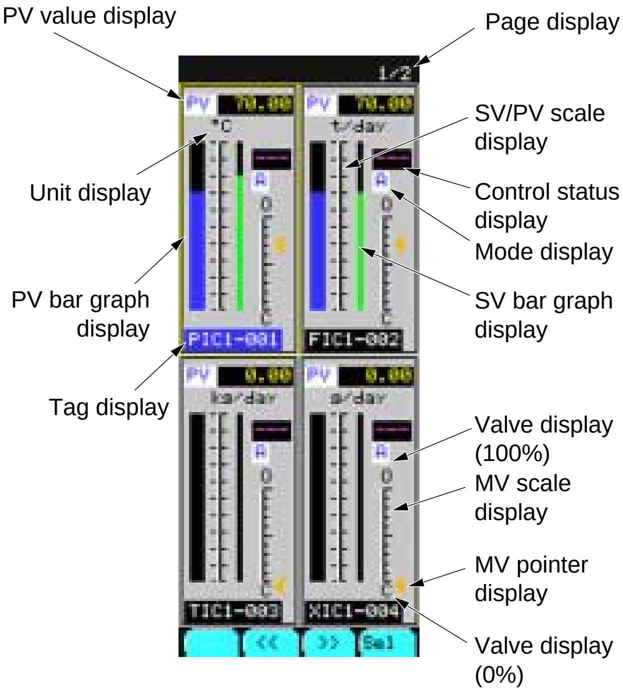


Fig. 6-2 4 LOOP screen

(2) Description of chameleon key

Page 1

	<<	>>	Sel

<< : To move the selection frame leftward.
When the cursor is placed at the left side, a page is fed.

>> : To move the selection frame rightward.
When the cursor is placed at the right side, a page is fed.

Sel : To jump to the 1LOOP display screen corresponding to the tag where the cursor is placed.

Page 2

Back		2Lp	1Lp

Back : To return to the source screen (the original screen before the current screen where you are working).

2Lp : To jump to the 2LOOP screen corresponding to the tag where the cursor is placed.

1Lp : To jump to the 1LOOP screen corresponding to the tag where the cursor is placed.

(3) Description of each item on 4 Loop display screen (Fig. 6-2)

Table 6-2

Displayed item	Function	Meaning of display	Unit
Tag display	The tags set in each module are displayed.	———	———
Unit display	The units set by each module are displayed..	———	———
PV value display	The PV value is displayed with numerical values. Note) Up to 6 digits including decimal point and sign.	———	Industrial value
PV bar graph display	The PV value is displayed with a bar graph. When the alarm set on the alarm setting screen (Section 7.8) occurs, the bar graph is displayed in red.	———	———
SV bar graph display	The SV value is displayed with a bar graph.	———	———
PV/SV scale display	A scale range of 0 to 100% is divided into 10% increment. The area corresponding to the alarm setting range is displayed in red.	———	———
MV pointer display	The MV value is displayed with a pointer.	———	———
MV scale display	A scale range of 0 to 100% is divided into 10% increment.	———	———
Mode display	The current control mode is displayed. (The 4 LOOP display screen does not switch any modes.	[C]:Cascade mode (remote mode) [A]:Auto mode [M]:Manual mode	———
Control status display	The current control status is displayed	[--]:Normal [INT]:Internal [SCC]:Transmission setting [EXT]:Internal [H M]:Hard manual [PVT]:PV tracking	———
Valve display	The orientation of the valves set by each module is displayed.	[O]:Abbreviation of OPEN [C]:Abbreviation of CLOSE	———

(4) Function of 4LOOP display screen

Enable

1) It allows you to jump to any of 2LOOP and 1LOOP screens corresponding to the tag selected by the cursor.

Disable

1) It does not change the SV, MV and control mode.

Caution

1) It can change the display order of the module by selecting DISP SETTING on Menu 2/3. (For details, refer to Item 7.9.4).
2) The tag of the selected module turns blue and the module is enclosed in a yellow line.

6.3 2LOOP display screen

(1) Description of screen

Data for 2 modules are displayed on a single screen.

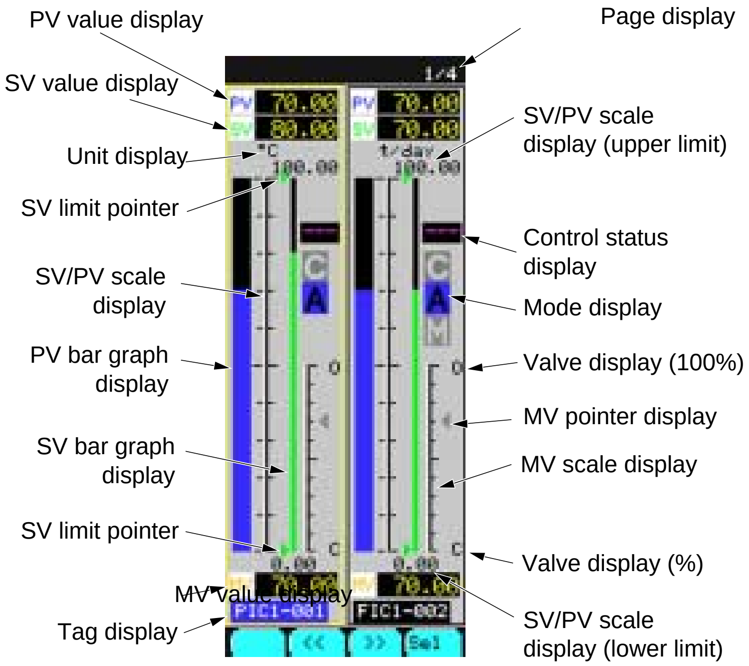


Fig. 6-3 2 LOOP screen

(2) Description of chameleon key

Page 1

	<<	>>	Sel

<< : To move the selection frame leftward.
When the cursor is placed at the left side, a page is fed.

>> : To move the selection frame rightward.
When the cursor is placed at the right side, a page is fed.

Sel : To jump to the 1LOOP display screen corresponding to the tag where the cursor is placed.

Page 2

Back		Parm	

Back : To return to the source screen (the original screen before the current screen where you are working).

Parm : To jump to Module Parameter Setting screen.

(3) Description of each item on 2 Loop display screen (Fig. 6-3)

Table 6-3

Displayed item	Function	Meaning of display	Unit
Tag display	The tags set in each module are displayed.	———	———
Unit display	The units set by each module are displayed..	———	———
PV value display	The PV value is displayed with numerical values. Note) Up to 6 digits including decimal point and sign.	———	Industrial value
PV bar graph display	The PV value is displayed with a bar graph. When the alarm set on the alarm setting screen (7.8) occurs, the bar graph is displayed in red.	———	———
SV value display	The SV value is displayed with numerical values. Note) Up to 6 digits including decimal point and sign.	———	Industrial value
SV bar graph display	The SV value is displayed with a bar graph.	———	———
PV/SV scale display	A scale range of 0 to 100% is divided into 10% increment. The area corresponding to the alarm setting range is displayed in red.	———	———
SV limit display (upper/lower limti)	The SV limit value (SV-H/SV-L) set by control parameter is displayed with a pointer.	———	———
MV pointer display	The MV value is displayed with a pointer.	———	———
MV value display		———	———
MV scale display	A scale range of 0 to 100% is divided into 10% increment.	———	———
Mode display	The current control mode is displayed. Note) The current mode is highlighted. When the Remote mode is requested, [C] blinks. When the Auto mode isrequired, [A] blinks.	[C]:Cascade mode (remote mode) [A]:Auto mode [M]:Manual mode	———
Control status display	The current control status is displayed	[--]:Normal [INT]:Internal [SCC]:Transmission setting [EXT]:Internal [H M]:Hard manual [PVT]:PV tracking	———
Valve display	The orientation of the valves set by each module is displayed.	[O]:Abbreviation of OPEN [C]:Abbreviation of CLOSE	———

(4) Function of 2LOOP display screen

Enable

1) It allows you to jump to any of 1LOOP screens corresponding to the tag selected by the cursor.
2) Set the SV/MV mode by using the Operation key to perform the controller operation.
3) It allows you to monitor an alarm/control status.

Disable

1) The module that is not selected cannot be operated. Point the cursor to the module you want to operate.

Caution

1) It can change the display order of the module by selecting DISP SETTING from Menu 2/3. (For details, refer to Item 7.9.3).
2) The tag of the selected module turns blue and the module is enclosed in a yellow line.

6.4 1LOOP display screen

(1) Description of screen

Data for 1 module are displayed on a single screen.

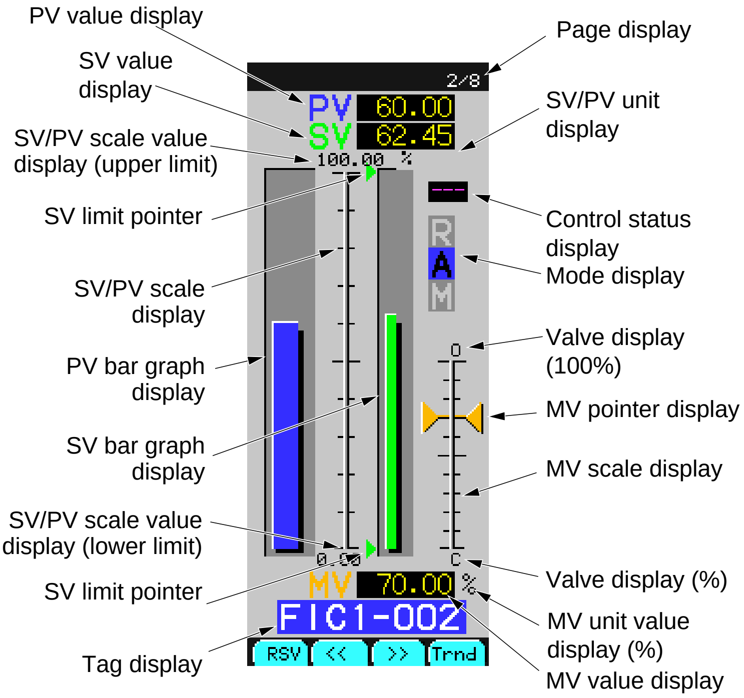


Fig. 6-4 1 LOOP screen

(2) Description of chameleon key

Page 1

RSV	<<	>>	Trnd

RSV : To display the remote SV screen.
PV bar graphs and PV values are switched to SV values. Pressing the PV chameleon key again returns to the previous screen.

<< : To display the previous module screen.

>> : To display the next module screen.

Trnd : To jump to the trend display.
(The group jumping to the display can be set on the trend jump setting screen in Item 7.12.8)

Page 2

Back	Cnst	Parm	Tune

Back : To return to the source screen.

Cnst : To jump to the constant Setting screen.

Parm : To jump to module parameter setting screen.

Tune : To jump to the tuning screen of the displeyed module.

(3) Description of each item on 1 Loop display screen

Table 6-4

Displayed item	Function	Meaning of display	Unit
Tag display	The tags set in each module are displayed.		———
Unit display	The units set by each module are displayed..		———
PV value display	The PV value is displayed with numerical values. Note) Up to 6 digits including decimal point and sign.		Industrial value
PV bar graph display	The PV value is displayed with a bar graph. When the alarm set on the alarm setting screen (7.8) occurs, the bar graph is displayed in red.		
SV value display	The SV value is displayed with numerical values. Note) Up to 6 digits including decimal point and sign.		Industrial value
SV bar graph display	The SV value is displayed with a bar graph .		
SV limit display (upper/lower limti)	The SV limit value (SV-H/SV-L) set by control parameter is displayed with a pointer.		
PV/SV scale display	A scale range of 0 to 100% is divided into 10% increment. The area corresponding to the alarm setting range is displayed in red.		
MV pointer display	The MV value is displayed with a pointer.		
MV value display	The MV value is displayed with numerical values. Note) Up to 6 digits including decimal point and sign.		
MV scale display	A scale range of 0 to 100% is divided into 10% increment.		
Mode display	The current control mode is displayed. Note) The current mode is highlighted. When the Remote mode is requested, [C] blinks. When the Auto mode is required, [A] blinks.	[C]:Cascade mode (remote mode) [A]:Auto mode [M]:Manual mode	
Control status display	The current control status is displayed	[--]:Normal [INT]:Internal [SCC]:Transmission setting [EXT]:Internal [H M]:Hard manual [PVT]:PV tracking	
Valve display	The orientation of the valves set by each module is displayed.	[O]:Abbreviation of OPEN [C]:Abbreviation of CLOSE	

(4) Function of 1LOOP display screen

Enable

1) It enables you to operate the module selected by the cursor.
2) It can monitor the alarm/control status.

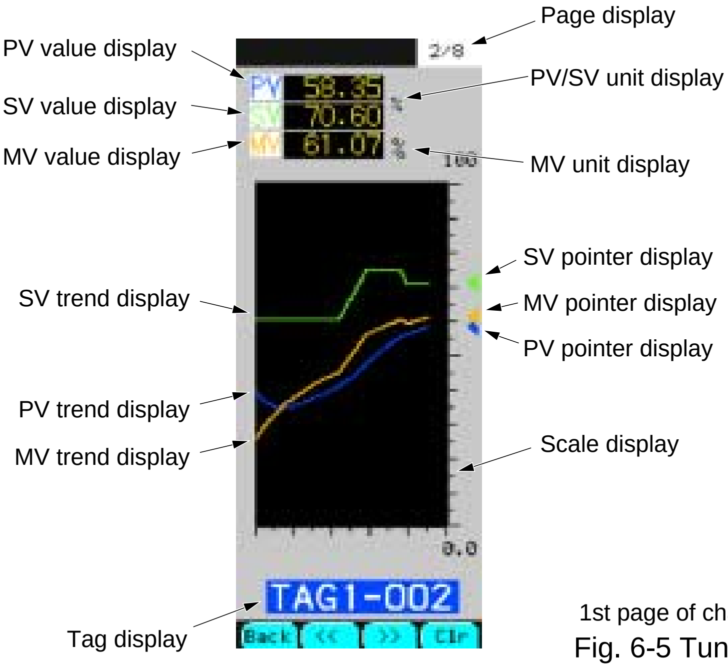
Caution

1) It can change the display order of the module by selecting DISP SETTING from Menu 2/3. (For details, refer to Item 7.9.2).
2) The MV pointer and MV value displayed on the front are not MV read-back value.

6.5 Tuning display screen

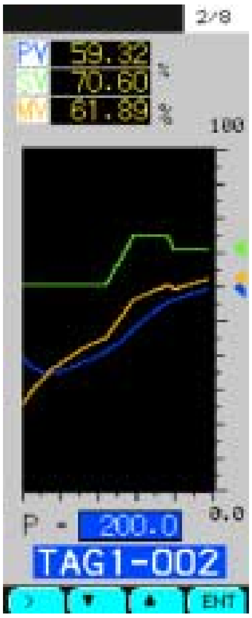
(1) Description of screen

It allows you to display the PV/SV/MV values and real time trend. The real time trend is plotted from left to right. When plotting reaches to the right end of the screen, the time scale is automatically double-sized and it starts plotting from the center.



1st page of chameleon keys

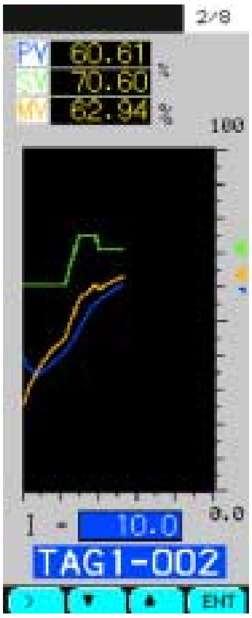
Fig. 6-5 Tuning screeen



P - 200.0

2nd page of chameleon keys
(for setting item P)

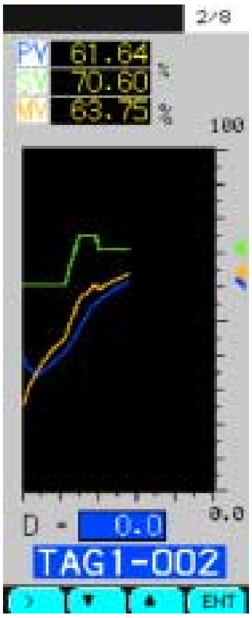
Fig. 6-6 Tuning screeen
(for setting Item P)



I - 10.0

3rd page of chameleon keys
(for setting item I)

Fig. 6-7 Tuning screeen
(for setting Item I)



D - 0.0

4th page of chameleon keys
(for setting item D)

Fig. 6-8 Tuning screeen
(for setting Item D)

(2) Description of chameleon key

Page 1

Back	＜＜	＞＞	Clr

BACK : To return to the previous screen from current screen.
＜＜ : To return to the previous page of the screen.
＞＞ : To advance to the next page of the screen.
Clr : To clear the real time trend displayed on the screen.

Page 2, 3 and 4

＞	▼	▲	Ent

＞ : To select the input digit/to switch the setting modes.
▼ : To decrease the input value.
▲ : To increase the input value.
Ent : To switch the setting mode.

(3) Description of each item

Displayed item	Function	Meaning of display	Unit
Tag display	The tags set in each module are displayed.		
Unit of PV/SV display	The units PV/SV set by each module are displayed.		Industrial value
Unit of MV display	The units MV set by each module are displayed.		Industrial value
PV value display	PV value is displayed with numerical values of 6 digits. Note) Decimal point and sign are included in 6 digits.		Industrial value
SV value display	SV value is displayed with numerical values of 6 digits. Note) Decimal point and sign are included in 6 digits.		Industrial value
MV value display	MV value is displayed with numerical values of 6 digits.		
Real time trend display (PV/SV/MV)	The PV/SV/MV values are displayed with trend (For specifications, see [Function] discribed later).		
Scale display	A scale range of 0 to 100% is divided into 10% increments.		
Parameter setting (P/I/D items)	Items P/I/D of the module parameters are set. Note) To change any of the setting items, use the Chameleon Select keys.		

(4) Function

Enable

1) P/I/D parameters of each module can be set while checking the action of PV/SV/MV with real time trend display.
2) The Operation key can be used to manipulate SV and MV.

Disable

1) It cannot set any module parameters other than P/I/D.
2) It cannot modify the mode by using the mode setting keys of the operation keys

Caution

If a page is modified by using the [＜＜] or [＞＞] button when the real time trend is currently displayed on the screen, the Tuning screen turn the picture again. However, pressing even the chameleon switch key cannot switch to the picture.

6.6 Trend display screen

(1) Description of screen

1) It allows you to display real time trend and historical trend.

2) To set the trend display, select TREND SETTING from Menu 2/3. (See section 7.7.)

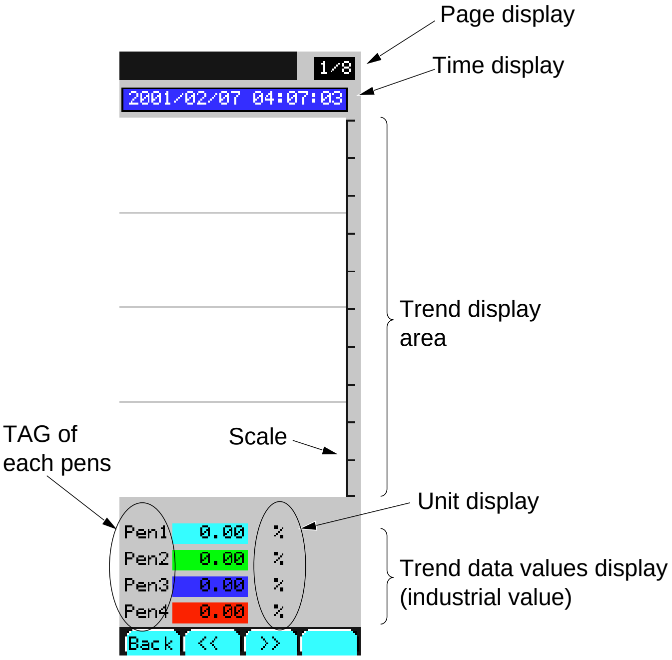


Fig. 6-9 Real time trend display screeen

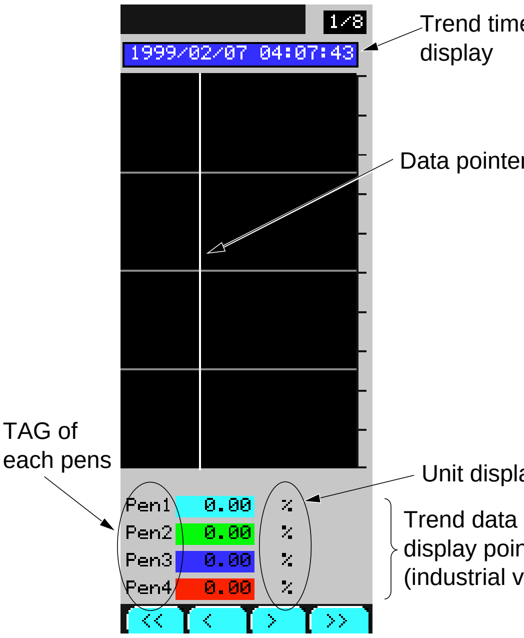


Fig. 6-10
Historical trend (at point sampling)

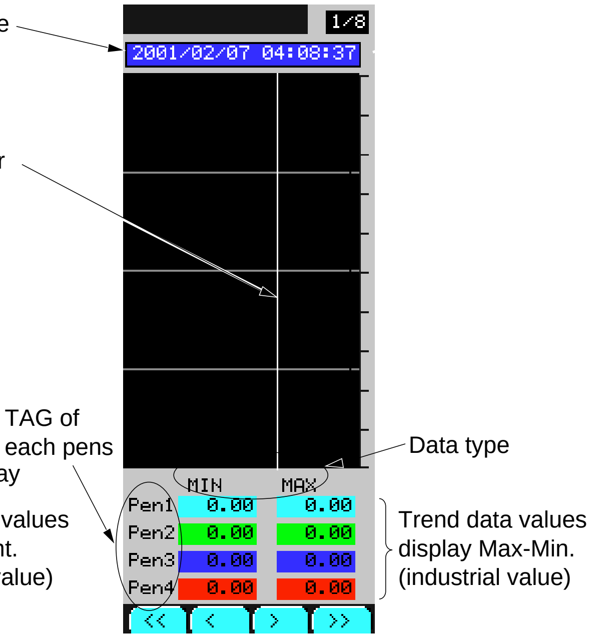


Fig. 6-11
Historical trend (at MIN/MAX sampling)

(2) Description of chameleon key

Real time trend

Page 1

Back	＜＜	＞＞	

BACK : To return to the previous screen to this screen.
＜＜ : To move to the first trend display screen before the currently displayed one.
＞＞ : To move the trend display screen after the currently displayed one.

Real time trend

Page 2

＞	▼	▲	Ent

＞ : To select the input digit and to switch the setting mode.
▼ : To decrease the input value.
▲ : To increase the input value.
Ent : To switch the setting mode. <in the select mode>
To switch to display the historical trend. <in the setting mode>

Historical trend

Page 1

＜＜	＜	＞	＞＞

＜＜ : To move the data pointer to the 10th sampling data before the current one
＜ : To move the data pointer to the first sampling data before the current one.
＞ : To move the data pointer to the first sampling data after the current data.
＞＞ : To move the data pointer to the 10th sampling data after the current one.

(3) Description of each item

Displayed item	Function	Meaning of display	Unit
Sampling data display time	It allows sampling data to be displayed according to the specified time between the starting time of trend and the current time. When the setting time is set after latest sampling data, the latest sampling data is selected. When the setting time is before the oldest sampling data, the oldest sampling data is selected. For trend setting, see Section 7.7 trend setting screen.	Time setting range	Current time ———
Each pen tag	It allows each tag set by Pens to be displayed. (Each pen tag can be set in Section 7.7, trend setting screen)	4 characters	
Trend data values display (Point/ Max-Min)	At the time of real time trend display: It allows current sampling data to be displayed with industrial values. At the time of historical trend display: It allows the time data indicated by the data pointer to be displayed with industrial values. (Industrial values can be set in Section 7.7, trend setting screen)		———
Unit display	It allows the units of Pen to be displayed. (The unit of each Pen can be set on page 2 of Section 7.7, trend setting screen).		———

How to display the historical trend

1) Display the chameleon key page 2 while the real time trend is being displayed.
2) Press the Ent key and select the time setting mode.
3) Operate by using the keys ＞ , ▼ and ▲ to set the time of historical trend data to display.
4) Press the Ent key again at the above status displays to display the historical trend.

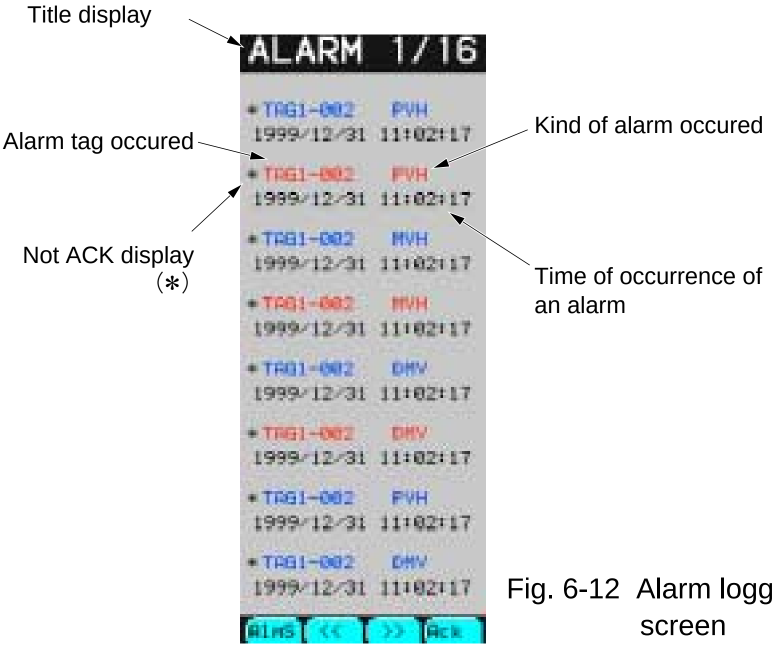
6.7 Alarm/fault screen

6.7.1 Alarm logging display screen

(1) Description of screen

1) It allows you to display the alarm logging that occurred to or was removed from the controller.
2) The asterisk mark (＊) is displayed at the tag that is not acknowledged.
3) When an alarm occurs, it is displayed in red. When an alarm is remedied, it is displayed in blue.
4) The alarm logging display screen contains 16 pages, enabling you to perform logging of 128 kinds of alarms.

   Note) At the top of the first page, the latest alarm is displayed.



```
ALARM 1/16
*TAG1-002    PVH
1999/12/31 11:02:17
*TAG1-002    PVH
1999/12/31 11:02:17
*TAG1-002    MVH
1999/12/31 11:02:17
*TAG1-002    MVH
1999/12/31 11:02:17
*TAG1-002    DMV
1999/12/31 11:02:17
*TAG1-002    DMV
1999/12/31 11:02:17
*TAG1-002    PVH
1999/12/31 11:02:17
*TAG1-002    DMV
1999/12/31 11:02:17
```

Fig. 6-12 Alarm logging display screen

(2) Description of chameleon key

Page 1

Alms	<<	>>	Ack

Alms : To move to the alarm status display screen.
<< : To return to the previous page.
>> : To return to the next page.
Ack : To acknowledge a page displayed on the screen.
Note) When the displayed page acknowledge, the asterisk mark (＊) will disappears.

Page 2

Back			

Back : To return to the Menu screen.

(3) Description of each item

Displayed item	Function	Meaning of display
Title/page display	A page of the alarm logging screen is displayed It contains 16 pages in all.	
Tag display	The tag that caused an alarm is displayed. Red : Alarm occurs Blue : Alarm remedied	Tag set for each module
Not ACK display (＊)	The asterisk mark (＊) is displayed at the tag that is not acknowledged. Note) By pressing the ACK key, the asterisk will disappear.	
Kind of alarm	A kind of alarm occurred is displayed.	See table below.
Time of alarm occured	The time when an alarm occurred is displayed with year/month/date, hour/minute/second.	

Display	Contents
DMV	Manipulated output change rate alarm
MVL	Manipulated output lower limit alarm (-25.00 to 125.00%)
MVH	Manipulated output upper limit alarm (-25.00 to 125.00%)
DVL	Deviation lower limit alarm (0.00 to 100.00%)
DVH	Deviation upper limit alarm (0.00 to 100.00%)
DPL	Process value change rate lower limit alarm (0.00 to 100.00%)
DPH	Process value change rate upper limit alarm (0.00 to 100.00%)
PVL	Process value lower limit alarm (the setting range may vary depending on the industrial value).
PVH	Process value upper limit alarm (the setting range may vary depending on the industrial value).
SVL	Set value lower limit alarm (the setting range may vary depending on the industrial value).
SVH	Set value upper limit alarm (the setting range may vary depending on the industrial value).

6.7.2 Alarm status display screen

(1) Description of screen

1) It allows you to display the status of an alarm occurring to the controller for each module.
2) An asterisk mark (＊) is attached to the item where an alarm occurs.
3) The alarm statuses for the primary and secondary modules on each loop are displayed on a single screen.

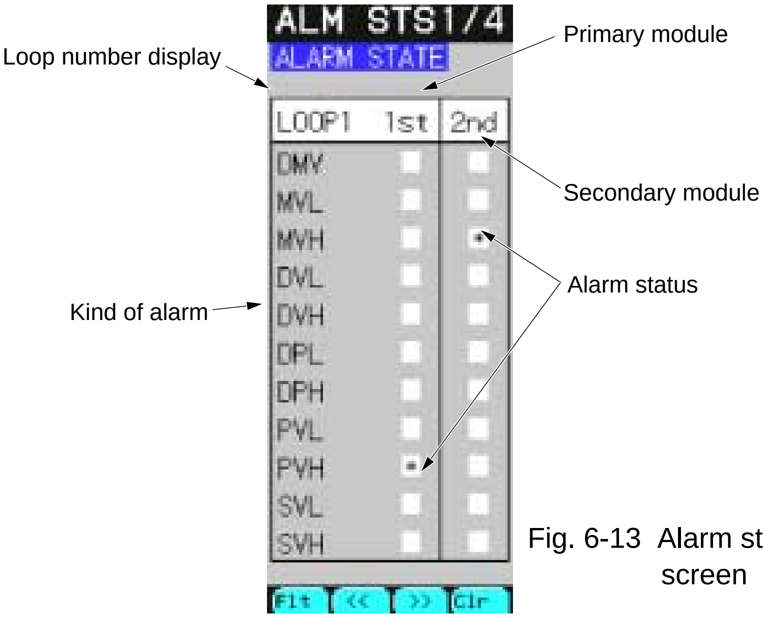


Fig. 6-13 Alarm status display screen

(2) Description of chameleon key

Page 1

Flt	＜＜	＞＞	Clr

Flt : To move to the fault logging display screen
＜＜ : To return to the previous page.
＞＞ : To return to the next page.
Clr : To clear the alarm latch (For the alarm latch settings, refer to Item 7.11.2).

Page 2

Back			

Back : To return to the Menu screen.

(3) Description of each item

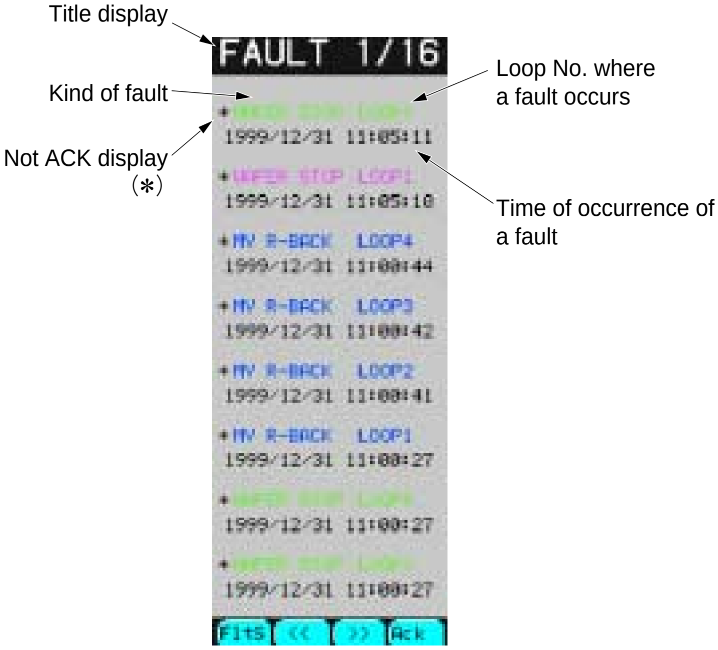
Displayed item	Function	Meaning of display
Title/page display	A title of the alarm status screen displayed.	
Loop number display	The loop number displayed on the screeen is displayed.	
Kind of alarm	11 kinds of alarm occurred is displayed.	See “Kinds of alarm” on the previous page .
Alarm status display	An asterisk (＊) is attached to the alarm occurred.	

6.7.3 Fault logging display screen

(1) Description of screen

1) It allows you to display the fault logging that occurred to or was removed from the controller.
2) The asterisk mark (＊) is displayed at the tag that is not acknowledged.
3) When a fault occurs, it is displayed in red. When the alarm is remedied, it is displayed in blue.
4) The fault logging display screen contains 16 pages, enabling you to perform logging of 128 faults.

Note) At the top of the first page, the latest alarm is arranged.



```
FAULT 1/16
* [illegible]
 1999/12/31 11:05:11
* WAFER STOP LOOP1
 1999/12/31 11:05:10
* MV R-BACK  LOOP4
 1999/12/31 11:00:44
* MV R-BACK  LOOP3
 1999/12/31 11:00:42
* MV R-BACK  LOOP2
 1999/12/31 11:00:41
* MV R-BACK  LOOP1
 1999/12/31 11:00:27
* [illegible]
 1999/12/31 11:00:27
* [illegible]
 1999/12/31 11:00:27
```

Fig. 6-14 Fault logging display screen

(2) Description of chameleon key

Page 1

Flts	<<	>>	Ack

Flts : To move to the fault status display screen.
<< : To return to the previous page.
>> : To advance to the next page.
Ack : To acknowledge a page displayed on the screen.
Note) When the displayed page acknowledge, the asterisk mark (＊) will disappears.

Page 2

Back			

Back : To return to the Menu screen.

(3) Description of each item

Displayed item	Function	Meaning of display
Title/page display	A page of the fault logging screen is displayed It contains 16 pages in all.	
Loop No. display	The loop No. that caused an fault is displayed. Red : Fault occurs Blue : Fault remedied	
Unit of PV/SV display	The asterisk mark (∗) is displayed at the tag.	
Kind of fault	A kind of fault occurred is displayed.	See table below.
Time of occurrence of a fault	The time when a fault occurred is displayed with year/month/date, hour/minute/second.	

Fault display	Meaning of faults
AI CHECK	AI check (ON/OFF)
DAI CHECK	Direct input AI check (ON/OFF)
OPTION AI	Direct input board down
MV R-BACK	MV read back error

Warning	Meaning of warning
FLASH WAR	Flash ROM error
OPT COM ER	OPTO22 transmission error
WAF STOP	Wafer stop
CNCT ERROR	Wrong wafer connection

6.7.4 Fault status display screen

(1) Description of screen

1) It allows you to display the status of a fault that occurs to the controller.

2) An asterisk mark (＊) is attached to the item of a fault.

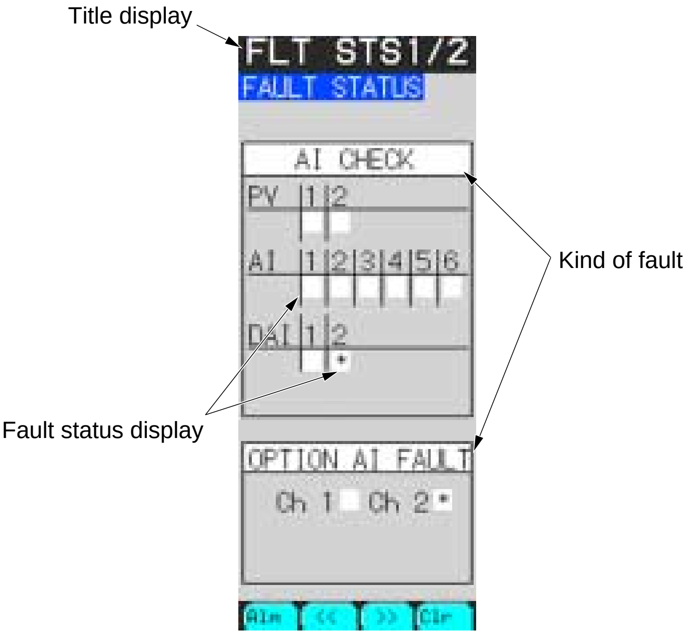


Fig. 6-15 Fault status 1/2

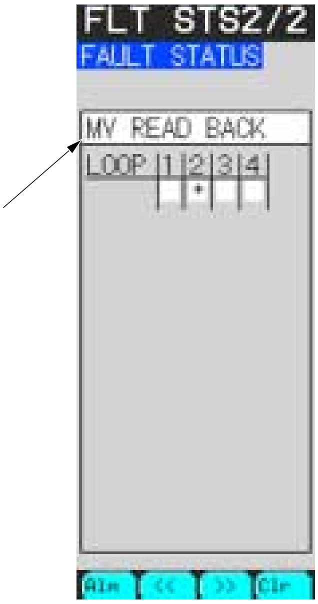


Fig. 6-16 Fault status 2/2

(2) Description of chameleon key

Page 1

Alm	<<	>>	Clr

Flt :To move to the alarm logging display screen.

<< : To return to the previous page.

>> : To advance to the next page.

Clr :To clear the fault latch. (For the fault latch setting, see Item 7.11.2).

Page 2

Back			

Back : To return to the Menu screen.

(3) Description of each item

Displayed item	Function	Meaning of display
Title/page display	The title of the fault status is displayed	
Fault status display (＊)	An asterisk mark (＊) is attached to the fault occurring to the controller.	
Kind of fault	A kind of fault is displayed. AI CHECK PV1 to 2 : Over range of analog input AI1 to 6 : Over range of analog input DAI1 to 2 : Over range of direct input OPTION AI FAULT Ch1 to 2 : Abnormal of direct input MV READ BUCK Ch1 to 4 : Fault of MV read buck	

7. VARIOUS SETTING

7.1 Menu screen

7.1.1 Function of screen

It allows you to jump to each screen of the controller.

It contains 3 pages in all.

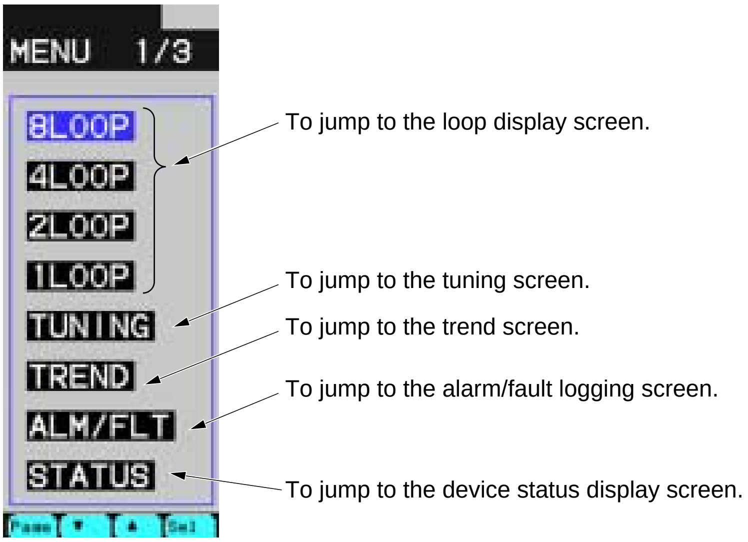
MENU 1/3 for monitors

MENU 2/3 for parameters settings

MENU 3/3 for system definition and program definition

7.1.2 Description of screens

(1) MENU 1/3 screen



To jump to the loop display screen.

To jump to the tuning screen.

To jump to the trend screen.

To jump to the alarm/fault logging screen.

To jump to the device status display screen.

Fig. 7-1-1 MENU 1/3 screen

Description of chameleon key

Page 1

Page	▼	▲	Sel

Page : To move to the next page to the menu screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : To jump to the screen selected by the cursor.

Page 2

8Lp	4Lp	2Lp	1Lp

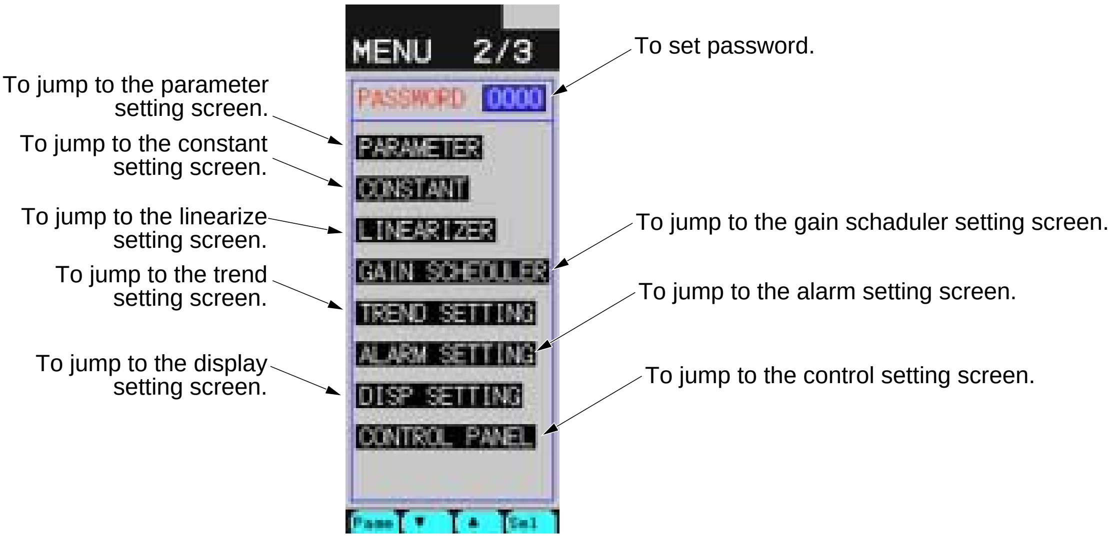
8Lp : To jump to the 8LOOP screen .
4Lp : To jump to the 4LOOP screen .
2Lp : To jump to the 2LOOP screen .
1Lp : To jump to the 1LOOP screen .

Page 3

Tun	Trd	Alm	Flt

Tun : To jump to the tuning screen .
Trd : To jump to the trend display screen .
Alm : To jump to the alarm logging screen .
Flt : To jump to the fault logging screen .

(2) MENU 2/3 screen



To set password.

To jump to the parameter setting screen.

To jump to the constant setting screen.

To jump to the linearize setting screen.

To jump to the gain schaduler setting screen.

To jump to the trend setting screen.

To jump to the alarm setting screen.

To jump to the display setting screen.

To jump to the control setting screen.

Fig. 7-1-2 MENU 2/3 screen

Description of chameleon key

Page 1

Page	▼	▲	Sel

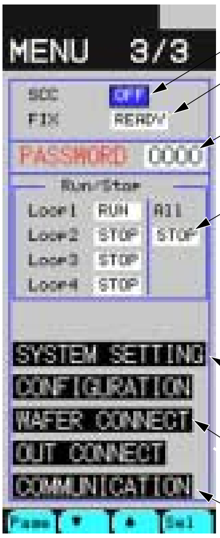
Page : To move to the next page to the menu screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : To jump to the screen selected by the cursor.

Description of each item

Symbol	Item	Function	Setting range	Unit	Initial value during shipment
PASSWORD	Password	It enables you to lock each screen of Menu 2/3. If the set point set herein is not identified with the password set in the System Definition screen shown in Section 7.11, setting change of the menu items displayed on MENU 2/3 is not allowed.	0000 to ffff	Hexa-decimal	0000

(3) MENU 3/3 screen

Description of screen



MENU 3/3

SCC OFF

FIX READY

PASSWORD 0000

Run/Stop

Loop1 RUN

Loop2 STOP

Loop3 STOP

Loop4 STOP

All STOP

SCC permit/inhibit.

To execute FIX. (to save settig value.)

To set password

To perform RUN/STOP of wafer.
*The display varies depending on the type you have purchased.

1 Control output	Loop1 only
2 Control outputs	Loop1, 2 ALL
4 Control outputs	Loop1 to 4 ALL (The screen at left)

To jump to the function definition screen.

To jump to the output connection screen.

To jump to the system definition screen.

To jump to the wafer connection screen.

To jump to the communication setting screen.

Fig. 7-1-3 MENU3/3 screen

Description of chameleon key

Page 1

Page	▼	▲	Sel

Page : To move to the next page to the menu screen.

▼ : To move the cursor downward.

▲ : To move the cursor upward

Sel : To jump to the screen selected by the cursor.

Caution

If the passwords are not cancelled on MENU 2/3 screen, setting change cannot be performed on the currently displayed MENU 3/3.

To make the setting change on MENU 3/3 screen effective, cancel the passwords of MENU 2/3, and then cancel passwords of MENU 3/3.

Description of each item

Symbol	Item	Function	Setting range	Unit	Initial value during shipment
SCC	Communication setting permit	It performs Permit/Inhibit of modification of SV, MV and modes via communication.	ON: Permit OFF: Inhibit	—	OFF
PASS-WORD	Password	It enables you to lock the screen setting of Menu 3/3. If the set point set here is not identified with the password set in the System Definition screen shown in 7.11, the setting change of each item displayed on MENU 3/3 cannot be performed.	0000 to ffff	Hexadecimal	0000
Loop1 Loop2 Loop3 Loop4	Wafer RUN/STOP	It allows you to perform RUN/STOP of wafer operations for each loop (1 to 4)	RUN: Wafer run STOP:Wafer stop	—	RUN
All	Wafer RUN/STOP	It allows you to perform RUN/STOP of wafer operations of all loops (1 to 4) at the same time.	RUN: Wafer run STOP:Wafer stop	—	RUN
SYSTEM SETTING	System definition	It allows you to jump to the system definition screen.			
CONFIGU-RATION	Function definition	It allows you to jump to the function definition screen.			
WAFER CONNECT	Wafer connection	It allows you to jump to the wafer connection screen.			
OUT CONNECT	Output connection	It allows you to jump to the output connection screen.			
COMMUNI-CATION	Communication setting	It allows you to jump to the communication setting screen.			
Fix	Parameters saving	It allows you to save the settable items such as various running parameters in FLASH ROM	READY (normal) WAIT (blue: in Fixing) WAIT (yellow: ready for fixing)		READY

Caution

If, while in FIX (while WAIT is being displayed), the mainframe has been turned off or power failure has occurred, parameters may be destroyed. Power must not be cut while in FIX.

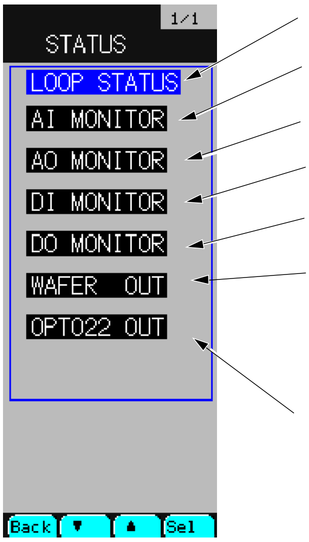
7.2 Status display screen

7.2.1 Function of screen

It displays various statuses of the controller. It contains 8 screens in all.

7.2.2 Description of screen

(1) STATUS screen menu



To jump to the loop status display screen.

To jump to the AI monitor screen.

To jump to the AO monitor screen.

To jump to the DI monitor screen.

To jump to the DO monitor screen.

To jump to the wafer I/O screen.

To jump to the OPTO I/O monitor.

Fig. 7-2-1 STATUS menu screen
(In case of OPTO22)

Description of chameleon key

1st display

Back	▼	▲	Sel

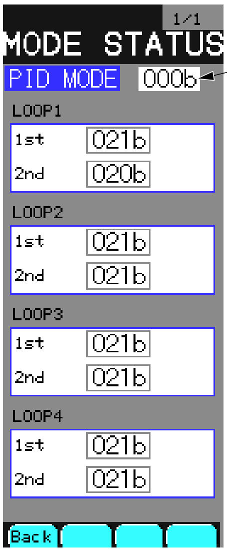
Back : To return to the previous screen to this screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : To jump to the screen selected by the cursor.

Symbol	Item	Function
LOOP STATUS	Loop status display	Allows you to display the control mode status of each loop.
AI MONITOR	AI monitor	Allows you to display the AI input value of the controller.
AO MONITOR	AO monitor	Allows you to display the AO input value of the controller.
DI MONITOR	DI monitor	Allows you to display the DI input status of the controller.
DO MONITOR	DO monitor	Allows you to display the DO output status of the controller.
WAFER OUT	Wafer I/O monitor	Allows you to display the wafer I/O values of each loop.
*OPTO22	OPTO22 I/O monitor	Allows you to display the I/O values of OPTO22.

* Depending on the type you have purchased, the items marked an asterisk mark may not be displayd.

(2) Loop status display

Description of screen



A cycle of the current wafer operations (hexadecimal) is displayed (in the unit of 10msec).
*The display may change depending on the type you have purchased.

1 Control output 2 Control outputs 4 Control outputs	Loop1 only Loop1, 2 ALL Loop1 to 4 ALL (The screen at left)

Fig. 7-2-2 Loop status display screen

Description of chameleon key

Page 1

Back			

Back : To return to the source screen.

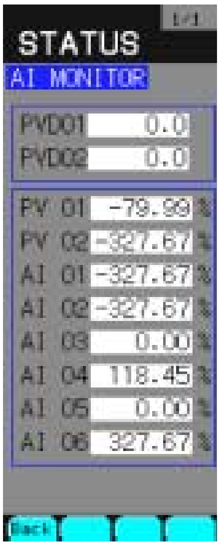
Description of each item

It displays the primary and secondary control modes of each loop with a hexadecimal number. The meaning of each bit is as follows:

Bit position	Meaning
0 X 8000	HM (Hard manual)
0 X 4000	M (Manual)
0 X 2000	EXT manual
0 X 1000	Soft manual
0 X 0800	SCC ON
0 X 0400	Remote
0 X 0200	Local
0 X 0100	PV tracking
0 X 0080	Forward
0 X 0040	Spare
0 X 0020	R request (Remote request)
0 X 0010	Auto request
0 X 0008	Not auto
0 X 0004	SCC permit
0 X 0002	LS mode
0 X 0001	Fault

(3) AI monitor, AO monitor

Description of screen



STATUS 1/1

AI MONITOR

PVD01 0.0

PVD02 0.0

PV 01 -79.99 %

PV 02 -327.67 %

AI 01 -327.67 %

AI 02 -327.67 %

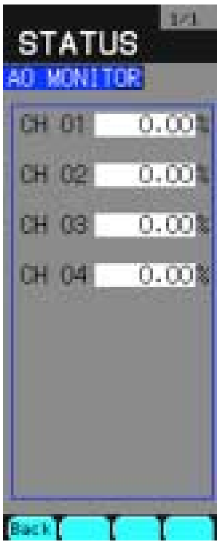
AI 03 0.00 %

AI 04 118.45 %

AI 05 0.00 %

AI 06 327.67 %

Fig. 7-2-3 AI monitor screen



STATUS 1/1

AO MONITOR

CH 01 0.00%

CH 02 0.00%

CH 03 0.00%

CH 04 0.00%

Fig. 7-2-4 AO monitor screen

Description of chameleon key

Page 1

Back			

Back : To return to the source screen.

Description of each item

Symbol	Item	Function	Meaning of display/ setting range	Unit
PVD01 PVD02	Direct input value	It allows you to display the temperature input value by the direct input when the optional direct input card is provided.	Input temperature	0.1°C
PV01 PV02	PV input value	It allows you to display the PV value of 1 to 5 V DC input	-25.00 to 125.00	%
AI01 to AI06	AI input value	It allows you to display the AI input value (*)	-25.00 to 125.00	%
CH01 to CH04	AO output value	It allows you to display the AO output value (*)	-25.00 to 125.00	%

* A scale of ZERO to FULL is divided into 0.00 to 100.00%.

(4) DI monitor, DO monitor

Description of screen

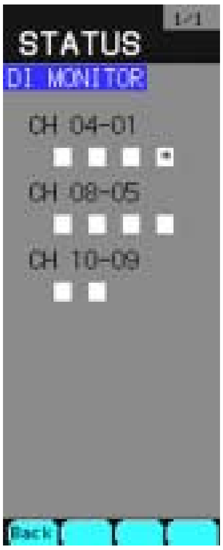


Fig. 7-2-5 DI monitor screen

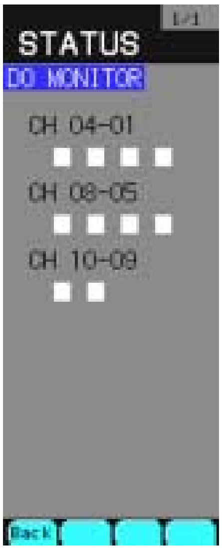


Fig. 7-2-6 DO monitor screen

Description of chameleon key

Page 1

Back			

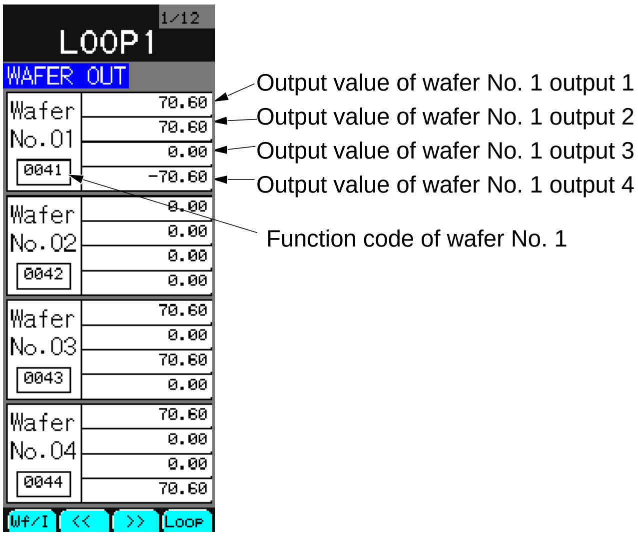
Back : To return to the source screen.

Description of each item

Symbol	Item	Function	Meaning of display	Unit
CH01 to CH10	DI input value	It allows you to display the input DI status of the controller.	Blank:DI is OFF. ＊ :DI is ON.	—
CH01 to CH10	DO output value	It allows you to display the input DO status of the controller.	Blank:DO is OFF. ＊ :DO is ON	—

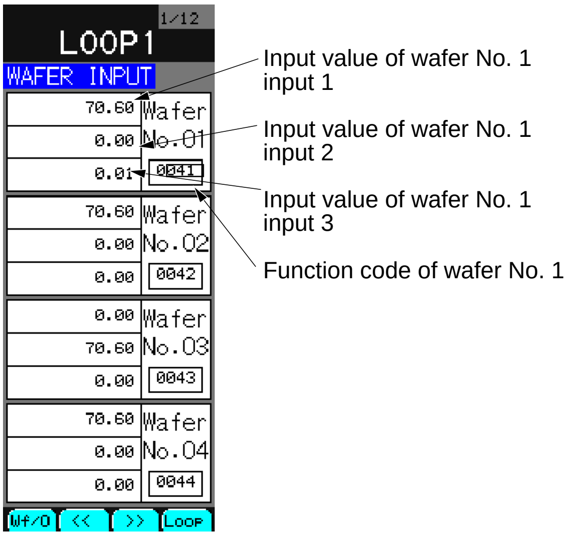
(5) Wafer I/O monitor

Description of screen



Output value of wafer No. 1 output 1
Output value of wafer No. 1 output 2
Output value of wafer No. 1 output 3
Output value of wafer No. 1 output 4
Function code of wafer No. 1

Fig. 7-2-7 Wafer output monitor screen



Input value of wafer No. 1 input 1
Input value of wafer No. 1 input 2
Input value of wafer No. 1 input 3
Function code of wafer No. 1

Fig. 7-2-8 Wafer input monitor screen

Description of chameleon key

Page 1

Wfi	<<	>>	LOOP

Wfi : To jump to the wafer input monitor screen.
<< : To display the 4th wafer position before current one.
>> : To display the 4th wafer position after current one.
LOOP : To display a wafer output of the next loop number.

Page 2

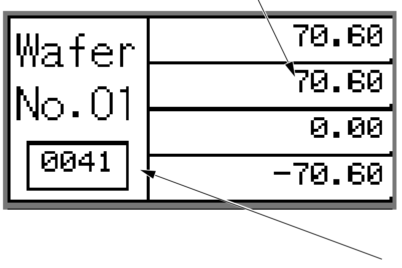
Wfo	<<	>>	LOOP

Wfo : To jump to the wafer output monitor screen.

Description of each item

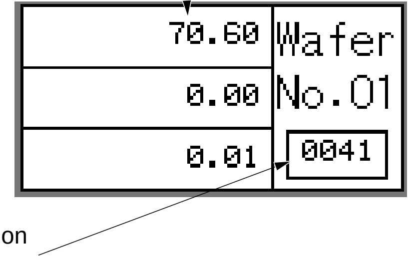
Wafer output monitor

Values of wafer output 1 to 4 are displayed.
[unit:%]



Wafer input monitor

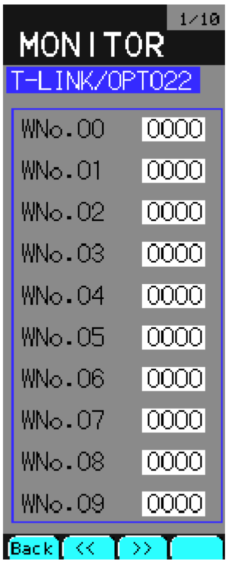
Values of wafer input 1 to 3 are displayed.
[unit:%]



Wafer mounting position
is displayed.

(6) OPTO22 master I/O monitor (only when optional OPTO22 is provided)

Description of screen



WNo.00	0000
WNo.01	0000
WNo.02	0000
WNo.03	0000
WNo.04	0000
WNo.05	0000
WNo.06	0000
WNo.07	0000
WNo.08	0000
WNo.09	0000

Fig. 7-2-9 OPTO22 master screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source screen.

<< : To display the previous wafer No. page.

>> : To display the next wafer No. page.

Description of each item

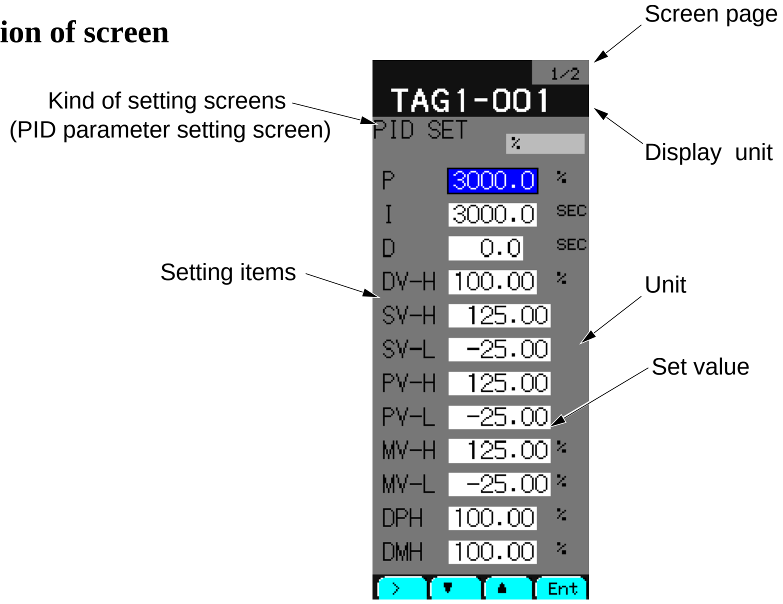
Symbol	Item	Function	Meaning of display	Unit
Wno 00 to Wno 99	I/O value	It allows you to display the I/O values of OPTO22.	Input value or ouput value	Hexa-deci-mal

7.3 Parameter setting screen

7.3.1 Outline

It allows you to set parameters (PID, etc.) of each control block for PID operation, ratio operation and program operation.

Description of screen



1/2
TAG1-001
PID SET %

P	3000.0	%
I	3000.0	SEC
D	0.0	SEC
DV-H	100.00	%
SV-H	125.00	
SV-L	-25.00	
PV-H	125.00	
PV-L	-25.00	
MV-H	125.00	%
MV-L	-25.00	%
DPH	100.00	%
DMH	100.00	%

Fig. 7-3-1 Parameter setting screen

Description of chameleon key

Page 1

Back	<<	>>	Page

Back : To return to the source screen.
<< : To move the first screen prior to current loop screen.
>> : To move the first screen next to current loop screen.
Page : To display the next page of current screen. If the page does not exist, it will not be displayed.

Page 2

>	▼	▲	Ent

[Display mode]
> : To go to the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Ent : To go to the setting modification mode.

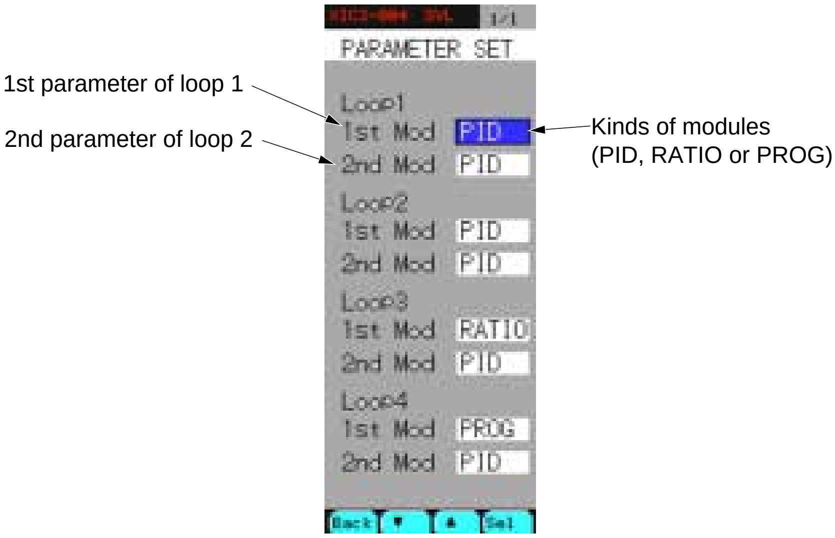
[Setting modification mode]
> : To modify the numerical digits.
▼ : To decrease the numerical value.
▲ : To increase the numerical value
Ent : To register the modification value.

7.3.2 Description of each screen

(1) Parameter setting screen menu

Description of screen

It allows you to jump to the 1st and 2nd parameter screens of each loop (1 to 4).



PARAMETER SET

Loop1
1st Mod PID
2nd Mod PID

Loop2
1st Mod PID
2nd Mod PID

Loop3
1st Mod RATIO
2nd Mod PID

Loop4
1st Mod PROG
2nd Mod PID

Fig. 7-3-2 Parameter setting menu screen

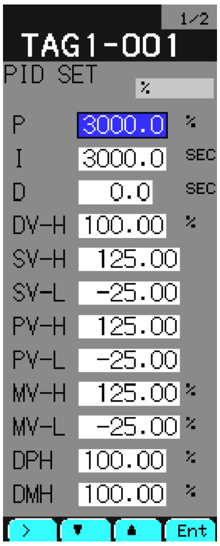
* The display may change depending on the type you have purchased.

1 Control output	Loop1 only
2 Control outputs	Loop1 and Loop2
4 Control outputs	Loop1 to Loop4 (See the screen above).

(2) PID parameter setting screen

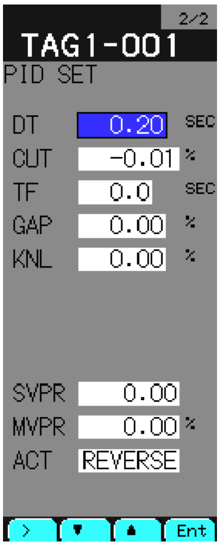
Description of screen

Primary PID parameter setting screen


1/2
TAG1-001
PID SET
%

P 3000.0 %
I 3000.0 SEC
D 0.0 SEC
DV-H 100.00 %
SV-H 125.00
SV-L -25.00
PV-H 125.00
PV-L -25.00
MV-H 125.00 %
MV-L -25.00 %
DPH 100.00 %
DMH 100.00 %

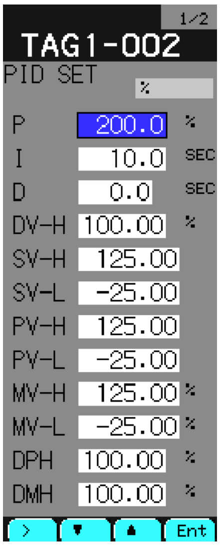
Fig. 7-3-3 <Page 1/2>


2/2
TAG1-001
PID SET

DT 0.20 SEC
CUT -0.01 %
TF 0.0 SEC
GAP 0.00 %
KNL 0.00 %
SVPR 0.00
MVPR 0.00 %
ACT REVERSE

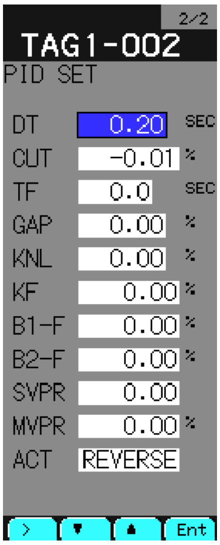
Fig. 7-3-4 <Page 2/2>

Secondary PID parameter setting screen


1/2
TAG1-002
PID SET
%

P 200.0 %
I 10.0 SEC
D 0.0 SEC
DV-H 100.00 %
SV-H 125.00
SV-L -25.00
PV-H 125.00
PV-L -25.00
MV-H 125.00 %
MV-L -25.00 %
DPH 100.00 %
DMH 100.00 %

Fig. 7-3-5 <Page 1/2>


2/2
TAG1-002
PID SET

DT 0.20 SEC
CUT -0.01 %
TF 0.0 SEC
GAP 0.00 %
KNL 0.00 %
KF 0.00 %
B1-F 0.00 %
B2-F 0.00 %
SVPR 0.00
MVPR 0.00 %
ACT REVERSE

Fig. 7-3-6 <Page 2/2>

Description of each item (1/2)

Symbol	Item	Function	Setting range	Unit	Initial value during shipment
P	Proportional band	Set the proportional bands according to the process gain	1.0 to 3276.7	%	3000.00
I	Integral time	Set an integral time. Control the integral time to allow an offset to adjust to 0 according to the integral acion.	0.1 to 3276.7	sec.	3000.00
D	Differential time	Set an differential time. Control response is improved by the differential action.	0.0 to 900.0	sec.	3000.00
DV_H	DV alarm	When the absolute value of DV exceeds the set value, an alarm occurs.	0.00 to 100.00	%	100.00
SV_H	SV upper limit	When the remote SV exceeds the set value, it is limited at the upper limit. The SV up key on the front panel becomes ineffective over the set value or 100.00.	-25.00 to 125.00 of industrial value	Industrial value	125.00
SV_L	SV lower limit	When the remote SV is below the set value, it is limited at the down limit. The SV down key on the front panel becomes ineffective under the set value or 0.00.	-25.00 to 125.00 of industrial value	Industrial value	-25.00
PV_H	PV upper alarm	When the PV value is above the set value, a PV-H alarm occurs.	-25.00 to 125.00 of industrial value	Industrial value	125.00
PV_L	PV lower alarm	When the PV value is below the set value, a PV-L alarm occurs.	-25.00 to 125.00 of industrial value	Industrial value	-25.00
MV_H	MV upper limit	When the MV value is above the set value in the Auto mode, it is limited at the upper limit. But, when it is above the set value in the manual mode, the MV up key can be used to increase beyond the set value.	-25.00 to 125.00	%	125.00
MV_L	MV lower limit	When the MV value is below the set value in the Auto mode, it is limited at the lower limit. But, when it is below the set value in the Manual mode, the MV down key can be used to decrease under the set value.	-25.00 to 125.00	%	-25.00
DPH	PV change rate alarm	When the rate of change in PV is above the set value, a DPH alarm occurs.	0.00 to 100.00	%	100.00
DMH	MV change rate limit	When a rate of change in MV is above the set value, it is limited at the upper limit. Such a process is available for a sudden change of MV.	0.00 to 100.00	%	100.00

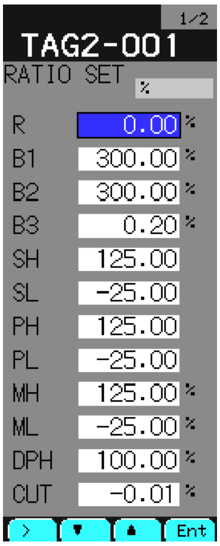
Description of each item (2/2)

Symbol	Item	Function	Setting range	Unit	Initial value during shipment
DT	Sampling cycle	Set a cycle for executing PID operation.	0.01 to 327.67	sec.	0.20
CUT	Rooter cut point	Set a cut point when performing switching operations for PV. PV is calculated as 0 if it is below the cut point.	-327.67 to -0.01: Rooter OFF 0.00 to 327.67: Rooter cut point	%	-0.01
TF	PV filter time constant	Use a PV filter effective for a big change of PV deflection due to noise. A PV response becomes bad as a bad side effect.	0.0 to 900.0	sec.	0.00
GAP	Dead band	When DV is below the set value, it is calculated as 0.	0.00 to 100.00	%	0.00
KNL	Non-linear gain	Values in the proportional band are changed when DV is below the GAP value. P(Knl)=100[%]knl ∗ P	0.00 to 327.67	%	0.00
KF	FF gain	Set feed forward gain, bias 1 and bias 2. FF=KF (input-B1F) + B2F	-327.67 to 327.67	%	0.00
B1_F	FF bias 1		-327.67 to 327.67	%	0.00
B2_F	FF bias 2		-327.67 to 327.6	%	0.00
SVPR	SV preset	Set an SV initial value when turning on the power.	-25.00 to 125.00 of industrial value	Industrial value	0.00
MVPR	MV preset	Set an MV initial value when turning on the power.	-25.00 to 125.00	%	0.00
ACT	Normal/reverse operation	Set the normal/reverse operations.	NORMAL: Forward operation REVERSE: Reverse operation		REVERSE

(3) Ratio parameter setting screen

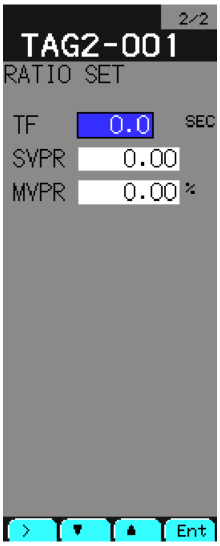
Description of screen

It allows you to set the first ratio wafer parameter.


1/2
TAG2-001
RATIO SET
%

R 0.00 %
B1 300.00 %
B2 300.00 %
B3 0.20 %
SH 125.00
SL -25.00
PH 125.00
PL -25.00
MH 125.00 %
ML -25.00 %
DPH 100.00 %
CUT -0.01 %

Fig. 7-3-7 <Page 1/2>


2/2
TAG2-001
RATIO SET

TF 0.0 SEC
SVPR 0.00
MVPR 0.00 %

Fig. 7-3-8 <Page 2/2>

Description of each item (1/2)

Symbol	Item	Function	Setting range	Unit	Initial value during shipment
R	Proportional factor	Set each ratio parameter. MV=R*(PV-B1)*SV/B3+B2	-327.67 to 327.67	%	100.00
B1	Ratio bias 1		-327.67 to 327.67	%	0.00
B2	Ratio bias 2		-327.67 to 327.67	%	0.00
B3	Ratio bias 3		-327.67 to 327.67	%	0.00
SV_H	SV upper limit	When the remote SV exceeds the set value, it is limited at the upper limit. The SV up key on the front panel becomes ineffective over the set value or 100.00.	-25.00 to 125.00 of industrial value	Industrial value	125.00
SV_L	SV lower limit	When the remote SV is below the set value, it is limited at the down limit. The SV down key on the front panel becomes ineffective under the set value or 0.00.	-25.00 to 125.00 of industrial value	Industrial value	-25.00
PV_H	PV upper alarm	When the PV value is above the set value, a PV-H alarm occurs.	-25.00 to 125.00 of industrial value	Industrial value	125.00
PV_L	PV lower alarm	When the PV value is below the set value, a PV-L alarm occurs.	-25.00 to 125.00 of industrial value	Industrial value	-25.00
MV_H	MV upper limit	When the MV value is above the set value in the Auto mode, it is limited at the upper limit. But, when it is above the set value in the manual mode, the MV up key can be used to increase beyond the set value.	-25.00 to 125.00	%	125.00
MV_L	MV lower limit	When the MV value is below the set value in the Auto mode, it is limited at the lower limit. But, when it is below the set value in the manual mode, the MV down key can be used to decrease under the set value.	-25.00 to 125.00	%	-25.00
DPH	PV change rate alarm	When the rate of change in PV is above the set value, a DPH alarm occurs.	0.00 to 100.00	%	100.00
TF	PV filter time constant	Use a PV filter effective for a big change of PV deflection due to noise. A PV response becomes bad as a bad side effect.	0.0 to 900.0	sec.	0.00
CUT	Rooter cut point	Set a cut point when performing switching operations for PV. PV is calculated as 0 if it is below the cut point.	-327.67 to -0.01: Rooter OFF 0.00 to 327.67: Rooter cut point	%	-0.00
SVPR	SV preset	Set an SV initial value when turning on the power.	-25.00 to 125.00 of industrial value	Industrial value	0.00
MVPR	MV preset	This parameter is not used for ratio calulation.	————	————	————

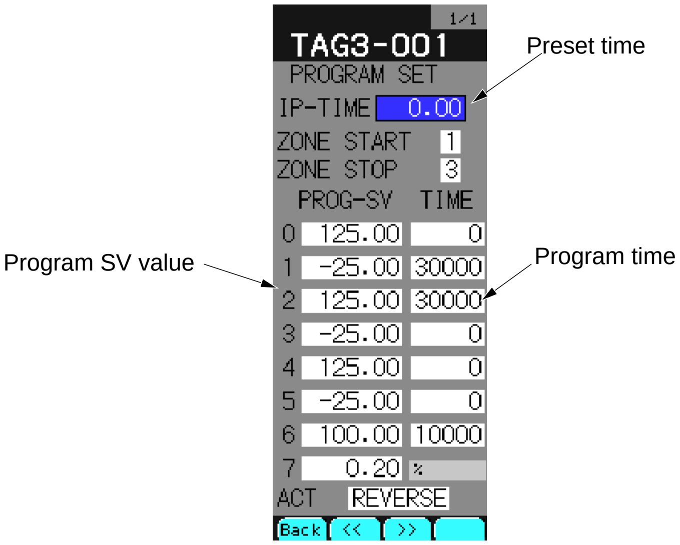
* Effective values with RATIO setting,

* When the system is set in the ratio control mode, the scale should be fixed to the range of 0.00 to 100.0%. See 7.12.2, Module Setting screen.

(4) Program operation parameter setting screen

Description of screen

It allows you to set the first program wafer parameter.


1/1

TAG3-001

PROGRAM SET

IP-TIME 0.00

ZONE START 1

ZONE STOP 3

	PROG-SV	TIME
0	125.00	0
1	-25.00	30000
2	125.00	30000
3	-25.00	0
4	125.00	0
5	-25.00	0
6	100.00	10000
7	0.20	%

ACT REVERSE

Preset time

Program SV value

Program time

Fig. 7-3-9 Program operation parameter setting screen

Description of each item

Symbol	Item	Function	Setting range	Unit	Initial value during shipment
IP-TIME	Preset time	It allows you to set a preset time at the time of an initial start.	0 to 327.67	min., hour, or day	0.00
ZONE_START	Selection signal start step No.	When the program step comes in th esetting No., the section signal is turned ON.	0 to 6	Step No.	
ZONE_STOP	Selection signal end step No.	When the program step comes in th esetting No., the section signal is turned OFF.	0 to 7	Step No.	
PROG_SV 0 to 7	Program set value	It allows you to set the target value of each program step.	0.00 to 100.00 of industrial value	Industrial value	0.00
TIME 0 to 7	Time period	It allows you to set the time period of each program step.	0 to 32767	sec. or min.	0

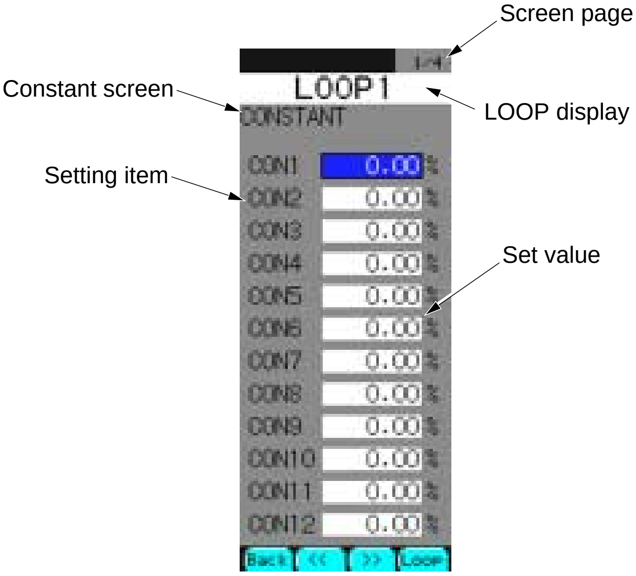
* Effective values with PROG setting,

7.4 Constant setting screen

7.4.1 Outline

It allows you to set the constant value when entering a constant value in a wafer at the time of wafer connection.

Description of screen



1/4

LOOP1

CONSTANT

CON1	0.00	%
CON2	0.00	%
CON3	0.00	%
CON4	0.00	%
CON5	0.00	%
CON6	0.00	%
CON7	0.00	%
CON8	0.00	%
CON9	0.00	%
CON10	0.00	%
CON11	0.00	%
CON12	0.00	%

Fig. 7-4-1 Constant setting screen

Description of chameleon key

Page 1

Back	<<	>>	Loop

Back : To return to the source screen.
<< : To display the previous page from current page.
>> : To display the next page from current page.
Loop : To move to the next loop screen from the current one.

Page 2

>	▼	▲	Ent

[Display mode]
> : To go to the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Ent : To go to the setting modification mode.

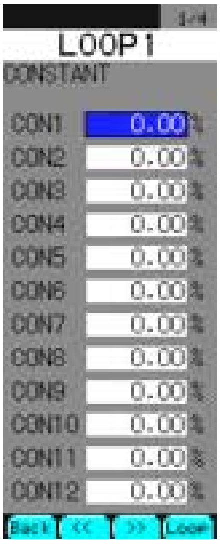
[Setting modification mode]
> : To move modified digit of numerical value.
▼ : To decrease the numerical value.
▲ : To increase the numerical value
Ent : To register the modified value.

7.4.2 Description of each screen

(1) Constant setting screen

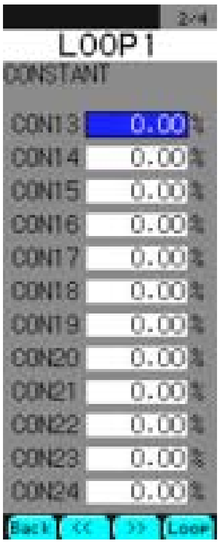
Description of screen

It allows you to set a total of 48 constants from CON1 to CON48 for each loop (1 to 4). The constants can be used among the loops.



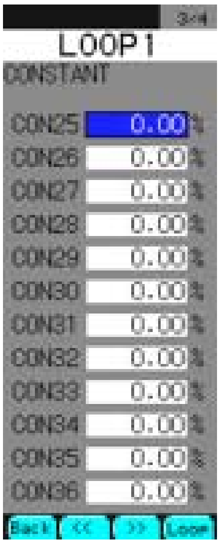
CON1 0.00 %
CON2 0.00 %
CON3 0.00 %
CON4 0.00 %
CON5 0.00 %
CON6 0.00 %
CON7 0.00 %
CON8 0.00 %
CON9 0.00 %
CON10 0.00 %
CON11 0.00 %
CON12 0.00 %

Fig. 7-4-2 <1/4>



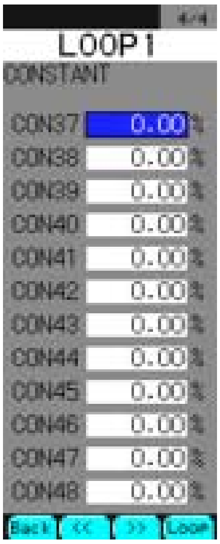
CON13 0.00 %
CON14 0.00 %
CON15 0.00 %
CON16 0.00 %
CON17 0.00 %
CON18 0.00 %
CON19 0.00 %
CON20 0.00 %
CON21 0.00 %
CON22 0.00 %
CON23 0.00 %
CON24 0.00 %

Fig. 7-4-2 <2/4>



CON25 0.00 %
CON26 0.00 %
CON27 0.00 %
CON28 0.00 %
CON29 0.00 %
CON30 0.00 %
CON31 0.00 %
CON32 0.00 %
CON33 0.00 %
CON34 0.00 %
CON35 0.00 %
CON36 0.00 %

Fig. 7-4-2 <3/4>



CON37 0.00 %
CON38 0.00 %
CON39 0.00 %
CON40 0.00 %
CON41 0.00 %
CON42 0.00 %
CON43 0.00 %
CON44 0.00 %
CON45 0.00 %
CON46 0.00 %
CON47 0.00 %
CON48 0.00 %

Fig. 7-4-2 <4/4>

* The number of constants to be used may be varied depending on the type you have purchased.

1 Control output	Loop1 only (48 constants)
2 Control outputs	Loop1 and Loop2 (96 constants)
4 Control outputs	Loop1 to Loop4 (192 constants)

Description of each item

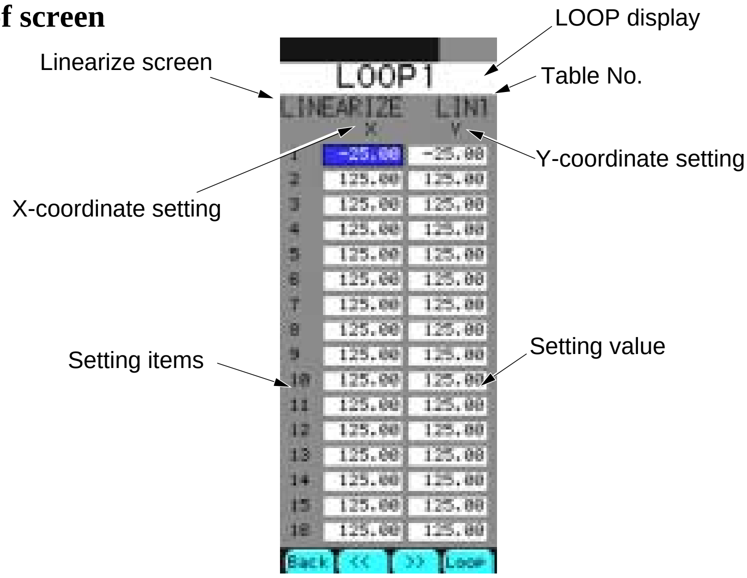
Symbol	Item	Function	Setting range	Unit	Initial value during shipment
CON1 to CON48	Constant	It allows you to set constants used for wafers.	-327.67 to 327.67	Decimal point	0.00

7.5 Linearize setting screen

7.5.1 Outline

It allows you to set the line tables used for the wafers (Wno. 0A, 0B, 91 to 94, A7) which perform the line fitting with respect to the input.

Description of screen



LOOP1

LINEARIZE LIN1

	X	Y
1	-25.00	-25.00
2	125.00	125.00
3	125.00	125.00
4	125.00	125.00
5	125.00	125.00
6	125.00	125.00
7	125.00	125.00
8	125.00	125.00
9	125.00	125.00
10	125.00	125.00
11	125.00	125.00
12	125.00	125.00
13	125.00	125.00
14	125.00	125.00
15	125.00	125.00
16	125.00	125.00

Fig. 7-5-1 Linearize setting screen

Description of chameleon key

Page 1

Back	<<	>>	LOOP

Back : To return to the source screen.
<< : To display the previous table on a screen.
>> : To displya the next table on a screen.
LOOP : To move to the next loop screen from the current one.

Page 2

>	▼	▲	Ent

[Display mode]
> : To go to the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Ent : To go to the setting modification mode.

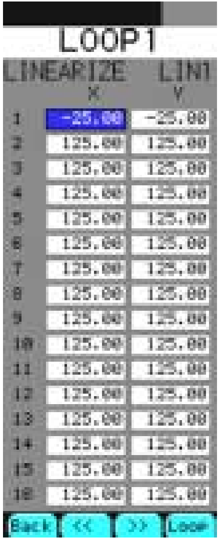
[Setting modification mode]
> : To move modified digit of numerical value.
▼ : To decrease the numerical value.
▲ : To increase the numerical value
Ent : To register the modified value.

7.5.2 Description of each screen

(1) Linearize setting screen

Description of screen

It contains 4 line tables for each of LIN 1 to LIN 4 for every loop (LOOP 1 to LOOP 4). It allows you to set up to 15 segmented lines for each table.

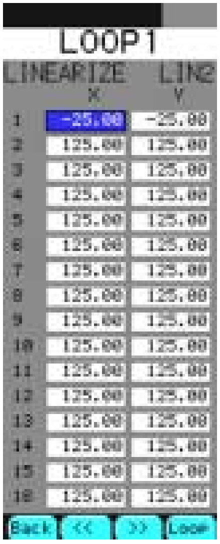


LOOP1

LINEARIZE LIN1

	X	Y
1	-25.00	-25.00
2	125.00	125.00
3	125.00	125.00
4	125.00	125.00
5	125.00	125.00
6	125.00	125.00
7	125.00	125.00
8	125.00	125.00
9	125.00	125.00
10	125.00	125.00
11	125.00	125.00
12	125.00	125.00
13	125.00	125.00
14	125.00	125.00
15	125.00	125.00
16	125.00	125.00

Fig. 7-5-2 LIN1

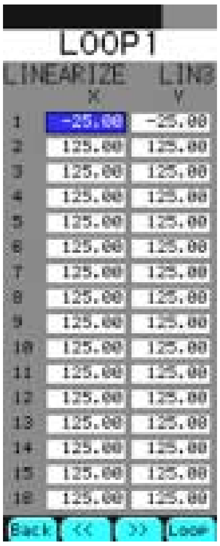


LOOP1

LINEARIZE LIN2

	X	Y
1	-25.00	-25.00
2	125.00	125.00
3	125.00	125.00
4	125.00	125.00
5	125.00	125.00
6	125.00	125.00
7	125.00	125.00
8	125.00	125.00
9	125.00	125.00
10	125.00	125.00
11	125.00	125.00
12	125.00	125.00
13	125.00	125.00
14	125.00	125.00
15	125.00	125.00
16	125.00	125.00

Fig. 7-5-3 LIN2

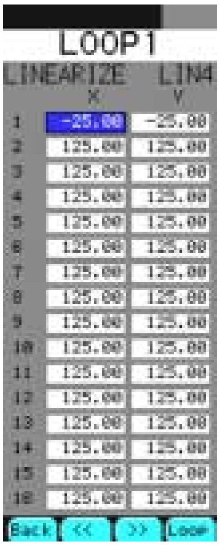


LOOP1

LINEARIZE LIN3

	X	Y
1	-25.00	-25.00
2	125.00	125.00
3	125.00	125.00
4	125.00	125.00
5	125.00	125.00
6	125.00	125.00
7	125.00	125.00
8	125.00	125.00
9	125.00	125.00
10	125.00	125.00
11	125.00	125.00
12	125.00	125.00
13	125.00	125.00
14	125.00	125.00
15	125.00	125.00
16	125.00	125.00

Fig. 7-5-4 LIN3



LOOP1

LINEARIZE LIN4

	X	Y
1	-25.00	-25.00
2	125.00	125.00
3	125.00	125.00
4	125.00	125.00
5	125.00	125.00
6	125.00	125.00
7	125.00	125.00
8	125.00	125.00
9	125.00	125.00
10	125.00	125.00
11	125.00	125.00
12	125.00	125.00
13	125.00	125.00
14	125.00	125.00
15	125.00	125.00
16	125.00	125.00

Fig. 7-5-5 LIN4

* The number of tables to be used may be changed depending on the type you have purchased.

1 Control output	Loop1 only (4 tables)
2 Control outputs	Loop1 and Loop2 (8 tables)
4 Control outputs	Loop1 to Loop4 (16 tables)

Identification of wafers to line tables No. is as follows:

WNo. (Wafer code)	Line table No.
91 0A	LIN1
92 0B	LIN2
93 A7*	LIN3
94	LIN4

* You can specify either of them.

Description of each item

Description of function

Symbol	Item	Function	Setting range	Unit	Initial value during shipment
X:1 to X:16	Linearize (X cordinate)	It allows you to set a numerical value on X coordinate on a table which performs line fitting.	-327.67 to 327.67	Decimal	See table below.
Y:1 to Y:16	Linearize (Y cordinate)	It allows you to set a numerical value on Y coordinate on a table which performs line fitting.	-327.67 to 327.67	Decimal	See table below.

Table : Set values before shipment

No.	X	Y
1	-25.00	-25.00
2	125.00	125.00
3	125.00	125.00
4	125.00	125.00
5	125.00	125.00
6	125.00	125.00
7	125.00	125.00
8	125.00	125.00
9	125.00	125.00
10	125.00	125.00
11	125.00	125.00
12	125.00	125.00
13	125.00	125.00
14	125.00	125.00
15	125.00	125.00
16	125.00	125.00

Note) For details of linear functions, refer to wafer instruction.

7.6 Gain schedule screen

This chapter describes how to set the gain schedule parameters (X, P, I, D) to be used in the gain scheduler, and it demonstrates an example of connection to the gain schedule wafer.

A gain scheduler is used to modify control constants (PID) according to the conditions. It allows you to set up to 2 types of gain schedules for each of the loops 1 to 4.

7.6.1 Gain schedule setting screen

By selecting "GAIN SCHEDULER" from Menu 2, you can read "X-PARAMETER" for one gain schedule of LOOP 1. The Chameleon keys allow you to change the settings and switch each parameter among X, P, I and D.

Function of screen

It allows you to set each parameter table of the gain schedules (X, P, I and D).

Description of screen

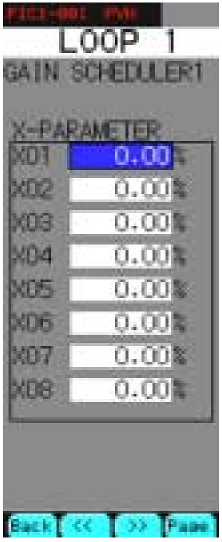

LOOP 1
GAIN SCHEDULER1
X-PARAMETER
X01 0.00%
X02 0.00%
X03 0.00%
X04 0.00%
X05 0.00%
X06 0.00%
X07 0.00%
X08 0.00%

Fig. 7-6-1
X-PARAMETER
setting

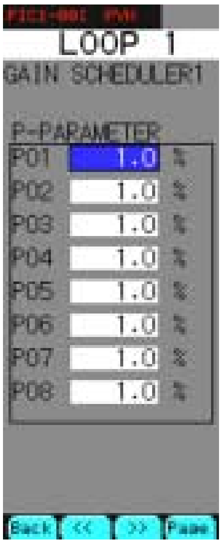

LOOP 1
GAIN SCHEDULER1
P-PARAMETER
P01 1.0 %
P02 1.0 %
P03 1.0 %
P04 1.0 %
P05 1.0 %
P06 1.0 %
P07 1.0 %
P08 1.0 %

Fig. 7-6-2
P-PARAMETER
setting

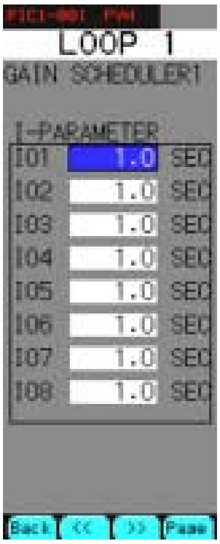

LOOP 1
GAIN SCHEDULER1
I-PARAMETER
I01 1.0 SEC
I02 1.0 SEC
I03 1.0 SEC
I04 1.0 SEC
I05 1.0 SEC
I06 1.0 SEC
I07 1.0 SEC
I08 1.0 SEC

Fig. 7-6-3
I-PARAMETER
setting

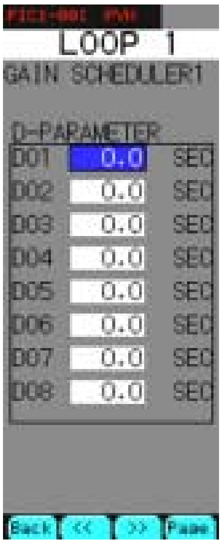

LOOP 1
GAIN SCHEDULER1
D-PARAMETER
D01 0.0 SEC
D02 0.0 SEC
D03 0.0 SEC
D04 0.0 SEC
D05 0.0 SEC
D06 0.0 SEC
D07 0.0 SEC
D08 0.0 SEC

Fig. 7-6-4
D-PARAMETER
setting

* The number of tables to be used may be changed depending on the type you have purchased.

1 Control output	Loop1 only (2 tables)
2 Control outputs	Loop1 and Loop2 (4 tables)
4 Control outputs	Loop1 to Loop4 (8 tables)

Description of chameleon key

Page 1

Back	＜＜	＞＞	Page

Back : To return to the source screen.

＜＜ : To move the screen in the order of [X ← P ← I ← D] whenever you press this key.

＞＞ : To move the screen in the order of [X → P → I → D] whenever you press this key.

Page : To switch the gain schedule tables whenever you press this key (gain schedule table contains up to 8 types = 4 LOOP × 2).

Page 2

＞	▼	▲	Ent

＞ : To switch to setting mode.
The setting digit moves to the right.

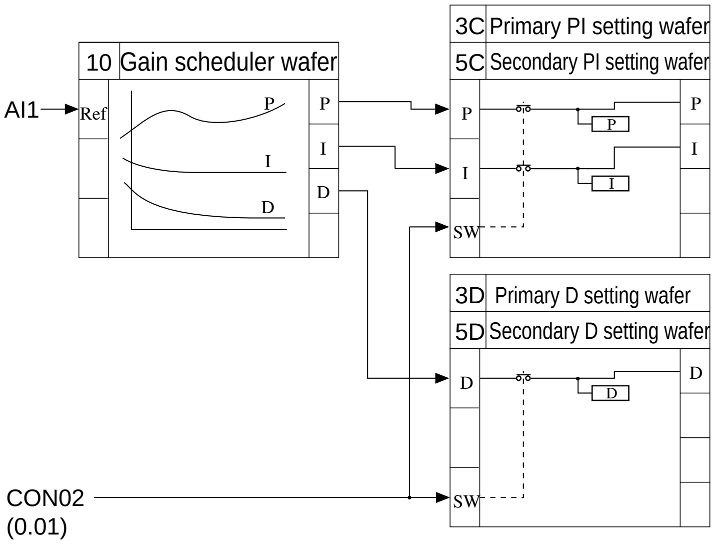
▼ : To move the cursor downward.
Numerical value of the selected digit is decreased.

▲ : To move the cursor upward
Numerical value of the selected digit is increased.

Ent : To switch to the setting mode (in the selection mode).
Displayed value is registered when it is in the setting mode.

Example of wafer connection

In an example, the parameters of P, I and D are determined as an adaptive index of the AI1 input based on the GS curve (gain schedule curve).



7.7 Trend setting screen

This chapter describes how to set trend functions. The trend functions are to perform trend display/ record of terminal code data set with pens. A trend group (x 8) contains 4 pens (a total of 32 pens).

When a memory card is set in the memory card slot of this instrument, it enables you to perform memory data logging of the trend data in the memory card (provided that a memory card interface option is provided).

7.7.1 Trend setting screen

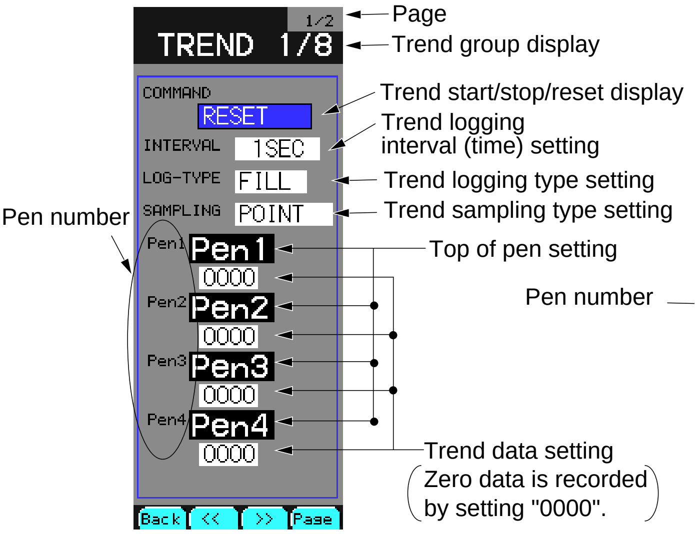
Select "TREND SETTING" from MENU 2/3 to display the trend setting screen.

Function of screen

The trend function settings should be performed for each trend group.

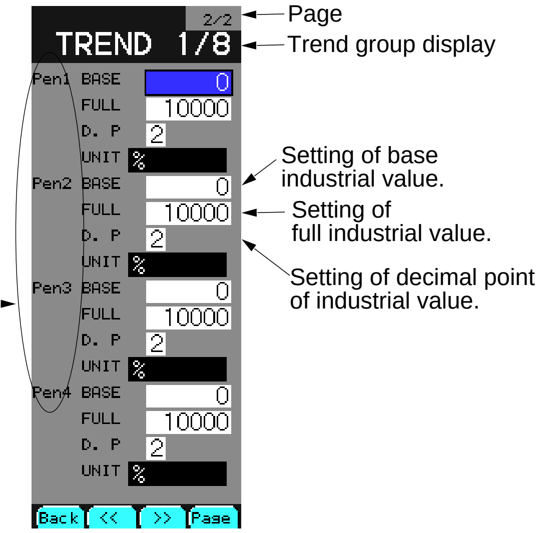
Note) The trend group corresponds to the title display on the screen (3/8 indicates the trend group 3). The trend display (real time/historical trend) set here is displayed on the TREND screen of MENU 1/3.

Description of screen



COMMAND RESET
INTERVAL 1SEC
LOG-TYPE FILL
SAMPLING POINT
Pen1 Pen1 0000
Pen2 Pen2 0000
Pen3 Pen3 0000
Pen4 Pen4 0000

Fig. 7-7-1 Trend setting screen (1/2 page)



Pen1 BASE 0
FULL 10000
D. P 2
UNIT %
Pen2 BASE 0
FULL 10000
D. P 2
UNIT %
Pen3 BASE 0
FULL 10000
D. P 2
UNIT %
Pen4 BASE 0
FULL 10000
D. P 2
UNIT %

Fig. 7-7-2 Trend setting screen (2/2 page)

Description of chameleon key

Page 1

Back	<<	>>	Page

Back : To return to the source screen.
<< : To move to the previous group.
>> : To move to the next group.
Page : To select page 1/2 or page 2/2 by key.

Page 2

>	▼	▲	Ent

[Display mode]

>	: To go to the setting modification mode.
▼	: To move the cursor downward.
▲	: To move the cursor upward
Ent	: To go to the setting modification mode.

[Setting modification mode]

>	: To shift the numerical change digit rightward.
▼	: To decrease the numerical value or change display items.
▲	: To increase the numerical value or change display items.
Ent	: To register the setting displayed on current screen.

Caution

- If the memory card is pulled out of the card slot during memory card logging, the logging data is temporarily saved in the buffer. When setting the memory card again, the logging data is recorded in the memory card. The internal buffer can save data of up to 200 samples at the time of POINT sampling. With MIN-MAX sampling, it can save up to 120 sampling data. If the amount of data is beyond the range, the buffer can erase sampling data in order from the past data.
- To remove the memory card, be sure to turn off the memory card with the memory card OFF switch. See 2.2, Names of Parts. If the memory card is carelessly removed by pressing the memory card remove button without turning off the power, the data saved in the card may be destroyed, thus it result in failure of reading and recording. In this case, insert the memory card into the card slot again and perform formatting of it. But, all of card data are cleared after formatting. (See 7.10.2 (4), IC card Support screen).
- If the sampling time interval has been set at 1 second, up to 16 points (4 trend groups) of data can be saved.
- If a memory card is used, data is written into the memory card when the write buffer is full with data. It corresponds to 6 point samplings or 4 MIN-MAX samplings. Namely, if the interval time is set at 1 hour, data will be written into the memory card every 6 hours in case of point sampling or every 4 hours in case of MIN-MAX sampling. If the trend has been started with the above setting, data will not first be recorded in the memory card after 1 hour but only after 6 hours (in case of point sampling). If, during this while, the memory card has been taken out and data is checked on PC, no data will exist in the card.
- If the memory card has no vacant space any longer, displaying "CARD-END", logging is started by replacing the memory card with a vacant one and changing the "CARD-END" to "START".
- Data will not be saved in the memory card even by changing the "CARD-END" to "START" with a memory card for which "CARD-END" has been displayed.

Description of each item (1/2)

Symbol	Item	Function	Setting range	Initial value during shipment
COMMAND	Command	It allows you to start, stop or reset the trend action. ① START (Trend start) It allows starting record of trend data. It also allows starting a write of the trend data into the memory card when an optional memory card is already inserted in the controller. ② STOP (Trend stop) It allows you to stop record of trend data. But, the recorded data and the settings are not cleared. ③ RESET (Trend data reset) It allows you to clear the data recorded so far. The settings (Pen) of logging type, sampling system and trend data pens 1 to 4 become valid by re-starting after resetting once. Note) Data will be cleared when changing has been made from RESET to START. Note) When performing data logging simultaneously by using the memory card, the data inside the memory card are held. ④ CARD_END (free capacity of memory card is short) It is displayed when free space of the memory card is short during memory data logging. When it is displayed, memory data logging is stopped. CARD_END cannot be set on a screen.	START/ STOP/ RESET	RESET
INTERVAL	Interval	It allows you to specify sampling time intervals for recording the trend data.	1,2,5,10, 15,30 SEC 1,2,5,10, 15,30 MIN 1,2 HOUR	1SEC
LOG-TYPE	Logging type	It allows you to select the logging types. ① FILL When the buffer is fill with as many trend data, data sampling stops, displaying “FULL END” on the trend display panel. ② ROUND Even when the buffer is full with as many trend data, sampling continues with new trend data overwriting the oldest trend data. Note) To change the logging type, set the LOG-TYPE and select the command “RESET”. Note) The number of data which can be accumulated in the buffer depends on the sampling method. "POINT" = 200 samplings. "MIN_MAX = 120 samplings. If, even in case of ROUND designation, the memory card is full, the memory card data will not be overwritten and the logging action will stop. In this case, the COMMAND display on the trend setting panel will turn "CARD_END". Resuming from "CARD_END" must be made via "RESET".	FILL/ROUND	FILL

Description of each item (2/2)

Symbol	Item	Function	Setting range	Initial value during shipment
SAMPLING	Sampling method	It allows you to select the sampling methods. ① POINT It performs a single data sampling at intervals. ② MIN-MAX It performs a single data sampling internally every 0.1 sec and records the MIN value and MAX value of the sampling data collected between sampling intervals as the trend data. Note) When an optional memory card is inserted, the number of maximum logging data depends on the capacity of the memory card. Note) To change the sampling method, press the RESET command.	POINT/MIN_MAX	POINT
TAG (PEN)	Tag number	It allows a tag of each pen to be set. The number of characters to be set is up to 4. A tag is specified by alphanumerical characters and special characters. For the setting of tags, refer to tag setting screen in item 7.12.2 (1). Up to 4 characters including alphanumerical characters and special characters.	Up to 4 characters including alphanumerical characters and special characters.	Pen 1 to 4
PEN 1 to 4	Trend data	It allows you to set trend data terminal codes. Note) To change the trend data, press the RESET command.	0000 to ffff	0000
BASE	Base scale of industrial value	It allows you to set base scales (industrial values) of each Pen data displayed at trend display (MENU 1/3). When the pen data is 0%, the Base Scale is displayed. Note) Do not set an equation as follows: BASE scale > FULL scale	-9999 to 32767	0
FULL	Full scale of industrial value	It allows you to set full scale (industrial values) of each Pen data displayed at trend display (MENU 1/3). When the pen data is 100%, the Full Scale is displayed. Note) Do not set an equation as follows: BASE scale > FULL scale	-999 to 32767	10000
D.P	Position of decimal point	It allows you to select decimal point position of each pen data displayed at trend display (MENU 1/3).	0 to 4	2
UNIT	Unit selection	It allows you to select units of each pen displayed at trend display (MENU 1/3). Select from Table 7.12.2 (2) unit list. A unit can be selected from 173 units registered in the table.	Select from Table 7.12.2 unit list	%

7.8 Alarm setting screen

This chapter describes the alarm setting screen.

7.8.1 Alarm setting screen

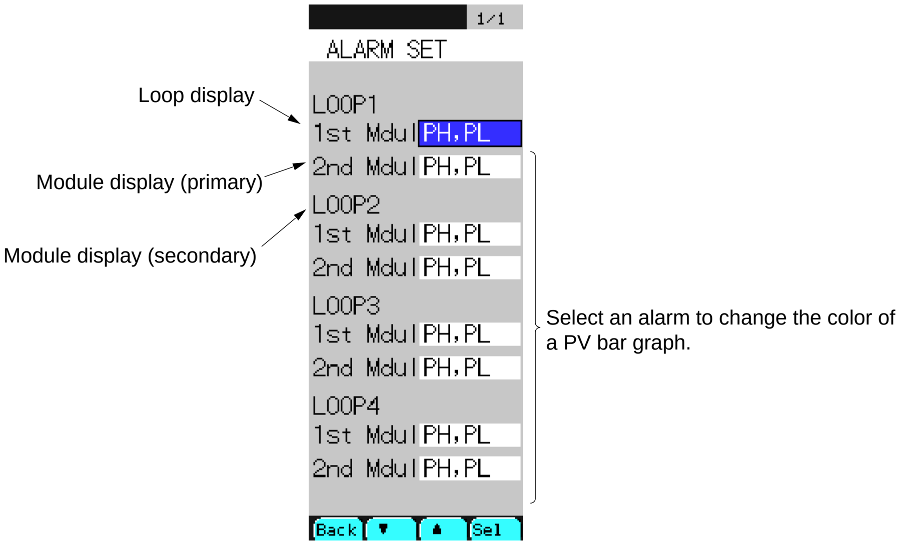
Select ALARM SETTING on MENU 2/3 to display the alarm setting screen.

Function of screen

Select an alarm that changes a color of the PV bar graph on the loop screen (1 LOOP, 2 LOOP, 4 LOOP and 8 LOOP screens). Selection of an alarm is performed for each module. The number of setting items is varied according to the number of loops (Figure below shows the screen with 4 loops.

When the setting alarm occurs, the PV bar graph turns from blue to red.

Description of screen



1/1

ALARM SET

LOOP1
1st Mdul PH,PL
2nd Mdul PH,PL

LOOP2
1st Mdul PH,PL
2nd Mdul PH,PL

LOOP3
1st Mdul PH,PL
2nd Mdul PH,PL

LOOP4
1st Mdul PH,PL
2nd Mdul PH,PL

Loop display

Module display (primary)

Module display (secondary)

Select an alarm to change the color of a PV bar graph.

Fig. 7-8-1 Alarm setting screen

Description of chameleon key

Page 1

Back	▼	▲	Sel

[Display mode]

Back : To return to the source screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : To go to the setting modification mode.

[Setting modification mode]

Back : To register the modified value.
▼ : To change the selection item.
▲ : To change the selection item.
Sel : To register the modified value.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
LOOP1 1st Mod 2nd Mod	Loop display First module Second module	None	None	None
	Alarm setting	It allows you to set an alarm that changes the PV bar graph on the loop screen. None : The color of a bar graph will remain when an alarm occurs. PH,PL : The bar graph will turn red when PH and PL alarms occur. DPH, DPL : The bar graph turn red when DPH and DPL occur. DH,DL : The bar graph will turn red when DH and DL alarm occur.	NONE/ PH,PL/ DPH, DPL/ DH,DL	NONE

7.9 DISP SETTING screen

It allows you to rearrange the order of displaying loops of the loop monitoring screens (1,2,4 and 8).

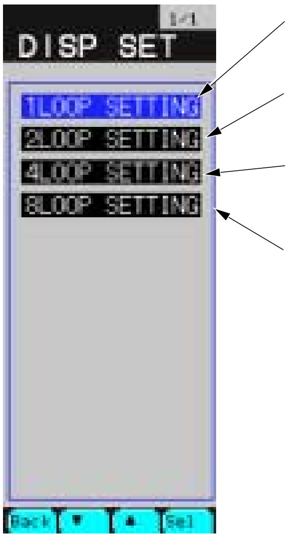
Since this controller is factory-set, useless monitor screens (loop screen) may also be displayed. It enables you to re-arrange the monitor display in order of importance.

7.9.1 DISPLAY setting screen

Function of screen

Re-arrange the display order and select one of the monitoring screens (1, 2, 4 and 8).

Description of screen



Change of the order displaying 1 LOOP monitor screen.

Change of the order displaying 2 LOOP monitor screen.

Change of the order displaying 4 LOOP monitor screen.

Change of the order displaying 8 LOOP monitor screen.

Fig. 7-9-1 DISP SETTING screen

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : To jump to the screen selected by the cursor.

7.9.2 1LOOP screen

Function of screen

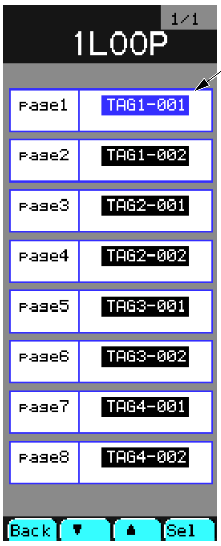
It allows you to select and set LOOP or wafer attributes such as PV, SV, MV and control mode displayed on each of 1LOOP monitor screens (page 1/8 to page 8/8), from the Tag list allocated to each LOOP.

The setting of tags displayed in the tag list should be performed on MENU 3/3 – CONFIGURATION-MODULE SETTING/WAFER SETTING.

Description of screen

* The display of tag list window to be used may be changed depending on the type you have purchased.

1 Control output	Loop attribute tag × 2, Wafer attribute tag × 8
2 Control outputs	Loop attribute tag × 4, Wafer attribute tag × 8
4 Control outputs	Loop attribute tag × 8, Wafer attribute tag × 8

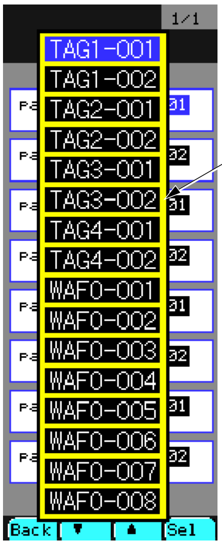


Page1	TAG1-001
Page2	TAG1-002
Page3	TAG2-001
Page4	TAG2-002
Page5	TAG3-001
Page6	TAG3-002
Page7	TAG4-001
Page8	TAG4-002

Module displayed on page 1.

Select any of the pages by ▲ or ▼ key and press the Sel key.

Fig. 7-9-2 1 LOOP screen



TAG1-001
TAG1-002
TAG2-001
TAG2-002
TAG3-001
TAG3-002
TAG4-001
TAG4-002
WAF0-001
WAF0-002
WAF0-003
WAF0-004
WAF0-005
WAF0-006
WAF0-007
WAF0-008

Tag list window

Fig. 7-9-3 Selecting from tag list

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : Open a tag list that is set for the item selected by the cursor to set. Select and set the item selected on the tag list window.

7.9.3 2LOOP screen

Function of screen

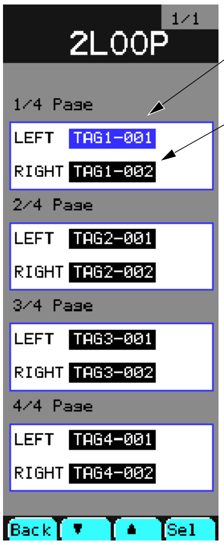
It allows you to select and set LOOP or wafer attributes such as PV, SV, MV and control mode displayed on each of 2LOOP monitor screens (page 1/4 to page 4/4), from the Tag list allocated to each LOOP.

The setting of tags displayed in the tag list should be performed on MENU 3/3 – CONFIGURATION-MODULE SETTING/WAFER SETTING.

Description of screen

* The display of tag list window to be used may be changed depending on the type you have purchased.

1 Control output	Loop attribute tag × 2, Wafer attribute tag × 8
2 Control outputs	Loop attribute tag × 4, Wafer attribute tag × 8
4 Control outputs	Loop attribute tag × 8, Wafer attribute tag × 8



2LOOP 1/1

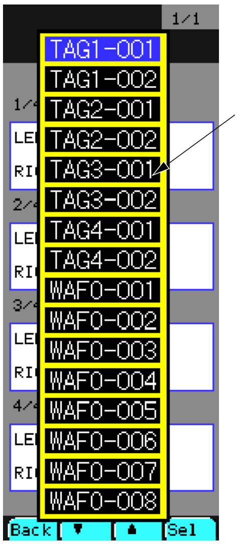
1/4 Page
LEFT TAG1-001
RIGHT TAG1-002
2/4 Page
LEFT TAG2-001
RIGHT TAG2-002
3/4 Page
LEFT TAG3-001
RIGHT TAG3-002
4/4 Page
LEFT TAG4-001
RIGHT TAG4-002

Module displayed on the left side of page 1/4.

Module displayed on the right side of page 1/4.

Select any of the pages by ▲ or ▼ key and press the Sel key.

Fig. 7-9-4 2 LOOP screen



TAG1-001
TAG1-002
TAG2-001
TAG2-002
TAG3-001
TAG3-002
TAG4-001
TAG4-002
WAF0-001
WAF0-002
WAF0-003
WAF0-004
WAF0-005
WAF0-006
WAF0-007
WAF0-008

Tag list window

Fig. 7-9-5 Selecting from tag list

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.

▼ : To move the cursor downward.

▲ : To move the cursor upward

Sel : Open a tag list that is set for the item selected by the cursor to set. Select and set the item selected on the tag list window.

7.9.4 4LOOP screen

Function of screen

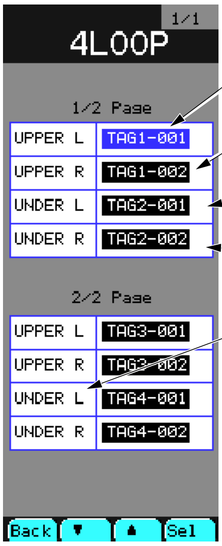
It allows you to select and set LOOP or wafer attributes such as PV, SV, MV and control mode displayed on each of 4LOOP monitor screens (page 1/2 to page 2/2), from the Tag list allocated to each LOOP.

The setting of tags displayed in the tag list should be performed on MENU 3/3 – CONFIGURATION-MODULE SETTING/WAFER SETTING.

Description of screen

* The display of tag list window to be used may be changed depending on the type you have purchased.

1 Control output	Loop attribute tag × 2, Wafer attribute tag × 8
2 Control outputs	Loop attribute tag × 4, Wafer attribute tag × 8
4 Control outputs	Loop attribute tag × 8, Wafer attribute tag × 8



Module displayed on the upper-left of page 1/2.

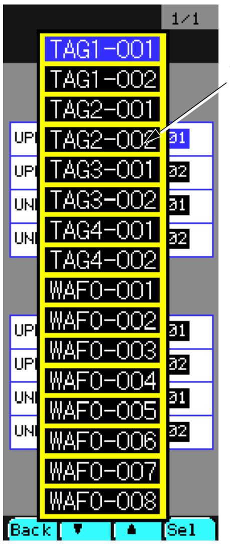
Module displayed on the upper-right of page 1/2.

Module displayed on the lower-left of page 1/2.

Module displayed on the lower-right of page 1/2.

Setting of page 2/2

Select any of the pages by ▲ or ▼ key and press the Sel key.



Tag list window

Fig. 7-9-6 4 LOOP screen

Fig. 7-9-7 Selecting from tag list

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.

▼ : To move the cursor downward.

▲ : To move the cursor upward

Sel : Open a tag list that is set for the item selected by the cursor to set. Select and set the item selected on the tag list window.

7.9.5 8LOOP screen

Function of screen

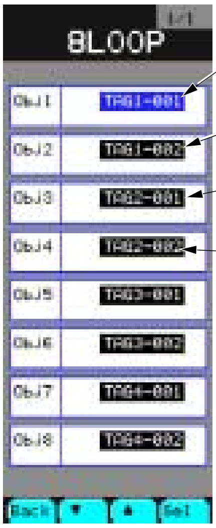
It allows you to select and set LOOP or wafer attributes such as PV and SV displayed on each of 8LOOP monitor screens, from the Tag list allocated to each LOOP.

The setting of tags displayed in the tag list should be performed on MENU 3/3 – CONFIGURATION-MODULE SETTING/WAFER SETTING.

Description of screen

* The display of tag list window to be used may be changed depending on the type you have purchased.

1 Control output	Loop attribute tag × 2, Wafer attribute tag × 8
2 Control outputs	Loop attribute tag × 4, Wafer attribute tag × 8
4 Control outputs	Loop attribute tag × 8, Wafer attribute tag × 8



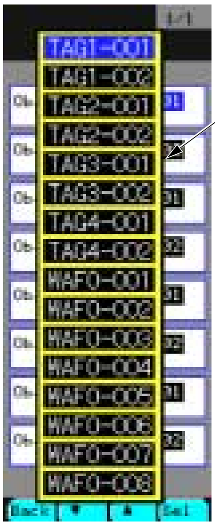
Module displayed on the top

Module displayed at the second stage from the top

Module displayed at the third stage from the top

Module displayed at the fourth stage from the top

Select any of the pages by ▲ or ▼ key and press the Sel key.



Tag list window

Fig. 7-9-8 8 LOOP screen

Fig. 7-9-9 Tag list window (Selecting from tag list)

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.

▼ : To move the cursor downward.

▲ : To move the cursor upward

Sel : Open a tag list that is set for the item selected by the cursor to set.
Select and set the item selected on the tag list window.

7.10 Control panel

7.10.1 Outline

Description of each item

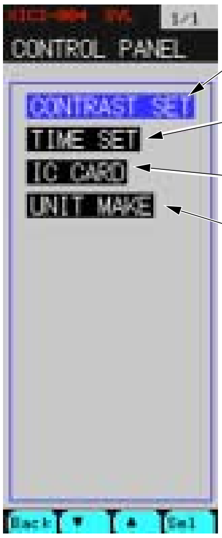
It provides several kinds of menus on the screen that support auxiliary functions of the controller.

Symbol	Item	Function
CONTRAST SET	Contrast setting screen	To adjust the contrast on the LCD screen.
TIME SET	Time setting screen	To set the control clock.
IC CARD	IC card support screen	To support the IC card
UNIT MAKE	Unit make screen	To make user’s unit to use

7.10.2 Description of each screen

(1) Control panel menu

Desctiption of screen



To jump to the contrast set screen.

To jump to the time set screen.

To jump to the IC card · upport screen.

To jump to the unit make screen.

Fig. 7-10-1 Control panel menu screen

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : To jump to the screen selected by the cursor.

(2) Contrast setting screen

Description of screen

It allows you to adjust LCD contrast.

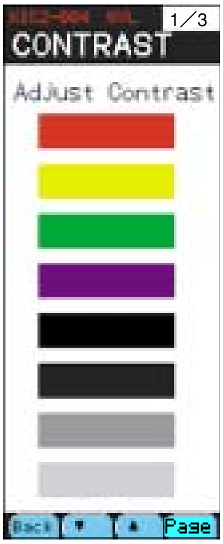


Fig. 7-10-4 Page 1

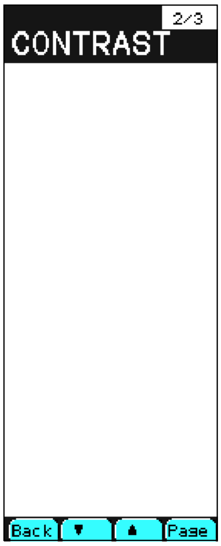


Fig. 7-10-5 Page 2

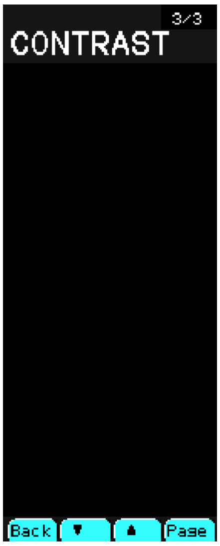


Fig. 7-10-6 Page 3

Description of chameleon key

Page 1

Back	▼	▲	Page

Back : To return to the source screen.
▼ : To turn down the contrast (the screen display is darken).
▲ : To turn up the contrast (the screen display is brighten).
Page : To advance a page to the contrast setting screen.

Supplement

If the screen becomes blank during operation, take the following steps:

1) Press the MENU key.
2) Hold down the MENU key and Chameleon Select keys ◌ at the same time. (About 20 seconds will be required until the screen restores to a normal state). However, the contrast adjustment value will not be saved even by adjusting the contrast or fixing. To save the contrast adjustment value, adjust the contrast temporarily by the above procedure. Then, make re-adjustment of the contrast on the Contrast Set screen and perform fixing.

(3) Time set screen

Description of screen

It is used to set the time of the controller clock.

TIME SET

1/1

year/month/day

1998/12/28

hour/min/sec

01:15:31

Fig. 7-10-5 Time setting screen

Description of chameleon key

Page 1

>	▼	▲	Ent

> : Select the item (year, month, day, hour, minute, second).
▼ : To increase numerical value.
▲ : To decrease numerical value.
Ent : Display mode → The modification mode is set.
Modification mode → Current value is registered.

Page 2

Back			

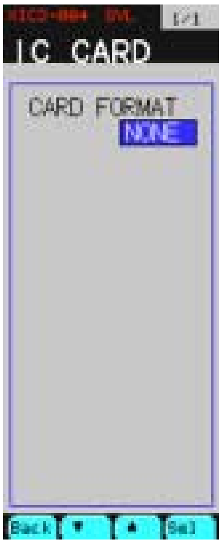
Back : To return to the source screen.

Note: The built-in clock may procedure an error of 1 second or less every time you turn ON/OFF the controller power

(4) IC card · support screen

Description of screen

It provides auxiliary functions to use the IC card for the controller.



CARD FORMAT NONE

Fig. 7-10-6 IC card support screen

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source menu.
▼ : To change the status of an item.
▲ : To change the status of an item.
Sel : To select an item or start to execute the commands.

Meaning of display

Display	Display color	Function
NONE	Blue	IC card is not inserted.
READY	Blue	IC card is inserted. Formatting is ready.

Procedure of formatting the IC card

Step	Key operation	Display	Display color	Function
1	Press “Sel”.	READY	Yellow	Selecting item to format.
2	Press “ ▲ ”.	WAIT	Yellow	Format start command
3	Press “Sel”.	WAIT	Blue	Formatting is started. Formatting.
4	———	READY	Blue	Formatting is ended.

Note
- When formatting IC cards, the WAIT message may be displayed for more than one minute. But, it will generally disappear in a several seconds.
- IC card formatted by CC-M should be used. If IC card formatted by PC is used, it may result in an error.
- Don’t remove IC card from CC-M during formatting, or otherwise it may result in damage to the IC card.

(5) Unit make screen

Description of screen

It is used when making units which are not included in the controller.

The controller provides capability of defining up to 10 units for user definitions.

1/1

Unit List

UNIT01 Kg/hour
UNIT02 l/min
UNIT03
UNIT04
UNIT05
UNIT06
UNIT07
UNIT08
UNIT09
UNIT10

10 kinds of units capable of definition.

Units defined by the user.

Fig. 7-10-7 Unit make screen

Description of chameleon key

Page 1

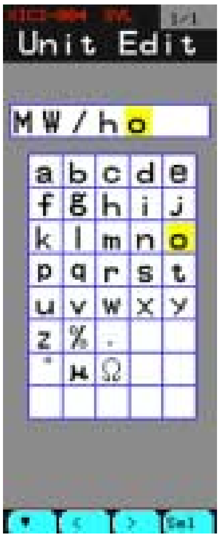
Back	▼	▲	Sel

Back : To return to the source menu.
▼ : To move the cursor downward.
▲ : To move the cursor upward.
Sel : To jump to the unit make screen selected by the cursor.

Description of unit make screen

To display the following unit edit screen, select the unit you want to make or modify on the unit make screen and then press the Sel key.

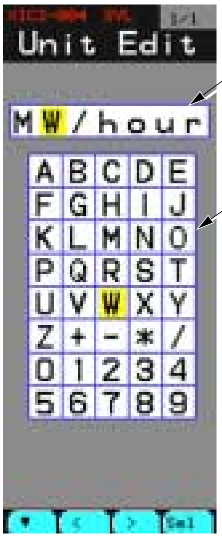
Unit edit screen


Unit Edit

MW/ho

a	b	c	d	e
f	g	h	i	j
k	l	m	n	o
p	q	r	s	t
u	v	w	x	y
z	%	.		
°	µ	Ω		

Fig. 7-10-8 <Page 1/2>


Unit Edit

MW/hour

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y
Z	+	-	*	/
0	1	2	3	4
5	6	7	8	9

To make units on this window.

To select any of characters.

Fig. 7-10-9 <Page 2/2>

Description of chameleon key

Page 1

▼	<	>	Sel

▼ : To move the cursor downward.
When you press this button at the bottom, the cursor moves to the top on the same row.

< : To move the cursor leftward.
When you press this button at theleft end, the cursor moves to another screen.

> : To move the cursor rightward.
When you press this button at the right end, the cursor moves to another screen.

Sel : Type any of characters selected by the cursor.

Page 2

Ent	Cncl		

Ent : To register the character string you made as unit.

Cncl : To return to the source screen by canceling edit.

7.11 SYSTEM SETTING screen

This chapter describes the basic setting for the system operation of the controller on the system setting screen (It contains 6 pages in all.)

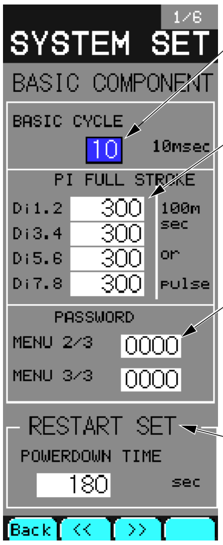
7.11.1 BASIC COMPONENT screen

It allows you to perform the basic setting for the system operation of the controller.

Function of screen

It is used to perform various settings for the controller basic operation.

Description of screen



Basic cycle (cycle settig for wafer operations)
Setting range : 10 to 50ms

PI input full stroke running time

Password setting up
Set up passwords to make Menu 2 and 3 valid.

Power down time
Continuous start/stop time

Fig. 7-11-1 System setting screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source menu.
<< : To advance to the next page.
>> : To return to the previous page.

Page 2

>	▼	▲	Ent

> : To switch to the set mode.
The setting digit moves to the right.

▼ : To move the cursor downward.
Numerical value of the selection digit decreases.

▲ : To move the cursor upward.
Numerical value of the selection digit increases.

Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
BASIC CYCLE	Basic cycle	Basic cycle for wafer operation is set. Wafer operation is performed at intervals of the time setting value herein. If the number of wafers to be used is great, and running time is insufficient, increase the set value. *3	10 to 50 100 to 500ms	20
PI-FULL STROKE DI1, 2 DI3, 4 DI5, 6 DI7, 8	PI full stroke	PI 1 full stroke running time setting *1 PI 2 full stroke running time setting *1 PI 3 full stroke running time setting *1 PI 4 full stroke running time setting *1	Entry of pulse number: 100 to 10000 Entry of pulse width: 1 to 2000 (Corresponding to 0.1 to 200 sec)	300
PASSWORD	Password setting	User password		
MENU 2/3		Setting for menu 2/3	0000 to ffff	0000
MENU 3/3		Setting for menu 3/3	0000 to ffff	0000
POWERDOWN TIME	Power down time	Power failure time capable of continuous start *2	0 to 32767 sec. *4	180

*1 DI 1 (+) and DI2 (-), DI 3 (+) and DI4 (-), DI 5 (+) and DI6 (-), DI 7 (+) and DI8 (-)

The pulse number or the pulse width should be entered by a combination of symbols given above. As results of pulse entry, the pulse number is stored in the terminal codes of 0010 to 0013 and the pulse widths are stored in 0014 to 0017.

In case of entry of pulse number:

Entry value (%) = entered pulse number ／ set value × 100(%)

In case of entry of pulse width:

Entry value (%) = entered pulse width (sec) ／ [set value × 0.1 (sec)] × 100(%)

Entry values above are once stored at the basic cycle.

If numerical values are set beyond the range of 1 to 2000 when entering pulse width, they are limited to the specified range.

*2 When the power is interrupted for a several seconds, the settings for performing continuous starts should be performed in units of seconds.

When it set to the INIT/CONT SW-CONT side at the front interior panel of the controller and the time of power interruption is set in a second or less, the controller will perform continuous start. (In other cases, it will perform an initial start).

Continuous start	:	Controls continuously from the condition just before the power interruption occurs during the restoration of power
Initial start	:	Controls from the initial stage during the power restoration.

* 3 Basic cycle setting sets the cycle of control calculation executed in the mainframe and output update cycle. Namely, if setting is 500 ms (50) for example, a control calculation is made every 500 ms and its result is outputted.

* 4 If 32767 sec is set, “CONT” is indicated. In this case, controller starts at continuous start mode independent of power interrupt.

7.11.2 ALARM SET screen

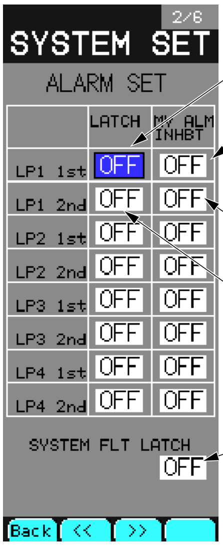
It allows you to specify whether an output of alarm/fault is latched.

Function of screen

It sets with ON/OFF whether to latch the status of an alarm or a fault that occurs.

The setting can latch alarms for PVH, PVL, DPH, DPL, DVH and DVL.

Description of screen



	LATCH	MV ALM INHBT
LP1 1st	OFF	OFF
LP1 2nd	OFF	OFF
LP2 1st	OFF	OFF
LP2 2nd	OFF	OFF
LP3 1st	OFF	OFF
LP3 2nd	OFF	OFF
LP4 1st	OFF	OFF
LP4 2nd	OFF	OFF

SYSTEM FLT LATCH OFF

To secify the alarm latch of the first PID on LOOP1.

To secify the MV alarm inhibit of the first PID on LOOP1.

To secify the MV alarm inhibit of the second PID on LOOP1.

To secify the alarm latch of the second PID on LOOP1.

To specify a latch of a system fault.

Fig. 7-11-2 Alarm setting screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source menu.
<< : To advance to the next page.
>> : To return to the previous page.

Page 2

>	▼	▲	Ent

> : To switch to the set mode.
The setting digit moves to the right.
▼ : To move the cursor downward.
Numerical value of the selection digit decreases.
▲ : To move the cursor upward.
Numerical value of the selection digit increases.
Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
LP1 1st–LATCH	Alarm latch	Alarm latch yes/no setting on the loop 1 primary	ON/OFF	OFF
LP1 2nd–LATCH		Alarm latch yes/no setting on the loop 1 secondary		
LP2 1st–LATCH		Alarm latch yes/no setting on the loop 2 primary		
LP2 2nd–LATCH		Alarm latch yes/no setting on the loop 2 secondary		
LP3 1st–LATCH		Alarm latch yes/no setting on the loop 3 primary		
LP3 2nd–LATCH		Alarm latch yes/no setting on the loop 3 secondary		
LP4 1st–LATCH		Alarm latch yes/no setting on the loop 4 primary		
LP4 2nd–LATCH		Alarm latch yes/no setting on the loop 4 secondary		
LP1 1st–MV ALM INH	MV Alarm inhibit	MV alarm inhibit setting on the loop 1 primary *1		
LP1 2nd–MV ALM INH		MV alarm inhibit setting on the loop 1 secondary		
LP2 1st–MV ALM INH		MV alarm inhibit setting on the loop 2 primary		
LP2 2nd–MV ALM INH		MV alarm inhibit setting on the loop 2 secondary		
LP3 1st–MV ALM INH		MV alarm inhibit setting on the loop 3 primary		
LP3 2nd–MV ALM INH		MV alarm inhibit setting on the loop 3 secondary		
LP4 1st–MV ALM INH		MV alarm inhibit setting on the loop 4 primary		
LP4 2nd–MV ALM INH		MV alarm inhibit setting on the loop 4 secondary		
SYSTEM FLT LATCH	Fault latch	Latch (yes/No) setting for system falut		

*1 When the MV alarm inhibit setting is ON, occurrence of the MV upper/lower alarm is inhibited. The MV values are limited within MV_H/MV_L.

7.11.3 SETTING LOCK screen

It allows you to make the keys invalid on each loop screen to prevent maloperation of the SV (set value), MV (manipulated variable) and operation mode.

Function of screen

It specifies whether or not to indicate the setting lock with ON/OFF for the primary and/or secondary module(s) of each loop.

Description of screen

SETTING LOCK

LOOP1 1st	OFF
LOOP1 2nd	OFF
LOOP2 1st	OFF
LOOP2 2nd	OFF
LOOP3 1st	OFF
LOOP3 2nd	OFF
LOOP4 1st	OFF
LOOP4 2nd	OFF

Specify whether or not to indicate the setting lock with ON/OFF on the LOOP1 primary.

Specify whether or not to indicate the setting lock with ON/OFF on the LOOP1 secondary.

Fig. 7-11-3 Setting lock screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source menu.

<< : To advance to the next page.

>> : To return to the previous page.

Page 2

>	▼	▲	Ent

> : To switch to the setting mode.

▼ : To move the cursor downward.

▲ : To move the cursor upward.

Ent : To switch to the setting mode. <in the selection mode>
The selection mode is switched as the current setting remains valid.
<in the setting mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
LOOP1 1st LOOP1 2nd LOOP2 1st LOOP2 2nd LOOP3 1st LOOP3 2nd LOOP4 1st LOOP4 2nd	Setting lock	ON: Operation is locked. The mode modification keys such as SV ▼▲ keys , MV ▼▲ keys and alphabetical characters including C, A, M cannot be accessed to locked loops. OFF: Operation lock is released.	ON/OFF	OFF

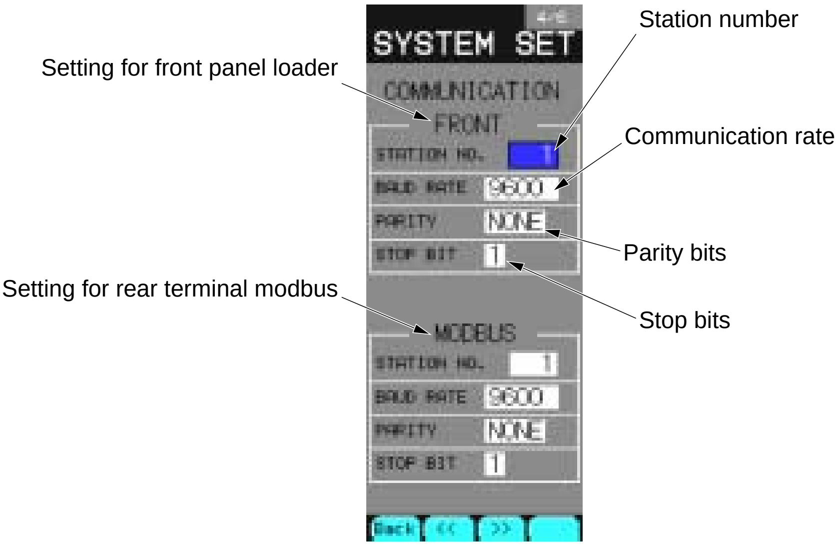
7.11.4 COMMUNICATION screen

It allows you to set the communication conditions between the front panel loader and the rear terminal modbus.

Function of screen

It provides capabilities of setting the communications conditions such as station number, communication rate, parity bits, and stop bits between the front loader and rear terminal modbus.

Description of screen



SYSTEM SET
COMMUNICATION

FRONT
STATION NO. 1
BAUD RATE 9600
PARITY NONE
STOP BIT 1

MODBUS
STATION NO. 1
BAUD RATE 9600
PARITY NONE
STOP BIT 1

Fig. 7-11-4 Communication condition setting screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source menu.
<< : To advance to the next page.
>> : To return to the previous page.

Page 2

>	▼	▲	Ent

> : To switch to the set mode.
The setting digit moves to the right.

▼ : To move the cursor downward.
Numerical value of the selection digit decreases.

▲ : To move the cursor upward.
Numerical value of the selection digit increases.

Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
SATION No.	Station number	Communication station number is set. *1	1 to 255	1
BAUD RATE	Communication rate	Communication rate is set. *2		
		FRONT………………………	9600	9600
		MODBUS…………………	19200	19200
PARITY	Parity	Parity bit setting	NONE, EVEN, ODD	NONE
STOP BIT	Stop bit	Stop bit setting	0 to 2	1

*1 For the settings for the loader and rear terminal modbus, the same station number is used.
The physical limit number connectable on the same line is up to 31 stations.

*2 A unit of communication rate is bps.

Note: It is necessary to do “FIX” procedure and to turn on power after power off, in order that communication settings shown as Table will be valid.

7.11.5 AI CHECK SET screen

It allows you to specify an occurrence of a fault with ON/OFF when values by analog inputs (PV1, 2, AI 1 to 6) and direct inputs exceed the normal range. AI1 to AI 6 can be set.

Function of screen

When values by analog input and direct input are entered over the normal range, it provides capabilities of selecting an occurrence of a fault with ON or OFF for each input.

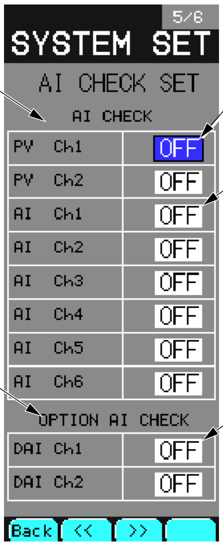
A check range is as follows. With the setting ON, it enables an fault to occur if an input value exceeds the range.

Description of screen

Input	Range	Check range
Voltage input	1 to 5VDC	-12.5 to 112.5%
	0 to 5VDC	112.5% on the up side only
	0 to 10VDC	112.5% on the up side only
Direct input	TC, PT	112.5% of input range

Setting for PV1, 2
AI1 to 6

Setting for direct
input 1ch to 2ch



AI CHECK SET

AI CHECK

PV Ch1	OFF
PV Ch2	OFF
AI Ch1	OFF
AI Ch2	OFF
AI Ch3	OFF
AI Ch4	OFF
AI Ch5	OFF
AI Ch6	OFF

OPTION AI CHECK

DAI Ch1	OFF
DAI Ch2	OFF

Specifying fault detection
with ON or OFF in the input
range of PV1ch

Specifying fault detection
with ON or OFF in the input
range of AI 1ch
Beyond the range of -12.5 to 112.5%

Specifying fault detection
with ON or OFF in the direct
input 1ch
Beyond the range of -5 to 105%

Fig. 7-11-5 Analog setting screen

Description of chameleon key

Page 1

Back	＜＜	＞＞	

Back : To return to the source menu.
＜＜ : To advance to the next page.
＞＞ : To return to the previous page.

Page 2

＞	▼	▲	Ent

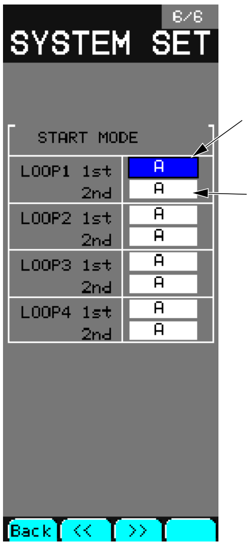
＞ : To switch to the set mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward.
Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
PVch1 ch2	AI check specification	Setting the ON/OFF of fault detection in the input range of PV ch1 and ch2	ON/OFF	OFF
AIch1 to ch2		Setting the ON/OFF of fault detection in the input range of AI ch1 and ch6		
DAIch1 ch2		Setting the ON/OFF of fault detection in the input range of direct input ch1 and ch2 ON : If an input value is -5% or less or 105% or more, DAI check fault function will work.		

7.11.6 START MODE screen

It allows you to specify the start mode for each loop when the controller power is turned on. The mode setting set in this screen becomes valid when the power ON condition switch [AUT] (Auto) shown on Section 2.2 “Names of each part” is set.



START MODE

LOOP1 1st A
2nd A
LOOP2 1st A
2nd A
LOOP3 1st A
2nd A
LOOP4 1st A
2nd A

To specify mode when starting loop1 primary.

To specify mode when starting loop1 secondary.

A : To start in the auto mode.
C : To start in the remote mode and cascade mode.
M : To start the manual mode.

＊On the primary, the manual mode can not be set.

Fig. 7-11-6 Start mode screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source menu.
<< : To move to the next page.
>> : To move to the previous page.

Page 2

>	▼	▲	Ent

> : To switch to the setting mode.
▼ : To move the cursor downward.
To change the selection item.
▲ : To move the cursor upward.
To change the selection item.
Ent : To switch to the setting mode. <in the selection mode>
To switch to the selection mode. <in the setting mode>

7.12 Configuration settting

7.12.1 Configuration menu screen

Select CONFIGURATION from Menu 3/3 to display the configuration menu screen.

Function of screen

It is used for switching to 7 types of configuration screens.

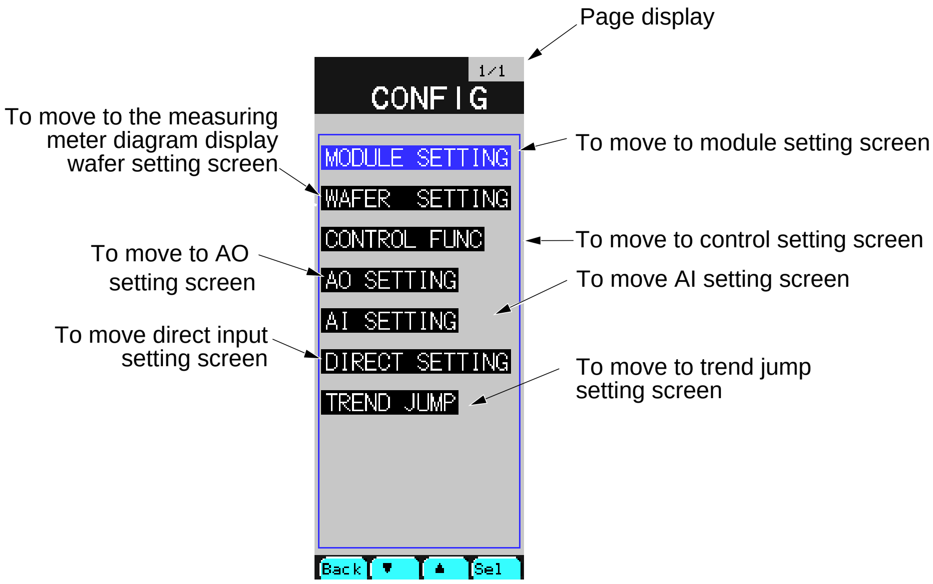


Fig. 7-12-1 Configuration menu screen

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Sel : To jump to the screen selected by the cursor.

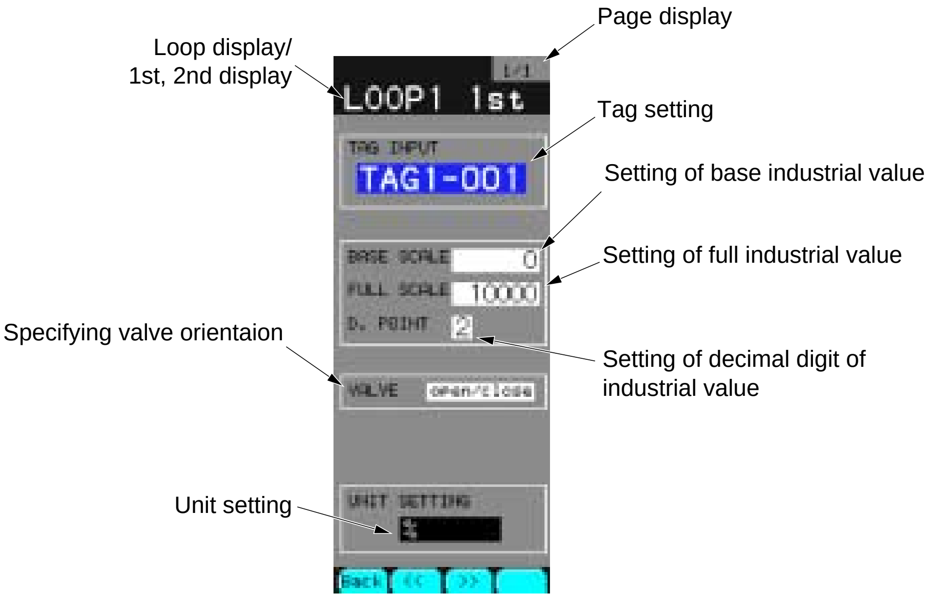
7.12.2 Module setting screen

Select MODULE SETTING from the configuration menu to display the module setting screen. It contains the screens for 4 loops.

Function of screen

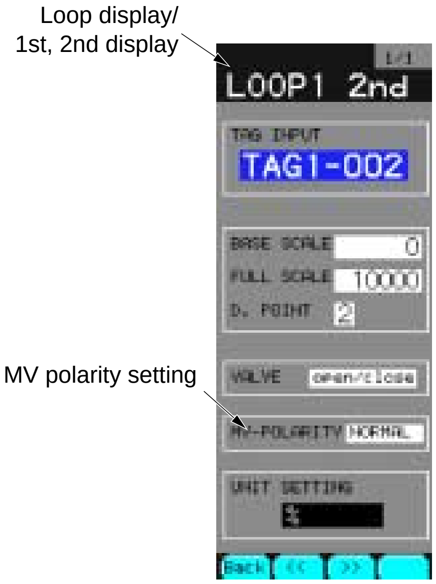
It is used to set the first module and second module.

Description of screen



1/1
LOOP1 1st
TAG INPUT
TAG1-001
BASE SCALE 0
FULL SCALE 10000
D. POINT 2
VALVE open/close
UNIT SETTING
%

Fig. 7-12-2 First module setting screen



1/1
LOOP1 2nd
TAG INPUT
TAG1-002
BASE SCALE 0
FULL SCALE 10000
D. POINT 2
VALVE open/close
MV-POLARITY NORMAL
UNIT SETTING
%

Fig. 7-12-3 Second module setting screen

Description of chameleon key

Page 1

Back	＜＜	＞＞	

Back : To return to the source screen.
＜＜ : To move to the next page.
＞＞ : To move to the previous page.

Page 2

＞	▼	▲	Ent

＞ : To switch to the set mode.
The setting digit moves to the right.

▼ : To move the cursor downward.
Numerical value of the selection digit decreases.

▲ : To move the cursor upward.
Numerical value of the selection digit increases.

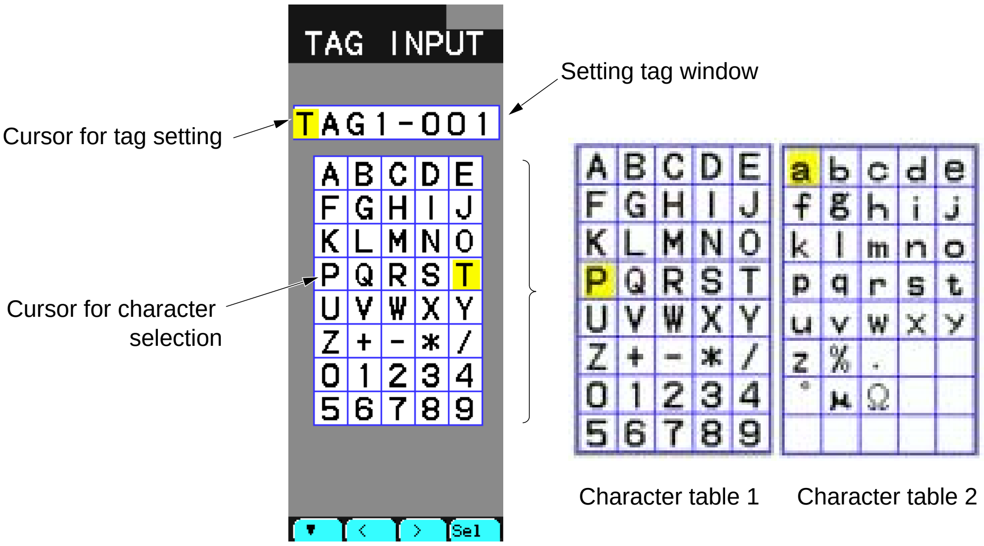
Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
TAG INPUT	Tag number	It sets a tag number of each module displayed on the LOOP screen or setting screen. The tag number can contain up to 8 characters. A tag is specified by alphanumerical characters and special characters. For the setting of tags, refer to tag setting screen in item 7.12.2 (1). Up to 8 characters including alphanumerical characters and special characters	Up to 8 characters including alphanumerical characters and special characters	—
BASE SCALE	Base scale of industrial value	A base scale of PV and SV is set with any values other than the decimal point. When PV and SV is 0%, the base scale is displayed. Note)Do not set an equation as follows: BASE SCALE>FULL SCALE	-9999 to 32767	0
FULL SCALE	Full scale of industrial value	It sets a full scale of PV and SV with any values other than the decimal point. When PV and SV is 100%, the full scale is displayed. Note)Do not set an equation as follows: BASE SCALE>FULL SCALE	-9999 to 32767	10000
D.POINT	Position of decimal point	It sets decimal point positions for display scales of PV and SV	0 to 4	2
VALVE	Valve orientation	It switches O/C displayed at 0% or 100% position of the MV scale of 1LOOP, 2LOOP and 4LOOP screens. OPEN/CLOSE: 0%=C, 100%=O CLOSE/OPEN: 0%=O, 100%=C	OPEN/CLOSE CLOSE/OPEN	OPEN/ CLOSE
MV_POLARITY (2nd loop alone is displayed.)	Polarity setting of MV output	It sets MV output polarity. Actions of MV indication and PV indication can be identified by the setting. NORMAL : MV output 0% =4mA : MV output 100% =20mA REVERSE : MV output 0% =20mA : MV output 100% =4mA Note)The settings do not involves switching of NORMAL and REVERSE for PID parameters.	NORMAL, REVERSE	NORMAL
UNIT SETTING	Unit selection	It sets units for each module displayed on the LOOP screen or Setting screen. Select from Table 7.12.2 (2), unit list A unit can be selected from 173 units registered in the Unit table.	Select from Table 7.12.2 (2), unit list	%

(1) Tag number setting screen

It allows you to set tag numbers containing up to 8 characters for each module. Point the cursor to the TAG INPUT on the module setting screen and press the Ent key to display the tag number setting screen.



TAG1-001

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y
Z	+	-	*	/
0	1	2	3	4
5	6	7	8	9

a	b	c	d	e
f	g	h	i	j
k	l	m	n	o
p	q	r	s	t
u	v	w	x	y
z	%	.		
°	µ	Ω		

Fig. 7-12-4 Tag setting screen

Description of chameleon key

Page 1

▼	<	>	Sel

▼ : To move the character selection cursor downward.

< : To move the character selection cursor to the left. When the cursor is positioned at the left end, it is moved to the right end of the next page.

> : To move the character selection cursor to the right. When the cursor is positioned at the right end, it is moved to the left end of the next page.

Sel : ① To move the tag setting cursor to the next digit.

② Set the characters selected by the character selection cursor at the digit selected by the tag setting cursor to move the tag selection digit to the right by one.

Page 2

Ent	Cncl		

Ent : To register tags of the tag setting window with new tags, and to return to the module setting screen.

Cncl : To return to the module setting screen without registering tags.

(2) Unit setting screen

It allows you to set units of each module.

Point the cursor to UNIT SETTING on the module setting screen and press the Ent key to display

Description of screen

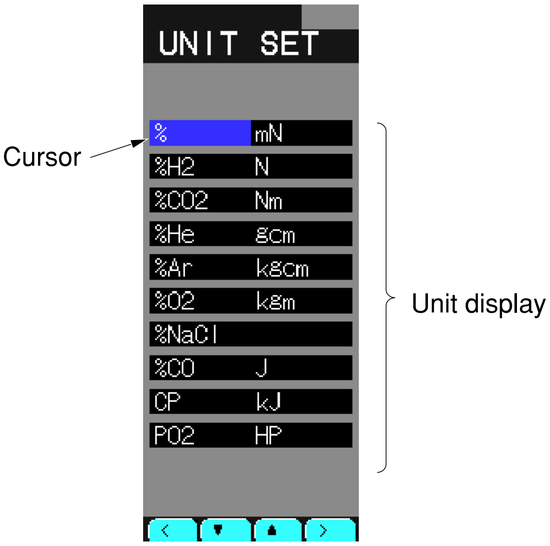


Fig. 7-12-5 Wafer output monitor screen

Description of chameleon key

Page 1

<	▼	▲	>

< : To move the unit selection table to the left by one column.

▼ : To move the unit selection table downward.

▲ : To move the unit selection table upward.

> : To move the unit selection table to the right by one column.

Page 2

Cncl			Ent

Cncl : To return to the module setting screen without registering the selected units.

Ent : Register selected units with new one, and to return to the module setting screen.

7.12.3 Instrument graphic display wafer setting screen

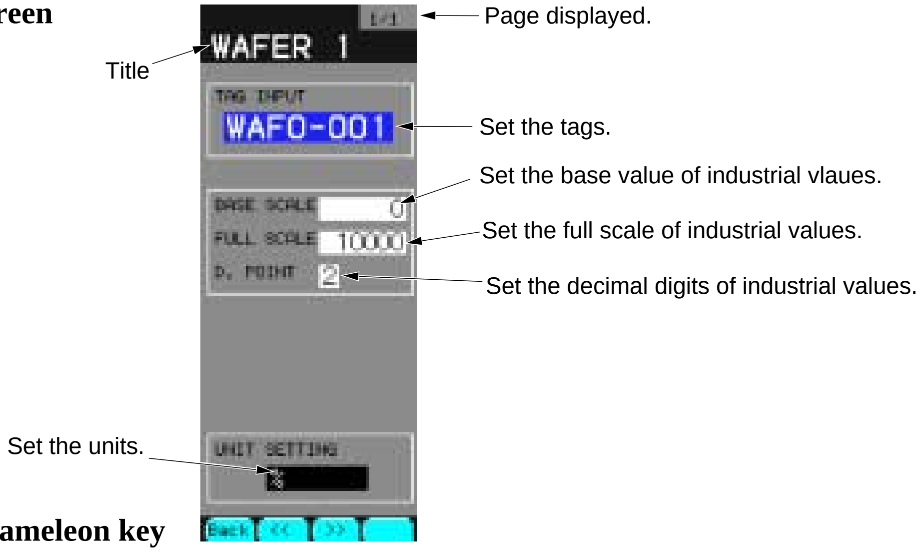
Select WATER SETTING from the configuration menu to display the instrument graphic display wafer setting screen.

Function of screen

It allows you to set the tags or units for displaying the wafer inputs on the LOOP screen. This screen corresponds to the instrument graphic display wafers given below.

Screen title (Wafer name)	Corresponding instrument graphic display wafer function codes	Screen title (Wafer name)	Corresponding instrument graphic display wafer function codes
WAFER 1 (LOOPDSP1)	EF	WAFER 5 (LOOPDSP5)	F3
WAFER 2 (LOOPDSP2)	F0	WAFER 6 (LOOPDSP6)	F4
WAFER 3 (LOOPDSP3)	F1	WAFER 7 (LOOPDSP7)	F5
WAFER 4 (LOOPDSP4)	F2	WAFER 8 (LOOPDSP8)	F6

Description of screen



WAFER 1

TAG INPUT
WAF0-001

BASE SCALE 0
FULL SCALE 10000
D. POINT 2

UNIT SETTING
%

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source screen.
<< : To move the previous page.
>> : To move the next page.

Page 2

>	▼	▲	Ent

\> : To switch to the set mode.
The setting digit moves to the right.

▼ : To move the cursor downward.
Numerical value of the selection digit decreases.

▲ : To move the cursor upward.
Numerical value of the selection digit increases.

Ent : To switch to the set mode. (in the set mode)
Or to switch to the set mode. (in the select mode)

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
TAG INPUT	Tag number	It sets a tag number of each module displayed on the LOOP screen or setting screen. The tag number can contain up to 8 characters. A tag is specified by alphanumerical characters and special characters. For the setting of tags, refer to tag setting screen in item 7.12.2 (1). Up to 8 characters including alphanumerical characters and special characters	Up to 8 characters including alphanumerical characters and special characters	—
BASE SCALE	Base scale of industrial value	A base scale of PV and SV is set with any values other than the decimal point. When PV and SV is 0%, the base scale is displayed. Note)Do not set an equation as follows: BASE SCALE>FULL SCALE	-9999 to 32767	0
FULL SCALE	Full scale of industrial value	It sets a full scale of PV and SV with any values other than the decimal point. When PV and SV is 100%, the full scale is displayed. Note)Do not set an equation as follows: BASE SCALE>FULL SCALE	-9999 to 32767	10000
D.POINT	Position of decimal point	It sets decimal point positions for display scales of PV and SV	0 to 4	2
UNIT SETTING	Unit selection	It sets units for each module displayed on the LOOP screen or Setting screen. Select from Table 7.12.2 (2), unit list	Select from Table 7.12.2 (2), unit list	%

Note) For the TAG setting, see 7.12.2 (1), “Tag number Setting screen”. For the unit setting, see 7.12.2 (2), “Unit Setting screen”.

Note) The settings of industrial values (BASE SCALE/FULL SCALE/DIMENSION) are valid for the only display of PV/SV numerical values. (The display of PV/SV/MV graphs and the display of MV numerical values are within 0 to 100% scale regardless of the setting).

Settable unit list

A list contains 173 units and it also provides capabilities of creating anther 10 units.
Note) To create the units, select UNIT MAKE from Menu 2/3, CONTROL PANEL.

℃	t / day	t / h	t / min	t / sec	mmH$_2$O	mg / cm^2	mPa	mm	ml	mm^2	g / cm^3
˚F	kg / day	kg / h	kg / min	kg / sec	mH$_2$O	g / cm^2	Pa	cm	l	cm^2	kg / cm^3
	g / day	g / h	g / min	g / sec	mHg	kg / cm^2	kPa	m	kl	m^2	g / m^3
	Nm^3 / day	Nm^3 / h	Nm^3 / min	Nm^3 / sec	cmHg		MPa				kg / m^3
	m^3 / day	m^3 / h	m^3 / min	m^3 / sec	mHg	N / mm^2			mm^3		t / m^3
	Nl / day	Nl / h	Nl / min	Nl / sec	mmAq	N / m^2			cm^3	g	g / l
%RH	l / day	l / h	l / min	l / sec					m^3	kg	kg / l
Vol%	cc / day	cc / h	cc / min	cc / sec	mbar	pai				t	g / ml
					bar	Torr			cc		
*	*	*	*	*	*	*	*	*	*		

ppm	%	mN	mm / sec	rps	μsec	mV	W	μF	kcal	cps	Pa.S
ppmNH$_3$	%H$_2$	N	mm / min	rpm	msec	V	kW	F	cal	cpm	mPa.S
ppmSO$_2$	%CO$_2$	Nm	mm / h	rph	sec	kV	VA	mH	kcal / m^3	μSv / h	
ppmH$_2$S	%He	gcm	m / sec		min	μA	kVA	H		mSv / h	
ppmCO	%Ar	kgcm	m/ min	m / sec^2	h	mA	Var	C	lx	nGy / h	
ppmO$_2$	%O$_2$	kgm	m / h	rad / sec		A	kVar	mΩ	cd	μGy / h	
ppmNOx	%NaCℓ		km / h				Ωcm	Ω	lm	μm	
ppb	%CO	J				A / T	kΩcm	kΩ	cd / m^2	g / m^2	
pH	CP	kJ				Hz	MΩcm	MΩ			
mol	PO$_2$	HP				db	μS / cm	μ			

Unit list Table 7-12-2

Boxes marked an asterisk (∗) are area for creating new units.

7.12.4 Control type settting screen

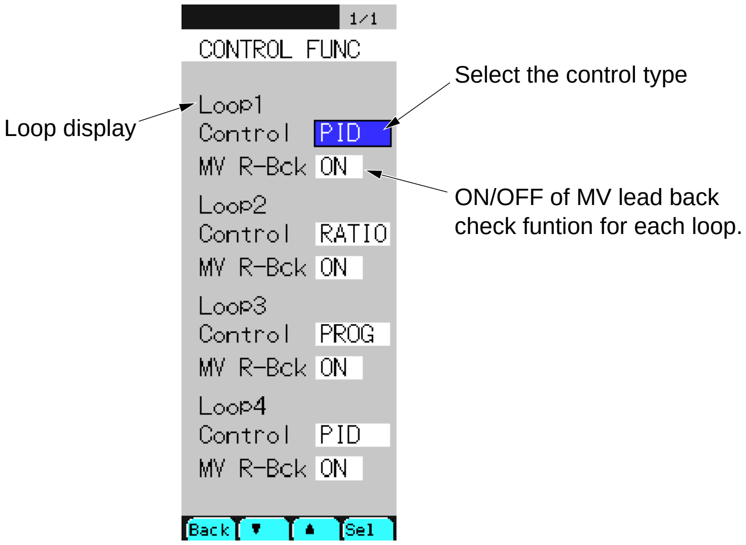
Select CONTROL FUNC from the configuration menu to display the control type setting screen.

The screen varies the setting number depending on the number of loops. Fig. 7-12-6 shows with 4 loops.

Function of screen

1) Control function of the controller can be selected from cascade control, ratio control and program control for each loop.
2) It can set ON/OFF of MV lead back check function for each loop.

Description of screen



CONTROL FUNC

Loop1
Control PID
MV R-Bck ON

Loop2
Control RATIO
MV R-Bck ON

Loop3
Control PROG
MV R-Bck ON

Loop4
Control PID
MV R-Bck ON

Loop display

Select the control type

ON/OFF of MV lead back check funtion for each loop.

Fig. 7-12-6 Control type setting screen

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the configuration menu screen.

▼ : To move the cursor downward to change the selection item.

▲ : To move the cursor upward to change the selection item.

Sel : To switch to the selection mode.
In the selection mode, the mode is switched to the movement mode.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
Control	Control type primary control	The setting items of PARAMETER on Menu 2 is changed by selecting the primary control type.	PID (cascade control) RATIO (ratio control) PROG (program control)	PID
MV RBAK	MV lead back function ON/ OFF setting	With ON setting, a system fault occurs when MV lead back error occurs.	ON/OFF	ON

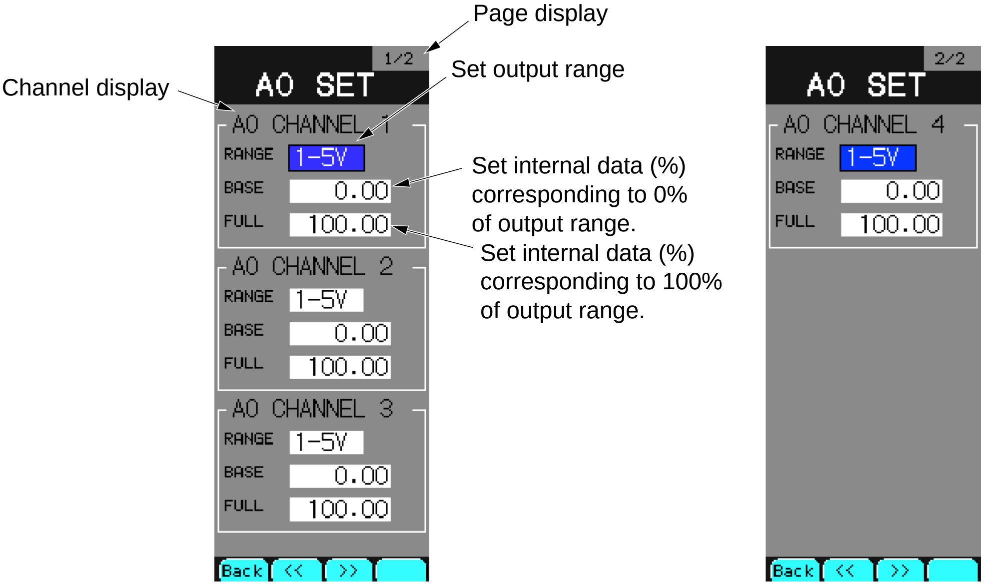
7.12.5 Analog output settting screen

Select AO SETTING from the configuration menu to display the analog output setting screen. AO1 to AO4 can be set.

Function of screen

It can set the analog output range.

Description of screen



1/2

AO SET

AO CHANNEL 1
RANGE 1-5V
BASE 0.00
FULL 100.00

AO CHANNEL 2
RANGE 1-5V
BASE 0.00
FULL 100.00

AO CHANNEL 3
RANGE 1-5V
BASE 0.00
FULL 100.00

2/2

AO SET

AO CHANNEL 4
RANGE 1-5V
BASE 0.00
FULL 100.00

Fig. 7-12-7 Analog output setting screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the configuration menu screen.
<< : To move to the previous page.
>> : To move to the next page.

Page 2

>	▼	▲	Ent

> : To switch to the set mode.
The setting digit moves to the right.
▼ : To move the cursor downward.
Numerical value of the selection digit decreases. Or to change the item.
▲ : To move the cursor upward.
Numerical value of the selection digit increases. Or to change the item.
Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
RANGE	Output range	It sets the analog output range. Industrial values are converted with the range setting.	1 to 5V 0 to 5V 0 to 10V	1 to 5V
BASE	Industrial base scale	It sets a base scale of the analog output. When an output data is within the range, 0% of the output range is outputted. Note) Never set an equation as follows: BASE>FULL	-327.67 to 327.67	0.00
FULL	Industrial full scale	It sets a full scale of the analog output. When an output data is within the range, 100% of the output range is outputted. Note) Never set an equation as follows: BASE>FULL	-327.67 to 327.67	100.00

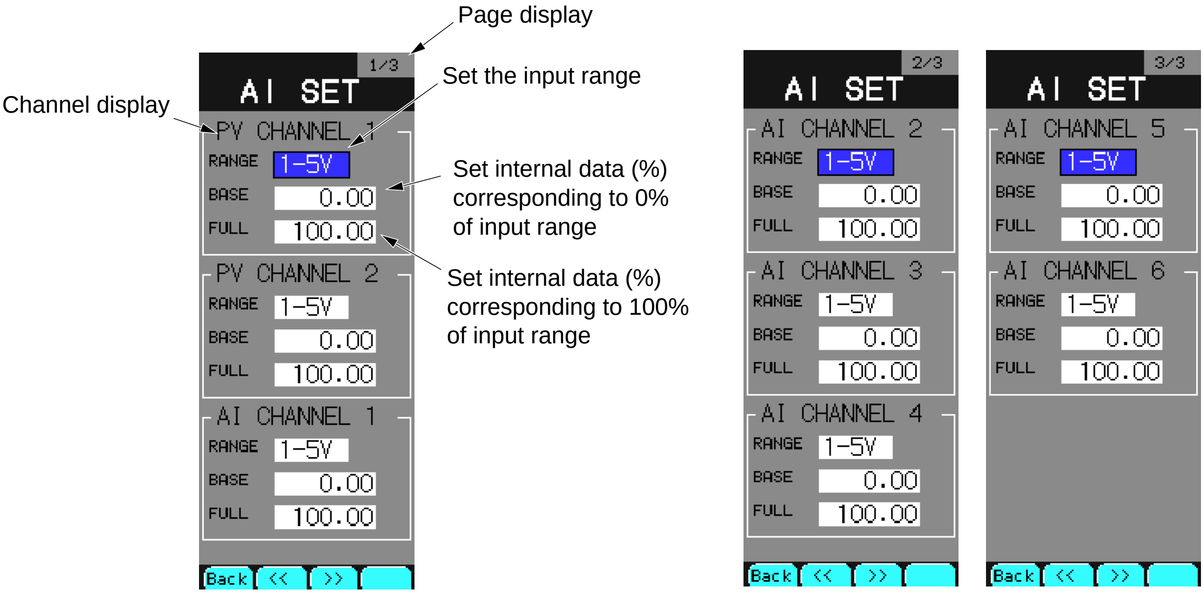
7.12.6 Analog input settting screen

Select AI SETTING from the configuration menu to display the analog input setting screen. The number of settable channels varies depending on terminals to be used.

Function of screen

It can set the analog input range.

Description of screen



Page display

Channel display

Set the input range

Set internal data (%) corresponding to 0% of input range

Set internal data (%) corresponding to 100% of input range

1/3

AI SET

PV CHANNEL 1
RANGE 1-5V
BASE 0.00
FULL 100.00

PV CHANNEL 2
RANGE 1-5V
BASE 0.00
FULL 100.00

AI CHANNEL 1
RANGE 1-5V
BASE 0.00
FULL 100.00

2/3

AI SET

AI CHANNEL 2
RANGE 1-5V
BASE 0.00
FULL 100.00

AI CHANNEL 3
RANGE 1-5V
BASE 0.00
FULL 100.00

AI CHANNEL 4
RANGE 1-5V
BASE 0.00
FULL 100.00

3/3

AI SET

AI CHANNEL 5
RANGE 1-5V
BASE 0.00
FULL 100.00

AI CHANNEL 6
RANGE 1-5V
BASE 0.00
FULL 100.00

Fig. 7-12-8 Analog input setting screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the configuration menu screen.
<< : To move to the previous page.
>> : To move to the next page.

Page 2

>	▼	▲	Ent

> : To switch to the set mode.
The setting digit moves to the right.
▼ : To move the cursor downward.
Numerical value of the selection digit decreases. Or to change the item.
▲ : To move the cursor upward.
Numerical value of the selection digit increases. Or to change the item.
Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
RANGE	Input range	It sets the analog input range. Industrial values are converted with the range setting.	1 to 5V 0 to 5V 0 to 10V	1 to 5V
BASE	Industrial base scale	It sets a base scale of the analog input. When an input data is within the range, 0% of the input range is inputted. Note) Never set an equation as follows: BASE>FULL	-327.67 to 327.67	0.00
FULL	Industrial full scale	It sets a full scale of the analog input. When an input data is within the range, 100% of the input range is inputted. Note) Never set an equation as follows: BASE>FULL	-327.67 to 327.67	100.00

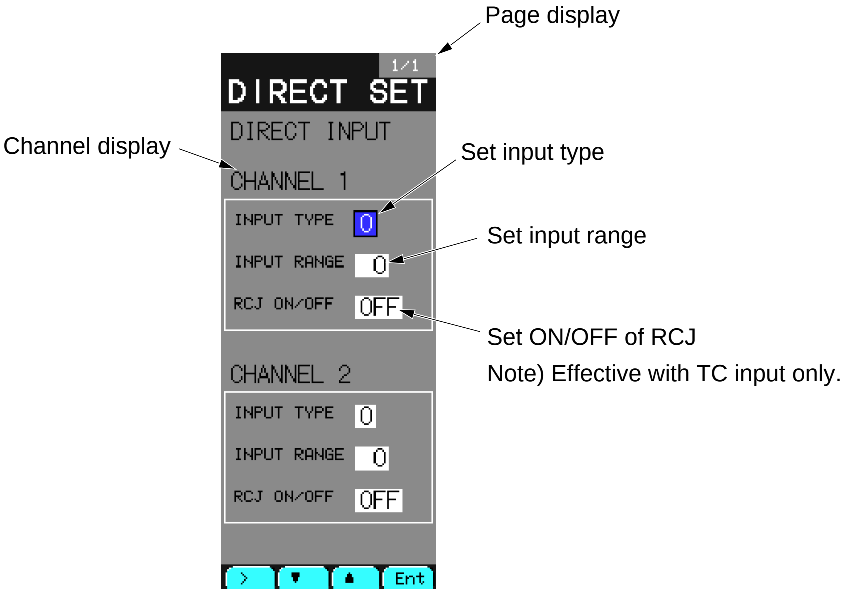
7.12.7 Direct input settting screen

Select DIRECT SETTING from the configuration menu to display the direct input setting screen.

Function of screen

It can set ON/OFF of direct input type, input range code and RCJ.

Description of screen



DIRECT SET

DIRECT INPUT

CHANNEL 1

INPUT TYPE 0

INPUT RANGE 0

RCJ ON/OFF OFF

CHANNEL 2

INPUT TYPE 0

INPUT RANGE 0

RCJ ON/OFF OFF

> ▼ ▲ Ent

Note) Effective with TC input only.

Fig. 7-12-9 Direct input setting screen

Description of chameleon key

Page 1

>	▼	▲	Ent

> : To switch to the set mode.
The setting digit moves to the right.

▼ : To move the cursor downward.
Numerical value of the selection digit decreases. Or to switch ON/OFF.

▲ : To move the cursor upward.
Numerical value of the selection digit increases. Or to switch ON/OFF.

Ent : To switch to the set mode. <in the select mode>
To switch to the select mode. <in the set mode>

Page 2

Back			

Back : To return to the configuration menu screen.

Description of each item

Item	Function	Meaning of display	Setting range	Initial value during shipment
Channel display	Display direct input terminal channels.	The channel is indetified with actual terminals.		—
INPUT TYPE	Select the input type from PT (thermoresistance) or TC (thermocouple)		00 :PT input 01 :TC input	00
INPUT RANGE	Set the input range with codes.	For relations between the input range and code, see the following table.	00 to 15	00
RCJ ON/OFF	Set RCJ (cold junction compensation) function with ON/OFF. When the input type is PT, the setting is not applicable.		ON/OFF	OFF

Note) When using thermoresistance or thermocouple input, an optional direct input unit is required.

Input type code table

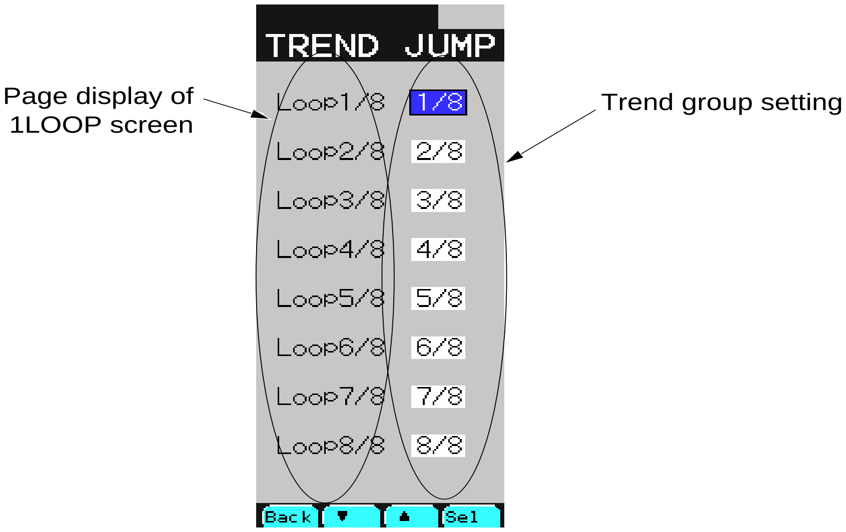
Code	TC		PT	
00	J thermocouple	0.0 to 400.0℃	PT	0.0 to 150.0℃
01	J thermocouple	0.0 to 800.0℃	PT	0.0 to 300.0℃
02	K thermocouple	0.0 to 400.0℃	PT	0.0 to 500.0℃
03	K thermocouple	0.0 to 800.0℃	PT	0.0 to 600.0℃
04	K thermocouple	0.0 to 1200.0℃	PT	−50.0 to 100.0℃
05	R thermocouple	0.0 to 1600.0℃	PT	−100.0 to 200.0℃
06	B thermocouple	0.0 to 1800.0℃	PT	−200.0 to 600.0℃
07	T thermocouple	−200.0 to 200.0℃	PT	−200.0 to 850.0℃
08	T thermocouple	−150.0 to 400.0℃	JPT	0.0 to 150.0℃
09	E thermocouple	0.0 to 800.0℃	JPT	0.0 to 300.0℃
10	E thermocouple	−200.0 to 800.0℃	JPT	0.0 to 500.0℃
11	S thermocouple	0.0 to 1600.0℃	JPT	0.0 to 600.0℃
12	N thermocouple	0.0 to 1300.0℃	JPT	−50.0 to 100.0℃
13	U thermocouple	−200.0 to 400.0℃	JPT	−100.0 to 200.0℃
14	WRe 5-26	0.0 to 2300.0℃	JPT	−200.0 to 600.0℃
15	PL-II thermocouple	0.0 to 1300.0℃	Settting inhibit	

7.12.8 Trend jump settting screen

Description of screen

It allows you to set the group number of the trend screen (MENU 1/3) jumping from 1 LOOP screen (MENU 1/3).

To move 1 LOOP screen to the TREND screen, use a chameleon key of "Trnd" at the right end of the first page of 1 LOOP screen.



TREND JUMP

Loop1/8	1/8
Loop2/8	2/8
Loop3/8	3/8
Loop4/8	4/8
Loop5/8	5/8
Loop6/8	6/8
Loop7/8	7/8
Loop8/8	8/8

Page display of 1LOOP screen

Trend group setting

Fig. 7-12-10 Trend jump setting screen

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.

[Display mode]

▼ : To move the cursor downward.

▲ : To move the cursor upward.

Sel : To set in to the setting modification mode.

[Setting modification mode]

▼ : To change the setting item.

▲ : To change the setting item.

Sel : To register the modified value.

Description of each item

Symbol	Item	Function	Setting range	Initial value
Loop number	Trend screen group number	It allows you to select the group number of trend screen jumping from each page of 1 LOOP screen. 1 LOOP n/8 shows page n/8 of 1 LOOP screen. Note) Modules allocated to each page of 1 LOOP screen can be set in Item 7.9.2, "1LOOP Screen".	1/8 to 8/8	Loop1/8 : 1/8 Loop2/8 : 2/8 Loop3/8 : 3/8 Loop4/8 : 4/8 Loop5/8 : 5/8 Loop6/8 : 6/8 Loop7/8 : 7/8 Loop8/8 : 8/8

7.13 Connection screen

This chapter describes the wafer connection screen and output connection screen. On the wafer connection screen, it explains how to insert, delete and copy. On the output connection screen, it explains how to set the output data for communication, analog and digital terminals or internal setting.

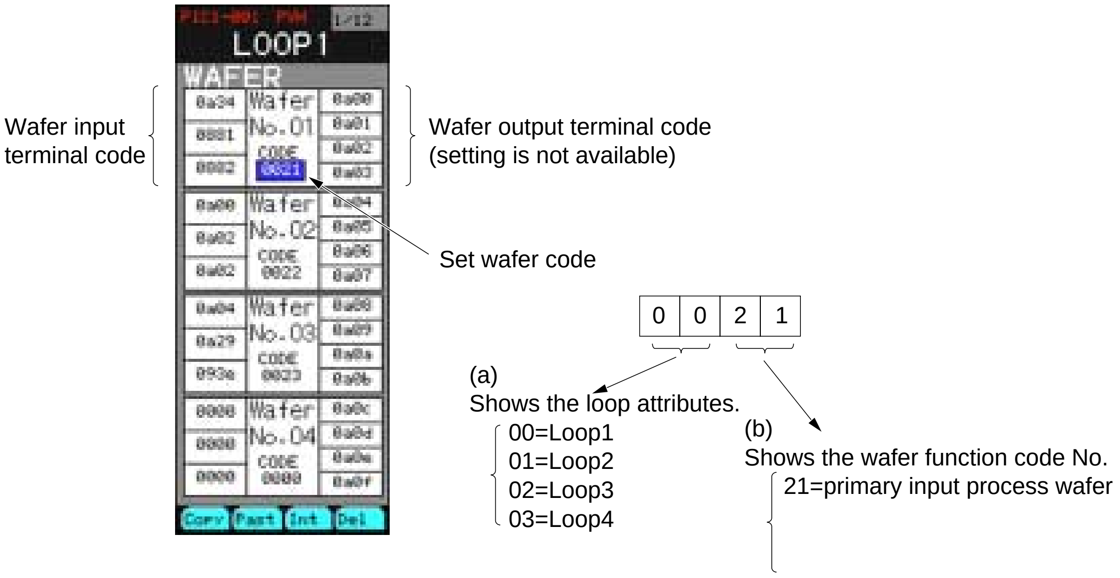
7.13.1 Wafer connection screen

Select WAFER CONNECT from MENU 3/3 to display the wafer connect screen.

Function of screen

It can connect 48 wafers for each loop. It allows you to insert, delete or paste wafers. It contains 12 screens for each loop.

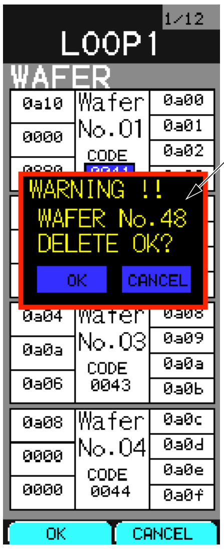
Description of screen



The wafer code should be set with 4-digit code No. combining the wafer loop attributes code (a) and wafer function code No. (b).

Fig. 7-13-1 Wafer connection screen

Description of message screen

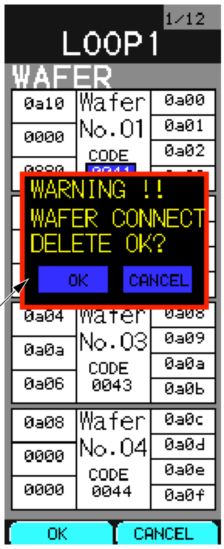


WARNING !!
WAFER No.48
DELETE OK?

A caution message appears when you try to insert a wafer with data set in wafer No. 48.

(When you select OK, wafer No. 48 will be deleted.)

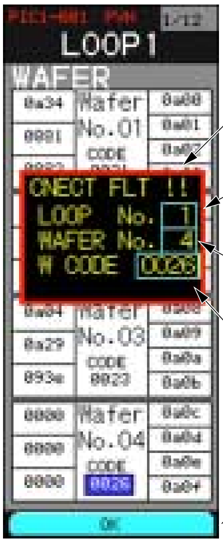
Insertion caution message screen
Fig. 7-13-2



WARNING !!
WAFER CONNECT
DELETE OK?

A caution message appears when you try to delete the wafer with an output of the deleted wafer connected to.

Delete caution message screen
Fig. 7-13-3



CNECT FLT !!
LOOP No. 1
WAFER No. 4
W CODE 0026

A caution message appears when the wafer code (that can not be used only one time) is used for more than 2 times in order to escape from the wafer connection screen.

Loop No. where a wafer connection error occurs

Wafer No. where a wafer connection error occurs

Wafer code where a wafer connection error occurs

The message screen will disappear by pressing the OK button (after that, check that the connection error is cleared).

Message screen
(when wafer use frequencies are abnormal)
Fig. 7-13-4

Description of chameleon key

Page 1

Back	＜＜	＞＞	LOOP

Back : To return to the source screen.
If a wafer connection error is found when you return to the source, the caution message (Fig. 7-13-4) is displayed.
＜＜ : To move to the previous page.
＞＞ : To move to the next page.
LOOP : To display the next LOOP screen.

Page 2

＞	▼	▲	Ent

[Display mode]
＞ : To go to the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Ent : To go to the setting modification mode.

[Setting modification mode]
＞ : To modified digit of numerical value.
▼ : To decrease the numerical value.
▲ : To increase the numerical value
Ent : To register the modified value.

Page 3

Copy	Past	Int	Del

Copy : To copy wafer data
To save the wafer code and connection code of inputs 1 to 3, move the cursor to the wafer code with wafer no. you want to make a copy or Input 1 to 3, and press the Copy key.

Past : To paste the wafer data.
To paste the saved data, move the cursor to the wafer code with wafer no. or inputs 1 to 3 you want to paste, and press the Past key.

Int : To insert a wafer

Move the cursor to the wafer code with wafer no. and inputs 1 to 3 you want to insert and press the Int key, so that a single no set wafer be inserted in wafer number and wafer number subsequent to this number will advance by one. When using wafer connection and output connection for the wafer output terminal code to which wafer number advances, the output terminal code will be replaced with an output terminal code of a new number.

If wafer No. 48 is already set in the wafer when inserting a wafer, an insertion caution message will appear (Fig. 7-13-2). Press the OK key to insert the wafer. The setting for wafer No. 48 is deleted and a terminal code of "0000" is set at the area where the output terminal code of wafer No. 48 is used. If you press the cancel button on the message screen, insertion is cancelled, returning to the source screen.

Del : To delete wafers.

Move the cursor to the wafer code of wafer no. and inputs 1 to 3 you want to delete and press the Del key. The wafer is deleted, and the number of a wafer subsequent to the wafer that you Move the cursor to the wafer code of wafer no. and inputs 1 to 3 you want to delete and press the Del key. The wafer is deleted, and the number of a wafer subsequent to the wafer that you deleted descends by one and no set wafer will be added to the wafer no. 48.

When using the wafer connection and output connection for the output terminal code of the wafer which the wafer number goes back to, an output terminal code will be replaced with output terminal code of a new terminal number.

When the wafer output terminal code you want to delete is already used, a delete caution message will appear as shown in Fig. 7-13-3. When you press the OK button, the wafer will be deleted and a terminal code of "0000" will be set in the area where the wafer output terminal code you want to delete is used.

If you select CANCEL on the message screen, delete will be cancelled, and the source screen returns.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
CODE	Wafer code	A wafer code to be used is set. Use care since there are some wafers that cannot use only one time during loops or cannot use together with other wafers at the same time. (Reference data: Wafer code table).	0000 to ffff	0000
INPUT 1 INPUT 2 INPUT 3	Input terminal Code 1 to 3	Set a terminal code which wafer inputs 1 to 3 are entered. When the input terminal code = 0000, the input value equals to 0.	0000 to ffff	0000

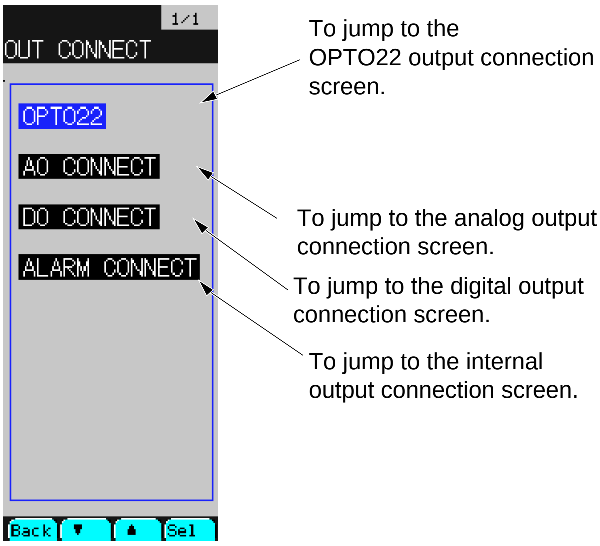
7.13.2 Output connection menu screen

Select OUT CONNECT from MENU 3/3 to display the output connection menu screen.

Function of screen

It can switch 5 types of output connection screens.

Description of screen



To jump to the OPTO22 output connection screen.

To jump to the analog output connection screen.

To jump to the digital output connection screen.

To jump to the internal output connection screen.

Fig. 7-13-5 Output connection menu screen

Description of chameleon key

Page 1

Back	▼	▲	Sel

Back : To return to the source screen.
▼ : To move the cursor downward.
▲ : To move the cursor upward.
Sel : To jump to the screen selected by the cursor.

7.13.3 T-LINK / OPTO22 output connection screen

Select OPTO22 from the output connection menu to display the OPTO22 output connection screen.

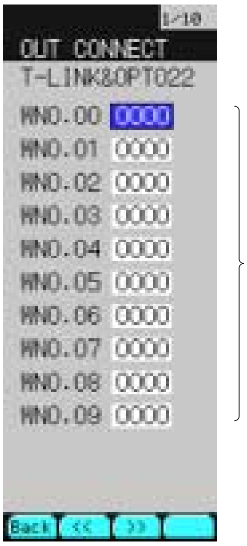
Note: T-link is not mounted on this instrument

Function of screen

It allows you to set data terminal codes to provide an output to the area of the OPTO22 communication I/O data area

It can set up to 100 output data. It can set 10 data on a single screen. The screen contains 10 page in all.

Description of screen



MNO.00 0000
MNO.01 0000
MNO.02 0000
MNO.03 0000
MNO.04 0000
MNO.05 0000
MNO.06 0000
MNO.07 0000
MNO.08 0000
MNO.09 0000

OPTO22 output connection code

Fig. 7-13-6 T-LINK/OPTO22 output connection screen

Description of chameleon key

Page 1

Back	＜＜	＞＞	

Back : To return to the source screen.
＜＜ : To move to the previous page.
＞＞ : To move to the next page.

Page 2

＞	▼	▲	Ent

[Display mode]
＞ : To set in the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward.
Ent : To set in the setting modification mode.

[Setting modification mode]
＞ : To move the value change digit.
▼ : To decrease the numerical value.
▲ : To increase the numerical value.
Ent : To register the modified value.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
WNo. 00 to WNo. 99	Output terminal code	Terminal codes of the output data are set at an output area for OPTO22 communication. Note) Be sure to set the terminal code 0001at the area where the input data are used.	0000 to ffff	0000

7.13.4 Analog output connect screen

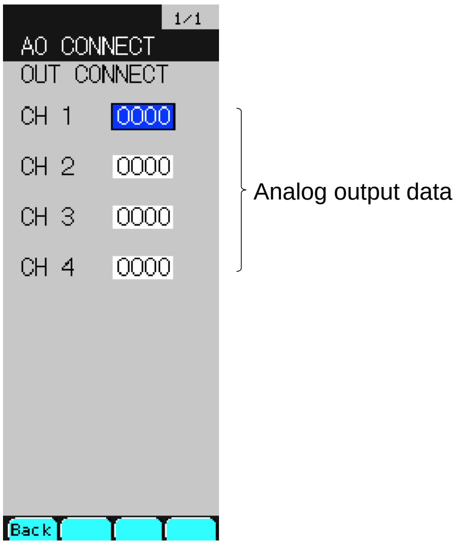
Select AO CONNECT from the output connection menu to display the analog output connection screen.

Function of screen

It allows you to set the terminal codes for data to provide an output to the analog output terminal. The analog output terminal provides the output voltage that is converted output data into the voltage range and scaling values.

For the settings of analog output voltage range and scaling values, refer to Item 7.12.5, "AO SET".

Description of screen



1/1
AO CONNECT
OUT CONNECT
CH 1 0000
CH 2 0000
CH 3 0000
CH 4 0000

Fig. 7-13-8 Analog output connect screen

Description of chameleon key

Page 1

Back			

Back	:	To return to the source screen.

Page 2

>	▼	▲	Ent

[Display mode]

>	:	To set in the setting modification mode.
▼	:	To move the cursor downward.
▲	:	To move the cursor upward.
Ent	:	To set in the setting modification mode.

[Setting modification mode]

>	:	To move the value change digit.
▼	:	To decrease the numerical value.
▲	:	To increase the numerical value
Ent	:	To register the modified value.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
CH 1 to CH4	Output terminal code	It allows you to set the terminal codes for data to provide an output to the analog output terminal. The analog output terminal provides the output voltage that is converted output data into the voltage range and scaling values.	0000 to ffff	0000

7.13.5 Digital output connect screen

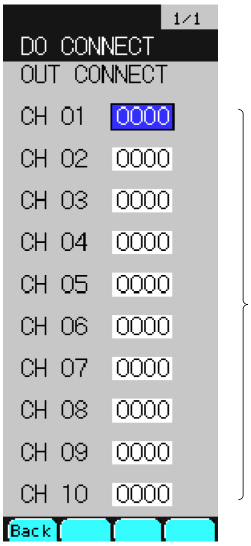
Select DO CONNECT from the output connect menu to display the digital output connect screen.

Function of screen

It allows you to set the terminal codes of data to provide outputs to the digital output terminals. The digital output terminal provides outputs of LOW or HI when the output data is "0" or "1", respectively.

It can set up to 10 output data.

Description of screen



1/1
DO CONNECT
OUT CONNECT
CH 01 0000
CH 02 0000
CH 03 0000
CH 04 0000
CH 05 0000
CH 06 0000
CH 07 0000
CH 08 0000
CH 09 0000
CH 10 0000

Digital output data

Fig. 7-13-9 Digital output connect screen

Description of chameleon key

Page 1

Back			

Back : To return to the source screen.

Page 2

>	▼	▲	Ent

[Display mode]

\> : To set in the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Ent : To set in the setting modification mode.

[Setting modification mode]

\> : To move the value change digit.
▼ : To decrease the numerical value.
▲ : To increase the numerical value
Ent : To register the modified value.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
CH 1 to CH10	Output terminal code	It allows you to set the terminal codes for data to provide an output to the digital output terminal. The digital output terminal provides outputs of LOW or HI when the output data is "0" or "1", respectively. (See Note 1).	0000 to ffff	0000

Note 1) Unless the output data is "0" or "1", it outputs the output data values at the minimum bit position (LSB).

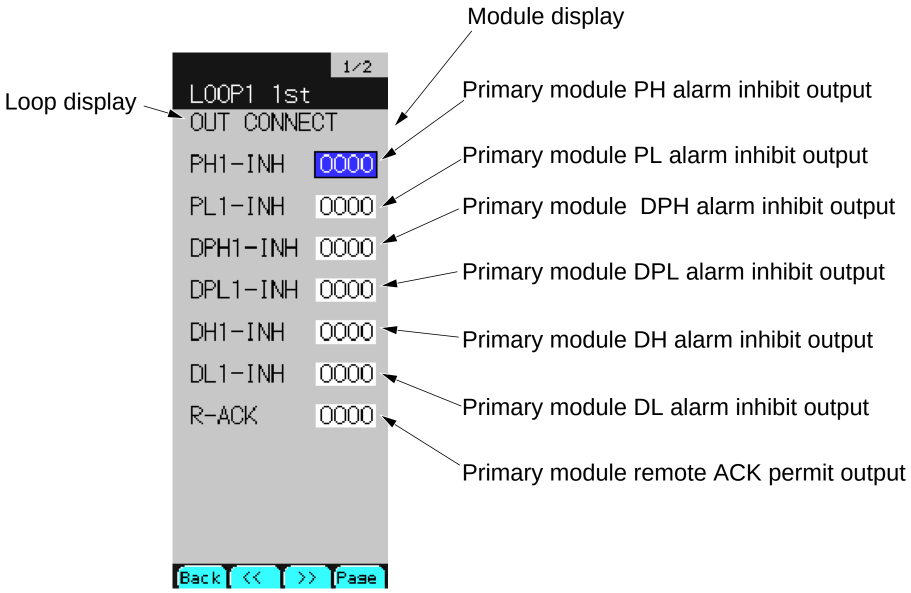
7.13.6 Internal setting output connect screen

Select ALARM CONNECT from the output connect menu to display the internal setting output connect screen.

Function of screen

It is terminals that can change the settings of alarm output, remote permit, PV tracking, SMAN request. It contains the setting screens for the primary and secondary modules for each loop. The screen contains pages (corresponding to the number of loops × 2) in all.

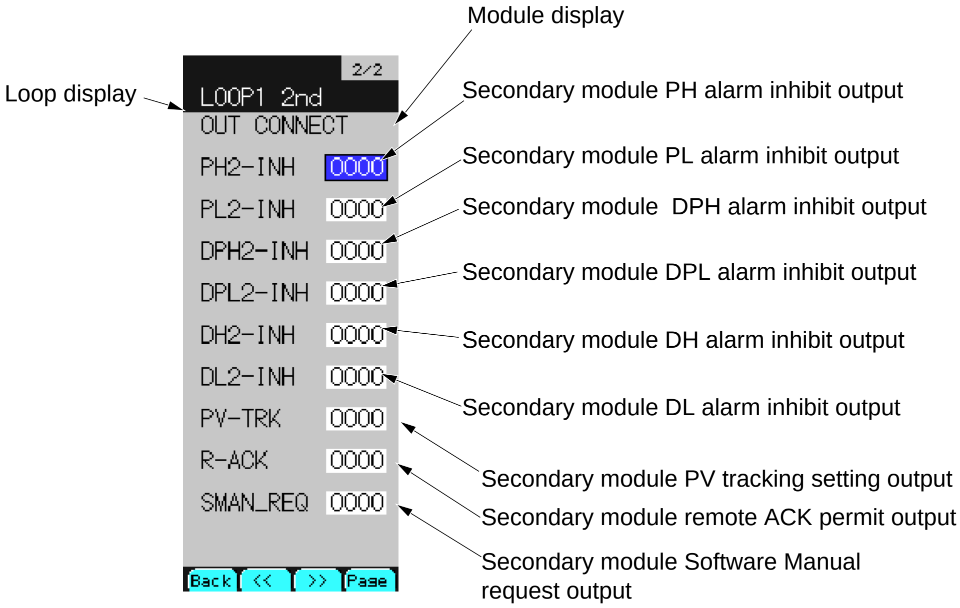
Description of screen



1/2
LOOP1 1st
OUT CONNECT
PH1-INH 0000
PL1-INH 0000
DPH1-INH 0000
DPL1-INH 0000
DH1-INH 0000
DL1-INH 0000
R-ACK 0000

Module display
Loop display
Primary module PH alarm inhibit output
Primary module PL alarm inhibit output
Primary module DPH alarm inhibit output
Primary module DPL alarm inhibit output
Primary module DH alarm inhibit output
Primary module DL alarm inhibit output
Primary module remote ACK permit output

Fig. 7-13-10 Internal output connect screen 1



2/2
LOOP1 2nd
OUT CONNECT
PH2-INH 0000
PL2-INH 0000
DPH2-INH 0000
DPL2-INH 0000
DH2-INH 0000
DL2-INH 0000
PV-TRK 0000
R-ACK 0000
SMAN_REQ 0000

Module display
Loop display
Secondary module PH alarm inhibit output
Secondary module PL alarm inhibit output
Secondary module DPH alarm inhibit output
Secondary module DPL alarm inhibit output
Secondary module DH alarm inhibit output
Secondary module DL alarm inhibit output
Secondary module PV tracking setting output
Secondary module remote ACK permit output
Secondary module Software Manual request output

Fig. 7-13-11 Internal output connect screen 2

Description of chameleon key

Page 1

Back	＜＜	＞＞	Page

Back : To return to the source screen.
＜＜ : To move to the previous page.
＞＞ : To move to the next page.
Back : To switch to display mode.

Page 2

＞	▼	▲	Ent

[Display mode]
＞ : To set in the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Ent : To set in the setting modification mode.

[Setting modification mode]
＞ : To move the value change digit.
▼ : To decrease the numerical value.
▲ : To increase the numerical value
Ent : To register the modified value.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
PH1-INH PL1-INH DPH1-INH DPL1-INH DH1-INH DL1-INH	Primary module alarm inhibit	It is an output terminal that inhibits the primary module alarm output. When data connected to the output terminal is "1", corresponding alarm output is inhibited. (Note 1)	0000 to ffff	0000
PH2-INH PL2-INH DPH2-INH DPL2-INH DH2-INH DL2-INH	Secondary module alarm inhibit	It is an output terminal that inhibits the secondary module alarm output. When data connected to the output terminal is “1”, a corresponding alarm output is inhibited. (Note 1)	0000 to ffff	0000
R-ACK	Remote permit of primary and secondary modules (cascade permit)	It is an output terminal that permits the primary and secondary modules alarm output. When data connected to the output terminal is “1”, a corresponding alarm output is permitted. (Note 1)	0000 to ffff	0000

Symbol	Item	Function	Setting range	Initial value during shipment
PV-TRK	Secondary module PV tracking	It is an output terminal that permits the secondary module PV tracking. When data connected to the output terminal is “1”, a PV tracking is executed. (Note 1)	0000 to ffff	0000
SMAN-REQ	Software Manual Request	It is an output terminal that requests manuals of the secondary module. When data connected to the output terminal is “1”, the loop control mode is switched to the manual. When data is returned to “0”, the former control mode returns. (Note 1)	0000 to ffff	0000

Note 1) Unless the output data is “0” or “1”, it outputs the output data values at the minimum bit position (LSB).

7.14 Communication screen

This chapter describes the communication screen.

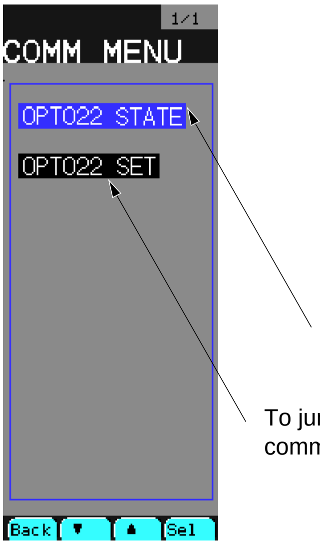
7.14.1 Communication menu screen

Select COMMUNICATION from Menu 3 to display the communication menu screen.

Function of screen

It is used to move to the communication screens.

Description of screen



To jump to OPTO22 STATE communication status display screen.

To jump to OPTO22 SET communication screen.

Fig. 7-14-1 Communication menu screen

Description of chameleon key

Back	▼	▲	Sel

Back : To return to the source menu.
▼ : To move the cursor downward.
▲ : To move the cursor upward.
Sel : To jump to the screen selected by the cursor.

7.14.2 OPTO22 communication status display screen

Selecting OPTO22 STATE from the communication menu to display the OPTO22 communication Status display screen.

Function of screen

It allows you to display the communication status with the connected modules for each station No. at the time of OPTO22 communication.

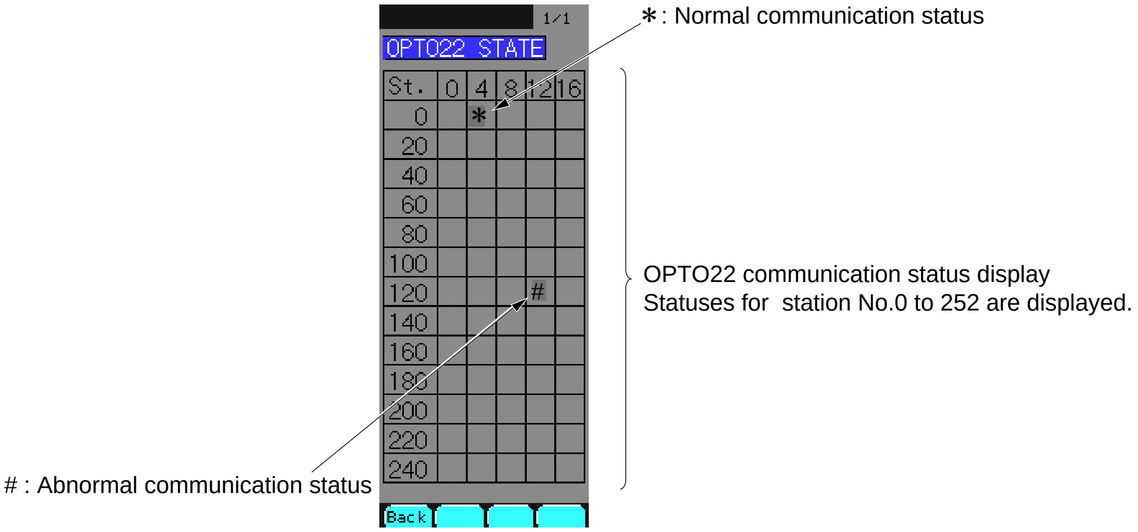
The ordinate of the screen shows the 10’s digit of the station number, while the abscissa of the screen shows the 1’s digit.

Statuses for station No. 0 to 252 are displayed.

Means of marks

∗	Normal communication status
#	Abnormal communication status

Description of screen



St.	0	4	8	12	16
0		∗			
20					
40					
60					
80					
100					
120				#	
140					
160					
180					
200					
220					
240					

∗ : Normal communication status

OPTO22 communication status display
Statuses for station No.0 to 252 are displayed.

: Abnormal communication status

Fig. 7-14-2 OPTO22 communication status display screen

Description of chameleon key

Back			

Back : To return to the source menu.

Note 1) Station No. means BRAIN’s station No.
Station No. can be set up by BRAIN’ADDR jumper setting. Refer to Item 7.14.4 (3).

7.14.3 OPTO22 communication setting screen

Select OPTO22 SET from the communication menu to display the OPTO22 communication setting screen.

Function of screen

It can set module of OPTO22's SNAP I/O communication types up to 40 tables.

The communication setting contain 5 parameters.

① The selection of USE or UN-use

② Communication data storage address

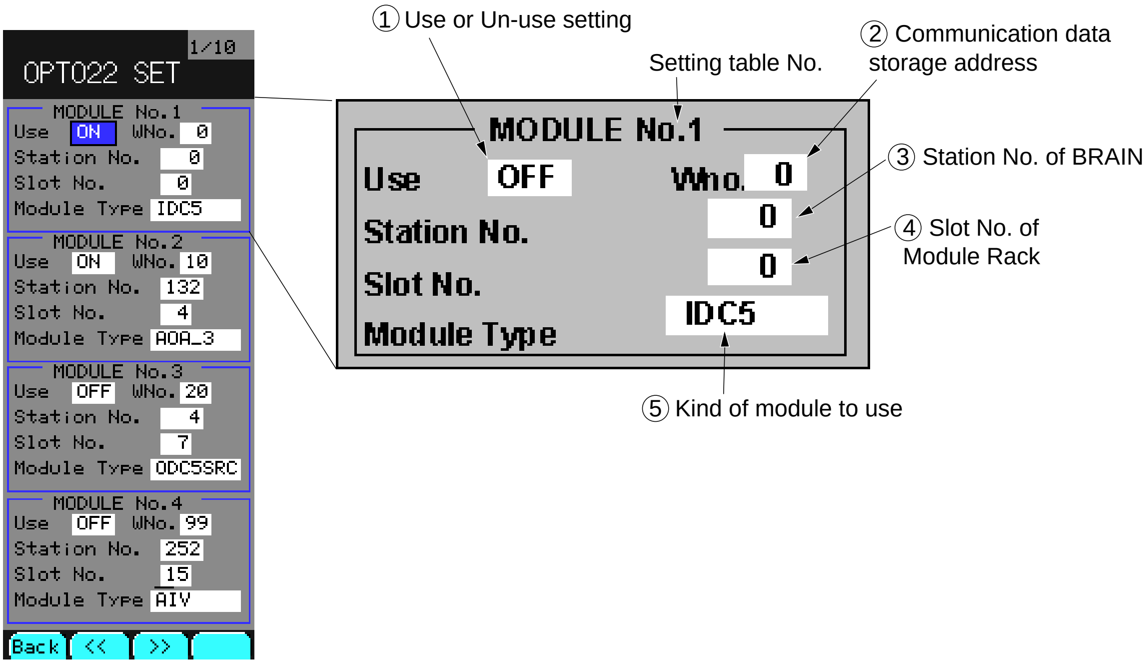
③ Station No. of BRAIN

④ Slot No. of Module Rack

⑤ Kind of module.

It can set 4 tables on a screen , and the setting screen contains 10 pages in all.

Description of screen



OPTO22 SET 1/10

MODULE No.1
Use ON WNo. 0
Station No. 0
Slot No. 0
Module Type IDC5

MODULE No.2
Use ON WNo. 10
Station No. 132
Slot No. 4
Module Type AOA_3

MODULE No.3
Use OFF WNo. 20
Station No. 4
Slot No. 7
Module Type ODC5SRC

MODULE No.4
Use OFF WNo. 99
Station No. 252
Slot No. 15
Module Type AIV

MODULE No.1
Use OFF Wno. 0
Station No. 0
Slot No. 0
Module Type IDC5

Fig. 7-14-3 OPTO22 communication setting screen

Description of chameleon key

Page 1

Back	<<	>>	

Back : To return to the source screen.
<< : To move to the previous page.
>> : To move to the next page.

Page 2

>	▼	▲	Ent

[Display mode]
> : To set in to the setting modification mode.
▼ : To move the cursor downward.
▲ : To move the cursor upward
Ent : To set in the setting modification mode.

[Setting modification mode]
> : To move value change digit.
▼ : To decrease the numerical value or to change the setting item.
▲ : To increase the numerical value or to change the setting item.
Ent : To register the modified value.

Description of each item

Symbol	Item	Function	Setting range	Initial value during shipment
Use	Communication ON/OFF	ON: It makes the setting table effective. OFF: It invalidates the setting table.	ON/OFF	OFF
Wno.	Communication data number	It contains 100 words in the OPTO22 communication data storage area. It allows you to use the data of the communication data number of this area as the communication data	0 to 99	0
Station No.	Station No. of BRAIN	It allows you to set the communication address of the BRAIN to use. Station No. of BRAIN can set up by ADDR jumper of BRAIN.	0 to 252	0
Slot No.	Slot No. of Module Rack	It allows you to set the Slot No. of Module Rack. Slot No. is written on Module Rack.	0 to 15	0
Module type	Kind of module	It allows you to select from 5 kind of the modules.	IDC5/ODC5SNK ODC5SRC AIV/AOA-3	IDC5

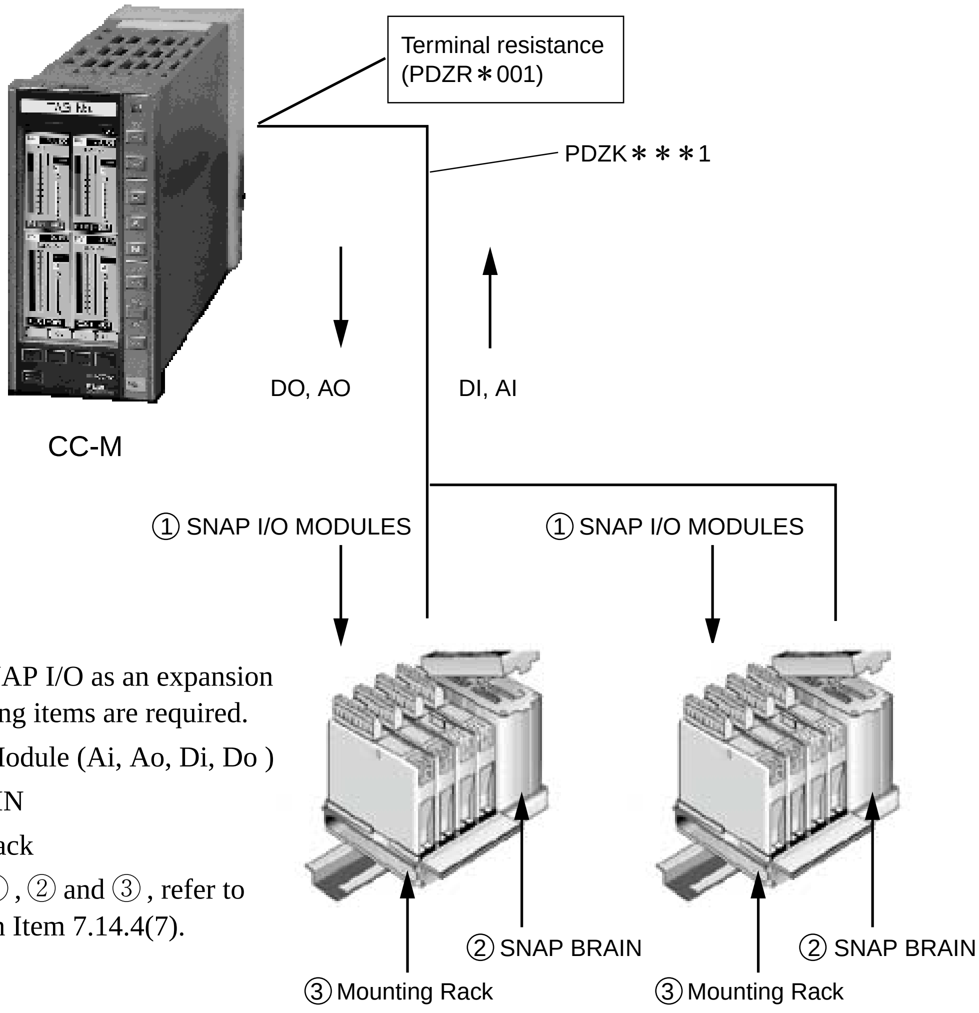
7.14.4 SNAP I/O (OPTO22) Manual for CC-M

This section describes how to use the SNAP I/O specified by CC-M.

(1) Specifications

1) No. of BRAIN to be expanded: 2 points
2) No. of I/O to be expanded:
    Analog I/O: Up to 4 points in total
    Digital I/O: Up to 36 points in total
3) Communication protocol: MISTIC
4) Physical specifications: EIA RS-485
5) Communication method: 2 wire, half-duplex, start-stop synchronous system
6) Communication speed: 57.6 kbps
7) Communication distance: 50 m long in max.
8) Insulation: Isolated from internal circuits / channel-to-channel is not isolated in each module.
9) Terminal resistance: 100Ω (option)

(2) Wiring diagram



Note) When using SNAP I/O as an expansion I/O, the following items are required.

① SNAP I/O Module (Ai, Ao, Di, Do)

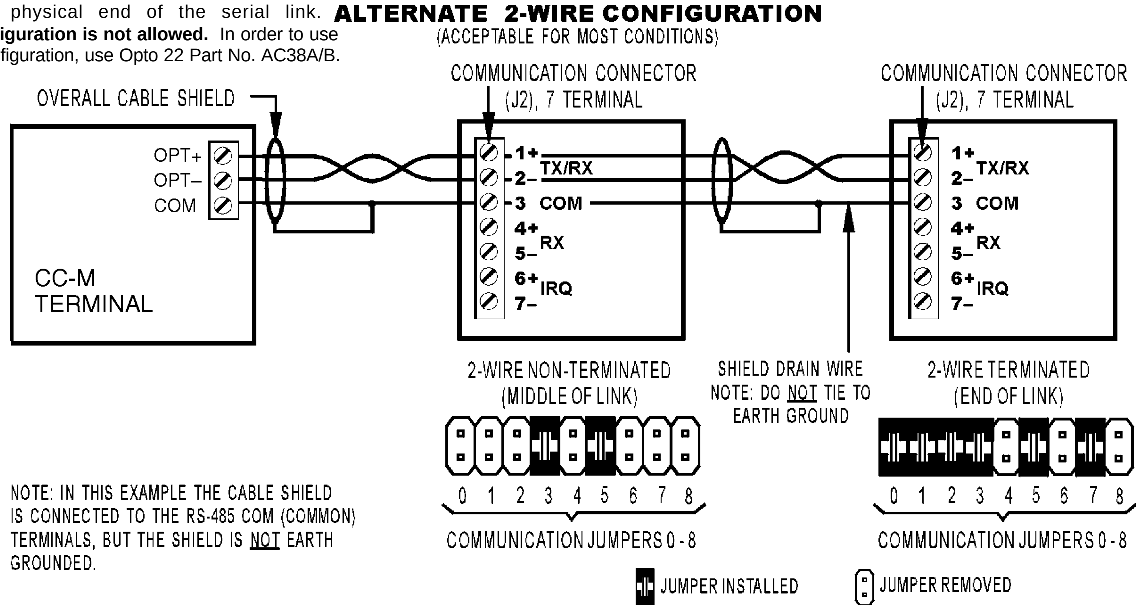
② SNAP BRAIN

③ Mounting Rack

For details of ①, ② and ③, refer to the data sheet in Item 7.14.4(7).

Optomux Communication Jumpers/Wiring

In order to meet published specifications, the RS-485 serial link requires two terminations, one at each physical end of the serial link. **Star configuration is not allowed.** In order to use a star configuration, use Opto 22 Part No. AC38A/B.

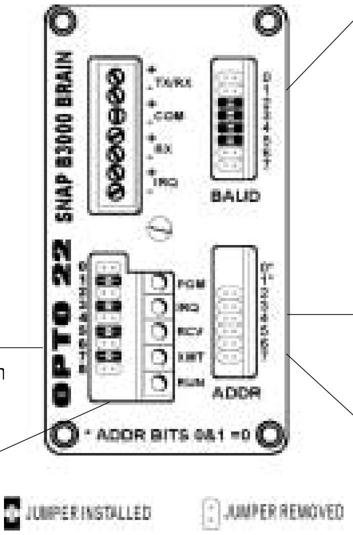


(3) Jampper setting

Set the BRAIN jumper as follows for communicating with the CC-M.

Note: When changing jumper settings, the new settings will not take effect until the next time the unit is powered up.

Jumper Settings for CC-M



MISTIC
2-WIRE
57.6 KBAUD
CRC-16
BINARY
ADDRESS(0 to 252)

0 to 3 = 57.6 Kbaud
4 = Binary
5 = CRC 16
6 = Mistic protocol

Address (0 to 252)

2-wire mode
This is the last unit on communication link.

Table : LED Description Table

LED	DESCRIPTION
PGM	LED will be on during Flash memory upgrade. Normally LED is off.
IRQ	Processor interrupt request currently active.
RCV	Processor is currently receiving data on communication line.
XMT	Processor is currently transmitting data on communication line.
RUN	Power on Processor (at least 4.75 VDC)

Table : Address

	7	6	5	4	3	2
0	□	□	□	□	□	□
4	□	□	□	□	□	■
8	□	□	□	□	■	□
12	□	□	□	□	■	■
16	□	□	□	■	□	□
20	□	□	□	■	□	■
24	□	□	□	■	■	□
28	□	□	□	■	■	■
32	□	□	■	□	□	□
36	□	□	■	□	□	■
40	□	□	■	□	■	□
44	□	□	■	□	■	■
48	□	□	■	■	□	□
52	□	□	■	■	□	■
56	□	□	■	■	■	□
60	□	□	■	■	■	■

	7	6	5	4	3	2
64	□	■	□	□	□	□
68	□	■	□	□	□	■
72	□	■	□	□	■	□
76	□	■	□	□	■	■
80	□	■	□	■	□	□
84	□	■	□	■	□	■
88	□	■	□	■	■	□
92	□	■	□	■	■	■
96	□	■	■	□	□	□
100	□	■	■	□	□	■
104	□	■	■	□	■	□
108	□	■	■	□	■	■
112	□	■	■	■	□	□
116	□	■	■	■	□	■
120	□	■	■	■	■	□
124	□	■	■	■	■	■

	7	6	5	4	3	2
128	■	□	□	□	□	□
132	■	□	□	□	□	■
136	■	□	□	□	■	□
140	■	□	□	□	■	■
144	■	□	□	■	□	□
148	■	□	□	■	□	■
152	■	□	□	■	■	□
156	■	□	□	■	■	■
160	■	□	■	□	□	□
164	■	□	■	□	□	■
168	■	□	■	□	■	□
172	■	□	■	□	■	■
176	■	□	■	■	□	□
180	■	□	■	■	□	■
184	■	□	■	■	■	□
188	■	□	■	■	■	■

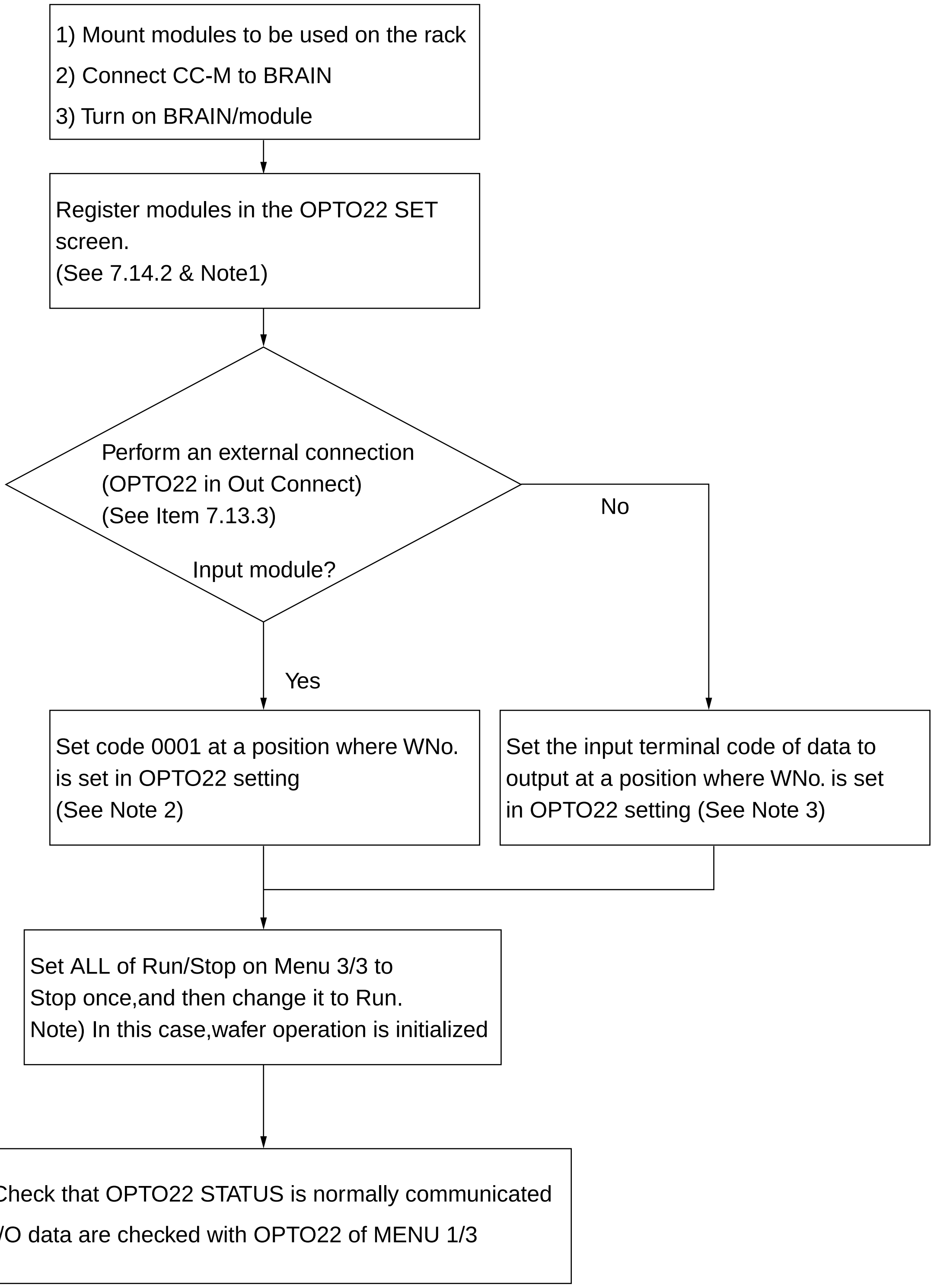
	7	6	5	4	3	2
192	■	■	□	□	□	□
196	■	■	□	□	□	■
200	■	■	□	□	■	□
204	■	■	□	□	■	■
208	■	■	□	■	□	□
212	■	■	□	■	□	■
216	■	■	□	■	■	□
220	■	■	□	■	■	■
224	■	■	■	□	□	□
228	■	■	■	□	□	■
232	■	■	■	□	■	□
236	■	■	■	□	■	■
240	■	■	■	■	□	□
244	■	■	■	■	□	■
248	■	■	■	■	■	□
252	■	■	■	■	■	■

■ = JUMPER INSTALLED □ = NO JUMPER

Address Configuration Notes:
1. Jumper positions 0 and 1 have no provision to install jumpers. These jumper positions are always set open by default.

(4) SNAP I/O operating procedures

Observe the following procedure to use SNAP I/O.



1) Mount modules to be used on the rack
2) Connect CC-M to BRAIN
3) Turn on BRAIN/module

Register modules in the OPTO22 SET screen.
(See 7.14.2 & Note1)

Perform an external connection
(OPTO22 in Out Connect)
(See Item 7.13.3)

Input module?

Set code 0001 at a position where WNo. is set in OPTO22 setting
(See Note 2)

Set the input terminal code of data to output at a position where WNo. is set in OPTO22 setting (See Note 3)

Set ALL of Run/Stop on Menu 3/3 to Stop once,and then change it to Run.
Note) In this case,wafer operation is initialized

1) Check that OPTO22 STATUS is normally communicated
2) I/O data are checked with OPTO22 of MENU 1/3

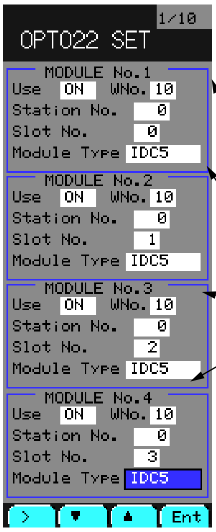
Note 1) Cautions on use of digital module

① The digital module is available at Slot No. 0 to 7.

② Four modules are allocated by sections of Slot No. 0 to 3 or Slot No. 4 to 7.

16 bit (4 modules x 4 bit) data is processed as 1 word data. For 4 digital modules for 1 word, set the same value as Wno. of OPTO22.

Example) When the module is mounted as shown in below, register the module as shown in the following OPTO22 settings.



OPTO22 SET 1/10

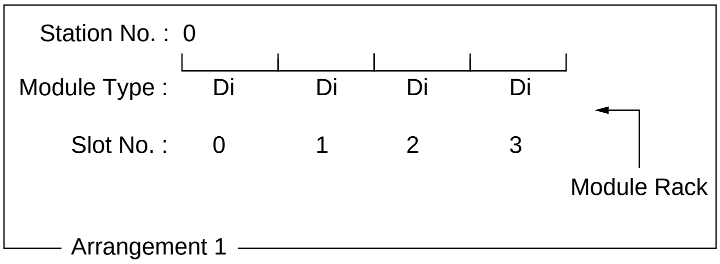
MODULE No.1
Use ON WNo. 10
Station No. 0
Slot No. 0
Module Type IDC5

MODULE No.2
Use ON WNo. 10
Station No. 0
Slot No. 1
Module Type IDC5

MODULE No.3
Use ON WNo. 10
Station No. 0
Slot No. 2
Module Type IDC5

MODULE No.4
Use ON WNo. 10
Station No. 0
Slot No. 3
Module Type IDC5

Set the same Wno.



Station No. : 0

Module Type : Di Di Di Di

Slot No. : 0 1 2 3

Arrangement 1

Note 2) To use SNAP I/O input data for wafer operation, use the input terminal code that is allocated to Wno.

Note 3) For the output terminal code, see a Table for output terminal code.

(5) Cautions

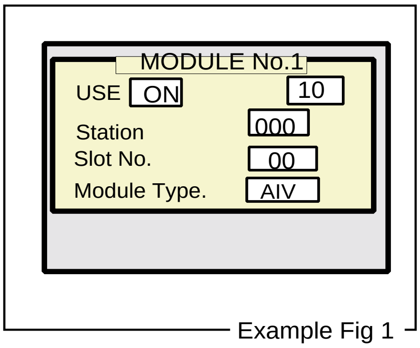
Analog module

1) Analog module has 2 input channels.

   It is necessary to set the code “0001” to Wno. of Out Connect corresponding to the value set by Wno. of OPTO22 Setting (see 7.13.3) and the next value.

   Example)

   When “10” is set in Wno. as at the time of registration of Ai module as shown in example Fig. 1, the code “0001” should be set in Wno. 10 and Wno.11 for output communication (out connect) of OPTO22, as shown in Example Fig. 2.



MODULE No.1

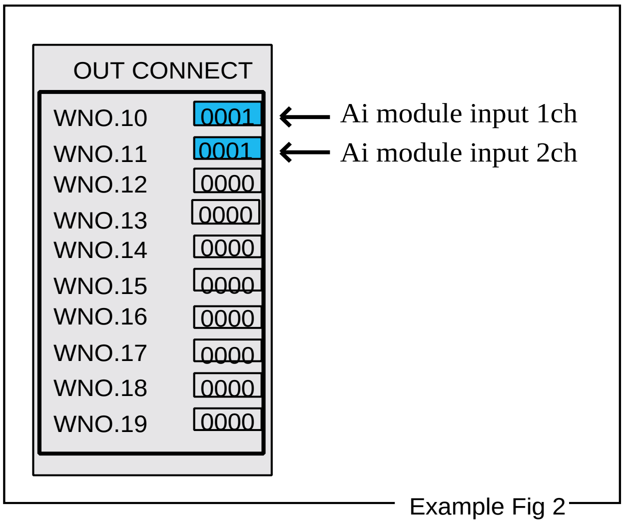
USE ON 10

Station 000

Slot No. 00

Module Type. AIV

Example Fig 1



OUT CONNECT

WNO.10	0001
WNO.11	0001
WNO.12	0000
WNO.13	0000
WNO.14	0000
WNO.15	0000
WNO.16	0000
WNO.17	0000
WNO.18	0000
WNO.19	0000

Example Fig 2

2) The input range of the analog input module is ±10 volts. If entry is made over the range, data is held at 30268.

3) Analog output is obtained within the given range (output is limited within the range of 4 to 20 mA).

Digital module

1) The digital module can be mounted only in Slot No. 0 to 3 or Slot No. 4 to 7.

2) The digital module processes 16 bits information of Slot No. 0 to 3 or Slot No. 4 to 7 as "1 word" data.

3) To process 1 word data of digital module:

   ① To create 1 word data for digital output, use BIT ON/OFF WAFER [3*].

   ② To resolve 1 word data for digital input into the bit data, use BIT RESOLUTION WAFER [38].

4) If, when using the digital module, settings of module type in OPTO22 Setting are wrong, it will not lead to communication error.

5) If Do module is set with the module type setting of OPTO22 Setting when Di module is used, an error will occur to Di module. In this case, turn off BRAIN once.

6) LED display on the digital module may differ from that of actual input/output data.

Others

1) Input module data is held by sampling data in a cycle since communication error has occurred.
2) If some errors occur to one of these modules when modules of the same type are mounted in 0 to 3 slot/4 to 7 slot/8 to 11slot/12 to 15 slot, data for all of other modules are held.

Example)

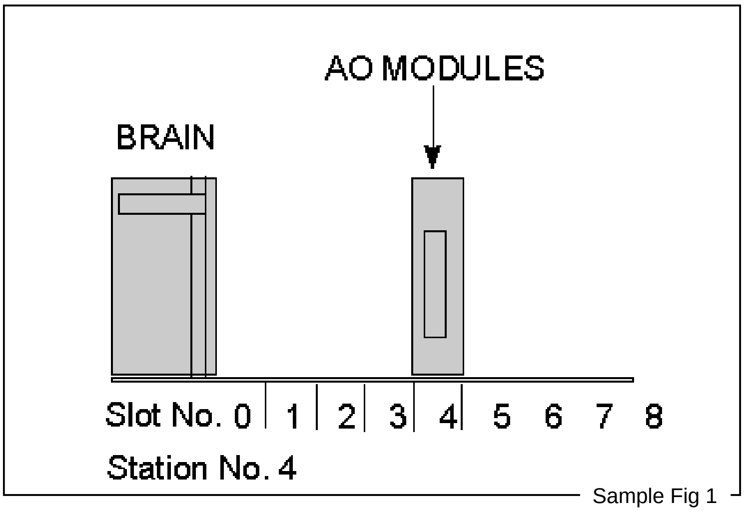
If an error occurs to Ai module of Slot 1, Ai module of Slot 1, 2 and 3 will cause an error.

3) When CC-M is turned OFF or communication line terminals are not connected, the output value from the output module is not constant.
4) SNAP I/O module is not isolated between channels.
5) Values displayed in OPTO22 of STATUS are as follows:
   ① When designating analog input, values that convert an input voltage of 1 to 5 volts into 0 to 100.00% are displayed.
   ② When designating analog output, currently outputted value is displayed (not actual output value). 0 to 100.00% correspond to 4 to 20mA.
   ③ When designating digital input, input data are displayed with 16 bit information (See Note 2) of 0 to 3 slot or 4 to 7 slot as 1 word data.
   ④ When designating digital output, currently outputted data (not actual output value) are displayed with 16 bit information (See Note 1) of 0 to 3 slot or 4 to 7 slot as 1 word data.

   Note 1) A digital module consists of 4 channels. The module having four slots (=4 modules per slot) contains 16 bit (1 word).

(6) Example of use

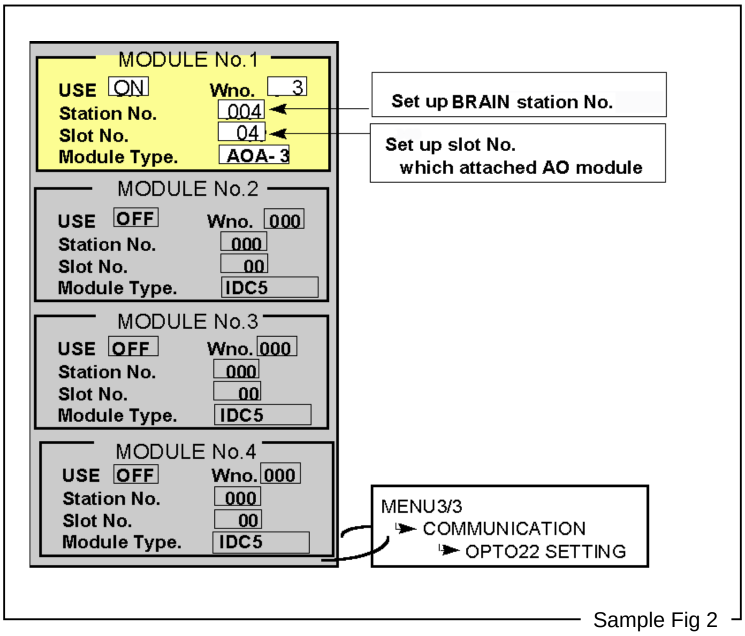
The analog output module mounted as shown in sample Fig. 1 provides an output of values set in Constant 1 (CON1).



Sample Fig 1

Step 1: Registry of analog output module

Register USE/Wno./Station No./Slot No./Module Type as shown in sample Fig. 2.



MODULE No.1
USE ON Wno. 3
Station No. 004
Slot No. 04
Module Type. AOA- 3

MODULE No.2
USE OFF Wno. 000
Station No. 000
Slot No. 00
Module Type. IDC5

MODULE No.3
USE OFF Wno. 000
Station No. 000
Slot No. 00
Module Type. IDC5

MODULE No.4
USE OFF Wno. 000
Station No. 000
Slot No. 00
Module Type. IDC5

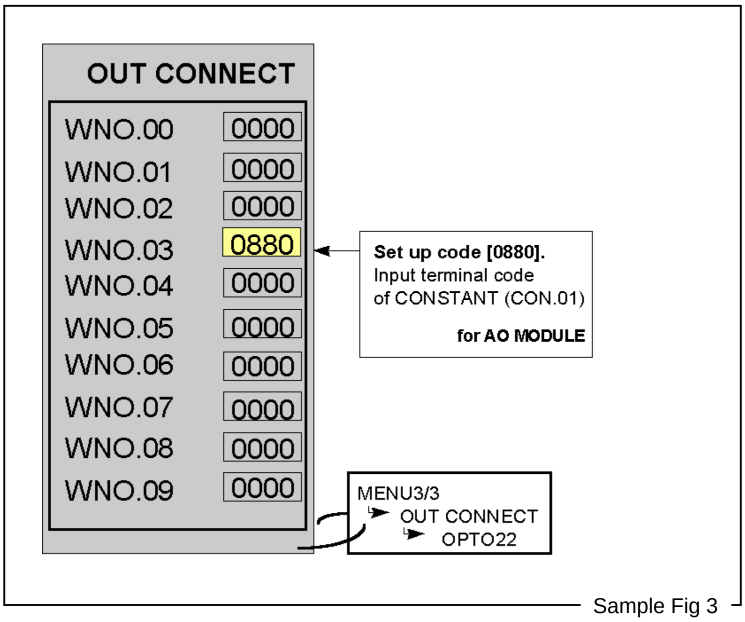
Set up BRAIN station No.

Set up slot No.
which attached AO module

Sample Fig 2

Step 2: Performing output connection

Set the input terminal code of the constant (CON1) in Wno.03 as shown in sample Fig. 3.



OUT CONNECT
WNO.00 0000
WNO.01 0000
WNO.02 0000
WNO.03 0880
WNO.04 0000
WNO.05 0000
WNO.06 0000
WNO.07 0000
WNO.08 0000
WNO.09 0000

Set up code [0880].
Input terminal code
of CONSTANT (CON.01)
for AO MODULE

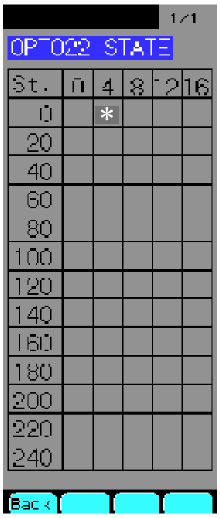
Sample Fig 3

Step 3: Execute All RUN/STOP of MENU 3/3.

When All RUN/STOP is in the RUN state, change it from RUN to STOP once, and return it from STOP to RUN.

Step 4: Check to ensure that the station set in OPTO22 STATUS is in normal communication.

Make sure that the asterisk (*) is attached to Station No. 4 as shown in Fig. 4.



OPTO22 STATE

St.	0	4	8	12	16
0		*			
20					
40					
60					
80					
100					
120					
140					
160					
180					
200					
220					
240					

*	Communication **OK !**
#	Communication **NG !**

Sample Fig 4

(7) Data sheet

1) SNAP BRAIN

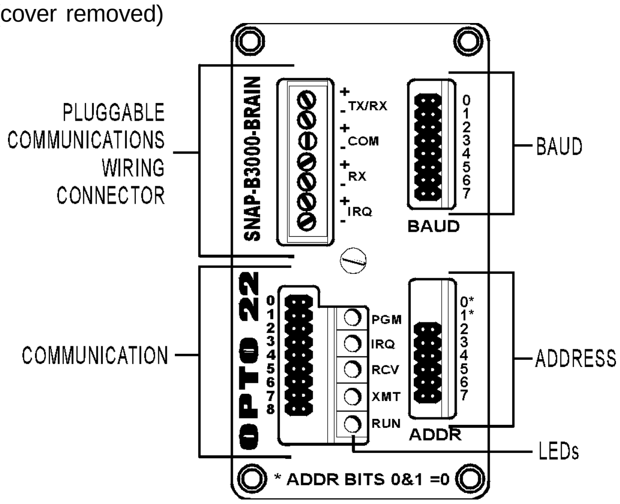
Specifications : GENERAL

Operating Specifications

Power Requirements	5.0 VDC ± 0.1 VDC @ 1.0A max.
Operating Temperature	0° to 70°C, 95% humidity, non-condensing
Communications Interface	RS-485/422, 2-wire, twisted pair(s), with shield
Data Rates	57600
Range: Multidrop	50m or 2 station
LED Indicators	RUN (Power On), RCV (Receive), XMT (Transmit), (IRQ) Interrupt, and (PGM) Program
Options: Jumper Selectable	Address Communication baud rate CRC Binary Mistic

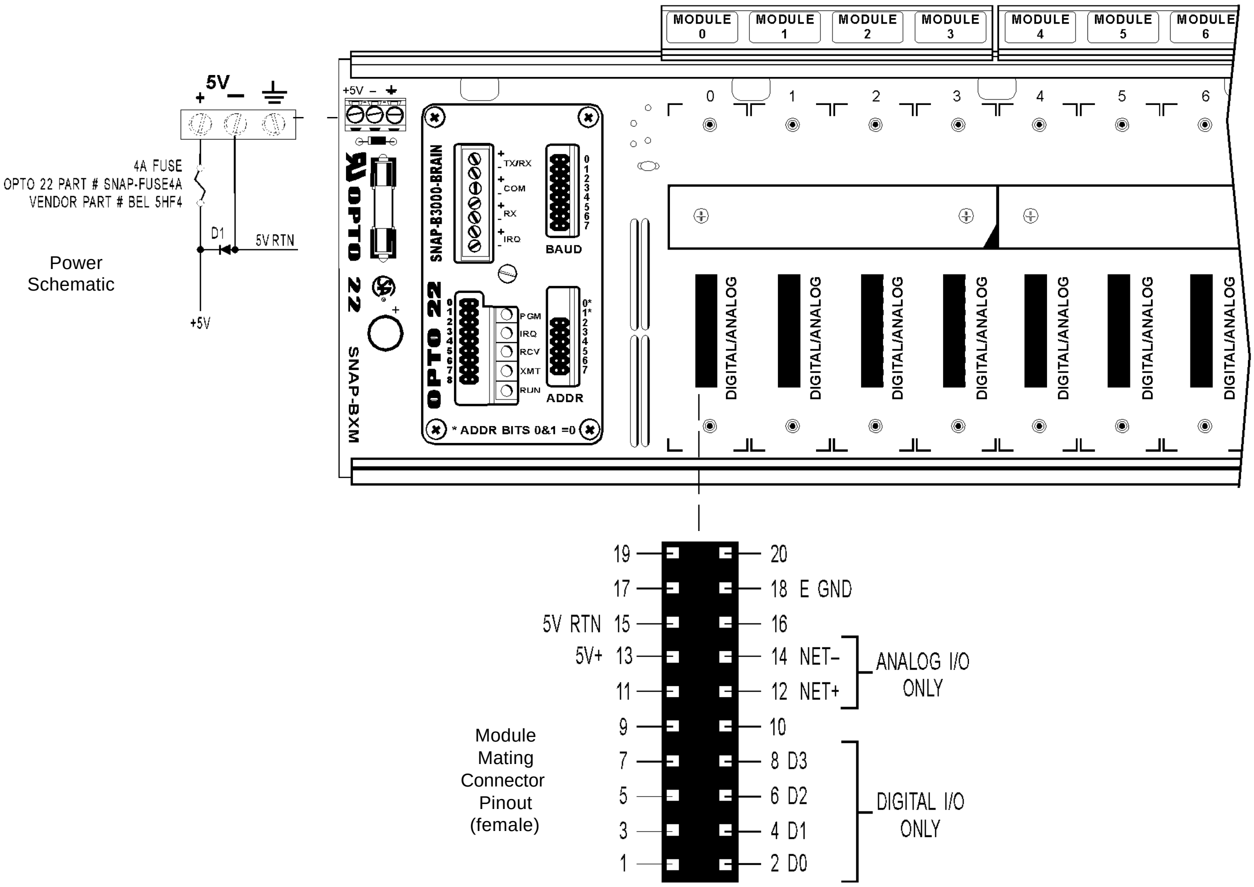
CONNECTORS AND JUMPERS

Top View: B3000
(cover removed)



2) Mounting Racks

Specifications



Operating Requirements

Part Numbers	Description	Maximum Power Requirements *	Operating Temperature Range	Relative Humidity
SNAP-B8M	8-module rack	5 VDC ± 0.1 @ 2.6 Amps max.	0° to 70°C	95%, non-condensing
SNAP-B16M	16-module rack	5 VDC ± 0.1 @ 4.2 Amps max.	0° to 70°C	95%, non-condensing

*This is the power requirement for a rack, brain board, and full load of analog modules.

Notes:

1. B3000 processor requires 1 Amp.
2. Analog modules require 200 mA each.
3. Digital modules require 50 mA each.
4. Rack module positions 8 and above are for analog modules only

3) SNAP I/O Modules

Modules and their specifications that are available for CC-M are given below.

Analog module

① Analog input module

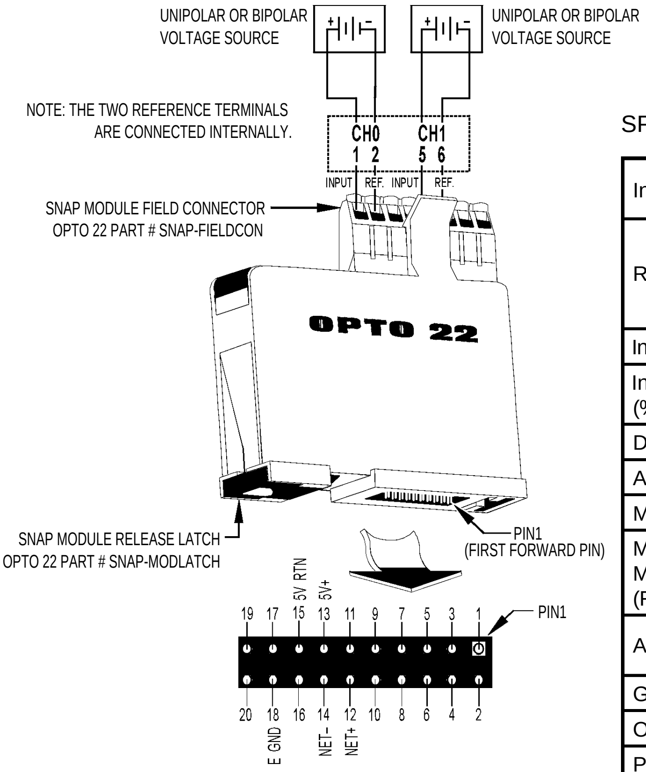
(VOLTAGE INPUT MODULE
-10VDC TO +10DVC)

Part Number	Description
SNAP-AIV	2-channel analog voltage input -10VDC to +10VDC

VOLTAGE INPUT MODULE
-10VDC TO +10DVC

DESCRIPTION

In CC-M, 1 volt of input voltage is regarded as 0%, and 5 volts as 100.00%
NOTE: Both channels share a common reference terminal.



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

SPECIFICATIONS

Input Range	From -10 Volts to +10 Volts
Resolution	0.4mV
Input Filtering	-3 db @64 Hz
Input Response Time (% of span/ DV/ Dt)	63.2% / 6.7 V / 10 mS
DC Common Mode Rejection	> -120 db
AC Common Mode Rejection	> -120 db @64 Hz
Maximum Survivable Input	220 Volts AC or 300 Volts DC
Maximum Operating Common Mode Voltage (Field term to logic connector)	500 Volts DC or Peak AC
Accuracy	0.05%, 5 mV @ 10 VDC 2.5 mV @ 5 VDC
Gain Temperature Coefficient	30 PPM/°C
Offset Temperature Coefficient	15 PPM/°C
Power Requirements	5 Volts DC (±0.15) @ 170mA
Input Resistance - Single Ended	1 M Ω (each channel) Both inputs share the same reference point
Ambient Temperature: Operating Storage	 0°C to 70°C -25°C to 85°C

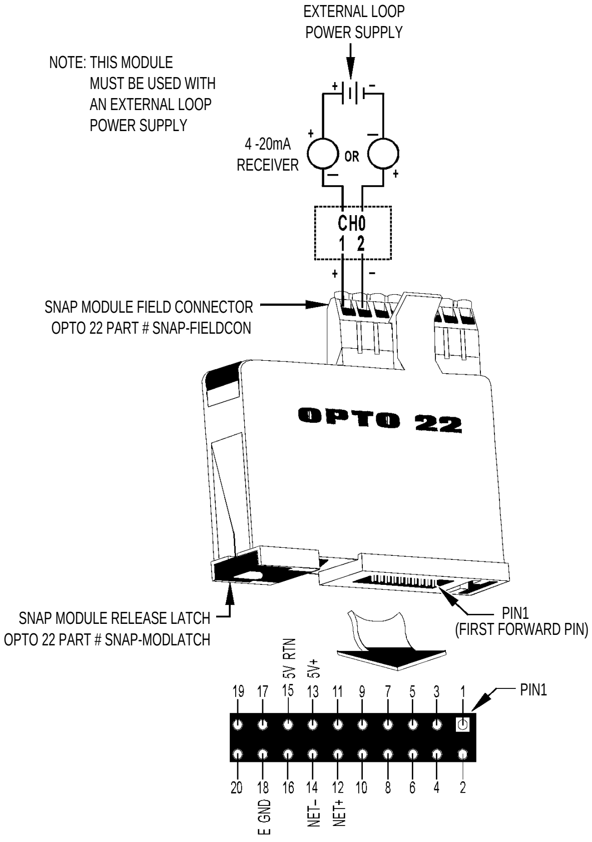
IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

② Analog output module

(Single-Channel Current
Output 4-20mA)

Part Number	Description
SNAP-AOA-3	Single-channel analog output current 4-20 m A

Single-Channel Current
Output 4-20 mA



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

> IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

DESCRIPTION

The SNAP-AOA-3 module provides a single channel of transformer and optically-isolated digital to analog conversion. The module has a true differential (floating) output that eliminates ground loops and has a nominal output range of 4 mA to 20 mA.

SPECIFICATIONS

Input	12-bit serial data
Output	4 to 20 mA (floating)
Span	16 mA
Resolution	3.9μA
Response Time (% of span/delta I/ delta time)	99.9%/15.98 mA/3 mS
DC Common Mode Rejection	> -120 db
AC Common Mode Rejection	> -120 db @60 Hz
Common Mode Output Range	500 Volts DC or Peak AC
Common Mode Resistance	>1000 MΩ
Accuracy	0.1% of span
Gain Temperature Coefficient	50 PPM/°C
Offset Temperature Coefficient	20 PPM/°C
Module Power Requirements	5 Volts DC (±0.15) @ 140 mA
Loop Power Requirements	10 Volts DC (min) to 32 Volts DC (max)
Max. Loop Resistance (Ohms) @ Loop Supply	250 350 950 1350 10V 12V 24V 32V
Max. Loop Resistance formula	$\text{Loop Resistance} = \frac{(\text{Loop Voltage - 5})}{0.02}$
Ambient Temperature: Operating Storage	 0°C to 70°C -25°C to 85°C

Digital module

③ Digital input/output module

Specifications

DC Input Modules

SNAP Digital AC & DC Modules	SNAP-IDC5
Key feature	--
Field Side Ratings (each channel)	
Nominal Input Voltage	24 VAC/VDC
Channel to Channel Isolation	300 VAC (1500 V transient)
Input Voltage Range	10-32 VAC/VDC
Turn On Voltage	10 VAC/VDC
Turn Off Voltage	3 VAC/VDC
Input Resistance	15K ohms (nominal)
Logic Side Ratings	
Logic Output Voltage	<.5V max. (on) @ 2mA sinking 2.7V min. (off) @ 400 mA sourcing
Logic Supply Voltage***	5VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum
Negative True Logic Output Drive	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL
Module Ratings	
Number of channels per module	4
Turn On Time	5 msec
Turn Off Time	15 msec
Optical Isolation (Field side to Logic side)	4,000 Volts (transient)
Temperature	0°C to 70°C, operating -30°C to 85°C, storage

* At 20kHz, 5Vp-p square wave input, 50% duty cycle.

** At 20kHz, 28Vp-p square wave input, 50% duty cycle.

*** When used in conjunction with a brain, the brain requires 5VDC ± 0.1VDC.

DC Output Modules

SNAP DIGITAL DC OUTPUT– LOGIC SOURCE AND SINK	SNAP-ODC5SRC	SNAP-ODC5SNK
Key Feature	Load sourcing	Load sinking
FIELD SIDE RATINGS (each channel)		
Line Voltage - Range	5 - 60 VDC	5 - 60 VDC
Line Voltage - Nominal	5 - 48 VDC	5 - 48 VDC
Current Rating 0°C to 70°C Ambient	3 Amps per Module 3/4 Amps per Channel	3 Amps per Module 3/4 Amps per Channel
Surge Current	5 Amps peak for 1 second	5 Amps peak for 1 second
Minimum Load	20 mA	20 mA
Output Voltage Drop	1.6 V max. @ .75 Amps	1.6 V max. @ .75 Amps
Off-State Leakage (60 Hz)	1 mA @ 60 VDC	1 mA @ 60 VDC
Peak Blocking Voltage	60 VDC	60 VDC
Fuse (common to all channels)	250 VAC - 4A 5x20mm Fast Acting Bell Fuse Part No. BEL 5HF4 Opto Part No. SNAP-4A	250 VAC - 4A 5x20mm Fast Acting Bell Fuse Part No. BEL 5HF4 Opto Part No. SNAP-4A
Channel-to-channel Isolation	Not applicable	Not applicable
LOGIC SIDE RATINGS		
Pickup Voltage	4V @ 5.5mA	4V @ 5.5mA
Dropout Voltage	1 VDC	1 VDC
Control Resistance	220 ohms	220 ohms
Logic Supply Voltage	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum
MODULE RATINGS		
Number of Channels per Module	4 4	
Turn-on Time	50 msec	50 msec
Turn-off Time	100 msec	100 msec
Optical Isolation (Field side to Logic side)	4,000 Volts (transient)	4,000 Volts (transient)
Temperature	0° to 70°C, operating -30° to 85°C, storage	0° to 70°C, operating -30° to 85°C, storage

* The power rating of the dry contact module must not exceed 10 VA under steady state or momentary in-rush conditions.

For voltages at or below 20 volts, the current limit is 0.5 amps.

For voltages above 20 volts, the maximum allowable current is determined by the following equation:

10VA = Current maximum

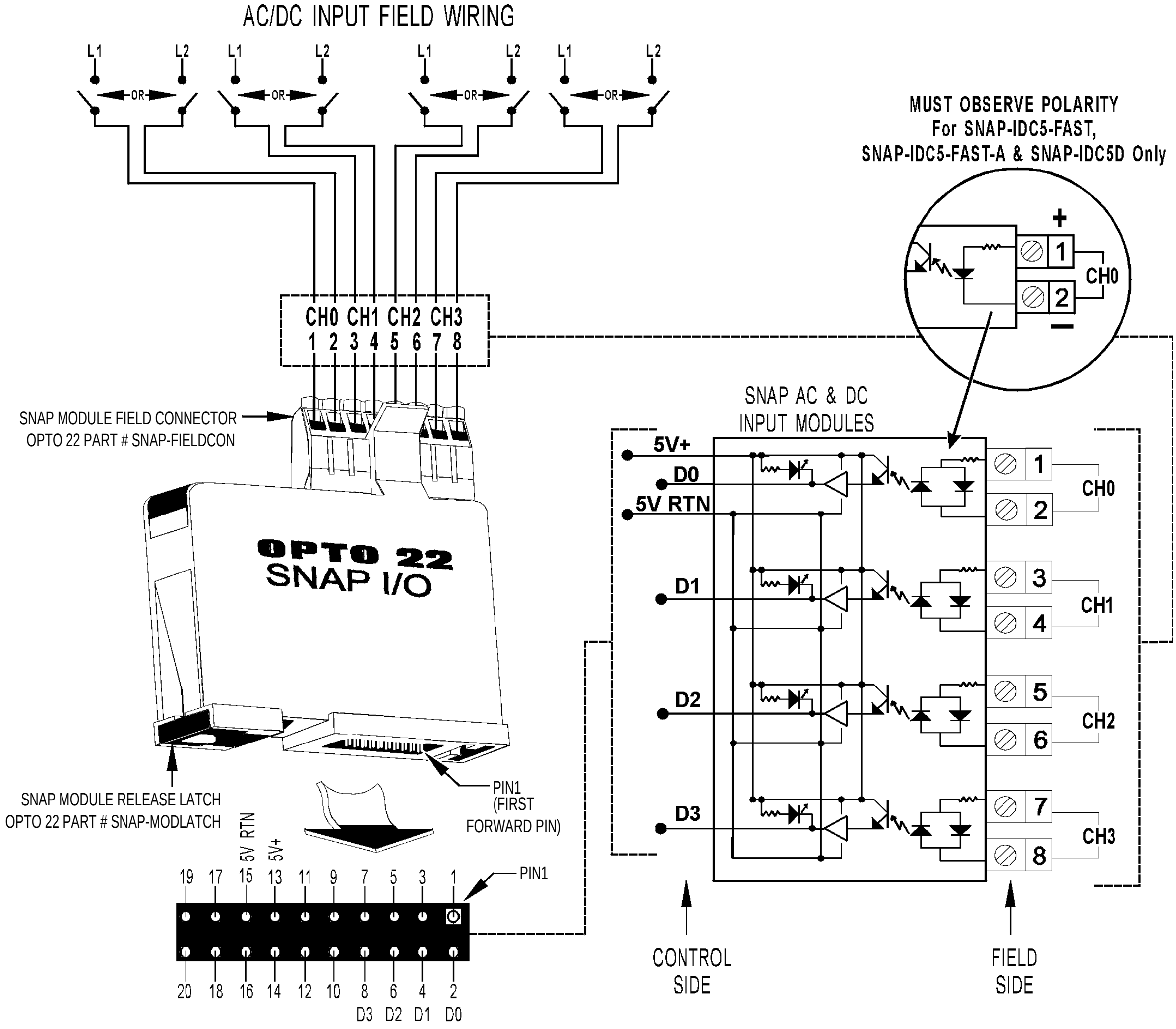
Voltage

④ **Digital input module**

(Schematics
AC and DC Input Modules)

Schematics

AC and DC Input Modules



SNAP DIGITAL ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

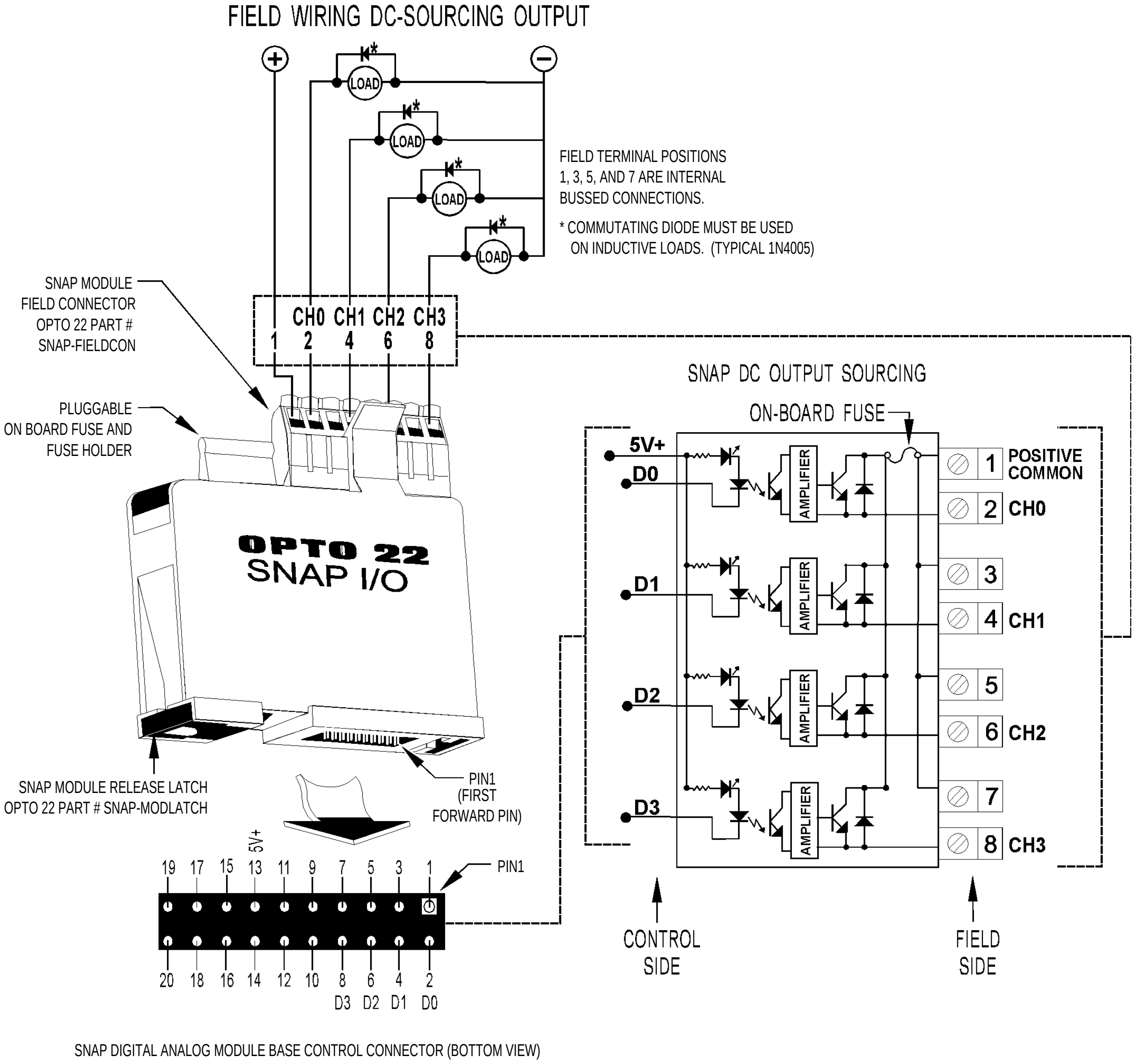
⑤ Digital output module -1

(Schematics
SNAP-ODC5SRC Output Module - Sourcing)

Part Number	Description
SNAP-ODC5SRC	4-channel DC output 5-60 VD C logic source

Schematics

SNAP-ODC5SRC Output Module - Sourcing



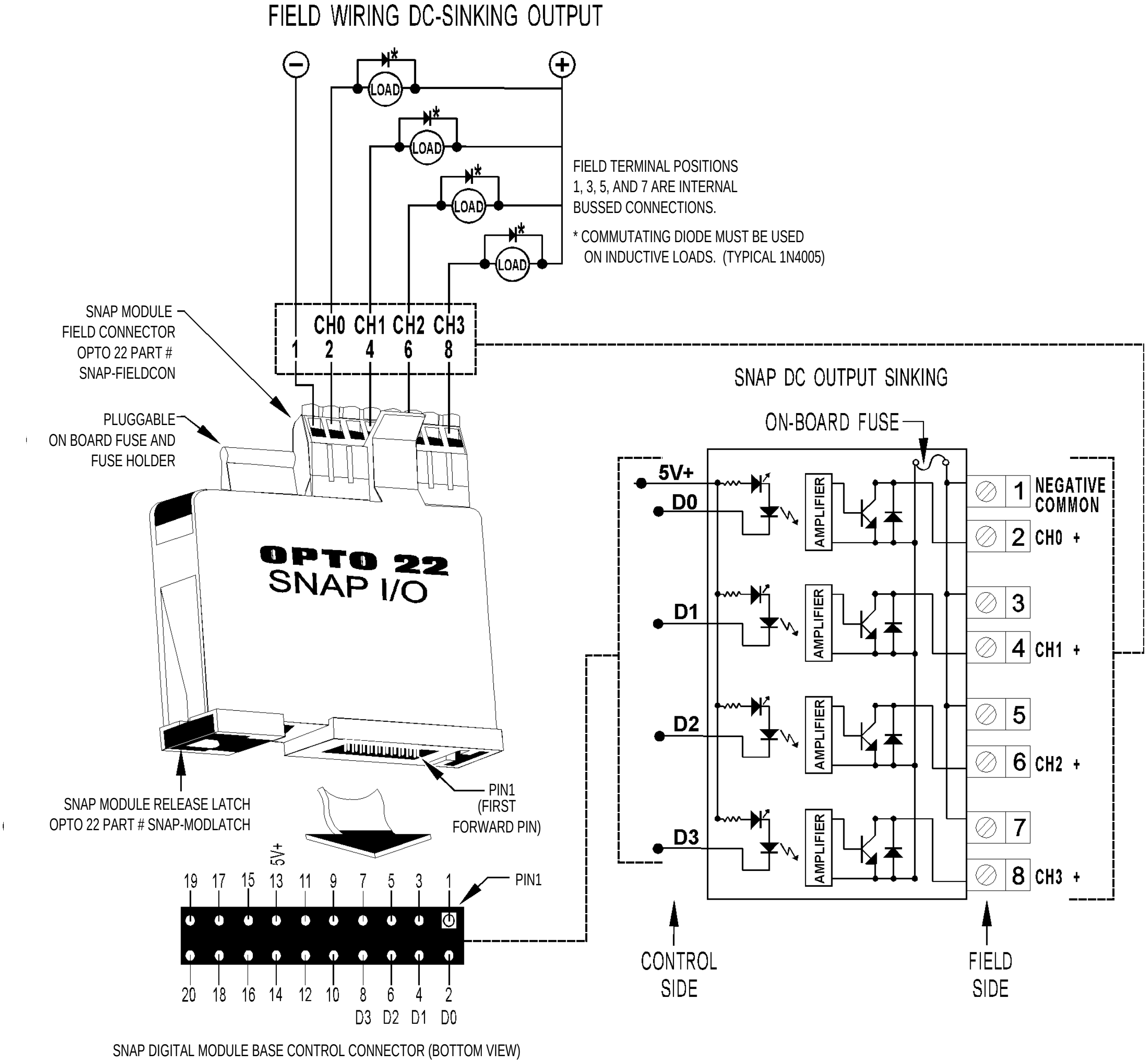
⑥ Digital output module -2

Schematics
SNAP-ODC5SNK Output Module - Sinking

Part Number	Description
SNAP-ODC5SNK	4-channel DC output 5-60 VD C logic sink

Schematics

SNAP-ODC5SNK Output Module - Sinking



Warning Task should be performed by experienced engineer only.

8. MOUNTING

8.1 Mounting

8.1.1 Mounting place

The instrument is so designed as to be mounted on an indoor panel. How the mounting place is proper affects the instrument service life and accessibility for maintenance and checkup. Pay attention to the following points.

(1) Not exposed to excessive vibration or impact.

(2) Avoid intense radiation or direct sunshine in a place where the ambient temperature is within 0 to 50°C with small temperature variation. If the ambient temperature is near normal temperature (20 to 25°C), the running results are good.

(3) Place where the humidity is 90% RH or lower, not dripped with water and not subjected to condensation.

(4) Not exposed to fines, dust or corrosive gases.

(5) Place where large current or spark is present, around a relay panel or the like is not desirable because of induction troubles.

(6) A good aeration is ensured for instrument heat radiation.

(7) A space is available so that wiring, maintenance, checkup, etc. can easily be made.

(8) More than 100 mm of space is secured below the main unit.

(9) There is no disturbance by electromagnetic wave from wireless equipment or portable telephone.

8.1.2 Temperature in panel

The temperature in the panel interior where the instrument is installed must be below 50°C which is the temperature around the instrument (within 15 cm from instrument). For this purpose, pay attention to the following points when preparing a panel.

(1) Do not install any equipment which produces excessive heat near the instrument.

(2) If another equipment is installed near the instrument, arrange so as not to hinder the air flow. Particularly, the heat is diffused upward and downward. Sufficiently secure spaces upward and downward.

(3) If the temperature around the instrument is supposed to exceed 50°C, install fans for forcing the atmospheric air into the panel.

8.1.3 Mounting method

(1) Panel cutout

Cut out the panel according to the cutout dimensions in “Fig. 8-3 Panel cutout dimensions”.

Note: The instrument front dimensions and panel cutout dimensions conform to IEC standards.

(2) Mounting method

1) Introduce the instrument through the panel cutout from the front and put the mounting fixture into the panel from the rear of the instrument.

2) Put mounting fixture angle into the rectangular cutout from the rear panel of the instrument and tighten bolt by a screwdriver to 0.4 to 0.5 N•m of torque.

3) Place the covering fixture that prevents foreign substance from entering the instrument on the case, with fixture angle inserted into the hole of the case.

4) Tighten the bolt of the covering fixture by a screwdriver to 0.2 to 0.3 N•m of torque.

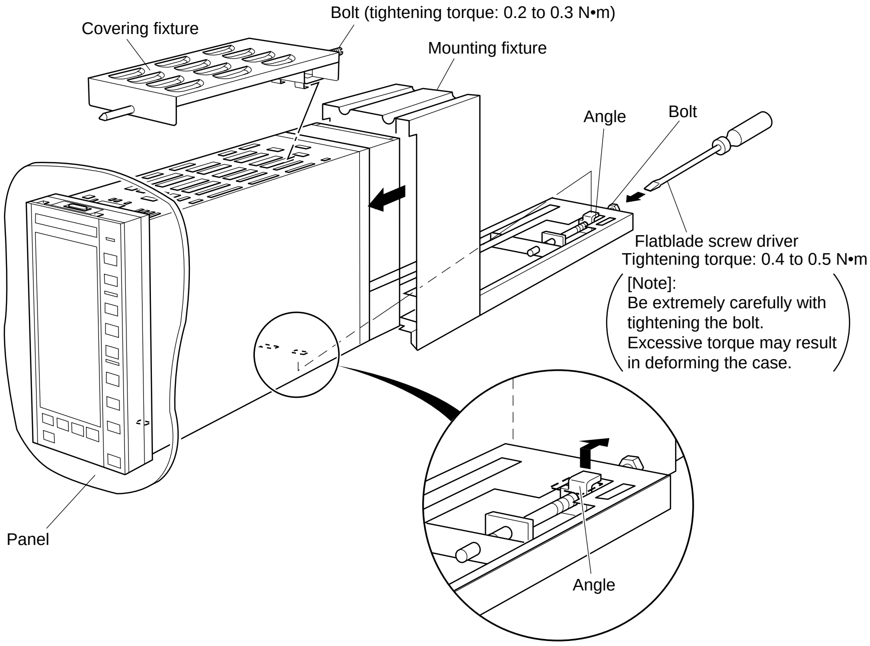


Fig. 8-1 Mounting method

⚠ Caution

An authorized engineer should take care of wring and mounting.

Be careful when mounting the instrument to avoid application of stress to the panel. Also, the torque should not be excessive. Otherwise, the case may deform or damage.

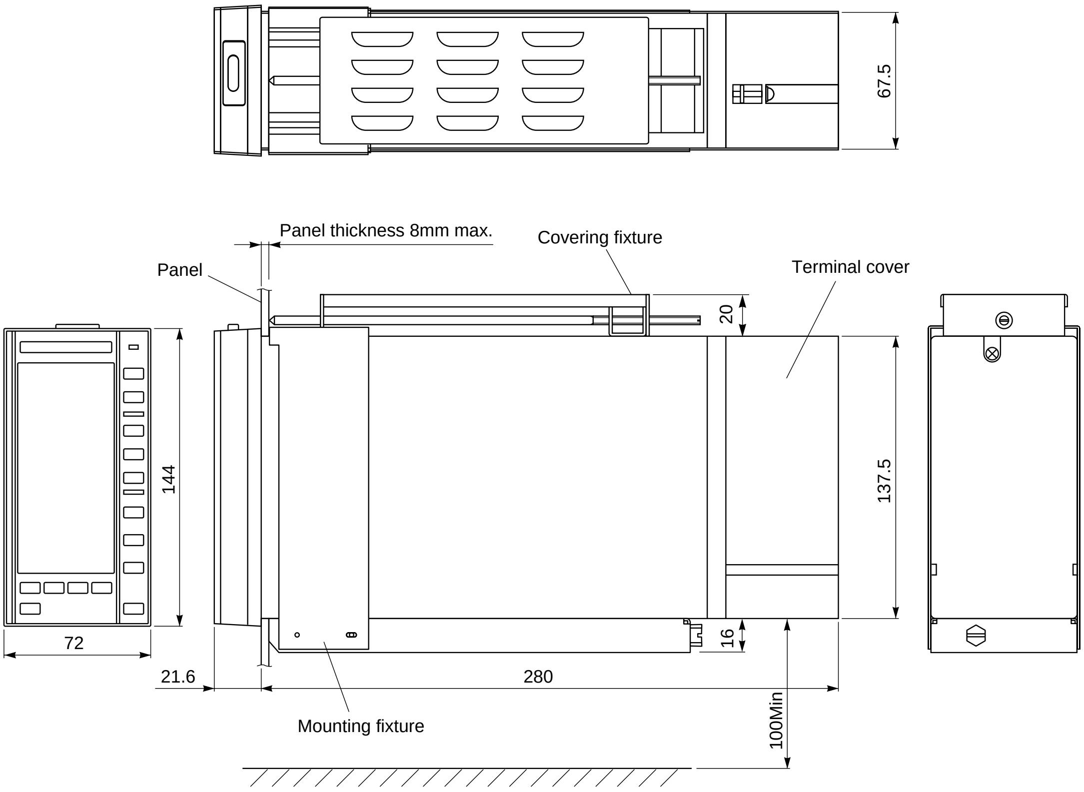


Fig. 8-2 Dimensions of compression terminals type

Panel cutout dimensions (unit in mm)

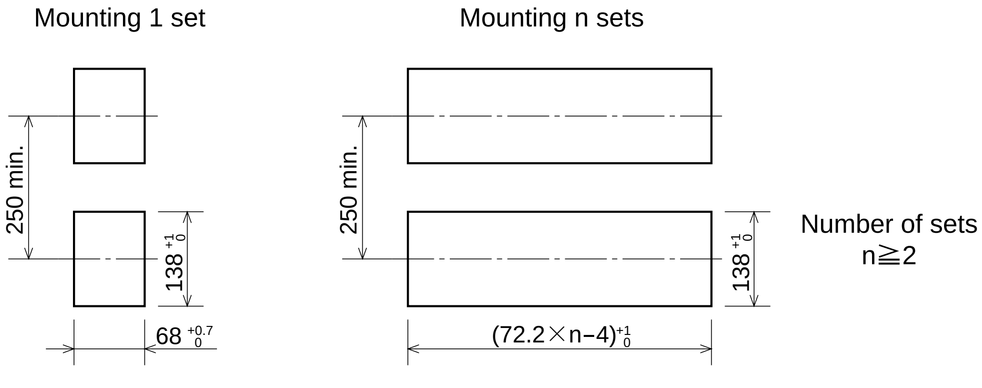


Fig. 8-3 Panel cutout dimensions

Warning Task should be performed by experienced engineer only.

9. WIRING

Before wiring, read the arrangement and description of block terminal symbols for the power terminal block so as to confirm their meaning.

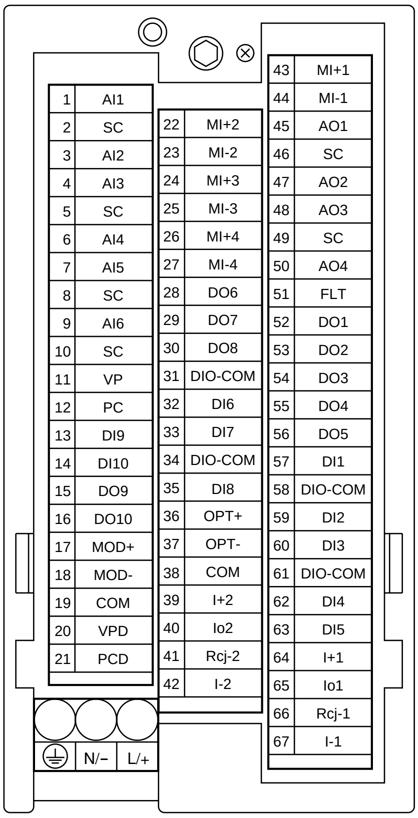


Fig. 9-1

Connection diagram

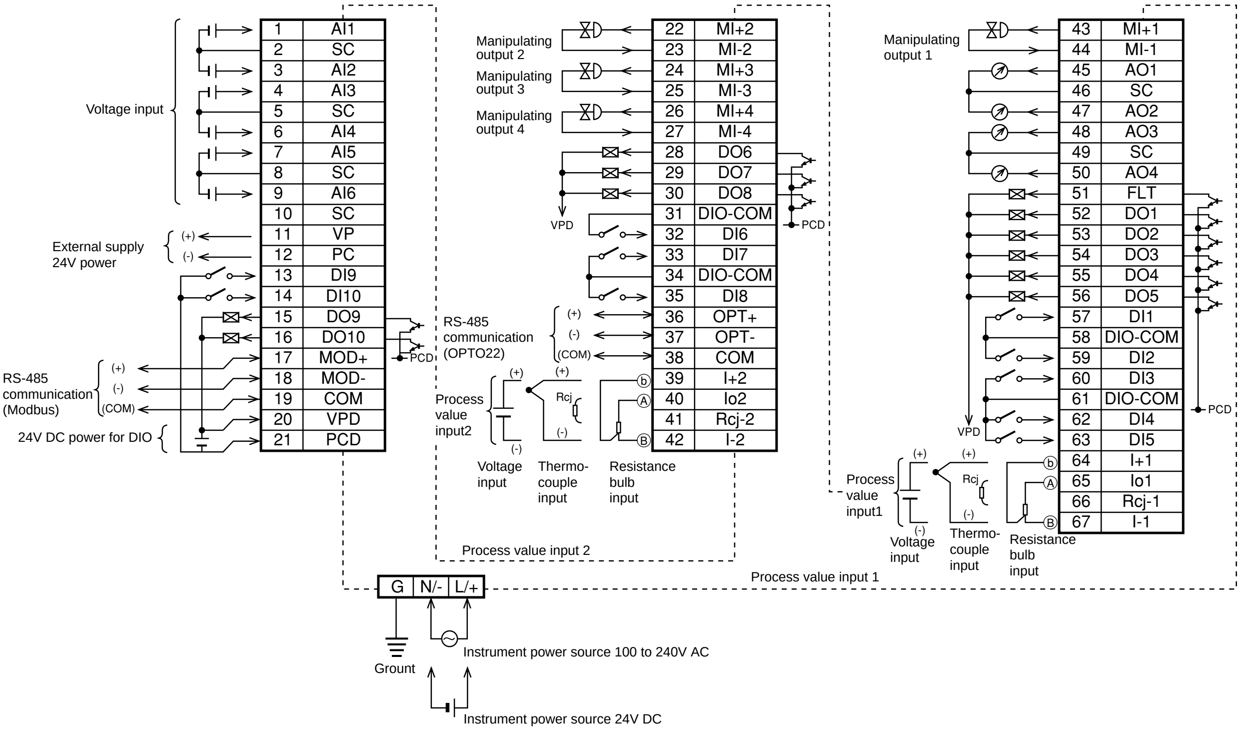


Fig. 9-2

9.1 Wiring to the terminals

(1) For wiring to the terminals, use 600V PVC wires IV (JIS C3307) or PVC cables CVV for control (JIS C3401). The applicable wire size is 0.2 to 2.5 mm^2. If bar terminals are used, their size must match the wire size.

(2) If there is a fear of induction disturbance, use shield wires and connect the shield line to G terminal.

Connect the following terminals by shield wires.

• Analog input	: AI1, AI2, AI3, AI4, AI5, AI6
• Analog output	: AO1, AO2, AO3, AO4, MI+1, MI-1, MI+2, MI-2, MI+3, MI-3, MI+4, MI-4
• Signal reference line	: SC, COM
• Power line	: VP, PC, VPD, PCD
• Communication line	: MOD+, MOD-, OPT+, OPT-

(3) Connect together unused MI+/- terminals.

9.2 Description on the terminals

Meaning of the terminal symbols

Table 9-1

Terminal symbol	Terminal No.	Meaning	Remarks
I+1, I-1, IO1	64, 67, 65	Process value input 1	1 to 5 V DC/TC input/Pt input
Rcj-1	66	Cold junction compensating terminal for process value input 1	Terminal for connecting Rcj module for TC input
I+2, I-2, IO2	39, 42, 40	Process value input 2	1 to 5 V DC/TC input/Pt input
Rcj-2	41	Cold junction compensating terminal for process value input 2	Terminal for connecting Rcj module for TC input
MI+1, MI-1	43, 44	Manipulating output 1	4 to 20 mA DC output
MI+2, MI-2	22, 23	Manipulating output 2	4 to 20 mA DC output
MI+3, MI-3	24, 25	Manipulating output 3	4 to 20 mA DC output
MI+4, MI-4	26, 27	Manipulating output 4	4 to 20 mA DC output
AI1, AI2, AI3, AI4, AI5, AI6	1, 3, 4, 6, 7, 9	Analog input	0 to 5 V DC input/0 to 5 V DC input/ 0 to 10 V DC input
AO1, AO2, AO3, AO4	45, 47, 48, 50	Analog output	0 to 5 V DC output/0 to 5 V DC output/ 0 to 10 V DC output
SC	2, 5, 8, 10, 46, 49	Signal common. Basic potential for AI, AO.	There are six SC terminals, which are connected together in the instrument.
DI1, DI2, DI3, DI4, DI5, DI6, DI7, DI8, DI9, DI10	57, 59, 60, 62, 63, 32, 33, 35, 13, 14	Digital input	30 V DC transistor input
DO1, DO2, DO3, DO4, DO5, DO6, DO7, DO8, DO9, DO10	52, 53, 54, 55, 56, 28, 29, 30, 15, 16	Digital output	30 V DC open collector output
FLT	51	Fault output	30 V DC open collector output
OPT+, OPT-	36, 37	Low order communication terminal	T-link (master)/OPTO22 low order slave module communication.
COM	38	Low order communication cable shield	Communication cable shield is connected.
MOD+, MOD-	17, 18	High order communication terminal	T-link (slave)/Modbus high order host communication.
COM	19	High order communication cable shield	Communication cable shield is connected.
VP	11	Auxiliary power output + terminal	24 V DC, 40 mA output
VPD	20	Digital input/output power input + terminal	DI, DO power input. If DI, DO is used, power must be supplied to this terminal.
PC	12	Auxiliary power output - terminal	
PCD	21	Digital input/output power input - terminal	DI, DO return line
DIO-COM	31, 34, 58, 61	Digital I/O power supply input terminal	Return line for DI, DO
L/+, N/-	None	Instrument power supply input	100 to 240V AC or 24V DC input
G	None	Grounding terminal	Be sure to conduct grounding.

9.3 Transmission connector cable

For wiring to the transmission connector, use the following cable. (It is not included in the scope of instrument and must be prepared separately.)

(1) Type designating method

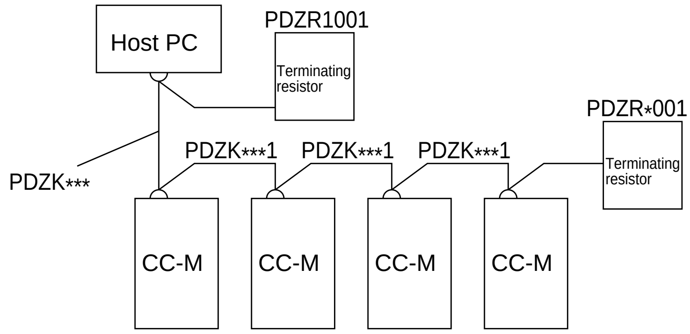
P D Z K □ □ □ 1	Description
	Combined instrument Modbus, OPTO22
4	PDA－PDA
5	PDA－PLC
6	PDA－PC
	Cable length (cm)
0A	30
0B	50
01	100
02	200
03	300
04	400
05	500
06	600
07	700
08	800
09	900
10	1000
ZZ	Others

(2) Type designating method

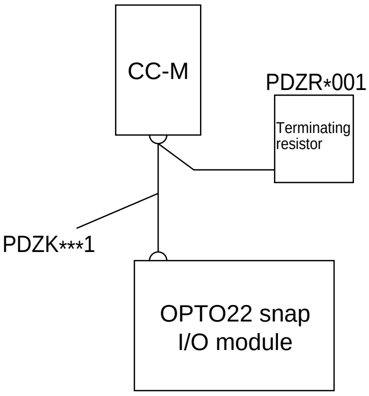
P D Z L □ 0 0 1	Description
	Combined instrument PC loader Length 3m
1	PDA－PC

(3) Typical configuration

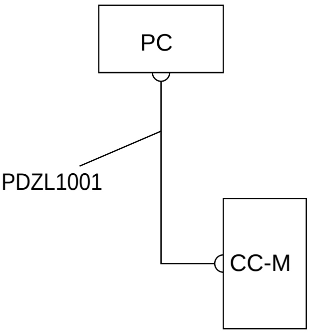
1）Modbus



2）OPTO22



3）Loader (RS-232C)



(4) Terminating resistor unit

Mount it to the instrument located at the end of compact controller M.

The terminating resistor unit is not included in the scope of instrument and must be prepared separately.

Name	Type to arrange
Terminating resistor for screw terminals	PDZR1001
Terminating resistor for compression terminals	PDZR2001

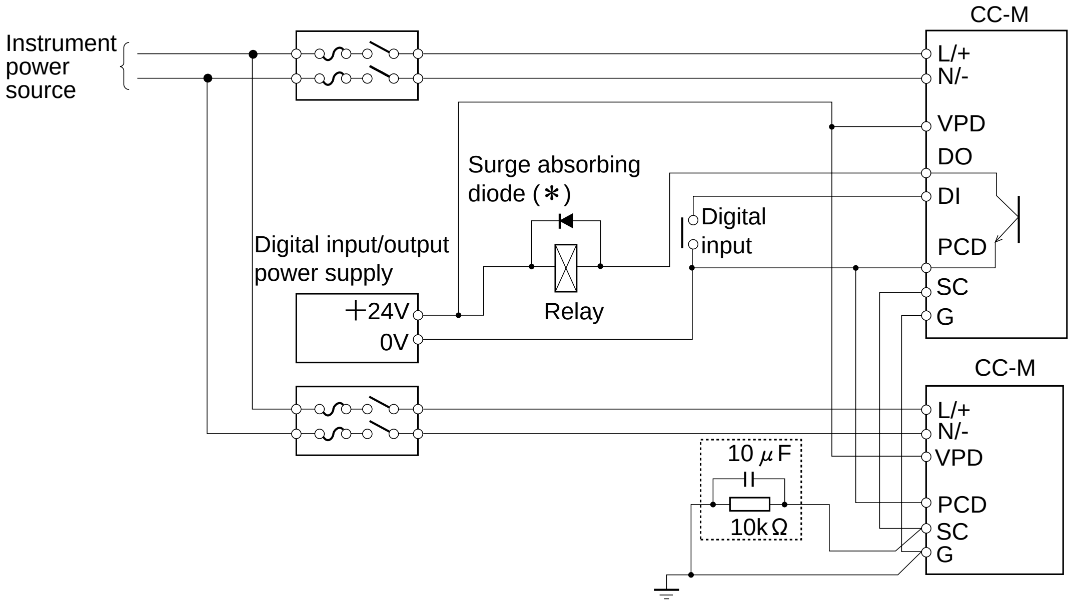
9.4 Wiring to instrument

9.4.1 Connection of power supply

Power switch is not incorporated in the instrument. And fuse is incorporated in the instrument (fuse rating 250V, 3.15A). Externally provide them if necessary.

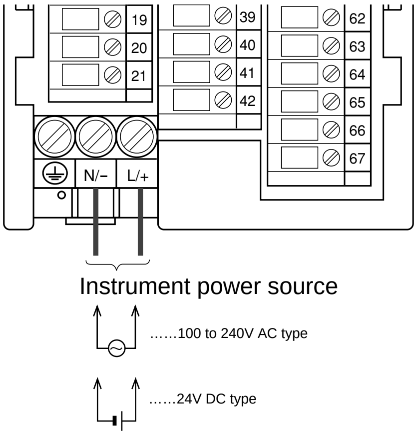
(1) Connection of instrument power supply

: + 24 V of 24 V DC } Digital input/output power supply
: + 0 V of 24 V DC
: Reference potential for analog signal
: Instrument power (supply power)
: 24 V power output (output current: 40 mA max.)



* If relay or the like is used, its surge may cause a maloperation of the instrument. In such a case, be sure to add a surge absorbing diode (surge absorber) externally.

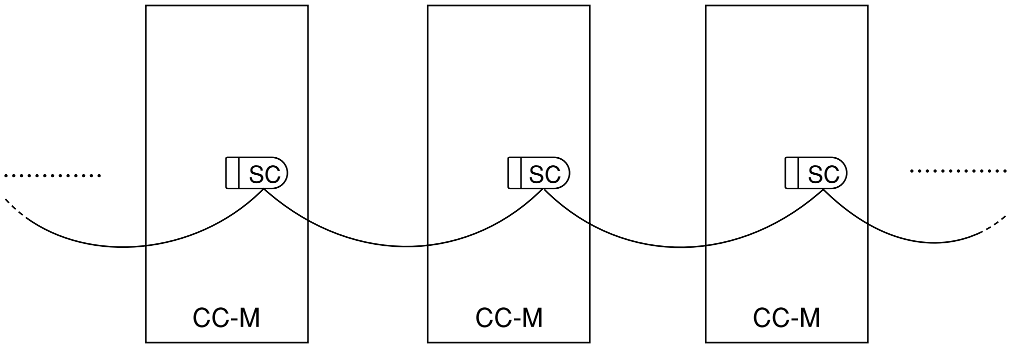
Connect instrument power source to the power terminals (terminal symbols L/+, N/-).



(2) Digital input/output power supply

Instrument power and digital input/output power can distinctly be supplied to the instrument. Therefore, the instrument power can be prevented from disappearing even when relay or protective diode connected in parallel with relay is short-circuited. Note that, if this arrangement is unnecessary, a normal operation can be recovered by interconnecting VP and VPD, and PC and PCD, omitting the digital input/output power supply. (See 9.4.4.)

SC wire (signal common bus) has only to be connected over several instruments without wiring independently from each instrument. It is recommended that the wiring over instruments in a loop form be arranged from the viewpoint of safety.



9.4.2 Grounding

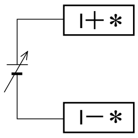
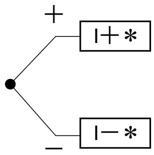
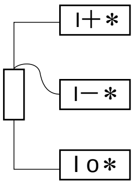
(1) Connect G terminal to ground at grade 3 (ground resistance 100Ω or less) or better by a wire of 2 mm^2 or more.

(2) Connect either of the 3 SC terminals to ground via C·R (10μF·10kΩ) at one point of the total systems. (See the broken line frame (⬚) in section 9.4.1 (1).)

9.4.3 Wiring of analog input signal

(1) Wiring to process variable input signal

You can select a process variable input out of 1 to 5 V DC, thermocouple input and resistance bulb input signal. If other than 1 to 5 V DC input, an optional direct input unit is required.

DC1 to 5V	Thermocouple input	Resistance bulb input
 I-terminal and SC terminal are connected together in instrument.	 	

(2) Wiring to other analog input/output signals

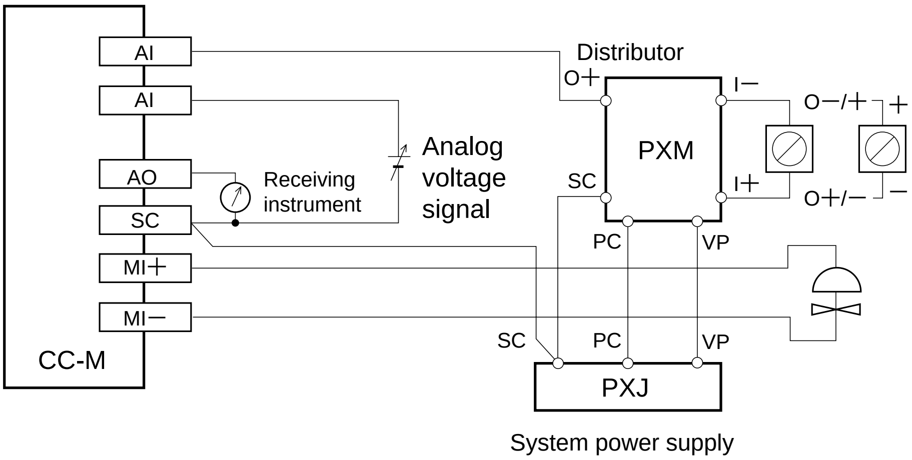
Connect the analog input/output signal as illustrated below.

SC is a reference potential of analog input/output signal (1 to 5 V DC signal). There are three SC terminals and they are connected together in the instrument.

The manipulating output (current output) flows in the direction from MI+ to MI-. If the current loop is left open, it is detected and an alarm (fault signal) is produced.

Input rating: Input resistance 1 MΩ or more, 15 kΩ outside the range (1 to 5 V DC signal).

Output rating: Output resistance 1Ω or less (1 to 5 V DC signal), allowable load resistance 600 Ω or less(current output).



AI : Analog input
AO : Analog output

* In system power supply (PXJ), PC and SC are connected together.

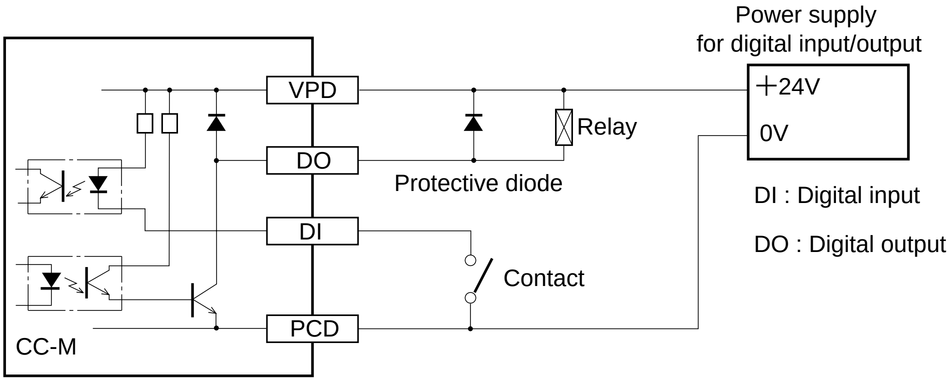
9.4.4 Wiring of digital input/output signals

Connect the digital input/output signals as illustrated below.

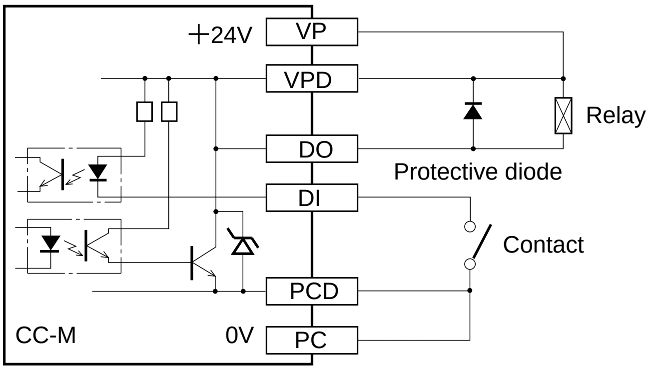
Before turning on the power supply for digital input, make sure without fail that the polarity of the protective diode connected in parallel with the relay is as illustrated below. Also make sure the polarity of a protective diode, if incorporated in the relay, is as illustrated below. If the polarity is reverse, an excessive current will flow, whereby the output circuit may be destroyed.

Input rating : Input current approx. 8 mA/24 V DC.

Output rating: 30 V DC × 0.1 A (max. rating).



If the instrument power is AC, power for digital input/output can be supplied through VP and PC terminals (see figure below). In this case, the digital input/output circuit is not isolated from the internal circuit.



⚠ CAUTION	• The output rating is 20 to 30 V DC (40 mA max.), which corresponds to output per MH54P. • **If the output current exceeds 40 mA, the instrument power supply may be destroyed.** • If the load is excessive, be sure to carry out wiring using a power supply for digital input/output. • If the OPTO SNAP I/O module is used for the lower rank communication, the power should not be supplied from this power source.

10. TROUBLESHOOTING

10.1 Troubleshooting

No.	Symptom	Check
1	The front display does not appear.	Is power properly supplied to mainframe? • The power line connection terminal is wrong. (See Chapter 9.) • Power not supplied. • Power line not connected or open circuited. →Confirm the wiring if it is correctly connected.
		Is the back light of LCD correctly lit? • The back light switch is not turned on. (See Section 2.2, bottom figure.) →Turn on the back light switch. • The back light switch reached the end of life. →Replace the back light switch with a new one. (See Chapter 12 for replacing the back light.)
		Is the main unit completely inserted in the mainframe case? • The main unit is not fully inserted. →Completely push in the main unit.
		Is there any unusual sound, smell or heating from the mainframe? • Anomaly of mainframe by entry of metal piece, etc. →Immediately stop operating and call us for service.
2	The front keys do not work.	Is not the key lock turned ON? →Turn off the key lock.
3	The manual run is impossible by front keys.	Isn't the wafer set at "STOP"? • The wafer computation is stopped. (See Item 7.1.2 (3).) →On this instrument, a manual operation is impossible while the wafer computation is stopped. Upon sufficiently making sure of system safety, set the wafer computation to "RUN" before manual operation.
4	PV bar graph display cannot be updated.	Isn't the wafer set at "STOP"? • The wafer computation is stopped. (See Item 7.1.2 (3).) →On this instrument, PV bar graph reading cannot be updated while the wafer computation is stopped.

No.	Symptom	Check
5	FLT lamp is lit and controller output is held.	A system fault is produced. →Referring to Section 6.7, investigate the cause of system fault and take remedial means.
6	FLT lamp blinks.	System warning is produced. →Referring to Section 6.7, investigate the cause of system warning and take remedial means.
7	The switch of back up operation unit (HMV) is turned on but the backup lamp would not light.	Wasn't the switch turned on from the beginning? • The switch was turned on before installing the HMV on the mainframe. →HMV turns to a backup status at OFF⇒ON rise front by the switch. Turn off and then on the switch.
8	HMV fault lamp of the back up operation unit (HMV) is lit.	Is the MI+/- connection secure? • MI+/- terminals of unused loops are left open. →HMV is provided with MI open-circuit detection function. Strap them for unused loops. • MI+/- connection is open-circuited. • The manipulated output line is not wired. →Recheck the wiring.
9	The main normal lamp of the back up operation unit (HMV) is extinguished.	Is the main unit securely set? • The main unit is detached. • The main unit is not securely inserted.
10	Warning of FLASH_WAR3 or 4 is produced.	Flash ROM data are erroneous. →For recovering the data from error, carry out FIX processing (see Item 4.6 (8)).
11	Warning of "WAF STOP" is produced while wafer is allowed to run.	In CC-M of 2 or 4 control output type, at least one loop is set at "STOP".. →Not abnormal. If at least one group is at "STOP", "WAF STOP" warning will be produced.
12	Data subjected to memory card logging may be missing.	Memory card logging is executed utilizing a vacant time of system software processing. If the wafer processing load is heavy or if many points are to be logged at a time, for example, data logged on the card may be missing since the control processing takes a precedence. But it is not a fault. → • Increase the trend setting interval. • Increase the basic cycle setting. (Note that the controllability will be affected.)

10.2 List of messages displayed on MENU 1/3-ALM/FLT screen

Alarm type	Alarm meaning (settable range)	Judging criterion
DMV	Manipulated output change rate	According to setting
MVL	Manipulated output low limit alarm (-25.00 to 125.00%)	According to setting
MVH	Manipulated output high limit alarm (-25.00 to 125.00%)	According to setting
DVL	Deviation low limit alarm (0.00 to 100.00%)	According to setting
DVH	Deviation high limit alarm (0.00 to 100.00%)	According to setting
DPL	Process variable change rate low limit alarm (0.00 to 100.00%)	According to setting
DPH	Process variable change rate high limit alarm (0.00 to 100.00%)	According to setting
PVL	Process variable low limit alarm (settable range depends on industrial value)	According to setting
PVH	Process variable high limit alarm (settable range depends on industrial value)	According to setting
SVL	Setpoint low limit alarm (settable range depends on industrial value)	According to setting
SVH	Setpoint high limit alarm (settable range depends on industrial value)	According to setting
Fault type	Fault meaning	
AI CHECK	AI check (ON/OFF)	Input range beyond -11.50 to 111.50%
DAI CHECK	Direct input AI check (ON/OFF)	Input range beyond -5.00 to 105.00%
OPTION AI	Direct input board down	Direct input board abnormal
MV R-BACK	MV read-back error	Read-back error beyond ± 10.00% or more or MV output open
Warning type	Warning meaning	
FLASH WAR	Flash ROM faulty	Flash ROM write, delete failed
OPT COM ER	OPTO 22 transmission faulty	OPTO 22 transmission faulty
WAF STOP	Wafer stop	Wafer computation stopped
CNCT ERROR	Wafer connection faulty	Wafer connected abnormally
ISA STOP	Soft PLC stop	Soft PLC computation stopped

Front FLT (fault) lamp status

Blink	Warning being produced
Lit	Fault being produced

11. DIFFERENCE FROM PAST MODELS

No.	Difference	CC-S / CC-F	CC-M
1	Maximium number of control loops	1 loop (2PID)	4 loops (8PID) (In case type is PDA34…)
2	MV bar graph display	Actual output read back value	Output value (expected)
3	Mode change key operation	Momentary press	Change to upload mode: Hold down 1 second Change to download mode: Momentary press.
4	Display unit	LED display	Color LCD unit. Back light must be replaced every 2 years.
5	Main frame depth	CC-S: 391mm, CC-F: 438mm	280mm.
6	Cubicle	Metal (Black/White)	Plastic resin (Gray)
7	HMV operation	Dial setting	UP/DOWN key setting
8	Setting of mode when power is turned on	By parameter/ SW	By front SW and parameters
9	Memory backup method	Nonvolatile memory	By battery. Battery must be replaced every 2 years. Program and parameter can be saved in flash ROM by FIX operation.
10	External terminal	M4 screw terminal+multi connector+transmission connector type	Compression terminal type
11	Mass	Approx. 2.9kg/ approx. 5kg	1.9kg max
12	Maximum wafer capacity	48 wafers	48 wafers×4 loops=192 wafers (for Type PDA34…)
13	Control mode	R-A-M type. A-M type.	C-A-M type.
14	Analog input	5 points/ 7 points	8 points. (2 points used also for thermocouple/Pt direct input terminal).
15	Control output	1 point	Up to 4 points
16	Auxiliary analog output	4 points/ 5 points	4 points.
17	Number of digital output points	6 points/ 6 points (fault output/alarm output of 2 points included)	11 points. (Fault output included.)
18	Transmission function	RS-422A (CC data line slave). RS-485A (CC data line slave).	RS-485 (MODBUS slave). RS-485 (OPTO 22 MISTIC protocol master).

No.	Difference	CC-S / CC-F	CC-M
19	Soft PLC function	None	Provided: Only when the 14th digit of the code symbol is "2", this is possible when used in combination with the software PLC configurator (option).
20	Memory card logging	None	Provided
21	Configurator	CC-S data loader	DOS/V PC loader (optional). • PC loader can be used only for CC-M of type code 14th digit=1. Soft Logic (optional). • Soft Logic can be used only for CC-M of type code 14th digit=2.
22	Front structure	IP65	IP54
23	Wafer No. 40. secondary basic control wafer	Provided	None
24	ALM indication	ALM indicator lamp output available by wafer	ALM indication output unavailable by wafer
25	DV·△MV indication	Provided	None
26	Program wafer association	Step counter / time lapse indication, etc. available	Unavailable
27	Operation in SCC mode	Front operation inhibited in SCC mode	Front operation available even in SCC mode. (Operation lock function provided.) SCC mode canceled upon selecting the remote/cascade mode.
28	Auto tuning function	Provided	None
29	Analog input error judgment	Judged in terms of input voltage level	-12.5% or lower, 112.5% or higher with respect to input scale
30	Control output (MV) 4 to 20mA output connection	In the same manner as other outputs, output connection should be performed on MI of the output terminal board.	MV values are outputted on MI by mounting wafer No. 44 (secondary MV output wafer). No output connection is required.

12. APPENDIX

12.1 SPECIFICATIONS

1. Control and computation functions

Control and computation functions are implemented by combining function-software packages called "wafers." Combination of wafers is called "wafer connection."

CC-M comprises 100 kinds of wafers.

Wafer connection is made by operating the keys on the front panel or using the special configurator.

(1) PID control

- Number of loops : Selected according to type designation from the following.
  1 loop (1 control output)
  2 loops (2 control outputs)
  4 loops (4 control outputs)
- Proportional band (P) : 1.0 to 3276.7%, set at 3000.0% for delivery
- Integration time (I) : 0.1 to 3276.7 sec, set at 3000.0 sec for delivery
- Derivative time (D) : 0.0 to 900.0 sec, set at 0.0 sec for delivery

(2) Programming function

- Programming method : Wafer connection method
  Select whether wafer connection is to be made by user or at the factory according to the designation
- Program capacity : 48 wafers × 4 loops (max. 192 wafers)
  A maximum of 48 wafers usable in 1 loop
- Kind of wafer : 100 kinds listed in Table 1

(3) Computation cycle : 200 ms for 4-loop (8PID) control of simplicity PID

(4) Alarm function

- Method : Alarm can be displayed and output through wafer connection.
- Kinds : Each high/low of PV, SV and MV, PV change rate alarm, MV change rate alarm, high/low deviations.

2. Input signals

Performance under reference condition(23±2˚C, 55±10%RH, Power voltage and frequency 50/60 Hz)

2-1 Analog input signal

- Number of inputs : 8 inputs

- Kind of signal : DC voltage, DC current, thermocouple (option), resistance bulb (option)

  Two thermocouple inputs or two resistance bulb inputs are selectable.

(1) DC voltage/DC current : Input range: Selectable among 0 to 5 V DC, 1 to 5 V DC and 0 to 10 V DC

Set at 1 to 5 V DC for delivery

: Input accuracy: ±0.1% ±1 digit of input span

: Industrial data conversion: settable within a range from -32767 to 32767

4, 3, 2 or 1 digit below decimal point or not decimal l point is selectable.

Set at 0.00% to 100.00% for delivery

: Industrial unit: Settable in up to 8 characters

Usable characters: Alphabets numerals, symbols such as +, – , ＊ , etc.

: Input accuracy guarantee range: –5% to 105% of input range except minus input.

: Maximum permissible voltage: ±35 V

: Input resistance: 1 MΩ or more

: Influence by ambient temperature: ±0.1% FS/10°C or less.

: Influence by power supply fluctuation: ±0.1% FS or less.

: Isolation : non-isolated from internal circuit.

: In case of DC current, shunt resistor need to be connected to input terminal to convert it to voltage

(250 Ω shunt resistor is optional item)

(2) Thermocouple (option) : Kind and measurable range: See Table 12-3.

: Input accuracy: ±0.2% FS ±1 digit

B type is ±5% FS between 0 to 400˚C

S and R type are ±1%FS between 0 to 500˚C

All type TC are ±5% FS under–100˚C

: Reference junction compensation error: ±1.0°C (provided measurable range is –50°C and higher)

: Input accuracy guarantee range: –5% to 105% of input range.

: Input resistance: 1 MΩ or more

: Allowable signal source resistance: 100 Ω or less (Zener barrier connection unallowable)

: Influence by signal source resistance: Approx. 0.25µV/Ω

: Influence by ambient temperature:

Within ±0.2% FS/10°C ±1°C

: Influence by source fluctuation: Within ±0.2% FS ±1∞C

: Burnout detection: Provided (input bias current approx. 0.25µA)

: Isolation: Isolated from internal circuit

: Reference junction compensation: By sensor module externally connected to terminal section

(3) Resistance bulb (option) : Kind and measurable range: See Table 12-3.

: Input accuracy: ±0.2% FS ±1 digit

: Input accuracy guarantee range: -5% to 105% of input range

: Allowable wiring resistance: 10Ω or less per wire, provided wiring resistance must be equal among 3 wires (Zener barrier connection unallowable)

: Influence by ambient temperature: Within ±0.2% FS/10˚C

: Influence by power supply fluctuation: ±0.2% FS or less

: Burnout detection: Provided (input bias current approx. 0.17mA)

: Isolation : Isolated from internal circuit

[Note] FS stands for full span.

- Sampling period : 100 ms

2-2 Digital input signal

- Number of inputs : 10 inputs
- Electrical specifications : No-voltage contact or transistor contact
  ON/0 V, OFF/24 V, ON current/about 8 mA
  Isolated from the internal circuit with a photocoupler. Not isolated between each digital input and output.
- Contact rating : 30 V DC, 10 mA or more
- Signal judgment : No-voltage contact
  Contact resistance; 200 Ω max. at ON, 100 kΩ min. at OFF
  : Transistor contact
  1V max at ON, leakage current 100μA max. at OFF

3. Output signals

Performance under reference condition(23±2˚C, 55±10%RH, Power voltage and frequency 50/60 Hz)

3-1 Analog output signal

(1) Control output

- Number of outputs : Selectable among 1, 2 and 4 outputs
- Kind of signal : 4 to 20 mA DC
- Output accuracy : ±0.2% FS
- Load resistance : 600 Ω or less
- Output accuracy guarantee range : 2 to 22 mA DC
- Influence by ambient temperature : Max ±0.2% FS/10˚C
- Influence by power supply fluctuation : Max. ±0.2% FS
- Isolation : Non-isolated from internal circuit

(2) Auxiliary analog output

- Number of outputs : 4 inputs
- Kind of signal : Selectable among 0 to 5 V DC, 1 to 5 V DC and 0 to 10 V DC
  : Set at 1 to 5 V DC for delivery
- Output accuracy : ±0.1% FS
- Load resistance : 15 kΩ or more
- Output guarantee range : 1 to 5 VDC : –12.5% to 112.5%
  : 0 to 5 VDC : 0% to 112.5%
  : 0 to 10VDC : 0% to 105%
- Influence by power supply fluctuation : Max. ±0.1% FS
- Isolation : Non-isolated from internal circuit

3-2 Digital output signal

- Number of outputs : 10 outputs
- Electrical specifications : Transistor open collector
  1 V max. at ON, 10 μA max at OFF.
  Isolated from the internal circuit with a photocoupler. Not isolated between each digital input and output.
- Output rating : 30 V DC, 100 mA max. (resistive load)

3-3 Fault output signal (terminal symbol FLT)

- Number of outputs : 1 output
- Electrical specifications : Transistor open collector
  1 V max. at ON, 10 μA max at OFF.
  Isolated from the internal circuit with a photocoupler. Not isolated between each digital input and output.
- Output rating : 30 V DC, 100 mA max. (resistive load)

4. Display

- Display unit : Color graphic liquid crystal display, with CFL back light contrast adjustable.
- Contents of display : Menu
  : Loop instrument diagram (1, 2, 4 and 8 loops)
  Bar graph display, digital display, etc. of PV, SV and MV.
  [Note] The term "loop" hereby indicates the number of control blocks. It does not mean the number of control outputs.
  : Tuning screen
  : Trend display (max. 8 screens)
  : Alarm and alarm history display
  : Analog input/output and digital input/output monitor
  : Wafer connection
  : Parameter setting

5. Setting and operation

(1) Set point setting method

- Setting key : Up key/down key
- Setting speed : Approx. 40 sec/FS
- Setting resolution : 0.05% FS/each push operation

(2) Control output operation method

- Operation key : Up key, down key and high-speed key
- Operation speed : Approx. 40 sec/FS (usual), approx. 8 sec/FS (high speed)

(3) Operation mode

- Kind of operation mode : C, A, M and HM

[Note]
C: Cascade mode (operation according to remote set point)
A: Auto mode (operation according to the local set point)
M: Manual mode (control output to be manually operated by operator)
HM: Hard manual mode (operation with backup operation unit)

- Setting method : Selected according to type designation from the following. C-A-M
- Changeover : Balance bumpless changeover for A → C.
: Balanceless bumpless changeover for others.

[Note] Balance bumpless changeover is a method where each setting value needs to be balanced by operator himself at the time of changeover.

[Note] Balanceless bumpless changeover is a method where each setting value is automatically balanced by the controller at the time of changeover.

(4) Security

- Method : Setting of a password
- Password : Settable in 4 numerals (within 0000 to ffff), 0000 set for delivery
- Contents of security : Inhibition of parameter setting

(5) Other setting items

- Tag number : Settable in up to 8 characters by each control block.
Usable characters; alphabes, numerals, symboles such as +, – , ＊ , etc.

6. Power supply

- Voltage rating : 100 V to 240 V AC 50/60 Hz or 24V DC
- Allowable voltage range : 85 V to 264 V AC or 20 to 30V DC
- Frequency : 47 to 63 Hz
- Power consumption : 60 VA or less (100 V to 240 V AC) or 30 W or less (24 V DC)
- External power supply (terminal symbol VP and PC) : 20V to 30V, max. 40mA

7. General performance and characteristics

- Insulation resistance : 500 V DC, 50 MΩ min.
- Dielectric strength : 2,000 V AC for 1 minute between power terminal and ground terminal in case of 100 V to 240 V AC power supply type.
  : 500 V AC for 1 minute between power terminal and ground terminal in case of 24 V DC power supply type.
  : 500 V AC for 1 minute between signal communication terminals and ground terminal
- Rush current : 60 A or less.
- Clock : Set and display year, month, day, hour, minute, second
  accuracy : ±100 ppm except of time log (less than 1 sec) which power ON / OFF action.
- Memory backup : Protection by lithium battery.
  Program and parameter are stored non-volatile memory.

8. Operating and storage conditions

- Installation location : at room
- Operating temperature : 0 to 50˚C
  0 to 40˚C when the right and left ones are closely mounted.
  Temperature change rate is 10˚C/h or less.
- Transport and storage temperature : -20 to 70˚C
  Temperature chage rate is 20˚C / h or less.
- Operating humidity : 5 to 90% RH, condensation unallowable
- Transport and storage humidity : 5 to 95% RH, condensation unallowable
- Operating continuous vibration : 4.9 m/s^2 (0.5 G) or less
- Transport and storage shock : Fall of 60cm max. in packed status

9. Power failure and restart function

- Permissible duration of momentary power failure
  : 20 ms at 90V AC (100 V to 240 V AC power supply type)
  [Note] In case of 24 V DC power supply type, system power supply unit (model:PXJ) is recommended to avoid power failure problem.
- Behavior at power failure detection
  : Control stops at detection of power failure.
- Power recovery mode : Selectable initial start and continuous start

10. Self-diagnosis

- Control and computation circuit failure : Monitoring with watchdog timer
- Input signal failure : Voltage/current input Monitoring of range over
  : Thermocouple and resistance bulb Monitoring of disconection
- Control output signal failure : Monitoring of disconnection by read back check
- Behavior at failure : FLT is indicated, FLT lamp lights, FLT output signal turns on, control stops and control output is held.

11. Structure

- Enclosure : Plastic (material: PC-ABS)
- Finish color : Front frame and enolosure both gray
- Flame resistance : UL94V-0
- Protection : Front face; IP54 (display unit and operation key)
- External dimensions (Width × height × depth) : 72 × 144 × 280 mm
- Mass : 1.9 kg or less
- Mounting method : Flush on indoor panel
  Vertical mounting as standard
  Tilted mounting allowed within backward angle 0 to 45.
  For panel cutout dimension, refer to panel cutout dimensions
- External terminal : Compression terminal type

12. Backup function (option)

- Method : With backup operation unit
- Number of control outputs : Selected from 1, 2 and 4 according to type designation
- Output signal : 4 to 20 mA DC
- Indication : Control output changeover indication of each loop (mA indication)
- Indicator method : 21-segment LED
- Indication changeover : Changeable to each loop by loop selection key
  Loop No. indicated by 1-digit LED
- Operation key : Control output up, control output down, loop selection
- Operation resolution : 5%
- Backup changeover : Changeover has been made by the backup operation unit switch. However, changeover cannot be made when the backup operation unit is faulty.
  : In all loops, changeover to the HM mode is blanceless and bumpless.

13. Communications function (option)

13-1 Modbus® protocol interface

- Communication behavior : Slave
- Communication protocol : Based on Modbus® protocol
- Physical specification : EIA RS-485
- Communication method : Communication method: 2 wire system, half duplex, start-stop synchronizing
- Connection form : Multi-drop
- Communication rate : 19.2 kbps
- Communication distance : Max. 500 m in total
- Number of connectable units : Max. 31 units
- Data length : Fixed to 8 bits
- Parity : Odd / Even / None
- Stop bit : 1 or 2
- Isolation : Isolated from internal circuit
- Terminal impedance : 100 Ω (optional item)
- Communication items : Parameters and process value.

13-2 OPTO22 interface

- Communication behavior : Host
- Usage : I /O extension
  Auxiliary analog input / output : Up to 4 points
  Auxiliary digital input / output : Up to 32 points
- Communication protocol : Based on OPTO22 interface (MISTIC protocol)
- Physical specification : EIA RS-485
- Communication method : Communication method: 2 wire system, half duplex, start-stop synchronizing
- Communication rate : 57.6 kbps
- Communication distance : Max.50m in total
- Number of connectable units : Max.31 units
- Isolation : Isolated from internal circuit
- Terminal impedance : 100 Ω (optional item)
- Communication item : Parameters, process values, etc.

13-3 Loader interface

- Communication protocol : Based on Modbus® protocol
- Physical specification : RS-232C
- Communication distance : Max.3 m

14. Soft Logic function (option)

[Note] The wafer does not operate with CC-M having Soft Logic function specifications.

- Programming method : Based on IEC 61131-3
- Available language : Ladder diagram (LD)
  Sequential function chart (SFC)
  Function block diagram (FBD)
  [Note] Programming is to be carried out using the configuration software.
  [Note] Programming and editing are not allowed on the controller
- Number of steps : Corresponding to 2k steps of ladder
- Computation cycle : 200 ms corresponding to 2k steps of ladder

15. Memory card interface function (option)

- Specification : Compact Flash® (Based on CFA)
- Compatible memory card : 5 V flash memory card
  Capacity 4, 20 and 30 MB
- Application : Store the logging data (up to 32 points)
  (Or up to 4 panels (16 points) if save cycle is 1 second)
- Saving period : Min. 1 sec
- Data storage capacity

Memory card capacity	Data storage
4MB	about 180 thousand data
20MB	about 900 thousand data
30MB	about 1.35 million data

1 data = 1 point record data.

- Format method : Dependent on this controller
- Data readout : Readout by personal computer using PCMCIA card slot
- Recommended memory card : Sandisk’s products
  Available by PC ship or other distributors.
  : Sandisk home page address http://www.sandisk.com

16. Standards under conformity

(1) General safety : IEC 1010-1 (1990)
EN 61010-1 (1993)

(2) EMC : Based on Emission EN 50081-2 (1994)
Based on Immunity EN 50082-2 (1995)

17. Configuration software

17-1 Programming loader software (code symbol : PDZP2001)

- Wafer connection can be entered, edited, uploaded and downloaded.
- Operation parameter can be entered, edited, uploaded and downloaded.
- Included in CD-ROM (Type: PDZQ2001 - option) or supplied CD-ROM.

17-2 Soft Logic Configurator (optical item)

- Programming method : Based on IEC 61131-3

[Note] The program made by this software cannot be changed by the controller itself.

17-3 Recommended personal computer system

- Hardware : DOS/V machine, Pentium 100MHz or higher
  Free hard disk capacity : 40MB or more
  Memory capacity : 32MB or more
- Operating system : Windows 95/98SE

18. Terminal section arrangement

- For terminal arrangement, see Fig. 12-1.

19. Relevant manual

- Communication specifications for compact controller M INP-TN512178-E
- Soft Logic for compact controller M INP-TN512474-E

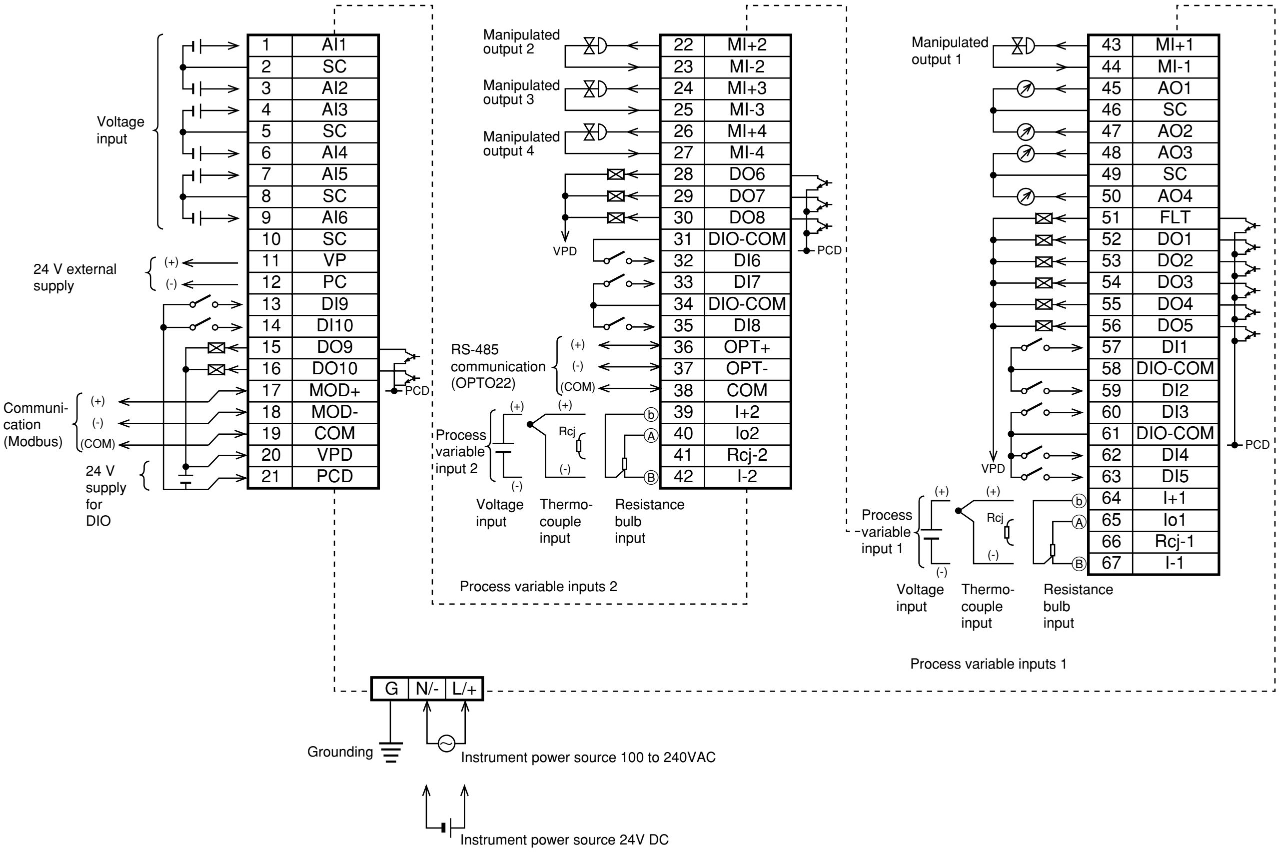


Fig. 12-1 Terminal arrangement

Input terminal code list 1/2

Table 12-1-1

Terminal name	Code	Loop 1	Loop 2	Loop 3	Loop 4
Pulse count input 1	FI1	0010			
│	│	│			
4	FI4	0013			
Pulse width input 1	PI1	0014			
│	│	│			
4	PI4	0017			
Process variable input 1	PV1	0030			
2	PV2	0031			
Analog input 1	AI1	0032			
│	│	│			
6	AI6	0037			
Direct input 1	PVD1	0038			
2	PVD2	0039			
Digital input 10	DI10	0095			
│	│	│			
1	DI1	009E			
OPTO22 input data 00	WNO00	0200			
│	│	│			
OPTO22 input data 99	WNO99	0263			
PV-1ch input error	FLT3-1	032F			
PV-2ch input error	FLT3-2	032E			
Ai-1ch input error	FLT3-3	032D			
│	│	│			
Ai-6ch input error	FLT3-8	0328			
PVD-1ch input error (direct input)	FLT5-1	034F			
PVD-2ch input error (direct input)	FLT5-2	034E			
MV1 read back FLT	FLT6-1	035F			
MV2 read back FLT	FLT6-2	035E			
MV3 read back FLT	FLT6-3	035D			
MV4 read back FLT	FLT6-4	035C			
Flash ROM erase error	WAR2-1	041F			
Flash ROM write error	WAR2-2	041E			
Basic cycle over	WAR2-3	041D			
Master flash ROM error	WAR2-4	041C			
Slave flash ROM error	WAR2-5	041B			
Wafer (Loop 1) stop	WAR3-1	042F			
│	│	│			
Wafer (Loop 4) stop	WAR3-4	042C			
Wafer wiring (Loop 1) error	WAR4-1	043F			
│	│	│			
Wafer wiring (Loop 4) error	WAR4-4	043C			
OPTO communication error	WAR5-1	044F			
Soft PLC calculation stop	WAR6-1	045F			
Constant 1	CON1	0880	1880	2880	3880
│	│	│	│	│	│
Constant 48	CON48	08AF	18AF	28AF	38AF

Input terminal code list 2/2

Table 12-1-2

Terminal name	Code	Loop 1	Loop 2	Loop 3	Loop 4
Primary control mode					
EXM	EXM1	0912	1912	2912	3912
SCC	SCC1	0914	1914	2914	3914
R	R1	0915	1915	2915	3915
L	L1	0916	1916	2916	3916
NORM	NORM1	0918	1918	2918	3918
RREQ（PRE）	RREQ1	091A	191A	291A	391A
AREQ（PUN）	AREQ1	091B	191B	291B	391B
NOT-A	NOTA1	091C	191C	291C	391C
SCC-EN	CEN1	091D	191D	291D	391D
LS	LS1	091E	191E	291E	391E
Secondary control mode					
HM	HM2	0930	1930	2930	3930
M	M2	0931	1931	2931	3931
EXM	EXM2	0932	1932	2932	3932
SMAN	SMAN2	0933	1933	2933	3933
SCC	SCC2	0934	1934	2934	3934
R	R2	0935	1935	2935	3935
L	L2	0936	1936	2936	3936
PVTRK	PVTR2	0937	1937	2937	3937
NORM	NORM2	0938	1938	2938	3938
R-REQ	RREQ2	093A	193A	293A	393A
A-REQ	A-REQ2	093B	193B	293B	393B
NOT-A	NOTA2	093C	193C	293C	393C
SCC-EN	CEN2	093D	193D	293D	393D
LS	LS2	093E	193E	293E	393E
Primary alarm					
SV-H	SH1	0940	1940	2940	3940
SV-L	SL1	0941	1941	2941	3941
PV-H	PH1	0942	1942	2942	3942
PV-L	PL1	0943	1943	2943	3943
△PV-H	△PH1	0944	1944	2944	3944
△PV-L	△PL1	0945	1945	2945	3945
DV-H	DH1	0946	1946	2946	3946
DV-L	DL1	0947	1947	2947	3947
MV-H	MH1	0948	1948	2948	3948
MV-L	ML1	0949	1949	2949	3949
△MV-H	△MH1	094C	194C	294C	394C
Secondary alarm					
SV-H	SH2	0950	1950	2950	3950
SV-L	SL2	0951	1951	2951	3951
PV-H	PH2	0952	1952	2952	3952
PV-L	PL2	0953	1953	2953	3953
△PV-H	△PH2	0954	1954	2954	3954
△PV-L	△PL2	0955	1955	2955	3955
DV-H	DH2	0956	1956	2956	3956
DV-L	DL2	0957	1957	2957	3957
MV-H	MH2	0958	1958	2958	3958
MV-L	ML2	0959	1959	2959	3959
△MV-H	△MH2	095C	195C	295C	395C
Wafer output terminal		0A00	1A00	2A00	3A00
		0ABF	1ABF	2ABF	3ABF

Unit code list

℃	t / day	t / h	t / min	t / sec	mmH_2O	mg / cm^2	mPa	mm	ml	mm^2	g / cm^3
˚F	kg / day	kg / h	kg / min	kg / sec	mH_2O	g / cm^2	Pa	cm	l	cm^2	kg / cm^3
	g / day	g / h	g / min	g / sec	mHg	kg / cm^2	kPa	m	kl	m^2	g / m^3
	Nm^3 / day	Nm^3 / h	Nm^3 / min	Nm^3 / sec	cmHg		MPa				kg / m^3
	m^3 / day	m^3 / h	m^3 / min	m^3 / sec	mHg	N / mm^2			mm^3		t / m^3
	Nl / day	Nl / h	Nl / min	Nl / sec	mmAq	N / m^2			cm^3	g	g / l
％RH	l / day	l / h	l / min	l / sec					m^3	kg	kg / l
Vol％	cc / day	cc / h	cc / min	cc / sec	mbar	pai				t	g / ml
					bar	Torr			cc		
＊	＊	＊	＊	＊	＊	＊	＊	＊	＊		

ppm	％	mN	mm / sec	rps	µsec	mV	W	µF	kcal	cps	Pa.S
ppmNH_3	％H_2	N	mm / min	rpm	msec	V	kW	F	cal	cpm	mPa.S
ppmSO_2	％CO_2	Nm	mm / h	rph	sec	kV	VA	mH	$kcal / m^3$	µSv / h	
ppmH_2S	％He	gcm	m / sec		min	µA	kVA	H		mSv / h	
ppmCO	％Ar	kgcm	m/ min	m / sec^2	h	mA	Var	C	lx	nGy / h	
ppmO_2	％O_2	kgm	m / h	rad / sec		A	kVar	mΩ	cd	µGy / h	
ppmNOx	％NaCℓ		km / h				Ωcm	Ω	lm	µm	
ppb	％CO	J				A / T	kΩcm	kΩ	cd / m^2	g / m^2	
pH	CP	kJ				Hz	MΩcm	MΩ			
mol	PO_2	HP				db	µS / cm	µ			

Unit list Table 12-2

Boxes marked an asterisk (＊) are area for creating new units.

Input kind codes

Input signal		Input type code	Input kind code	Measuring range℃
Resistance bulb JIS (IEC)	Pt100Ω	00	00	0.0 to 150.0
			01	0.0 to 300.0
			02	0.0 to 500.0
			03	0.0 to 600.0
			04	−50.0 to 100.0
			05	−100.0 to 200.0
			06	−200.0 to 600.0
			07	−200.0 to 850.0
Resistance bulb Old JIS	JPt100Ω		08	0.0 to 150.0
			09	0.0 to 300.0
			10	0.0 to 500.0
			11	0.0 to 600.0
			12	−50.0 to 100.0
			13	−100.0 to 200.0
			14	−200.0 to 600.0
			15	Setting inhibited
Thermocouple	J	01	00	0.0 to 400.0
	J		01	0.0 to 800.0
	K		02	0.0 to 400.0
	K		03	0.0 to 800.0
	K		04	0.0 to 1200.0
	R		05	0.0 to 1600.0
	B		06	0.0 to 1800.0
	T		07	−200.0 to 200.0
	T		08	−150.0 to 400.0
	E		09	0.0 to 800.0
	E		10	−200.0 to 800.0
	S		11	0.0 to 1600.0
	N		12	0.0 to 1300.0
	U		13	−200.0～400.0
	WRe5−26		14	0.0 to 2300.0
	PL−II		15	0.0 to 1300.0

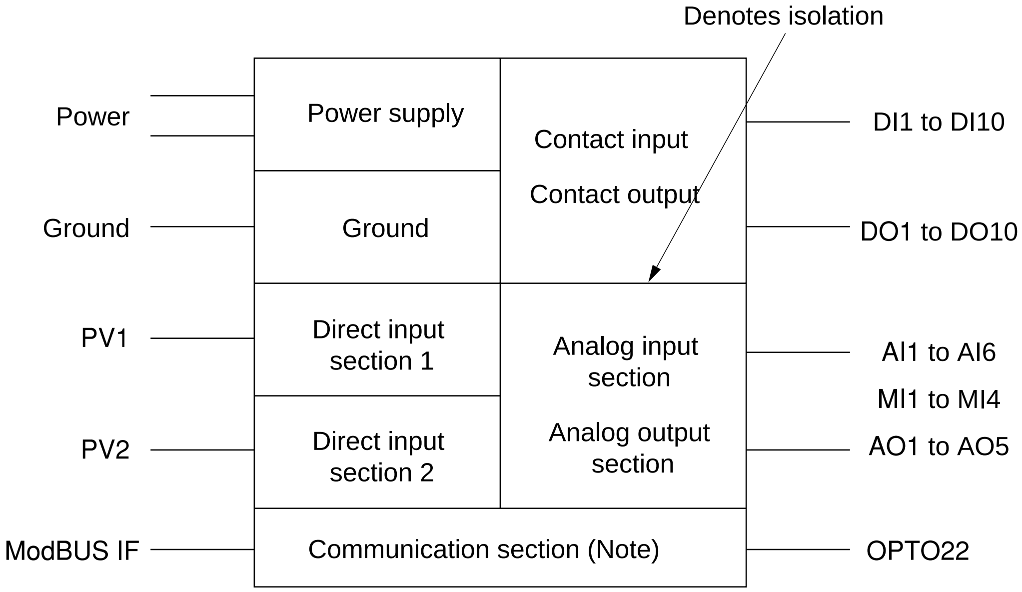
Table 12-3

Accuracy guarantee scope

Table 12-4

	Range	Accuracy guarantee scope		AI check/output limit scope	
		Scope	Accuracy	Scope	Accuracy
Input	1to 5VDC input	-5.0 to 105.0%	±0.1%	-12.5 to 112.5%	±0.1%
	0 to 5VDC input	0.0 to 105.0%	±0.1%	Upper side only112.5%	±0.1%
	0 to 10VDC input	0.0 to 105.0%	±0.1%	Upper side only112.5%	±0.1%
	TC, Pt input	-5.0 to 105.0%	±0.2% Different for R, S, B thermocouples. ± 5.0% below - 100℃.	-5.0 to 105.0%	±0.2% Different for R, S, B thermocouples. ± 5.0% below - 100℃.
Output	4 to 20mA output	-12.5 to 112.5%	±0.2%	-25.0 to 125.0%	±1.0%
	1 to 5VDC output	-12.5 to 112.5%	±0.1%	No limit	Not specified
	0 to 10VDC output	0 to 105%	±0.1%	No limit	Not specified
	0 to 5VDC output	0 to 112.5%	±0.1%	No limit	Not specified

Isolated blocks



12.2 Maintenance

Warning Task should be performed by experienced engineer only.

How to replace the back light (CFL) for liquid crystal display

- A back light is furnished as spare besides the one which is factory mounted.

(1) Replacing with a spare back light

1) In Fig. 12.2.1, operate the slide switch in the direction of arrow → at ① marked on it. (The back light will extinguish.)
2) Slide the CFL cover in the direction of arrow ↑ at ② marked on it for removing it.
3) In Fig. 12.2.2 disengage the connector (③) where the upper lead is white with red line and engage the connector (④) of the spare back light (only white leads) with the socket. (This replaces the back light with the spare.)
4) Remount the removed CFL cover.
5) Operate the slide switch in the direction opposite to→ at ①.

This completes the replacement with and lights the spare back light.

(2) Replacing the back light proper

1) In Fig. 12.2.1, operate the slide switch in the direction of arrow → at ① marked on it.
2) Slide the CFL cover in the direction of arrow ↑ at ② marked on it for removing it.
3) In Fig. 12.2.2, disengage the back light connector and pull the back light holding down its lever ⑤. (The back light will come off.)
4) Install a new back light and engage white lead with red line side of the connector with the socket.
5) Remount the removed CFL cover.
6) Operate the slide switch in the direction opposite to → at ①.

This completes the replacement with and lights the spare back light.

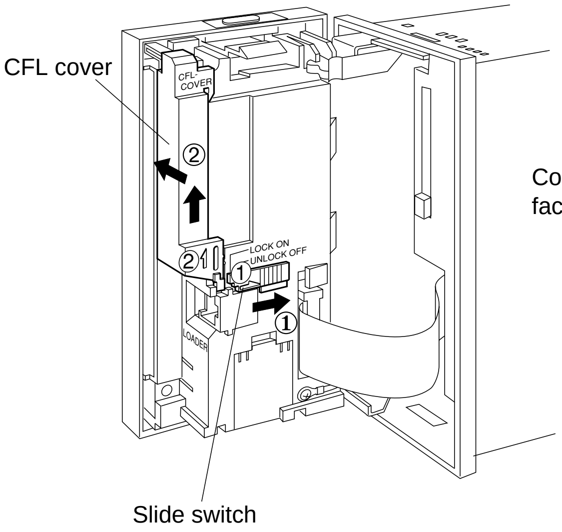


Fig. 12-2-1

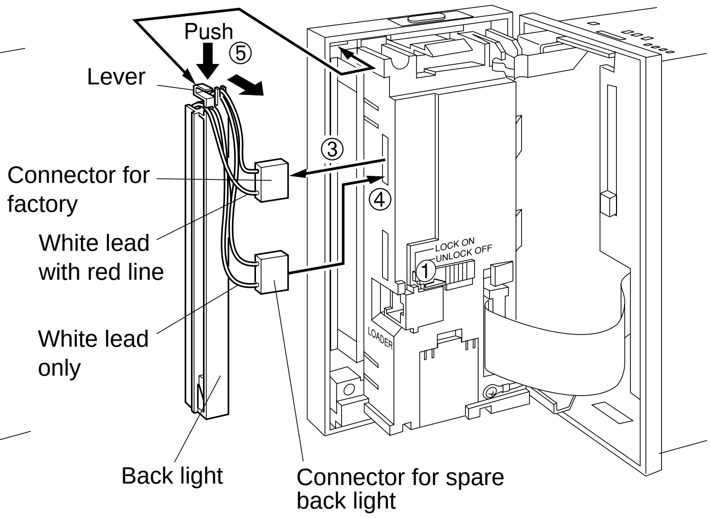


Fig. 12-2-2

12.3 Logical operation of run mode change signal

Fig. 12-3-1 shows the flow diagram of SV on the primary side, and Fig. 12-3-2 shows the flow diagram of SV on the secondary side. Fig. 12-3-3 shows the flow diagram of MV on the secondary side.

Fig. 12-3-4 shows the logic diagram of run mode change for primary block, and Fig. 12-3-5 the logic diagram of run mode change for secondary block.

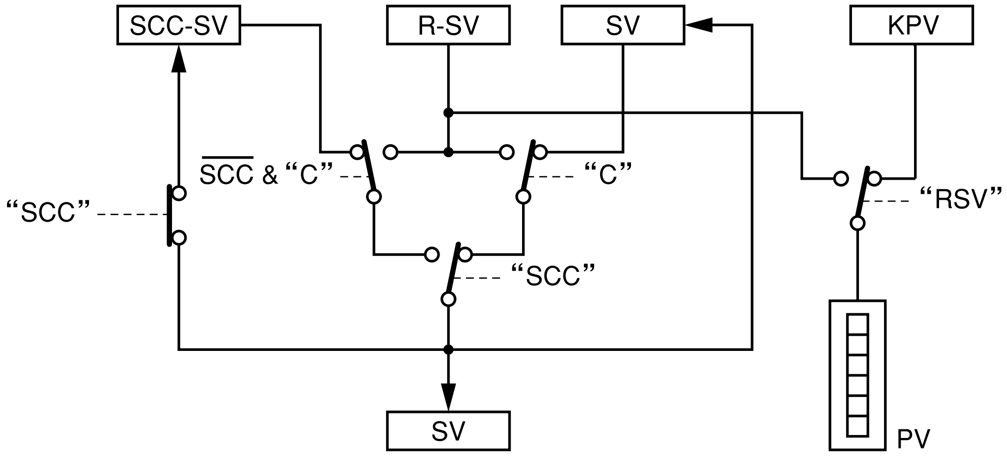


Fig. 12-3-1 Flow diagram of SV on the primary side

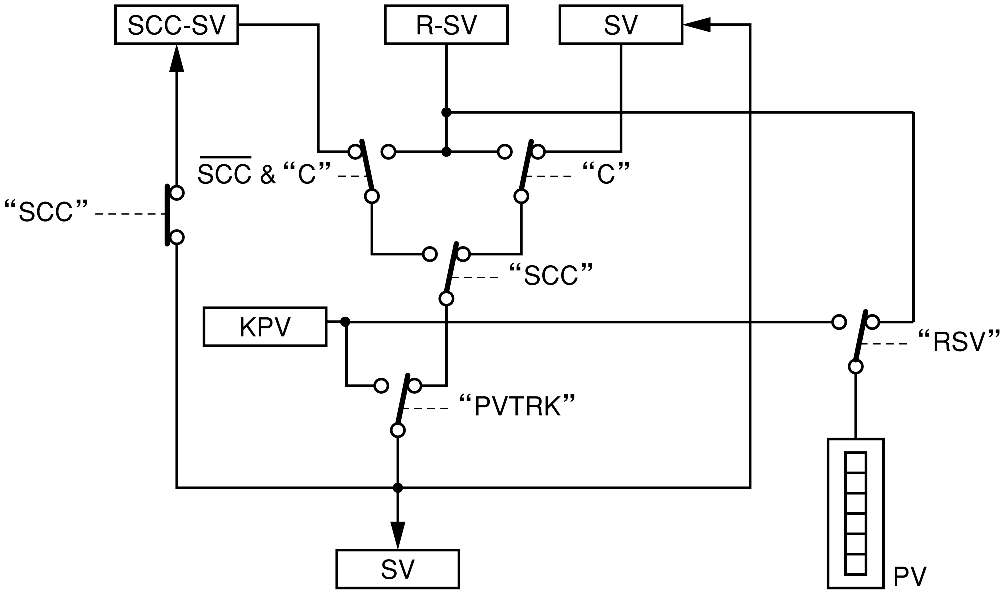


Fig. 12-3-2 Flow diagram of SV on the secondary side

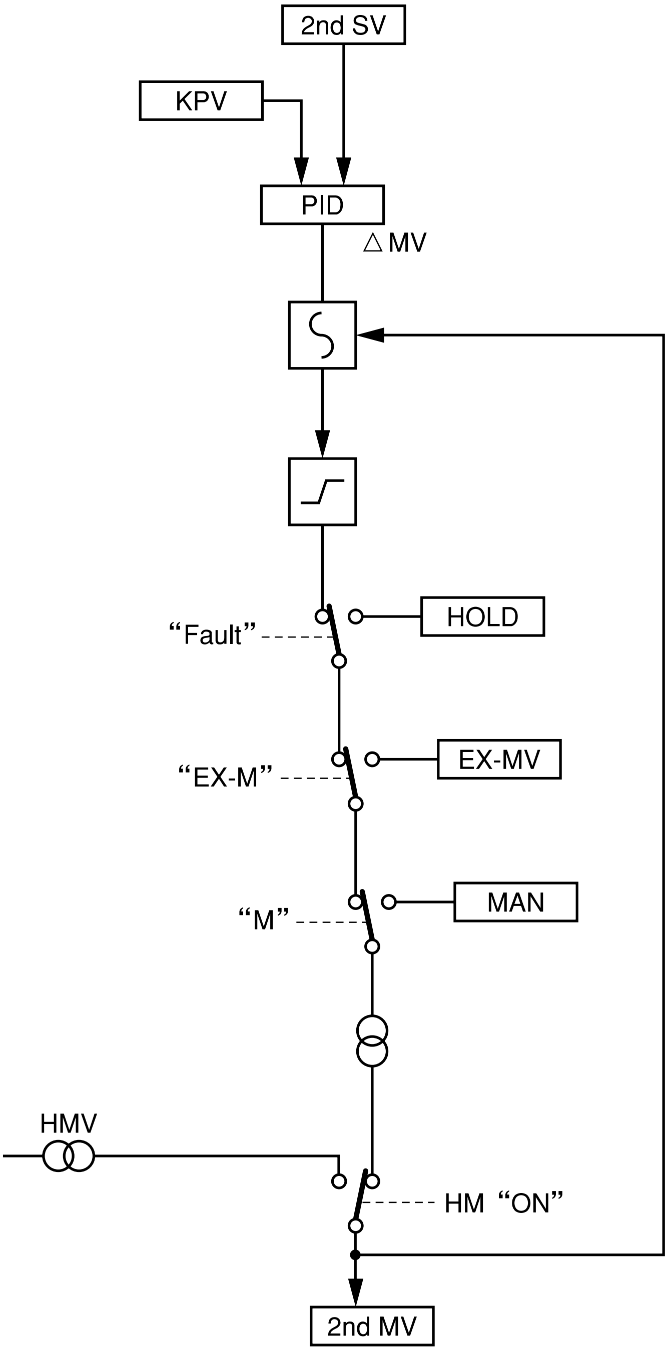
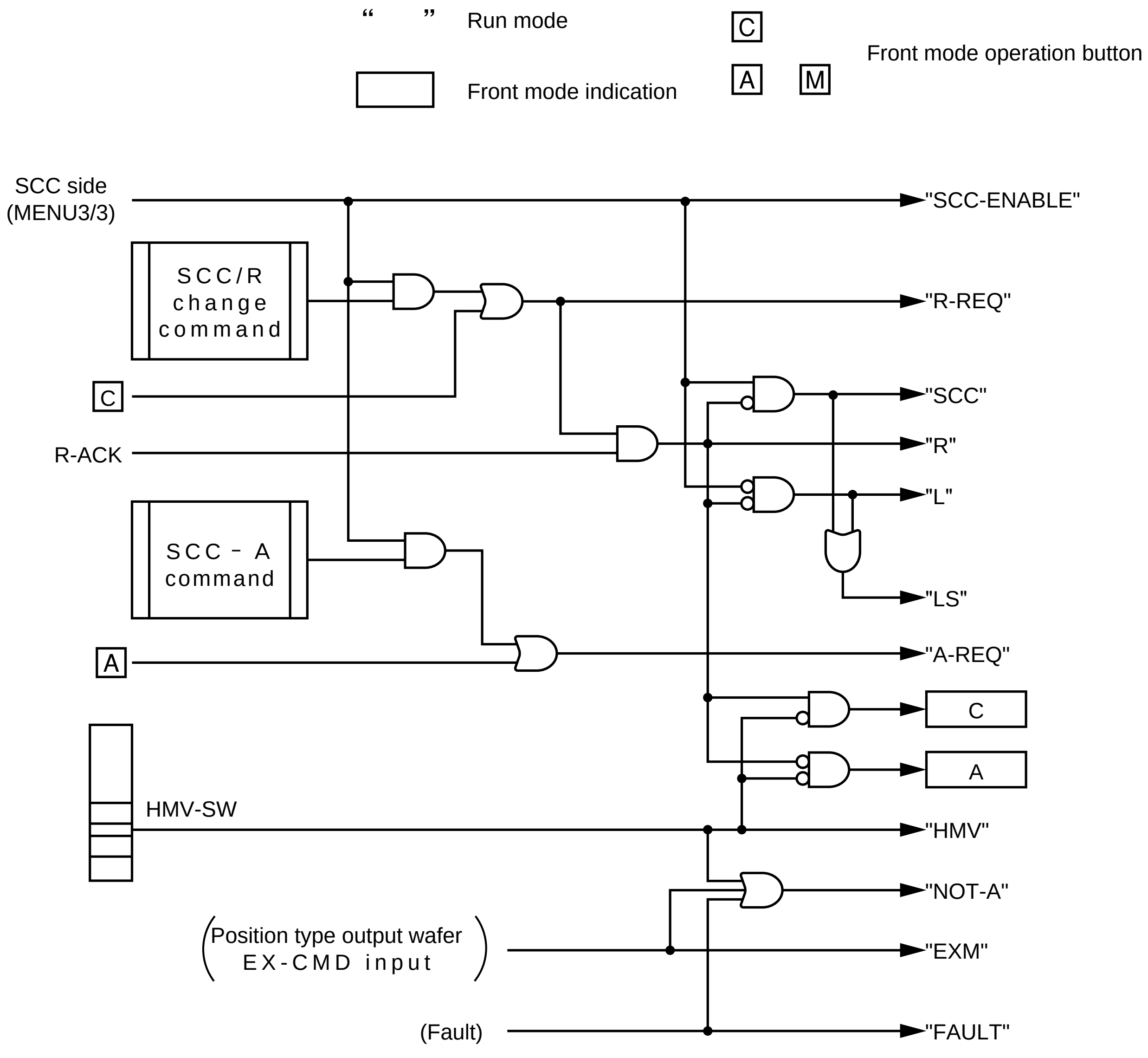
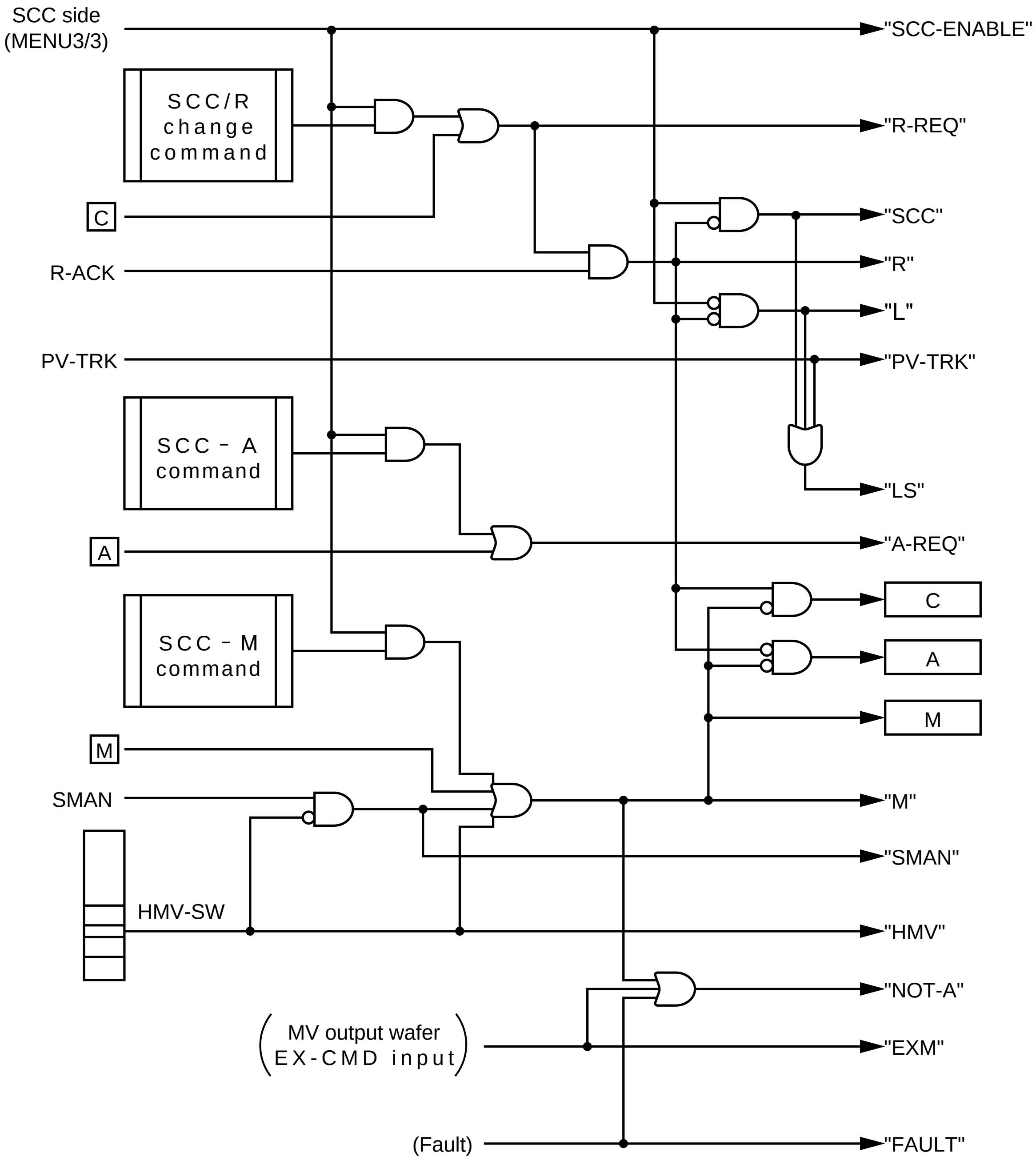


Fig. 12-3-3 Flow diagram of MV on the secondary side



Note) If HMV SW is ON, R-REQ and A-REQ are invalidated.

Fig. 12-3-4 RUN mode of primary block



Note) If M mode is ON, C mode is inhibited.
Note) If HMV SW is ON, R-REQ and A-REQ are invalidated.

Fig. 12-3-5 Run mode of secondary block

FUJI ELECTRIC

Setup Manual

Compact Controller-M

Programming Loader

Type: PDZP2001

< October 1999 > INP-TN1PDZP-E

1. Foreword

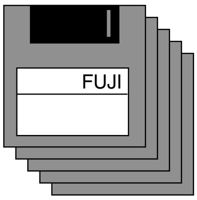
Thank you very much for purchasing our Programming Loader for Compact Controller M (CC-M).
This manual contains step-by-step instructions for beginning to use the Programming Loader (hereinafter referred to as Loader) that performs wafer connection and parameter settings by using the supplied personal computer software for CC-M. It explains how to set up the loader and cautions on use.
Before using the programming loader, read this manual carefully.
An exclusive transmission cable (front loader cable) to connect between CC-M and your personal computer is an option, not supplied with this loader.

* This manual assumes that you are already familiar with Windows 95 operating system and CC-M intended for use with this loader.

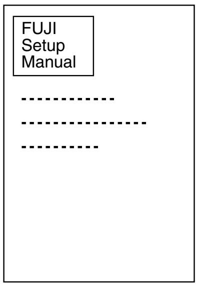
Related documents:
Instruction Manual for Compact Controller M
--------------- INP-TN1PDA2/3-E

2. Packaged items

- Setup manual 1
- Install disks 5
  (Floppy disk: #1/5 to #5/5)



Install disks (5)



Setup manual

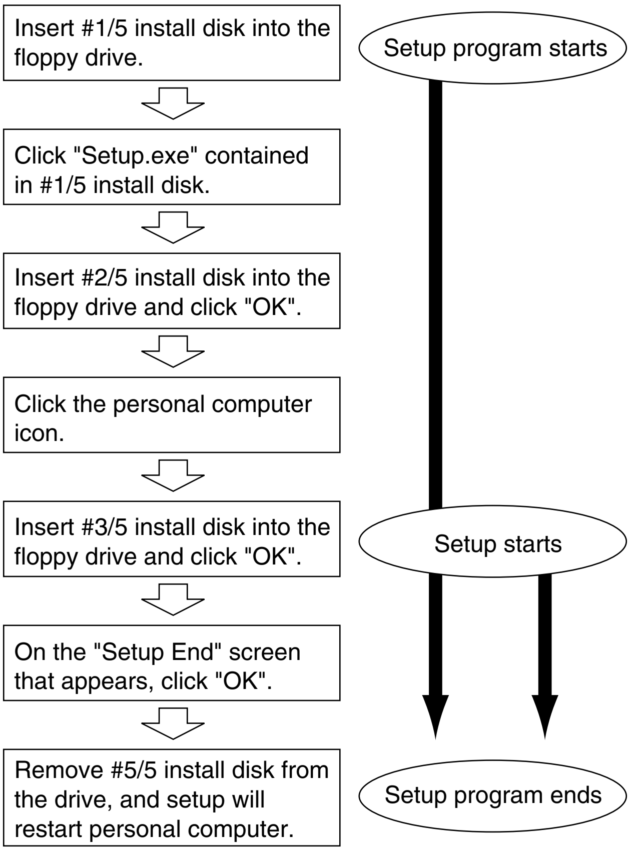
3. Operating environment

To use the loader, your personal computer and front loader cable are required.

- Personal computer
  DOS/V personal computer
  (CPU: Pentium 100 MHz or higher)
  Available hard-disk space: 40 MB or more
  Memory capacity: 32 MB or more
  Display : 800 × 600 dots or higher
  Applicable OS : Windows 95
- Front loader cable (Option)
  Type: PDZL1001 (3 m long)

4. Loader setup

The loader should be set up according to the following procedure.
Note: Other application software should be closed before starting setup.



Insert #1/5 install disk into the floppy drive.

Click "Setup.exe" contained in #1/5 install disk.

Insert #2/5 install disk into the floppy drive and click "OK".

Click the personal computer icon.

Insert #3/5 install disk into the floppy drive and click "OK".

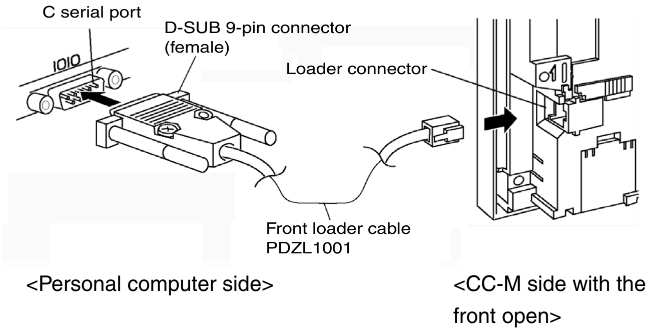
On the "Setup End" screen that appears, click "OK".

Remove #5/5 install disk from the drive, and setup will restart personal computer.

5. Starting and closing Loader

1) How to start loader

(1) Ensure that CC-M is properly connected to your personal computer by the front loader cable as shown below:



Connection diagram of front loader cable

(2) The settings of CC-M communication should be performed as follows

① Perform the following communication setting.
② Execute the Fix process.
③ Restart CC-M.

By doing these steps ① to ③, newly set communication settings becomes valid.

BAUD RATE = 9600
PARITY = NONE
STOP BIT = 1

(3) To start the Loader, select "Start" → "Program"→ "WAFER LOADER" from the Task bar.

2) How to close Loader

(1) Select "File" → "End" from the Menu bar.
(2) A confirmation message appears, asking you if you want to save the change of the contents displayed on window.
(3) When you want to save the change, click on the "Yes" button. If you cancel it, click on "No".
(4) The Loader is closed.

Note) Clicking the Close button (x) at the upper-right corner of the window closes the Loader in a different way from the above.

6. Loader function

1) Communication function (Data send/receive with CC-M)

CC-M and Loader have 4 kinds of communication functions conducted by them; all upload/download for communication of all parameters included in windows and upload/download for communication of currently displayed window.

(1) All upload (CC-M → Loader)
Reads the data from CC-M on any window that contains currently-displayed window.
(2) All download (Loader → CC-M)
Writes the data into CC-M on any window that contains currently-displayed window.
(3) Upload (CC-M → Loader on each screen)
Reads only parameter values contained in currently-displayed window from CC-M.
(4) Download (Loader → CC-M on each screen)
Writes only parameter values contained in currently-displayed window into CC-M.

2) Parameter setting function

It enables you to input and set CC-M parameters on the Loader window. For the method of setting parameters, select the item you want to set from the Pull-down menu or type the setting value by using numerical keys on the key board.

3) Command output function

It enables you to send "Fix" and "Run/Stop" commands from the Loader to CC-M. You can use this command by selecting "Option" → "System Command" on the Menu bar. If you press the OK button when any discrepancy is displayed between CC-M and Loader, the Fix and Run/Stop commands are sent to CC-M.

4) Wafer connection function

It enables you to register and connect wafers which are mounted on CC-M. In addition, it contains the Edit function such as "Insert", "Delete" and "All delete" of wafers.

5) Data read/storage function

It enables you to read the data in the Loader by saving the data setting of the loader as a file on your personal computer or by opening such file.

7. Troubleshooting

No.	Contents of trouble	Remedy
1	Communication time is too long (more than 5 minutes).	Switch one screen to another screen with the Loader, and return to the former screen to perform communication again.
2	The CC-M screen is not displayed as set.	Switch the CC-M screen to another screen, and return to the former screen.
3	The "Data Error" (Retry Max) message appears.	After pressing the OK button, perform communication again.
4	The screen cannot escape from the numeric setting status.	Set the value in the setting range again and press the "Enter" key.
5	A voltage of -2 to -3V is applied across the CC-M AO output terminals.	When CC-M is connected to your PC with the cable, do not turn off the CC-M.
6	A message appears, asking you if you want to save the change although you haven't changed the data.	As per specification. Select "No" and close the screen.

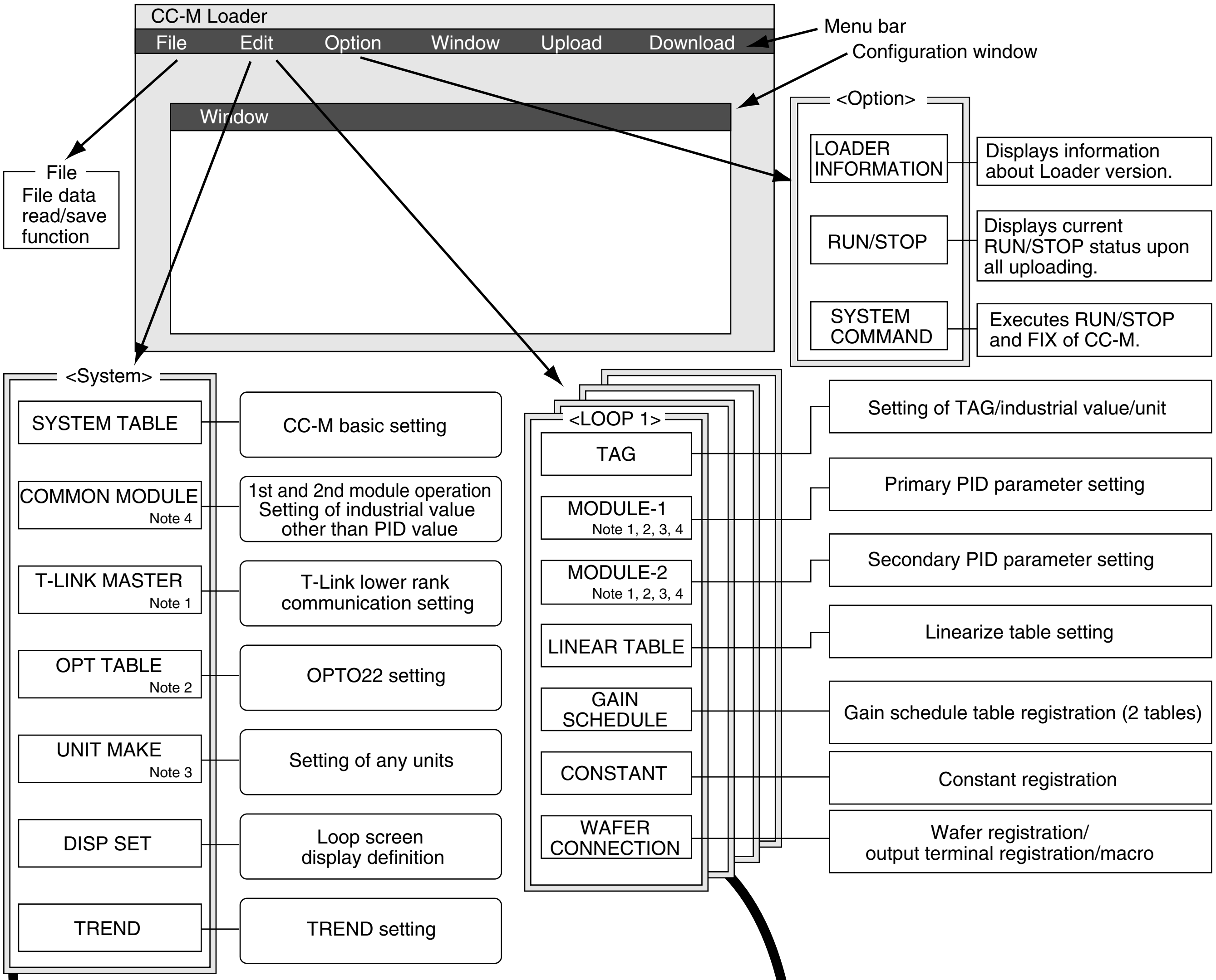
8. Safety precautions

To ensure correct and safe operation of the unit, you are requested to observe the following items of safety precaution. We are not responsible for any damage or loss caused by handling your unit against the precaution items given below.

⚠ WARNING

- In order to ensure a complete safety on your system even in the event of trouble with the unit, malfunction or program error, the system must be designed using an external protection/safety circuit against personal accidents and serious disasters.
- It is forbidden to transfer a part or the whole of contents of the manual without permission.
- Contents of the manual are subject to change without prior notice.
- The contents of this manual have been prepared carefully. However, it should be noted that Fuji is not responsible for errors in writing or missing of information if found in this manual, or for any loss (including indirect loss) resulting form use of information.
- Be sure to read “Readme.txt”, too.

9. Screen Map



<Caution on use of system>

Note 1: If T-Link function is not provided on CC-M, it cannot be used.
Note 2: If OPTO22 function is not provided on CC-M, it cannot be used.
Note 3: "Ω" is displayed as "@".
Note 4: Refrain from setting "the base scale value>full scale value".

<Caution on use of "LOOP">

Note 1: In case of DV-H=100.00, "100.0" is displayed.
Note 2: Set the second digit below the decimal point of DT parameter to 0.
Note 3: The setting range of DT is from 0.10 to 327.67.
Note 4: The setting range of SVPR is from -327.67 to 327.67.
Note 5: Don't set the "base scale value" > "full scale vale".
Note 6: The RATIO and PROG screens are the ones excluded from all uploading and all downloading. Upload or download them individually.
Note 7: S01 to S16 correspond to WNO. 00 to 15 that is connected to T-Link slave.
Note 8: The wafer code setting range is between "0000" and "03FF".
Note 9: SMAN 1 to 4 corresponds to SMAN REQ 1 to 4.
Note 10: By pressing any of the "SINGLE PID", "CASCADE" and "RATIO" buttons, forcibly determined wafer code is inputted.

<General caution>

Note 1: This software is designed for 4-loop (4-control output). If No. 2 to 4 control output don't exist, their corresponding screen cannot be used.
Note 2: The initial value of each screen is different from that of CC-M.
Note 3: When opening new Configuration window, close all windows which are currently open.
Note 4: Print function is not available.

Fuji Electric Co., Ltd.
Head office
11-2 Osaki 1-chome, Shinagawa-ku, Tokyo, 141-0032 Japan
Phone: 81-3-5435-7111
http://www.fujielectric.co.jp/eng/sg/KEISOKU/welcome.htm

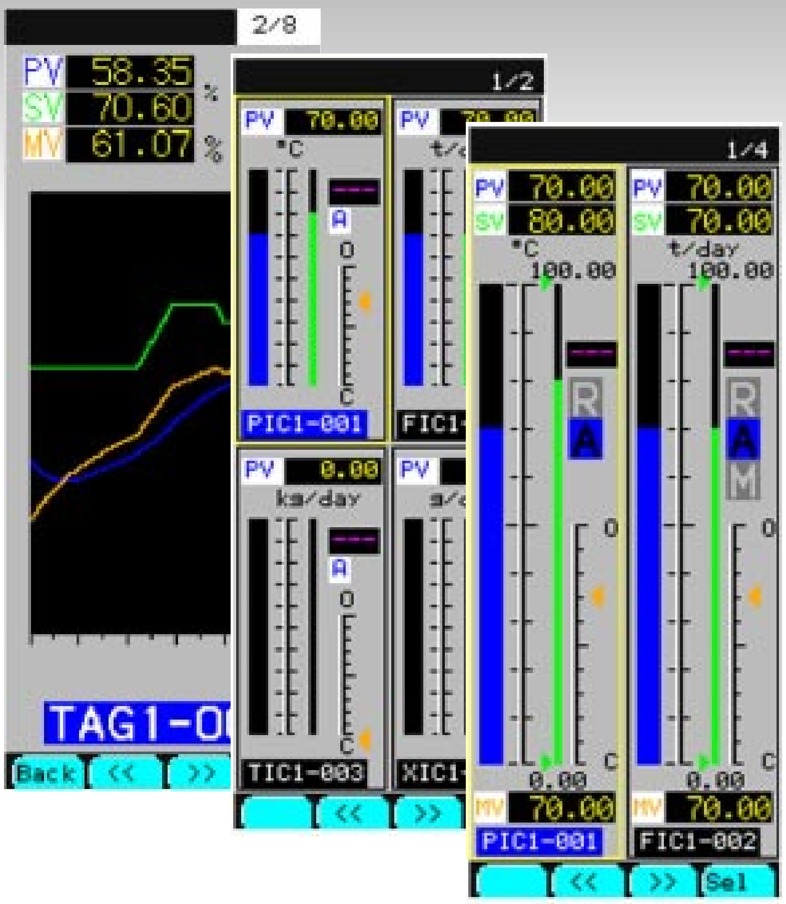
Fuji Electric Instruments Co., Ltd.
Sales Div., International Sales Dept.
No. 1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan
Phone: 81-42-585-6201, 6202
Fax: 81-42-585-6187, 6189

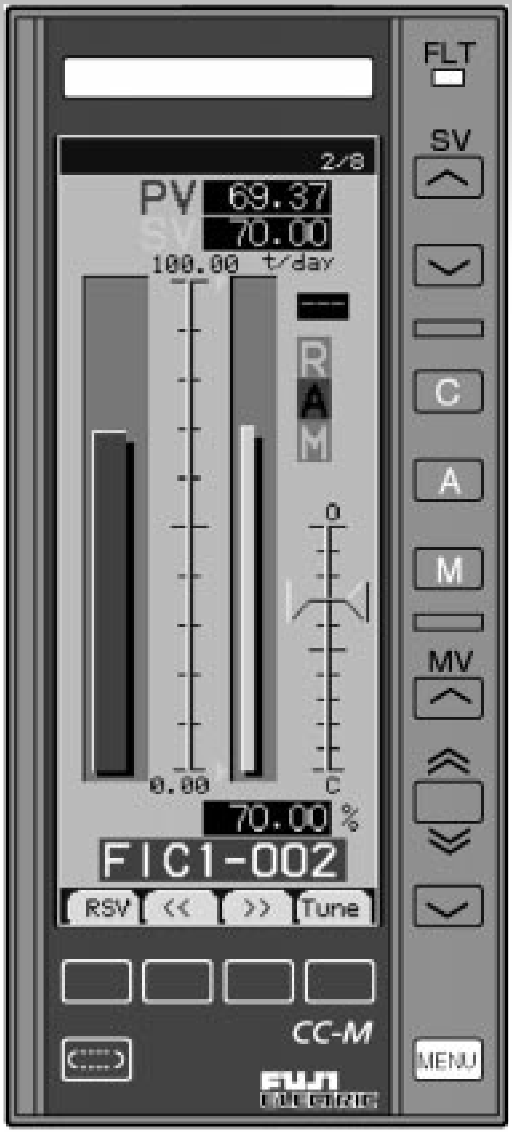
FUJI
ELECTRIC

CC-M

Compact Controller M

Introductory Guide





Fuji Electric Instruments Co., Ltd.

INTRODUCTION

This introductory guide, intended for customers who have purchased this controller for the first time or who consider purchase of this controller in the future, shows the guideline for the functions of the Compact Controller M (CC-M).

- Carefully read the instruction manual and sufficiently be familiar with its contents before installing, operating and maintaining the Compact Controller M. Improper handling may cause accidents or injuries.
- The specifications of the Compact Controller M are subject to change without prior notice for improvement of the product.
- It is strictly forbidden to remodel the Compact Controller M without permission. We will not be responsible for any accident attributable to such remodeling without permission.
- The contents of this manual have been prepared carefully. However, it should be noted that Fuji is not responsible for any consequential damages from errors in writing or missing of information.

Windows 95 is the registered trademark of Microsoft Corporation.
Modbus® is the registered trademark of MODICON.
ISaGRAF® is the registered trademark of CJ International (France).
Sandisk and Compact Flash are the trademarks of Sandisk Corporation.
OPTO 22 Interface and SNAP I/O are the registered trademarks of OPTO 22, USA.

Request

- It is forbidden to transfer a part of or the whole of contents of the manual without permission.
- Contents of the manual are subject to change without prior notice.
- If there are any parts hard to understand, errors in writing or missing information, please notify a sales representative.

Issued in May, 1999
First edition June, 1999

SAFTEY PRECAUTIONS

Before use, carefully read the safety precautions for correct operation.

- The precautions concern important matters related to safety. Be sure to observe them. The safety matters are ranked to "DANGER" and "CAUTION".

Indications and meanings are as follows.

DANGER	If the handling is wrong, dangerous situations might occur, causing death or serious injury.
CAUTION	If the handling is wrong, dangerous situations might occur, causing medium or slight degree of injury or physical damage only.

DANGER

- If the fault or anomaly of the controller may cause serious accident or troubles to other devices, externally install an appropriate emergency stop circuit and protective circuit to avoid accidents.
- The controller has neither power switch nor fuses. Install them if necessary. (Fuse rating 250 V, 1A)
- For avoiding controller breakage and fault, supply a power voltage that matches the rating.
- For avoiding electric shock, malfunction and controller troubles, do not turn on power until all installation and wiring have been completed.
- The controller is not an intrinsically-safe explosion-proof type. Do not use it in atmosphere of combustible or explosive gases.
- Never disassemble, retouch, remodel or repair the controller. Otherwise, abnormal behavior, electric shock or fire may occur.
- While turned on, do not touch the terminals. Otherwise, electric shock or malfunction may occur.
- Before engaging or disengaging the module or unit, turn off the power. Otherwise, electric shock, malfunction or troubles may occur.
- Periodic maintenance is recommended so that the controller can be used continuously and safely.
- Some parts installed on the controller have limited service life or are subjected to secular change.

⚠ CAUTION

- Do not use any controller which is found damaged or deformed when unpacked. Otherwise, fire, malfunction or fault may occur.
- Make sure the product is as specified before use. Otherwise, the product may be broken or troubled.
- Do not drop, tip over or give a shock to the product. Otherwise, the product may be broken or suffer from a fault.
- Install the controller so that dust, wire chip, iron powder or other foreign matters will not enter it. Otherwise, malfunction or fault may occur.
- Periodically make sure terminal screws and setscrews are securely tightened. Use at a loosened status may cause fire or malfunction.
- When changing the setting, forced output, startup, shutdown or other operations during running, sufficiently check the safety. Improper operation may break or trouble the controller.
- During running, the supplied terminal cover must be attached to the terminal base. Otherwise, electric shock or fire may occur.
- For mounting the controller, avoid the following places.
    Ambient temperature is beyond the range of 0 to 50°C (0 to 40°C at close mounting sidewise).
    Ambient humidity is beyond the range of 45 to 90 %RH.
    A condensation occurs.
    Exposed to corrosive gases (particularly, sulfuric gas, ammonia or the like) or combustible gases.
    Vibration or impact is exerted to the main body of the controller.
    Splashed with water, oil, chemical, steam or vapor.
    Exposed to dust, salt or iron excessively.
    Inductive disturbance is so excessive as to easily produce electrostatic charge, magnetic field or noise.
    A heat accumulation occurs by radiation heat, etc.
- If dipped in water, do not use the controller. Otherwise, electric leakage, electric shock or fire may occur.
- For connecting a thermocouple input, do not use wires other than specified compensating wires. Otherwise, reading error or abnormal behavior may occur.
- For connecting a resistance bulb input, use three wires of a low resistance and of no difference in the resistance of each wire. Otherwise, reading error or abnormal behavior may occur.
- If noise from the source is excessive, add an insulating transformer and use a noise filter.
- For cleaning the main body of the controller, do not use alcohol, benzene or other organic solvents. Do not directly splash water to the controller. Otherwise, deterioration, fault, electric leakage, electric shock or fire may occur.
- When discarding the product, handle it as an industrial waste.
- Be sure to carry out grounding. Otherwise, electric shock or malfunction may occur.
- Wiring must be carried out by qualified specialists. Wrong wiring may cause fire, fault or electric shock.

ABOUT THE GUIDE

This guide consists of the six chapters shown below.

1. GENERAL
   This chapter explains the general outlines of features of the Compact Controller M. First, please understand the overview of features of the compact.

2. NAMES OF PARTS
   This chapter shows the names of parts of the Compact Controller M and their functions. Please read this chapter before operations

3. INSTALLING AND WIRING
   This chapter explains the means for installation and wiring for service personnel.

4. RUNNING AND OPERATION
   This chapter, intended for personnel who are in charge of running and operating the Compact Controller M, explains how to turn on the power, how to operate keys on the front section, and how to switch the operation modes and the monitor display screens.

5. PROGRAMING FUNCTIONS
   This chapter, intended for users who design systems and who program functions by themselves, explains how to prepare connection specifications and how to program functions based on the connection specifications.

6. USE OF NETWORK
   This chapter explains the system configurations using the network function of the Compact Controller M and the methods of sending and receiving communication data on the network.

7. REFERENCE
   The reference shows the specifications of the Compact Controller M, the outline drawing, and the list of the dissimilarities between the Compact Controller M and our conventional models.

Table of contents

1

GENERAL

This chapter explains the general outlines of the Compact Controller M (CC-M). First, understand the features and components of the Compact Controller M.

1-1 Features

The Compact Controller M is a process controller of continuous output type that can program control functions according to customer specifications.
Using a resistance bulb and thermocouple direct input as an input signal besides a unified signal of 1 to 5 V DC and through the abundant control and computation functions, the controller provides an excellent cost performance and flexibility.

- Multi-loop controller of a maximum of 4 loops (4 control outputs)
  The Compact Controller M has a multi-loop controller function of a maximum of 4 loops (8 control blocks and 4 control outputs) by combining the primary and secondary control blocks.
  The Compact Controller M is still of a front-panel size as our conventional models were, and contains all the functions that several controllers used to have.

- Programming control and computation functions by wafers
  The control and computation functions can be programmed by combining (connecting) the function blocks (package software) called “wafer”.
  The Wafer can be connected (programmed) in the controller alone by operating the keys in the front section while switching the setting menus displayed in the LCD.
  With the optional configuration software, programs made in a personal computer can be download to the Compact Controller M.
  The Compact Controller M has wafers with abundant control and computation functions, which archives various kinds of control functions.
  - Single loop control
  - Single control of multiple loops
  - Cascade (PID) control
  - Proportional control
  - Program (PROG) control
  - Multiple input selecting control
  - Various advanced control

- Legible color graphic LCD
  The color graphic LCD provides the graphic displays, such as the bar graphs and the trend graphs, of operating and monitoring status. With various kinds of menus displayed on the LCD, setting of parameters and programming of wafers can be performed.

- Adaptable to networking (option)
  High and low order communication capabilities by Modbus® interface (under development), OPTO22 interface (under development) or the PLC link (T-link) of our company’s make are available.
  Those communication capabilities provide an extension to the input/output (I/O), connections of several CC-Ms, and a centralized monitor system with a personal computer.

- Software PLC (option)
  The software PLC allows the PLC function to be executed in the Compact Controller M.
  The PLC function can be programmed by the programming software intended for the purpose (ISaGRAF ®) (under development), using the PLC function programming languages (FBD, LD, and SFC) which conform to IEC 1131-3.

- Backup function (option)
  Should the main unit of the CC-M fail, the incorporated backup operation unit can be switched into service, avoiding impact to the system.

- Memory card (option)
  The Compact Flash® memory card stores logging data. The logging data, when read into a personal computer, can be managed and analyzed.

1-2 Components

Figure 1-1 shows the block diagram of the components of the Compact Controller M.
This controller consists of the color graphic LCD with back light, the front section equipped with various kinds of keys, the main unit which controls a maximum of 4 loops, and the external terminal section composed of input/output terminals (screw terminals and pressure terminals).
Optional units can provide further capabilities to the controller. (Refer to page 1-7.)

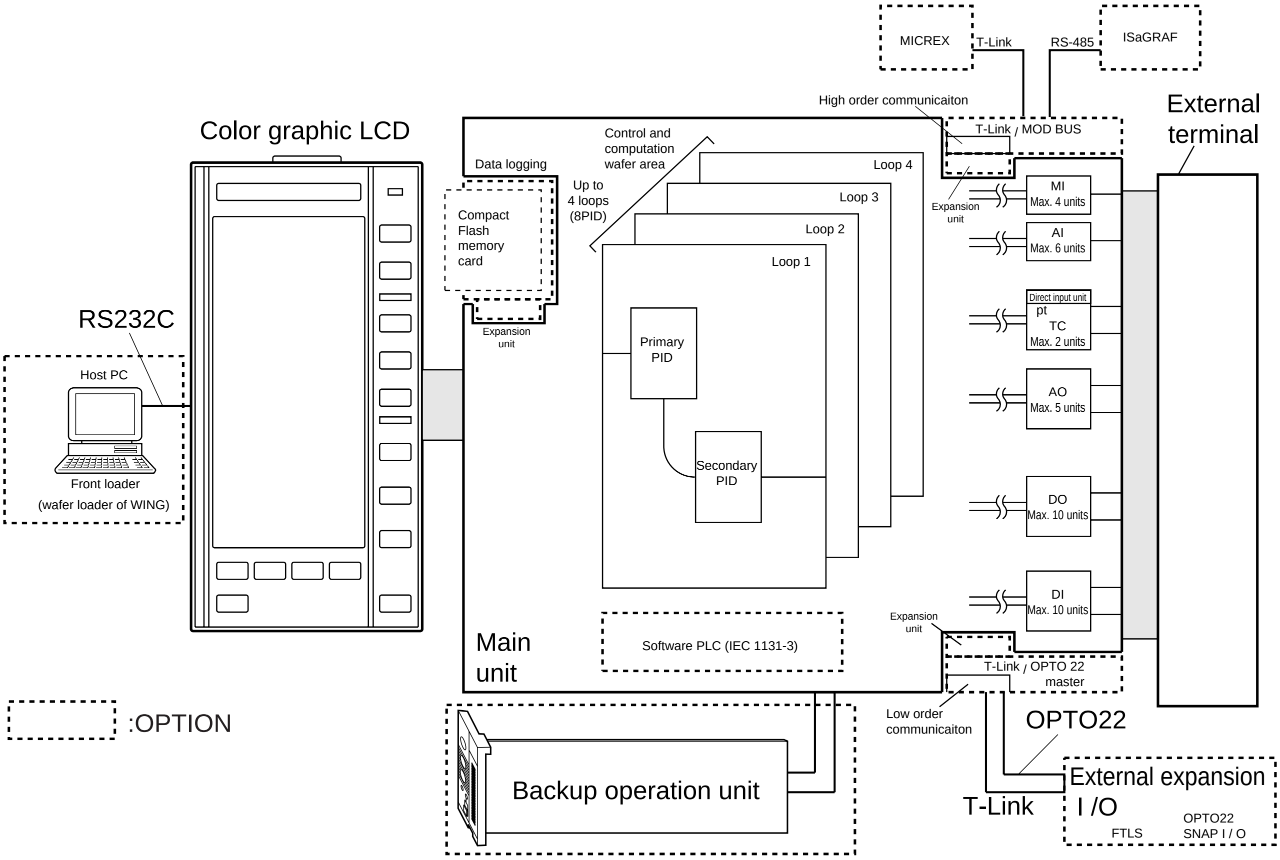


Figure 1-1 CC-M component block

The thermocouple input signal or resistance bulb input signal other than a unified signal of 1 to 5 V DC can be input to the process variable input. (Specify by type when placing an order.)

1-3 Programming

1.3.1 Wafer concepts

The controller has various computation and signal processing functions built in the blocks function by function called “wafer”. The control and computation functions can be programmed by combining (connecting) those wafers.

The wafer is designed so that users can program the control and computation functions while visualizing the procedures for computing and processing. It eliminates the need to use complex commands and structures used in general program language.

Figure 1-2 shows the symbol illustration, and Figure 1-4 shows the controller structure concept for programming.

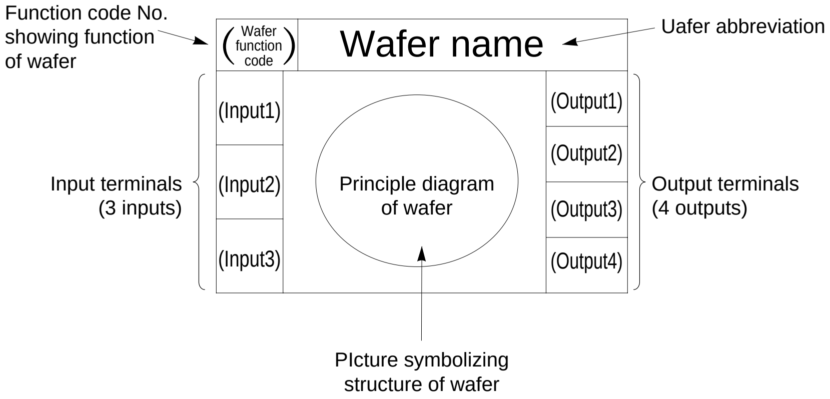


Figure 1-2 Structure of the wafer symbol

Each wafer, having a maximum of three input terminals and of four output terminals as shown in the symbol illustration, performs the computation shown in the principal diagram on the signals that are input to the input terminals, and then outputs to the output terminals.
The functions and number of the input/output terminals vary depending on the computation functions of the wafers.

For example, the primary proportional operation wafer shown in Figure 1-3 has two input terminals; the PV (the process variable input) and the SV (the setting value input), and one output terminal; the MV (control output). The wafer performs the computation shown in the principal diagram on the signals which are input to the PV and SV, and then outputs to the MV.

Each wafer has its name and function code. The function code of the primary proportional operation wafer shown in Figure 1-3 is 25.

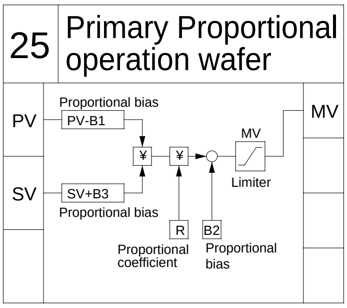


Figure 1-3 Symbol example (the primary proportional operation wafer)

The wafer function codes are the same as those used in our conventional model (CC-S). For the computation function and function code of each wafer, refer to the Instruction Manual of the Compact Controller M.

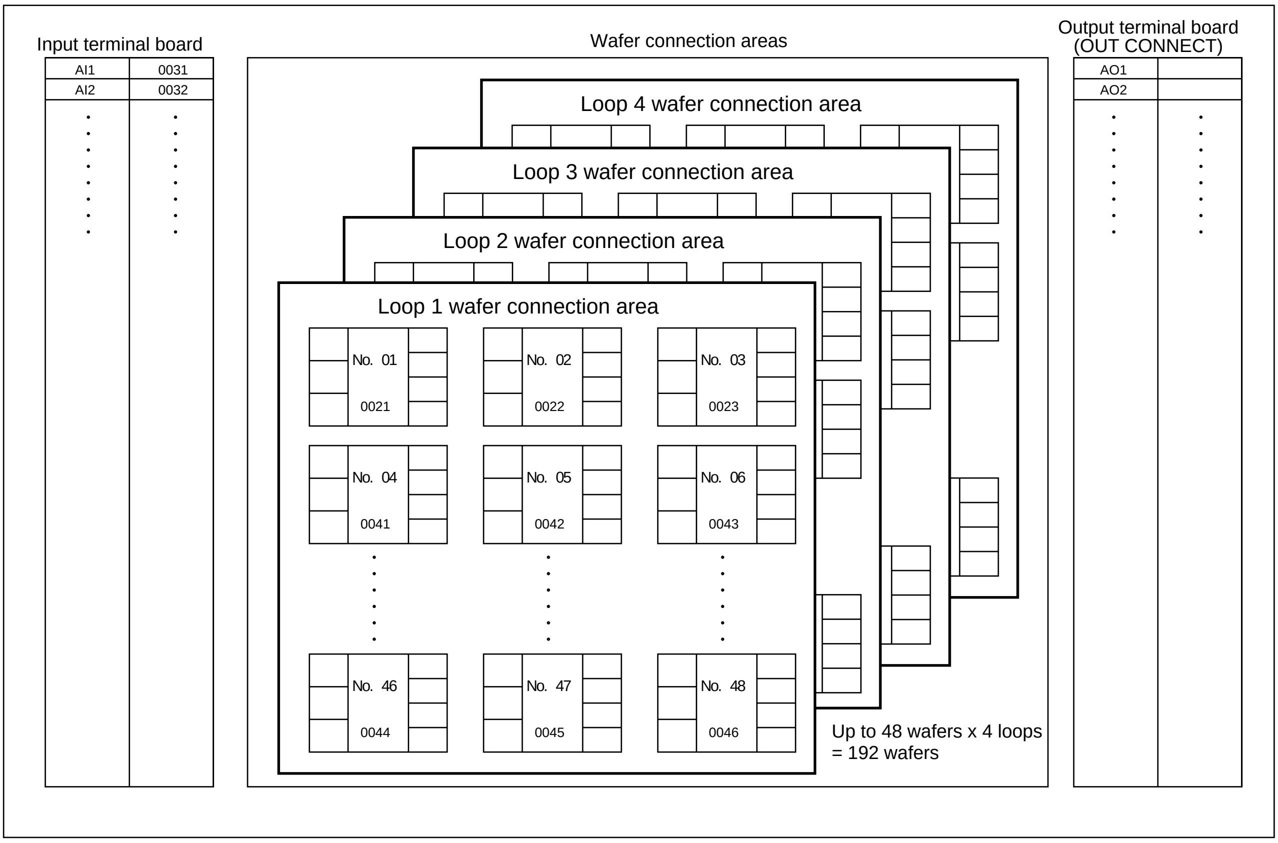


Figure 1-4

1.3.2 Connecting (programming) wafers

Each loop has 48 wafers (W01 to W48) as shown in Figure 1-4.
For programming, the wafer function codes have only to be registered into the wafer areas to connect the input/output to the wafers according to the procedure of computing and processing.

The wafers are connected by registering the wafer output code which is assigned to each of the wafer output terminals, into the input terminal position of the next wafer.

The input terminal code is assigned to each of the external input terminals as shown in the left table in Figure 1-4. The external input terminals are connected to the wafer inputs by registering each input terminal code to the input terminal position of the wafer.

Programming wafers and various settings can be all performed from the front section of the controller. With the optional configuration software, programs made in a personal computer can be download to the controller.

For the procedure of programming, refer to “PROGRAMMING FUNCTIONS” in this guide.
For usage of the configuration software, refer to the Instruction Manual of the configuration software.

1-4 Examples of application

With its abundant control functions and options, the Compact Controller M is applied to a wide range of uses, from small control systems to large systems.
Examples of application are shown below.

Water treatment controller
Dewatering control
Pump control
Medicine injection control

Boiler controller
Feedwater control + drum water level control
Combustion control
Low O_2 control

Combustion furnace controller
Batch furnace
Continuous furnace

City gas controller
Manufacturing process
Heat capacity adjusting control
Supply control

Garbage processing controller
Combustion temperature control
Air blow • exhaust control

Others
Autoclave controller
Computation for the quantity of water of open-watercourse
Multiple gas analyzer switching computation

1-5 Options

1.5.1 Backup operation unit

This backup operation unit backs up the control output in manual operation if the main unit of the CC-M fails.

It is incorporated in the front section.

The main unit can be replaced while the backup operation unit is operating, minimizing impact to the system.

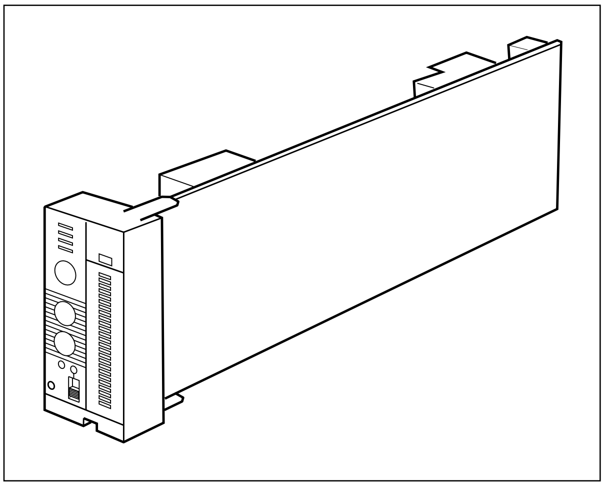


Figure 1-5

1.5.2 Memory card

The Compact Flash® memory card stores logging data (the data displayed on the trend display screen).

Note: Up to 4 data for each trend display screen can be recorded, and a maximum of 32 data for eight screens can be recorded.

An amount of data which can be stored in a memory card varies depending on the capacity of memory cards.

Memory card capacity	Data storage
4MB	Approx.180 thousand data
20MB	Approx.900 thousand data
30MB	Approx.1.35 million data

1 data means a record data in one sampling.

Memory cards and PCMCIA adapters for memory cards are available from PC shops or other distributors.

- Recommended memory cards
  Sandisk models
  SDCFB-4-101-00 (4MB)
  SDCFB-20-101-00 (20MB)
  SDCFB-30-101-00 (30MB)

URL http://www.sandisk.com

Since logging data is stored in a text format, the data, when read into a personal computer equipped with a PCMCIA card slot, can be processed by a text editor or a spreadsheet package. (This requires a PCMCLA adapter for memory cards.)

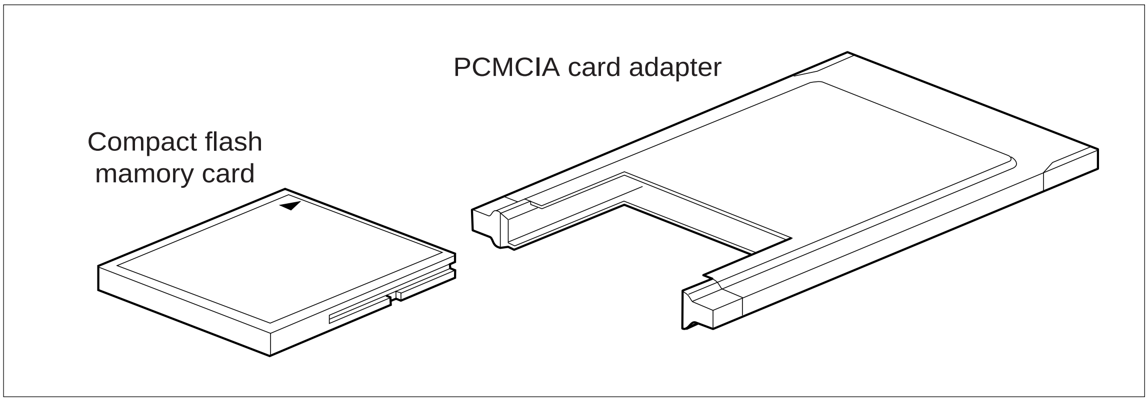


Figure 1-6

1.5.3 T-link interface

The T-link interface is a network interface that uses our sequence link (T-link) protocol.
It is available in two types, for high order communication and for low order communication.
With the interface for high order communication, the controller can be connected to the hosts (high order systems), such as CCM-viewer, etc.
With the interface for low order communication, the controller can be connected to our FPOS series of extending I/O modules for sequence (PNA and PYH) to extend the number of I/O.
Several CC-Ms can function in a coordinated system.

1.5.4 Modbus® interface

Modbus protocol interface (under development)
The Modbus protocol interface is used for high order communication.
The Modbus, an internationally standardized protocol interface, can connect the CC-M to the controllers and personal computers that incorporate the Modbus protocol communication function.

1.5.5 OPTO22 interface

The OPTO22 interface is used for low order communication.
This interface can connect the CC-M to various kinds of OPTO22's SNAP I/O modules.

1.5.6 Software PLC

The software PLC is an optional software that allows the PLC function to execute in the controller.
Control programs can be prepared by a personal computer using PLC control language that conforms to IEC 1131-3, and then those control programs can be executed in the Compact Controller M.
A programming software used in the controller is ISaGRAF®, a standard software.
Using the ladder program on the software PLC, computation and control functions can also be programmed.

When the software PLC is installed, wafer programming can not be performed.

1.5.7 Configuration software

With the configuration software, wafer programming can be performed in a personal computer.
Programs made in a personal computer can be downloaded to the controller through the loader interface (RS-232C) in the front section.

1-6 Type list

Alphabets and numbers that follow “PDA2” show the presence or absence of functions and options in the controller.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

P D A 2 ☐ ☐ ☐ ☐ - ☐ ☐ ☐ ☐ ☐ - ☐ ☐

	Contents		
	Controller fuction <1st to 4th digits>		
PDA2	Programmable type		
	Control loops <5th digit>		
1	1 loop		
2	2 loop		
4	4 loop		
	External terminal <6th digit>		
1	M3.5 screw		
2	Pressure terminal		
	Process variable input <7th digit>		
A	1 to 5 V DC		
C	Thermocouple		
D	Resistance bulb Pt 100		
E	Resistance bulb JPt 100		
1	Revision No. <8th digit>		
	Power source <9th digit>		
A	100 to 240 V AC		
	Setting method <10th digit>		
C	C-A-M type		
A	A-M type		
R	R-A-M type		
	Backup operation unit <11th digit>		
Y	None		
A	1 loop, 100 to 240 V AC		
B	2 loop, 100 to 240 V AC		
C	4 loop, 100 to 240 V AC		
	Transfer funciton <12th digit>		
	(High order)	(Low order)	(Memory card interface)
Y	None	None	None
S	T-link	None	With
T	T-link	T-link	With
R	Modbus ®	OPTO22	With
M	None	None	With
	Instruction manual <13th digit>		
Y	None		
W	Japanese		
V	English		
	Program method <14th digit>		
1	Wafer connection method		
2	Software PLC function (ISaGRAF)		
	Wafer connection <15th digit>		
0	None		
8	With 47 or less wafers		
9	With 48 or more wafers		

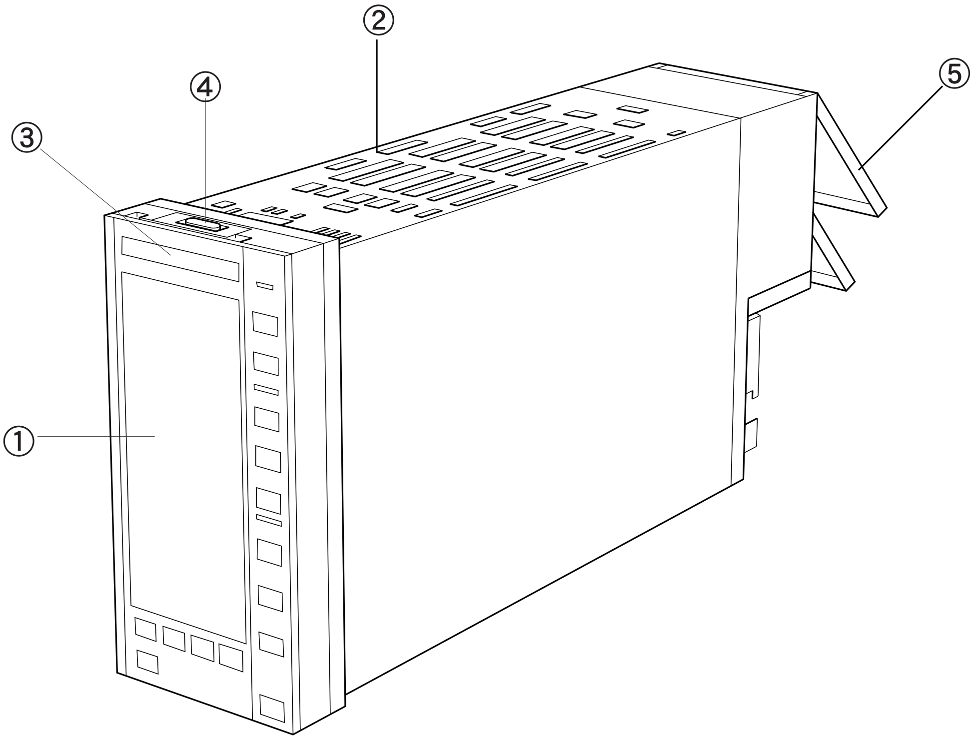
!

The CC-Ms are available in the [R-A-M] (remote) display type and the [C-A-M] (cascade) display type. Although this guide shows both the two types, they are different just in their indications, not in their functions, operations and performances.

2 NAME OF PARTS

This chapter shows the appearance, names of parts and functions of Compact Controller M (CC-M).

2-1 Appearance



① Front section
Consists of the color graphic LCD and the keys operating the controller.
Can be drawn from the main body.

② Main body
Consists of the main unit and the backup operation unit.

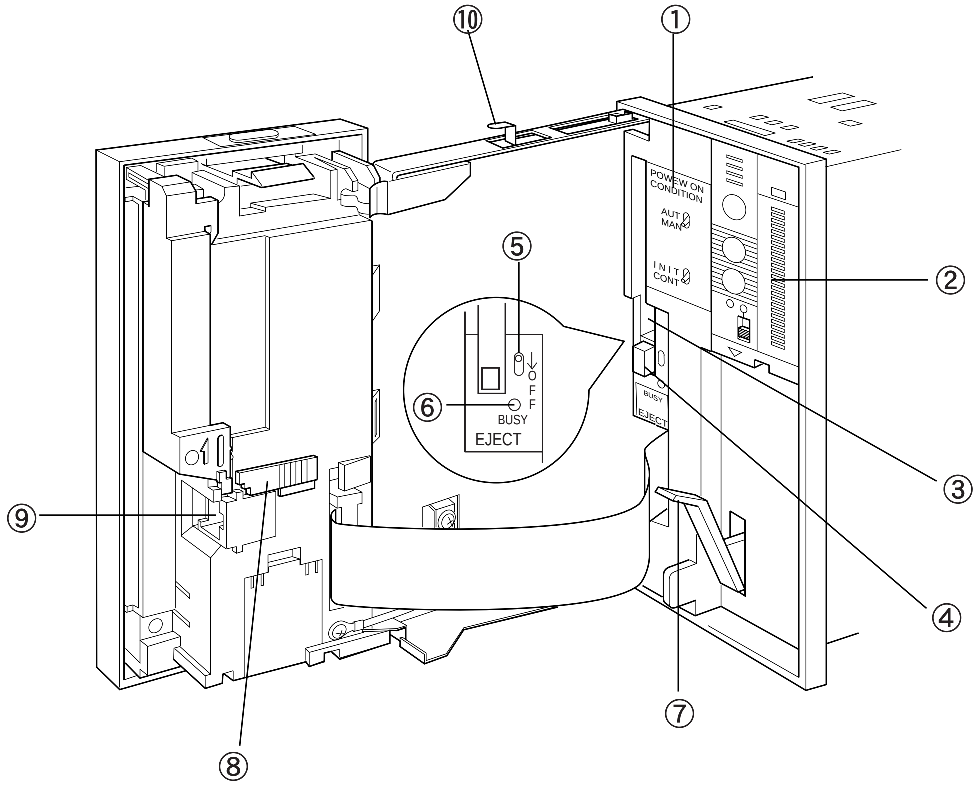
③ Tag plate
Tag No. of the controller (the name of the controller, etc.) can be indicated on this tag plate.

④ Lock button
Press this lock button to draw the front section.

⑤ Terminal cover
Intended for the protection of the terminal section.

This cover is so designed as to come off when subjected to excessive stress.

2-2 Internal parts (with the front section drawn)



① Power ON condition switch
Sets the operation mode at power ON.

② Backup operation unit
When replacing the main unit due to a failure of the controller or other problems, this backup operation unit produces MV output by manual operation.

This unit can be installed if 11th digit of the type is A, B or C.

---

③ Memory card insertion opening

④ Memory card eject button
Press to eject the memory card.

⑤ Memory card ON/OFF switch
Turns on/off the power of the memory card.
Before ejecting the memory card, press to turn off the power of the memory card.

⑥ Memory card BUSY lamp
Lit while the power of the memory card is turned on.

!

Never eject the memory card while this lamp is lit. Otherwise, stored data may be corrupted.

⑦ Lever
Intended for pulling out the main unit.
The main unit can be pulled out by tilting this lever downward and pulling it toward you.

!

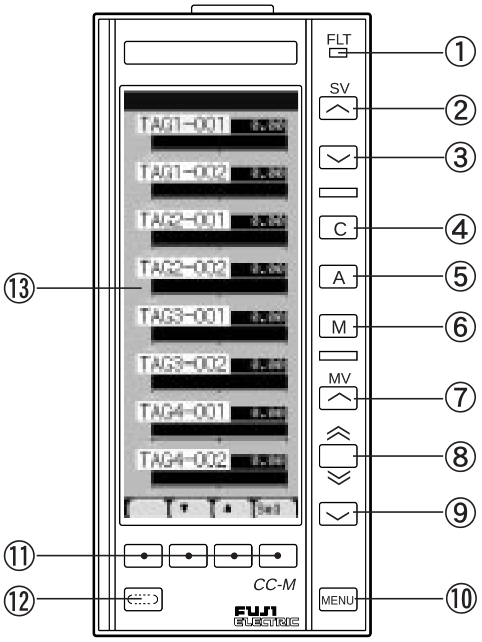
Be sure to loosen the lock screw for transportation on the back of the controller before operations.

⑧ LCD back light ON/OFF switch
Lights or extinguishes the back light.

⑨ Connector for loader
Connected to the loader. Remove the cover before connecting to the loader.

⑩ Internal lock button
Press to push in the front section and pull out the main unit.

2-3 Front section (display/operation section)



① FLT lamp
Lit when a system fault (abnormality) occurs.
Blinks when a system warning occurs.
Remains off under normal operation.

② SV up key
Press to increase the SV (the setting value).

③ SV down key
Press to decrease the SV (the setting value).

④ Cascade mode key
Switches to the cascade mode.

⑤ Auto mode key
Switches to the auto mode.

⑥ Manual mode key
Switches to the manual mode.

⑦ MV up key
Press to increase the MV (the control output value) in the manual mode.

⑧ MV quintuple speed key
Pressing the MV up key or MV down key while pressing this key, quintuples the increasing and decreasing speeds of the MV.

⑨ MV down key
Press to decrease the MV (the control output value) in the manual mode.

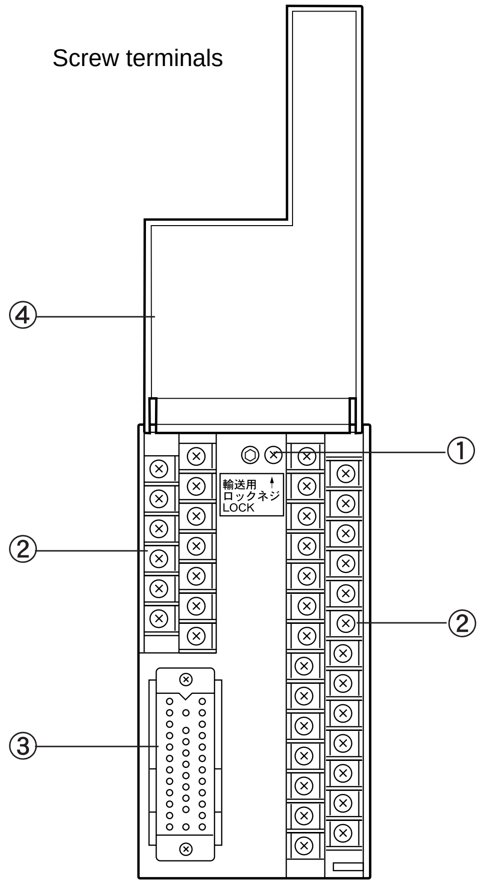
⑩ MENU key
Displays the MENU screen (MENU1/3) on the LCD. Pressing this key while the MENU screen is displayed, switches to MENU1/3, MENU2/3 and MENU3/3 one by one.

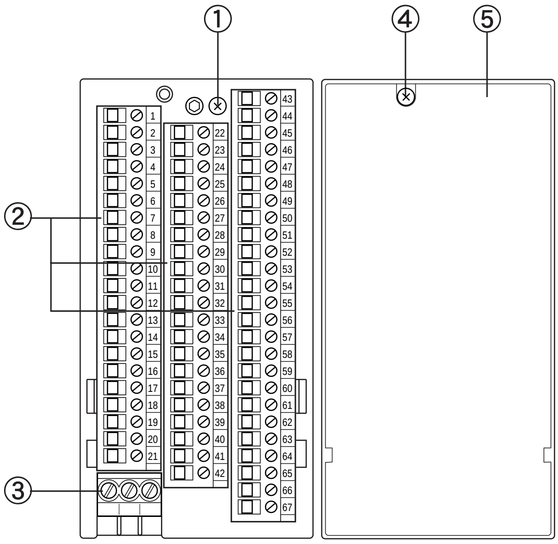
⑪ Chameleon key (1, 2, 3, and 4)
Press to switch the display screens, to set various functions, and to enter values.
The function of each key varies depending on displayed screens and operations. The function is displayed right above the key (the lowermost part of the LCD).

⑫ Chameleon change key
Changes functions of the chameleon keys.

⑬ Color graphic LCD

2-4 Backside (Terminal section)


Screw terminals


Pressure terminals

① Lock screw for transportation
Secures the main unit for transportation.

Be sure to loosen this lock screw before installation.

② Block terminal base
Consists of terminals that are connected to the power supply and the input/output cables.

③ Multi-connector
Consists of terminals that are connected to the input/output cables.

④ Terminal cover
Intended for the protection of the terminal section.
Can be opened by pulling the lower part of the cover toward you.

This cover is so designed as to come off when subjected to excessive stress.

① Lock screw for transportation
Secures the main unit for transportation.

Be sure to loosen this lock screw before installation.

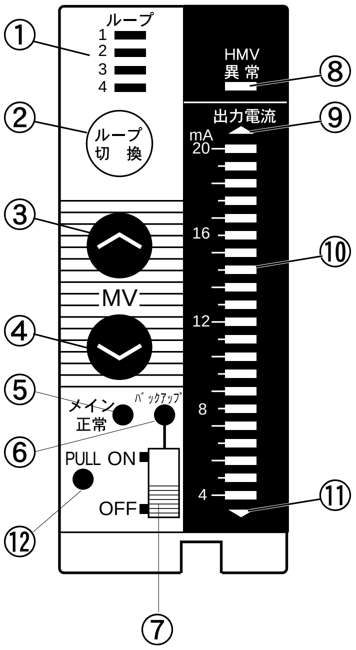
② Block terminal base
Consists of terminals that are connected to the input/output cables.

③ Power terminal base
Consists of terminals that are connected to the AC power.

④ Terminal cover securing screw
Secures the terminal cover.

⑤ Terminal cover
Intended for the protection of the terminal section.
Secured to the controller with the terminal cover securing screw ④.

2-5 Backup operation unit (HMV)



① Loop display
Shows MV loop No.

② Loop change switch
Each press of this button advances the displayed loop as 1 → 2 → 3 → 4 → 1 → · · ·.

③ MV up key
Increases MV output.

④ MV down key
Decreases MV output.

⑤ Main unit normal lamp
Lit when the main unit operates normally.

⑥ Backup lamp
Lit when the backup operation unit is backing up the MV (control output).

⑦ Backup ON/OFF switch
Turns on/off the back up unit. Turn it on to back up the MV (control output).

⑧ HMV abnormal lamp
Lit if anything is wrong with the backup operation unit.

While the HMV abnormal lamp is lit, operations by the backup operation unit are not allowed.

⑨ Overrange lamp
Lit when the output power display unit reads over 20mA.

⑩ MV bar graph
Shows the monitor values of the output MV while the backup operation unit is turned off, and shows the setting values of the output MV while the backup operation unit is turned on.

⑪ Underrange lamp
Lit when the output power display unit reads under 0mA.

⑫ Knob
Hold and pull this knob when pulling the backup operation unit from the main body.

3 INSTALLING AND WIRING

This chapter explains how to install the Compact Controller M (CC-M) and how to connect the cables to the external terminals.

3-1 Before installing and wiring

3.1.1 Precautions for installing place

This controller is so designed as to install on an indoor panel. The installing place affects the controller service life and accessibility for maintenance and checkup. Pay attention to the following points.

(1) Not exposed to excessive vibration or impact.

(2) Avoid intense radiation or direct sunshine in a place where the ambient temperature is within 0 to 50 °C with small temperature variation. If the ambient temperature is near normal temperature (20 to 25 °C), the running results are good.

(3) Place where the humidity is 90 %RH or lower, not dripped with water and not subjected to condensation.

(4) Not exposed to fines, dust or corrosive gases.

(5) Place where large current or spark is present, around a replay panel or the like is not desirable because of induction troubles.

(6) A good aeration is ensured for controller heat radiation.

(7) A space is available so that wiring, maintenance, checkup, etc. can easily be made.

(8) More than 100 mm of space is secured below the main body.

(9) Place where no disturbance by electromagnetic wave from wireless equipment or portable telephone is present.

3.1.2 Precautions for temperature in panel

The temperature in the panel interior where the controller is installed (around the controller (within 15 cm from the controller)) must be below 50 °C. For this purpose, pay attention to the following points when preparing a panel.

(1) Do not install any equipment that produces excessive heat near the controller.

(2) If another equipment is installed near the controller, arrange so as not to hinder the air flow. Since the heat is diffused upward and downward, sufficiently secure spaces upward and downward.

(3) If the temperature around the controller is supposed to exceed 50 °C, install fans for forcing the atmospheric air into the panel.

3.1.3 Precautions for wiring

(1) For wiring to screw terminals, use 600V PVC wire IV (JIS C3307) or control PVC cable CVV (JIS C3401) and compression terminals. The compression terminal size must be 1.25 x 3.5S or 2 x 3.5S (applied wire size: 0.25 to 2 mm^2).

(2) For wiring to pressure terminals, use 600V PVC wire IV (JIS C3307) or control PVC cable CVV (JIS C3401). The applicable wire size is 0.2 x to 2.5 mm^2. If bar terminals are used, their size must match the wire size.

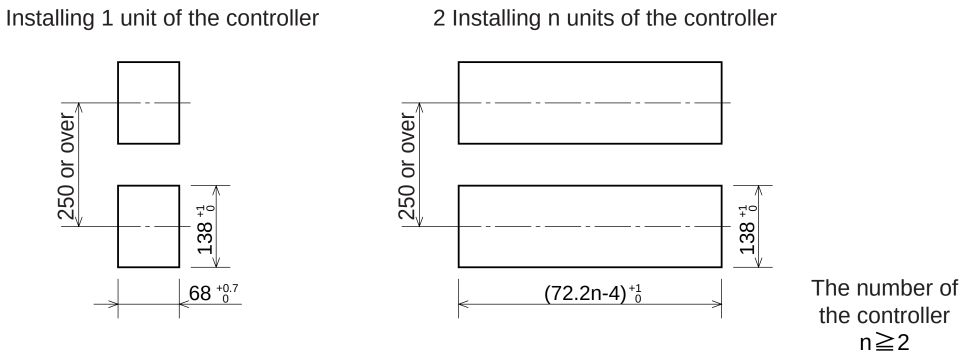
(3) If there may be induction disturbance, prepare a shield wire and connect the woven metal shield of the wire to the G terminal.
Connect the terminals of the following cables with shield wires.
- Analog input cable
- Analog output cable
- Reference potential cable
- Power cable
- Communication cable

(4) Make unused MI+/– terminals short-circuited.

(5) Entering chippings from wiring or pieces of metal into the controller may result in a failure of the controller. Therefore, never remove the protective film (white film) on top of the case until wiring is completed.

However, if the controller operates with the protective film on it, this will hinder ventilation for the controller. Be sure to remove the protective film before turning on the power.

3-2 Installing on panel



Installing 1 unit of the controller

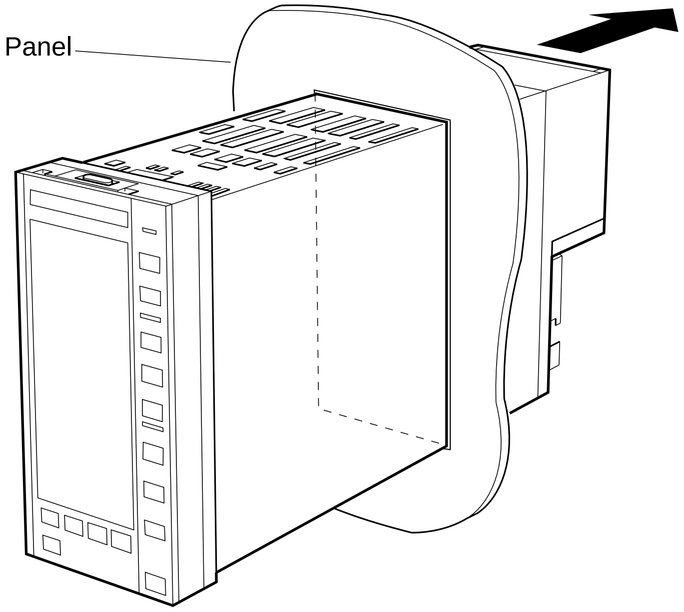
2 Installing n units of the controller

Panel cutout dimensions

Make an installing cutout in a panel according to “Panel cutout dimensions”. Use a panel of 8mm or less in thickness to install the controller on.

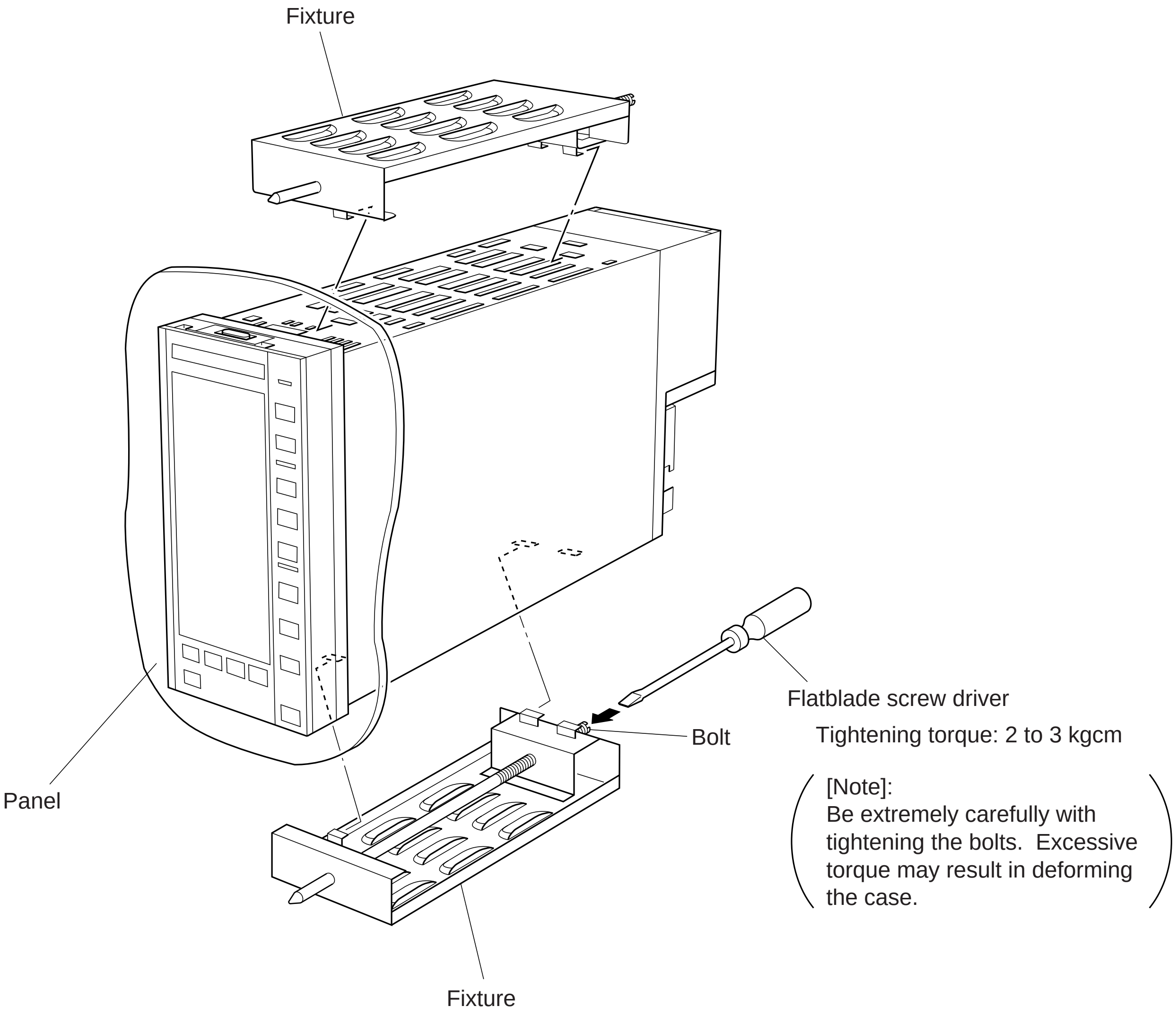
Note) The controller front dimensions and panel cutout dimensions conform to IEC standards.

1. Insert the controller through the panel cutout from the panel front.



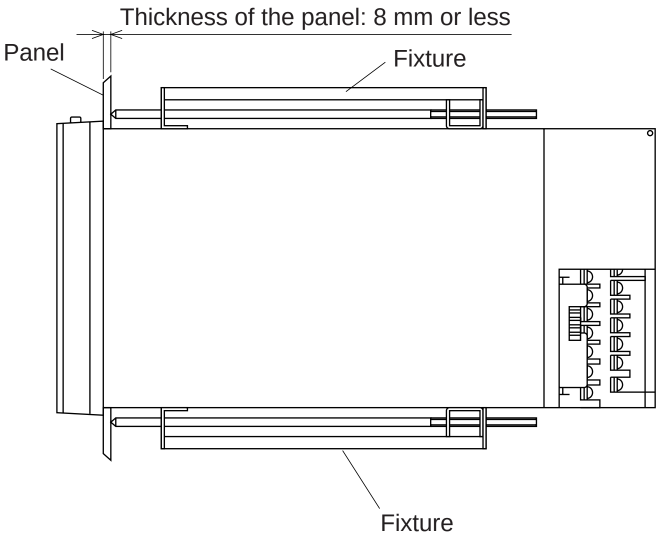
2. Insert each of the supplied fixtures into the upper and lower cutouts in the case as shown in Figure on the next page.

3. Torque the bolts of the fixtures to 2 to 3 kgcm by a flatblade screwdriver. Be extremely carefully with tightening the bolts. Excessive torque may result in deforming the case.



Tightening torque: 2 to 3 kgcm

[Note]:
Be extremely carefully with tightening the bolts. Excessive torque may result in deforming the case.



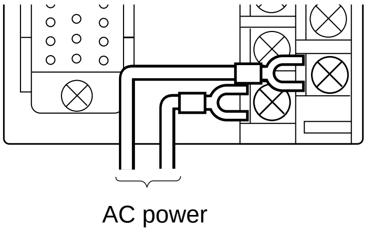
3-3 Connecting the power and grounding

3.3.1 Connecting controller power supply (AC power)

A power switch and fuses are not incorporated in the controller. Attach a power switch and fuses on the external part of the controller if necessary.

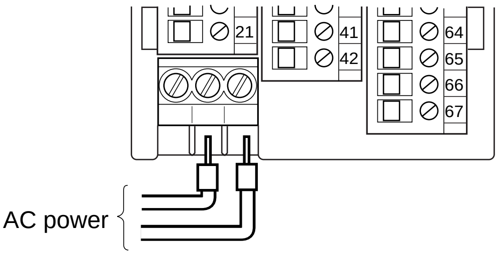
(1) For screw terminals

Connect AC power to the power terminals N/– (terminal No. 64) and L/+ (terminal No. 83).



(2) For pressure terminals

Connect AC power to the power terminals N/– and L/+.

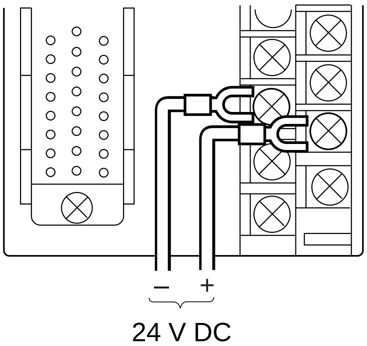


3.3.2 Connecting power supply for digital input/output (24 V DC)

The power for controller (AC power) and digital input/output power (24 V DC) can be separately supplied to the controller. This prevents the controller from being cut off from power even when the relay or the protective diode connected in parallel with the relay is short-circuited.

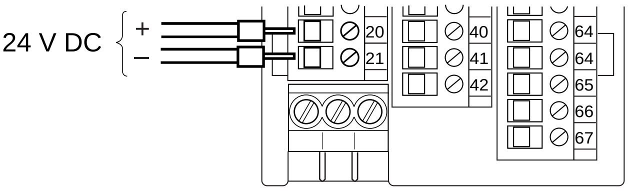
(1) For screw terminals

Connect the 24 V DC power supply to the power input +terminal VPD of power supply for digital input/output (terminal No. 82) and to the power input ñterminal PCD (terminal No. 62).



(2) For pressure terminals

Connect the 24 V DC power supply to the power input +terminal VPD of power supply for digital input/output (terminal No. 20) and to the power input –terminal PCD (terminal No. 21).

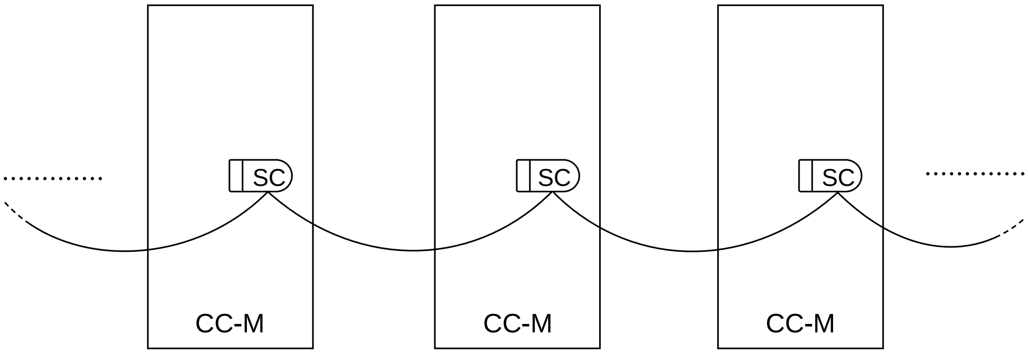


Note that if this arrangement is unnecessary, it is possible to connect the power output +terminal VP of auxiliary power supply to the VPD, and the power output –terminal PC to the PCD, instead of using the power supply for digital input/output (Current output: 40mA or less).

3.3.3 Connecting a signal common wire

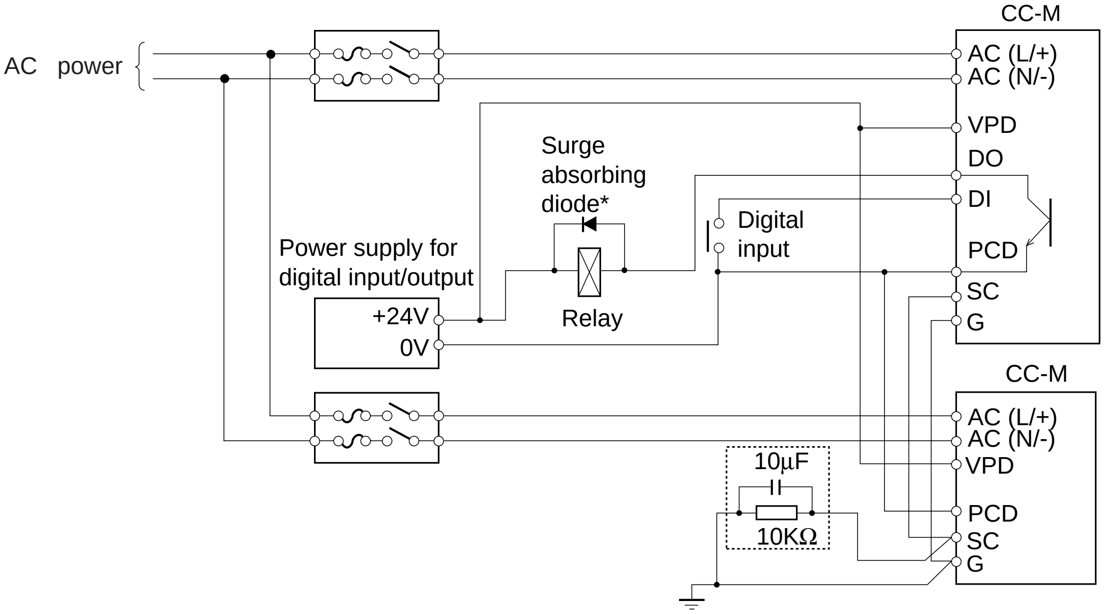
When several controllers are used, an SC wire (signal common bus) has only to be connected over the several controllers as shown in Figure below without wiring each controller independently.

Note) It is advisable that wiring be carried out over the controllers in a loop form for safety reasons.



3.3.4 Grounding

1. Connect the G terminal to ground at grade 3 (ground resistance: 100W or less) or better by a wire of 2 mm^2 or more.
2. Connect one of the SC terminals to ground via C • R (10µF • 10kW) at one point of the system.



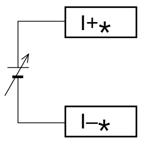
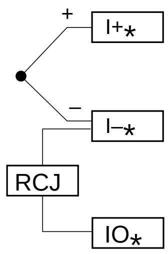
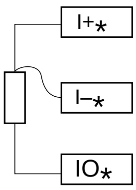
*: If a relay or the like is used, its surge may cause a malfunction of the controller. Therefore, be sure to attach a surge absorbing diode (surge absorber) on the external part of the controller.

3-4 Connecting input/output cables

3.4.1 Connecting analog input cables

(1) Connecting process variable input cables

As a PV (process variable input), 1 to 5 V DC, thermocouple input, and resistance bulb input can be selected.

1 to 5 V DC input	Thermocouple input	Resistance bulb input
 The I–terminals and the SC terminals are short-circuited in the controller.		

---

if you select input other than 1 to 5 V DC input, an optional direct input unit is required.
For connecting each input cable, refer to Figure below.
For the thermocouple input, connect the supplied cold junction compensating resistor (Rcj) between the I– and IO terminals.

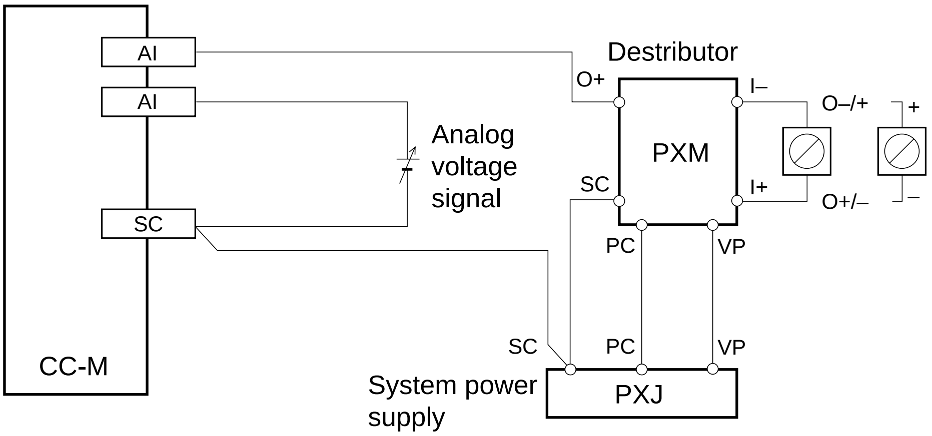
---

(2) Connecting other analog input cables

For other analog input cables, connect them to the analog input terminals AI as shown in Figure below.

The analog reference potential SC has three terminals which are short-circuited in the controller.

Input rating: Input resistance of 1 MW or more, and of 15 kW for outside of the input range (1 to 5 V DC)



AI: Analog input

[Note]:
The PC and the SC are connected in the system power supply (PXJ).

3.4.2 Connecting analog output cables

(1) Connecting control output cables

Connect the MV (control output) to the control output terminals MI+ and MI– as shown in Figure below.

The control output (i.e. current output) flows from MI+ to MI–.

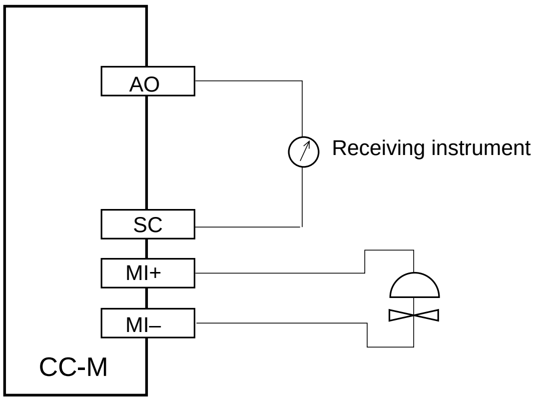
Output rating: allowable load resistance: 600W or less

(2) Connecting other analog output cables

For other analog input cables, connect them to the analog output terminals AO as shown in Figure below.

The analog output is a voltage output (1 to 5 V DC). The analog reference potential SC has three terminals which are short-circuited in the controller.

Output rating: Output resistance of 1W or less



AO : Analog output
MI+, MI- : Control output

3.4.3 Connecting digital input/output cables

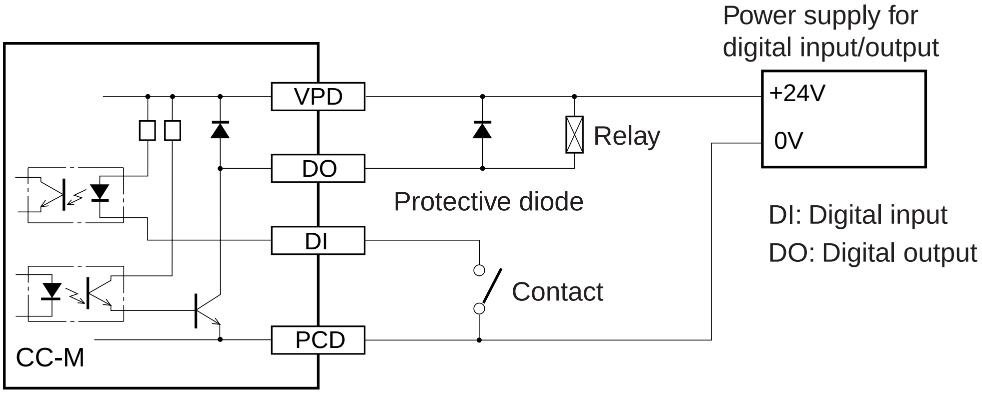
Connect the digital input/output cables as shown in Figure below.

The digital input/output terminals are insulated by photocouplers.

!

If the relay or the like is connected to the digital output terminals, its surge may cause a malfunction of the controller. Therefore, be sure to attach a surge absorbing diode (surge absorber) on the external part of the controller. Before turning on the power supply for digital input/output, confirm the polarity of the surge absorbing diode. If a protective diode is incorporated in the relay, make sure that its polarity is as shown in Figure below. If the polarity is reverse, an excessive current will flow in the digital output terminals, possibly resulting in breaking the output circuit.

Input rating: input current of approx. 8 mA/24 V DC



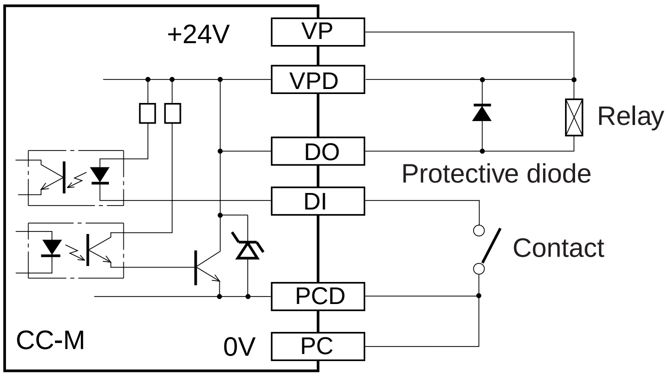
Output rating: 30 V DC x 0.1 A (max. rating)

The controller can be supplied with digital input/output power from the power output +terminal VP and – terminal PC of the auxiliary power supply.

In this case, the digital input/output circuit is not insulated from the internal circuit.

!

The output rating of the auxiliary power supply is 20 to 30 V DC (40mA max.), which corresponds to output per MH54P. An output current in excess of 40mA may result in breaking the controller. If an excessive load is applied, be sure to connect the power supply for digital input/output to the external part of the controller power supply.



3-5 Networking

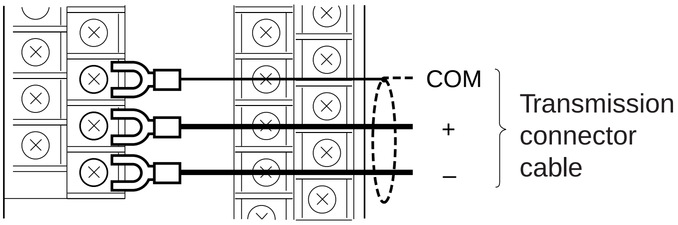
This controller is equipped with two types of terminals, high order communication terminals, (T-link or Modbus) and low order communication terminals (T-link or OPTO22).

3.5.1 Networking for lower order communication

For a low order network with low order slave modules, such as input/output modules, connect a transmission connector cable to the following terminals.

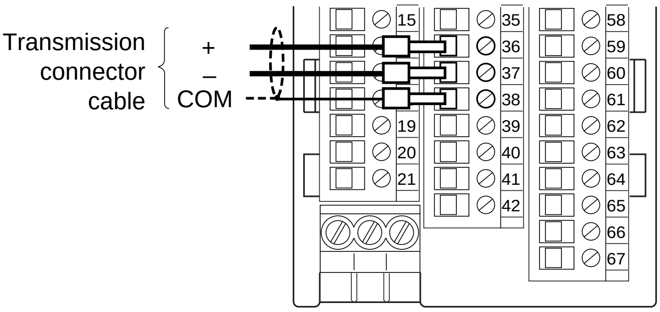
(1) For screw terminals

Connect a transmission connector cable to low order communication terminal T1 (terminal No.36), T2 (terminal No.37), and low order communication cable shield VST2 (terminal No.35).



(2) For pressure terminals

Connect a transmission connector cable to low order communication terminal OPT+ (terminal No.36), OPT– (terminal No.37), and low order communication cable shield COM (terminal No.38).

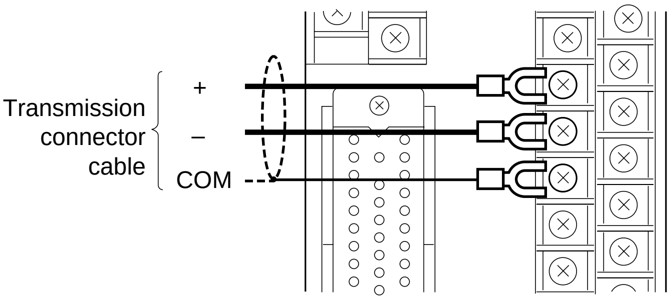


3.5.2 Networking for high order communication

For a high order network with PC, etc., connect a transmission connector cable to the following terminals.

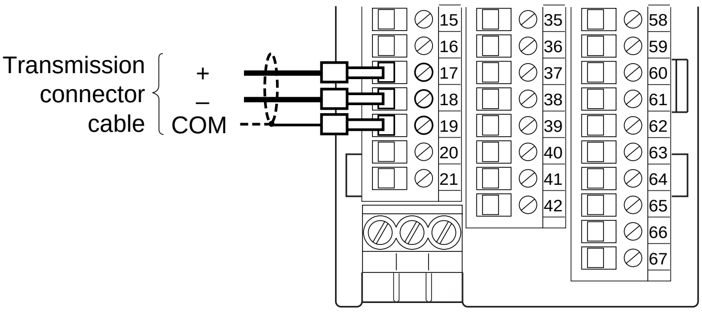
(1) For screw terminals

Connect a transmission connector cable to the high order communication terminal MoD+ (terminal No.58), MoD– (terminal No.59), and high order communication cable shield VST1 (terminal No.60).



(2) For pressure terminals

Connect a transmission connector cable to the high order communication terminal MoD+ (terminal No.17), MoD– (terminal No.18), and high order communication cable shield COM (terminal No.19).



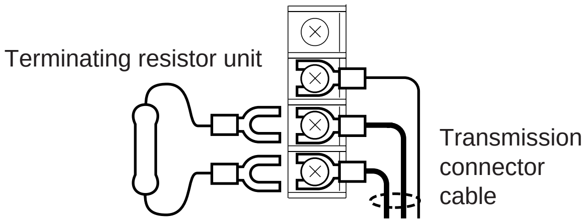
The transmission connector cable is not included with the controller and must be prepared separately.

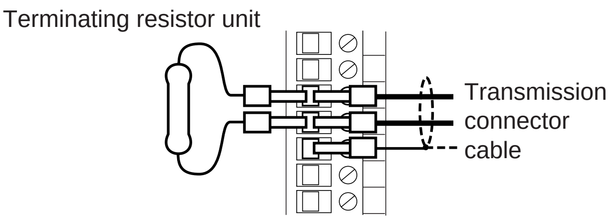
3.5.3 Connecting the terminating resistor unit

When networking, connect the terminating resistor unit to the end of the network. The typical configurations of networking and installing place of the terminating resistor unit are shown on the next page.

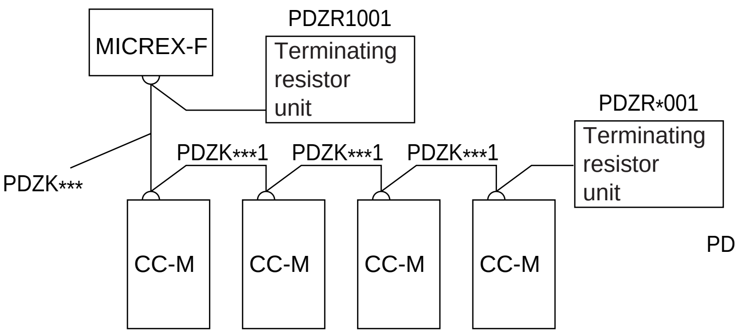
The terminating resistor unit is not included with the controller and must be prepared separately.

Name	Type
Terminating resistor for screw terminals	PDZR1001
Terminating resistor unit for pressure terminals	PDZR2001

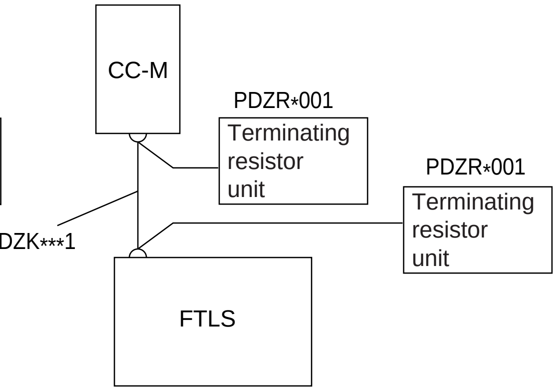




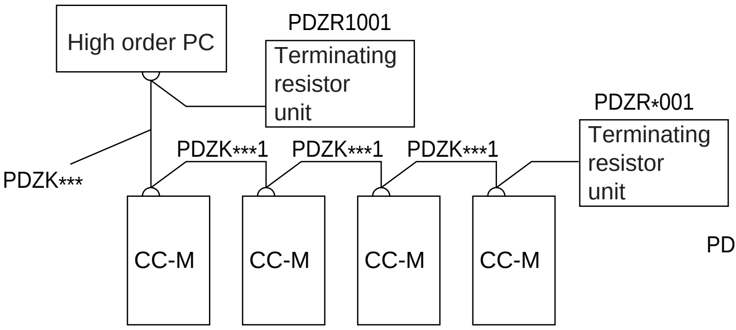
1) T-LINK



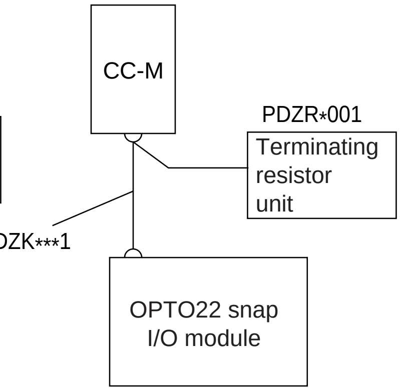
2) T-LINK



3) Modbus



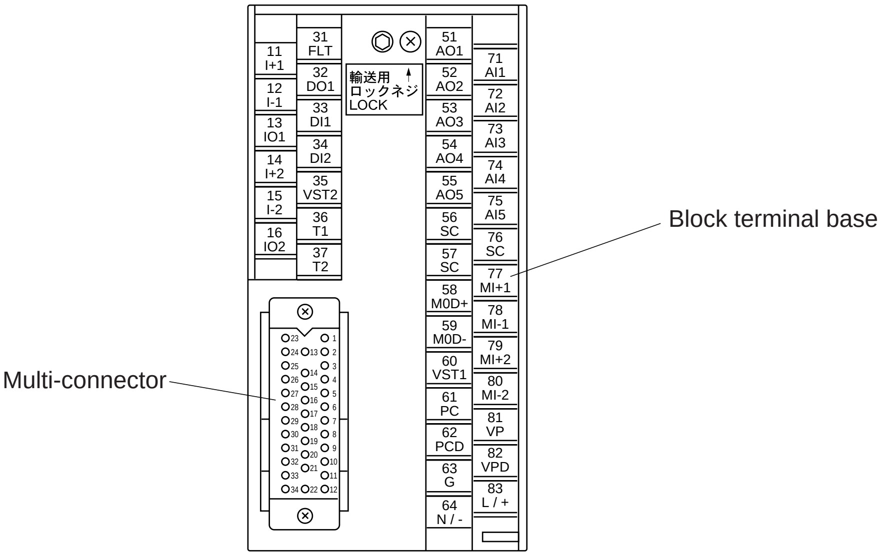
4) OPTO22



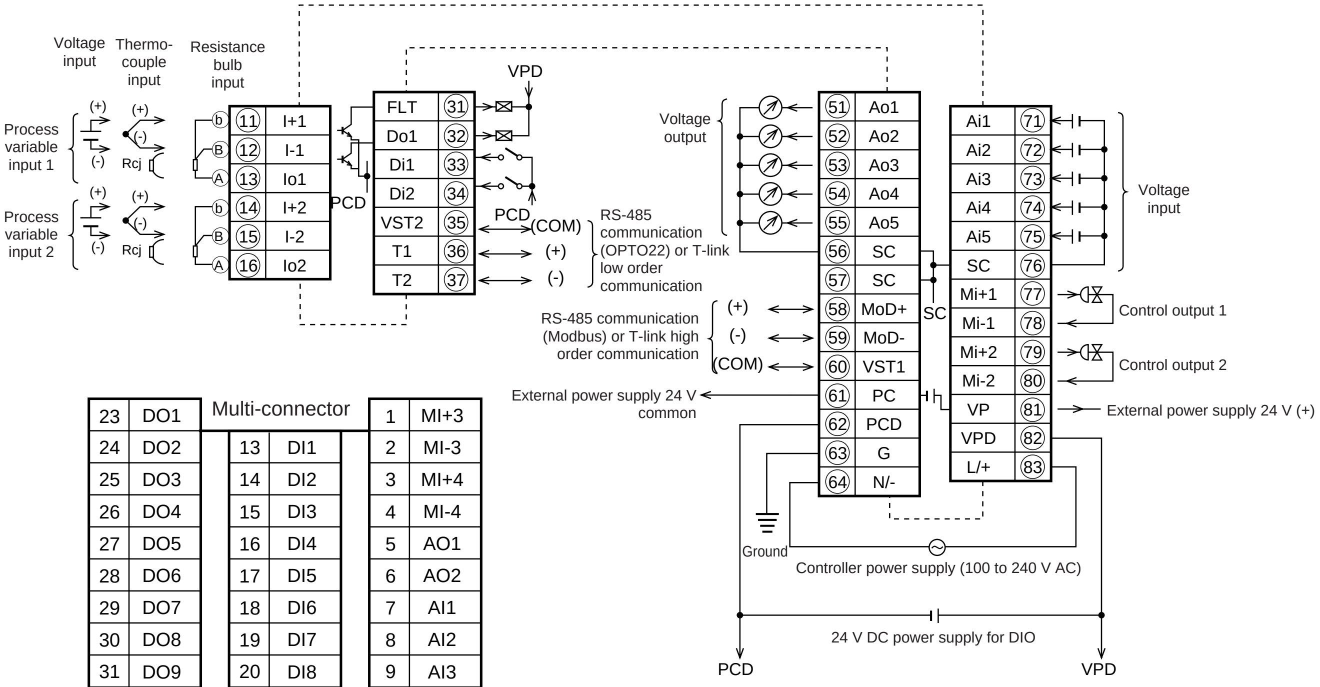
3-6 Layout of terminals

3.6.1 Screw terminals

(1) Layout of screw terminals



Connection diagram



Multi-connector

23	DO1			1	MI+3
24	DO2	13	DI1	2	MI-3
25	DO3	14	DI2	3	MI+4
26	DO4	15	DI3	4	MI-4
27	DO5	16	DI4	5	AO1
28	DO6	17	DI5	6	AO2
29	DO7	18	DI6	7	AI1
30	DO8	19	DI7	8	AI2
31	DO9	20	DI8	9	AI3
32	DO10	21	DI9	10	AI4
33	VPD	22	DI10	11	SC
34	PCD			12	PCD

(2) List of screw terminal symbols

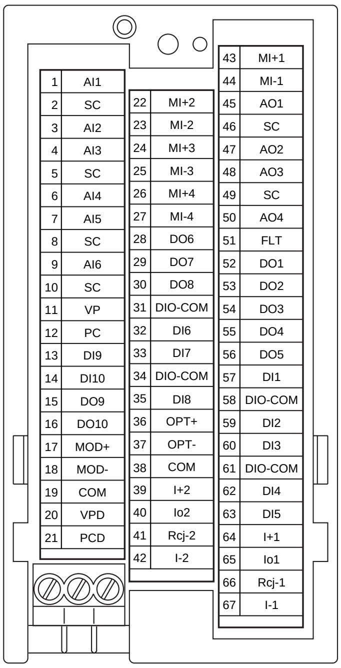
Terminal symbol	Terminal No.	Description	Remarks
I +1, I – 1, IO1	11, 12, 13	Process variable input 1	1 to 5 V DC input / TC input / Pt input
I +2, I – 2, IO2	14, 15, 16	Process variable input 2	
MI +1, MI – 1	77, 78	Control output 1	4 to 20mA DC current output
MI +2, MI – 2	79, 80	Control output 2	
AI1, AI2, AI3, AI4, AI5	71, 72, 73, 74, 75	Analog input	1 to 5 V DC input / 0 to 5 V DC input / 0 to 10 V DC input
AO1, AO2, AO3, AO4, AO5	51, 52, 53, 54, 55	Analog output	1 to 5 V DC output / 0 to 5 V DC output / 0 to 10 V DC output
SC	56, 57, 76, 11	Signal common. Reference potentials for AI and AO.	There are four SC terminals which are short-circuited in the controller.
DI1,DI2	33, 34	Digital input	30 V DC transistor input
DO1	32	Digital output	30 V DC open collector output
FLT	31	Fault output	30 V DC open collector output
T1, T2	36, 37	Low order communication terminal	Communication with low order slave module, such as T-link (master) and OPTO22.
VST2	35	Low order communication cable shield terminal	Connected to the woven metal shield of the communication cable.
MOD+, MOD–	58, 59	High order communication terminal	Communication with high order hosts, such as T-link (slave) and Modbus.
VST1	60	High order communication cable shield terminal	Connected to the woven metal shield of the communication cable.
VP	81	Power output +terminal of auxiliary power supply	24 V DC, 40mA output
VPD	82	Power input +terminal of power supply for digital input/output	Power input for DI and DO. If DI or DO is used, the power should be supplied to this terminal.
PC	61	Power output –terminal of auxiliary power supply	
PCD	62	Power input –terminal of power supply for digital input/output	Return line for DI and DO.
L/+, N/–	83, 64	Controller power supply input	100 to 240 V AC input
G	63	Grounding terminal	Be sure to carry out grounding

(3) List of multi-connector terminal symbols

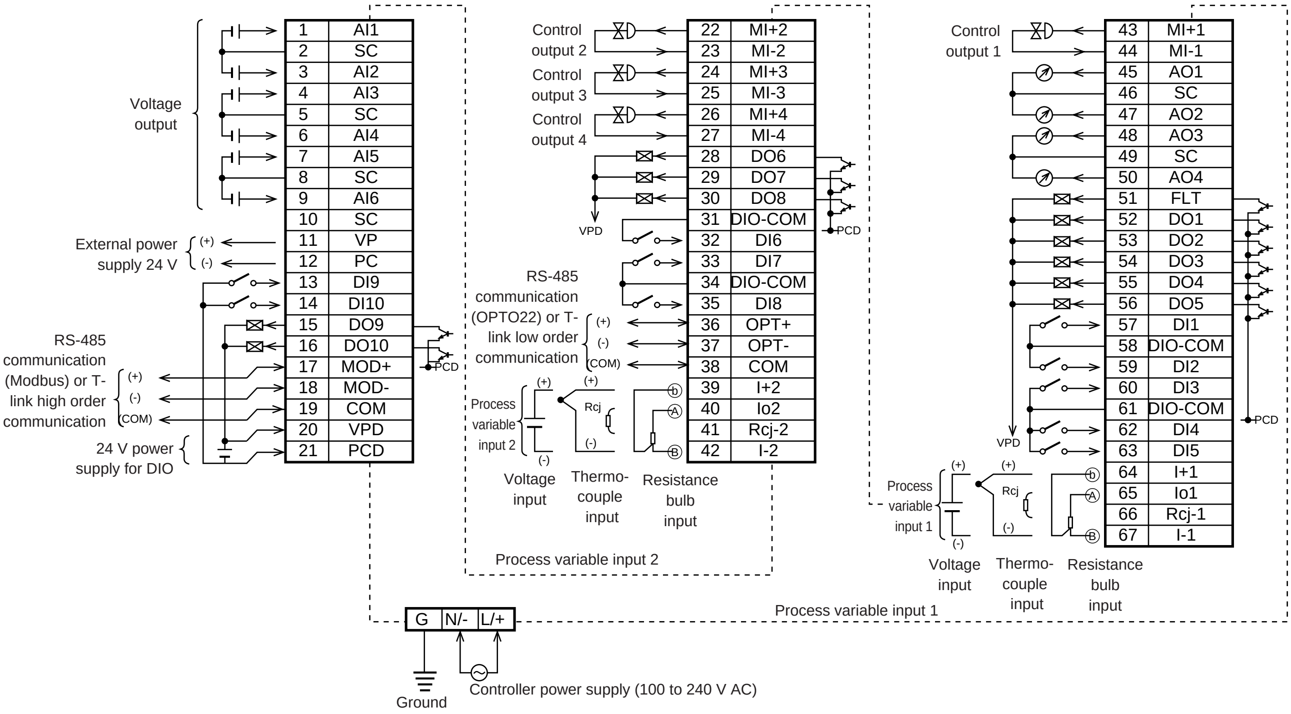
Terminal symbol	Terminal No.	Description	Remarks
MI + 3, MI – 3	1, 2	Control output 3	4 to 20mA DC current output
MI + 4, MI – 4	3, 4	Control output 4	4 to 20mA DC current output
AO1, AO2	5, 6	Analog output	1 to 5 V DC output / 0 to 5 V DC output / 0 to 10 V DC output
AI1, AI2, AI3, AI4	7, 8,9,10	Analog input	1 to 5 V DC input / 0 to 5 V DC input / 0 to 10 V DC input
SC	11	Signal common. Reference potentials for AI and AO.	
PCD	12	Power input ñterminal of power supply for digital input/output	Return line for DI and DO.
DI1,DI2,DI3, DI4,DI5,DI6, DI7,DI8,DI9, DI10	13,14,15, 16,17,18, 19,20,21, 22	Digital input	30 V DC transistor input
DO1,DO2, DO3,DO4, DO5,DO6, DO7,DO8, DO9,DO10	23,24,25, 26,27,28, 29,30,31, 32	Digital output	30 V DC open collector output
VPD	33	Power input +terminal of power supply for digital input/output	Power input for DI and DO. If DI or DO is used, the power should be supplied to this terminal.
PCD	34	Power input –terminal of power supply for digital input/output	Return line for DI and DO

3.6.2 Pressure terminals

(1) Layout of pressure terminals



Connection diagram



(2) List of pressure terminal symbols

Terminal symbol	Terminal No.	Description	Remarks
I + 1, I – 1,IO1	64, 67,65	Process variable input 1	1 to 5 V DC input / TC input / Pt input
Rcj-1	66	Cold junction compensating terminal for process variable input 1	The terminal for connecting Rcj module for TC input.
I + 2, I – 2, IO2	39,42,40	Process variable input 2	1 to 5 V DC input / TC input / Pt input
Rcj-2	41	Cold junction compensating terminal for process variable input 2	The terminal for connecting Rcj module for TC input.
MI + 1, MI – 1	43,44	Control output 1	4 to 20mA DC current output
MI + 2, MI – 2	22,23	Control output 2	4 to 20mA DC current output
MI + 3, MI – 3	24,25	Control output 3	4 to 20mA DC current output
MI + 4, MI – 4	26,27	Control output 4	4 to 20mA DC current output
AI1,AI2,AI3, AI4,AI5,AI6	1,3,4,6,7,9	Analog input	1 to 5 V DC input / 0 to 5 V DC input / 0 to 10 V DC input
AO1,AO2, AO3,AO4	45,47,48,50	Analog output	1 to 5 V DC output / 0 to 5 V DC output / 0 to 10 V DC output
SC	2,5,8,10,46,49	Signal common. Reference potentials for AI and AO.	There are six SC terminals which are short-circuited in the controller.
DI1,DI2,DI3, DI4,DI5,DI6, DI7,DI8,DI9, DI10	57,59,60, 62,63,32, 33,35,13, 14	Digital input	30 V DC transistor input
DO1,DO2, DO3,DO4, DO5,DO6, DO7,DO8, DO9,DO10	52,53,54, 55,56,28, 29,30,15, 16	Digital output	30 V DC open collector output
FLT	51	Fault output	30 V DC open collector output
OPT+,OPT	36,37	Low order communication terminal	Communication with low order slave module, such as T-link (master) and OPTO22.
COM	38	Low order communication cable shield terminal	Connected to the woven metal shield of the communication cable.
MOD+, MOD–	17,18	High order communication terminal	Communication with high order hosts, such as T-link (slave) and Modbus.
COM	19	High order communication cable shield terminal	Connected to the woven metal shield of the communication cable.
VP	11	Power output +terminal of auxiliary power supply	24 V DC, 40mA output
VPD	20	Power input +terminal of power supply for digital input/output	Power input for DI and DO. If DI or DO is used, the power should be supplied to this terminal.
PC	12	Power output –terminal of auxiliary power supply	
PCD	21	Power input –terminal of power supply for digital input/output	Return line for DI and DO.
OCD-COM	31,34,58,61	Power input –terminal of power supply for digital input/output	Return line for DI and DO.
L/+, N/–	None	Controller power supply input	100 to 240 V AC input
G	None	Grounding terminal	Be sure to carry out grounding.

4

RUNNING AND OPERATION

This chapter explains how to install the Compact Controller M (CC-M) and how to connect the cables to the external terminals.

4-1 Turning on power

4.1.1 Turning on power

This controller is not equipped with a power switch. Immediately after AC power is supplied to the power supply terminals, the controller starts to run.

The 8 loop screen shown in Figure appears when the controller is started up.

Then, the control operations start in the startup mode explained in “4.1.2 Startup mode after turning on power”.

4.1.2 Startup mode after turning on power

The startup operations of the controller after turning on power vary depending on the settings of POWER ON CONDITION switch in the front section.

- **AUTO/MAN switch (operation mode setting switch)**

AUTO: Starts up in the operation mode which is selected for each control block of a loop in the START MODE of the SYSTEM SET menu.

MAN: Starts up in the manual mode regardless of the settings in the START MODE.

The operation mode can be selected between the Auto (A) mode and the Remote (R)/Cascade (C) mode with operation mode select key in the front section.

- **INIT/CONT switch (initializing switch)**

INIT: Computing starts after all control and computation results are initialized (Initial start mode).

CONT: Computing is resumed from the last status before power-off (Continuous start mode).
If the controller is cut off from power due to a power failure or others, the control and computations can be continued to perform immediately after the power is recovered. However, if the period of a power failure exceeds the time period set in the RESTART TIME of the SYSTEM SET menu, the initial start mode is selected.

4-2 Operations on monitor screens

4.2.1 About monitor screens

The 8 loop screen which is displayed immediately after power on, is switched to the monitor screens for each loop, the tuning display screen, and the alarm/fault screen, etc. by operating MENU key or chameleon keys in the front section.

The loop which is displayed in the MENU 1/3 (where the monitor screens are selected) does not mean the control loop of the controller but mean the primary control loop or the secondary control loop of each loop.

4.2.2 Switching monitor screens

Perform the following operations to switch to a desired monitor screen.

- **Selecting a desired monitor screen in the menu.**

1. Press the MENU key to display the MENU 1/3.
2. Press the chameleon key [▲] or [▼] to move the cursor (blue) to the desired monitor screen, and press the chameleon key [Sel].
   The desired monitor screen appears.

When the loop display screen is selected, the monitor screen for loop 1 is always displayed first.

→ 8 loop display screen
→ 4 loop display screen
→ 2 loop display screen
→ 1 loop display screen
→ Tuning display screen
→ Trend display screen
→ Alarm/fault screen
→ Status display screen

- **Selecting screens by chameleon keys**

When the chameleon change key is pressed while the MENU 1/3 screen, the 8 loop display screen, or the 4 loop display screen is displayed, the following keys are displayed. Pressing each of the displayed key changes to the loop display screen of the pressed key.

(4Lp: 4 loop display screen, 2Lp: 2 loop display screen, 1Lp: 1 loop display screen)

- **Changing monitor screens**

Pressing the chameleon key [<<] or [>>] changes the displayed loop.

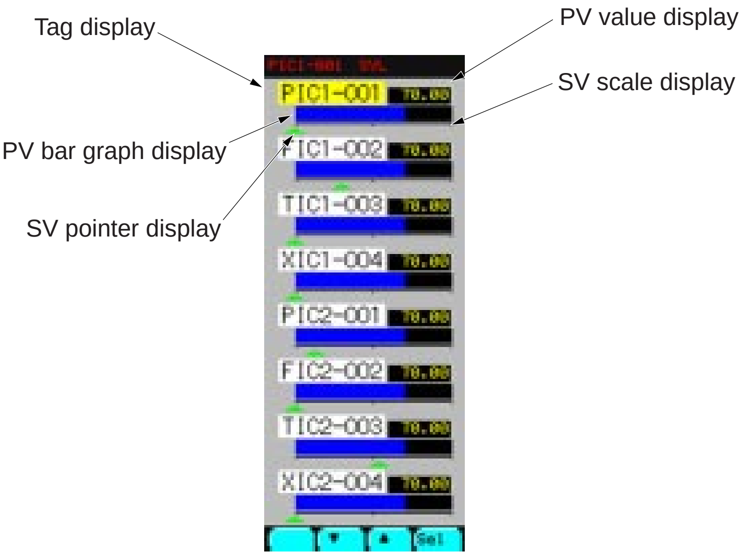
- **Backing to the previous screen**

While the [Back] is displayed as the chameleon key, (When not displayed, press the chameleon change key to display the [Back]), press the [Back] key to back to the previous screen.

4.2.2 Display and operation on monitor screens

■ 8 loop display screen

The screen shows the following data of 8 loops.

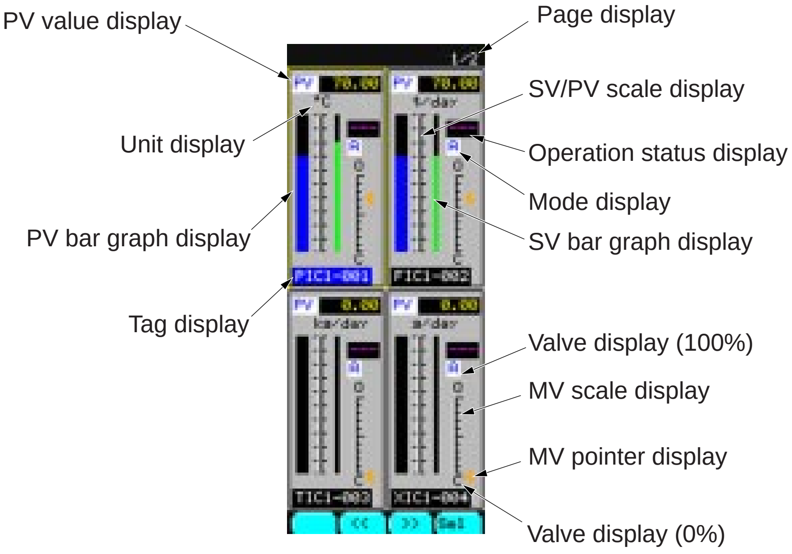


■ Operations on 8 loop display screen

When the chameleon key [▲] or [▼] is pressed to select a loop (the tag display changes to yellow.) and then the [Sel] is pressed, the selected loop screen will be displayed.

■ 4 loop display screen

The screen shows the following data of 4 loops.

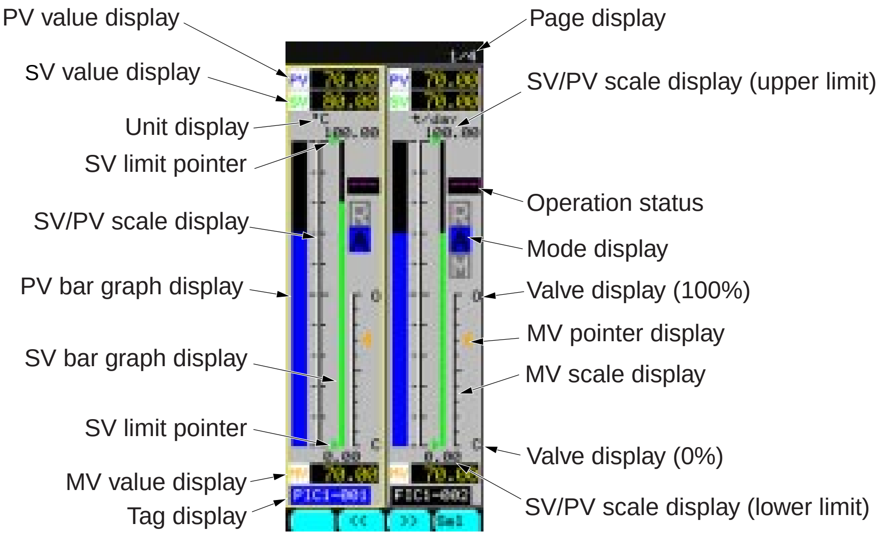


■ Operations on 4 loop display screen

When the chameleon key [<<] or [>>] is pressed to select a loop (the tag display changes to blue.) and then the [Sel] is pressed, the selected loop screen will be displayed.

■ 2 loop display screen

The screen shows the following data of 2 loops.

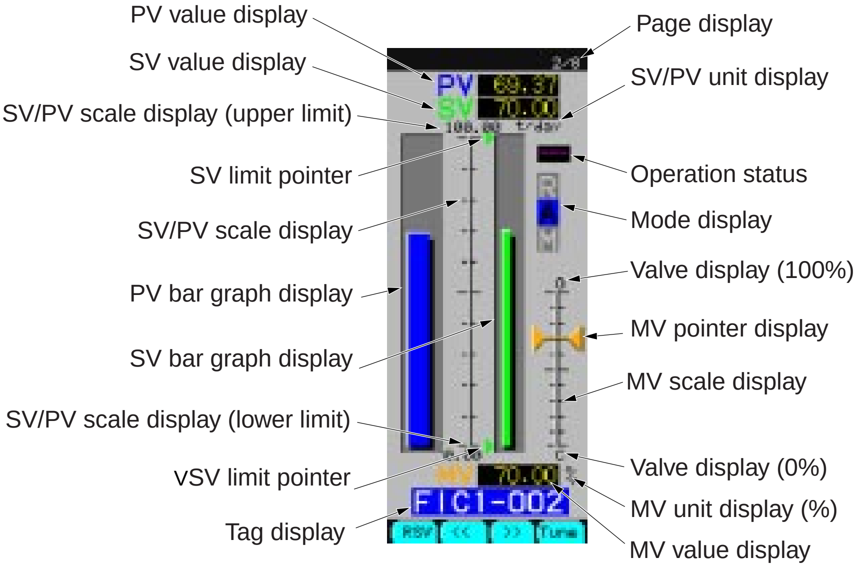


■ Operations on 2 loop display screen

- When the chameleon key [<<] or [>>] is pressed to select a loop (the tag display changes to blue.), and the [Sel] is pressed, the selected loop screen will be displayed.
- Pressing the operation mode select key changes the operation modes in the selected loop.
- When the auto mode [A] is selected as the operation mode in the selected loop, pressing the SV up or SV down key changes the SV (the setting value) of the selected loop.
- When the manual mode [M] is selected as the operation mode in the selected loop, pressing the MV up or MV down key changes the MV (the control output value) of the selected loop (the secondary control loop only).
- When the chameleon change key is pressed to display the [Parm] and then the [Parm] key is pressed, the control parameter display screen for the selected loop is displayed.

■ 1 loop display screen

The screen shows the following data of 1 loop.



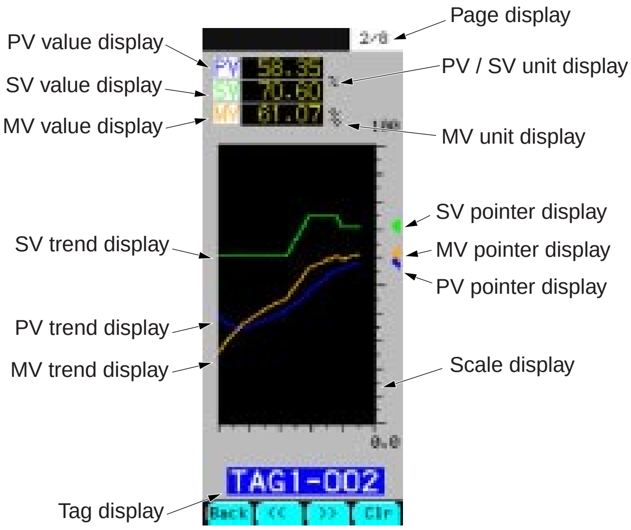
Operations on 1 loop display screen

- Pressing the chameleon key [<<] or [>>] changes the loop to be displayed.
- Pressing the operation mode select key changes the operation modes in the selected loop.
- When the auto mode [A] is selected as the operation mode in the selected loop, pressing the SV up or SV down key changes the SV (the setting value) of the selected loop.
- When the manual mode [M] is selected as the operation mode in the selected loop, pressing the MV up or MV down key changes the MV (the control output value) of the selected loop (the secondary control loop only).
- Pressing the chameleon key [Tune] changes to the tuning display screen of the selected loop.
- When the chameleon change key is pressed to display the [Cnst] and then the [Cnst] key is pressed, the control constant display screen for the selected loop is displayed.
- When the chameleon change key is pressed to display the [Parm] and then the [Parm] key is pressed, the control parameter display screen for the selected loop is displayed.

Tuning display screen

The screen shows the PV/ SV/ MV values and the real-time trend.

The real-time trend appears from the left of the screen to the right. When the real-time trend reaches to the right end of the screen, the time scale doubles automatically, and the real-time trend appears from the center of the screen to the right



Operations on tuning display screen

- When the chameleon key [Clr] is pressed, the displayed real-time trend is cleared and new data is displayed.
- When the chameleon change key is pressed repeatedly, the setting values of the P, I, and D terms for the loop displayed in the lower part of the screen are displayed in order.


P = 200.0


I = 10.0


D = 0.0

4-3 Operations on menu screens

4.3.1 About menu screens

The LCD displays not only the monitor screen during running but also the operation screens to set the control constants and the various parameters for wafer programming, and control and computation.

The menu screen consists of the following three screens. Each screen has further hierarchical menus depending on the menu items.

Table on the next page shows the menu items that can be selected on the menu screens.

This guide does not explain all screens of the controller. For more detailed information of each screen, refer to the Instruction Manual.

4.3.2 Switching menu screens

While the monitor screens are displayed, displaying and switching the menus are performed in the following procedure.

1. Press the MENU key.
   The MENU 1/3 screen appears.
2. Press the MENU key repeatedly to display a desired menu screen.
   Each press of the MENU key advances the screen as MENU 1/3 → MENU 2/3 → MENU 3/3 → MENU 1/3 · · ·.
3. Pressing the chameleon key [▲] or [▼] moves the cursor (blue) to a desired menu item.
4. Press the chameleon key [Sel].
   The setting screen for the menu item selected in Step 3, or the menu screen which lists further menu items appears. If the menu screen appears, repeat Steps 3 and 4 to display the desired setting screen.
5. Confirm and change the setting items.
6. Pressing the chameleon key [Back] backs to the previous screen. Pressing the MENU key backs to the MENU 1/3.

!

On the MENU 2/3 and MENU 3/3, the various menu items for setting computation and control functions are displayed. In order to prevent important setting items from changing by a mistaken operation, a password can be set for each of the MENU 2/3 and MENU 3/3 screens. Once a password is set, the menu items can not be selected unless the password is entered into the field of PASSWORD.

The password can be set in the SYSTEM SET screen.

Screen	Function of each screen	Menu item
MENU 1/ 3	Changes the display screen for 8/4/2/1 loops.	8LOOP 4LOOP 2LOOP 1LOOP
	Changes to the turning display screen.	TUNING
	Changes to the trend display screen.	TREND
	Changes to the alarm/fault display screen.	ALM/FLT
	Changes to the operating status display screen for the input/output and the loops.	STATUS
MENU 2/ 3	Changes to the control parameter setting screen.	PARAMETER
	Changes to the control and computation constant screen.	CONSTANT
	Changes to the linearizer parameter screen.	LINEARIZER
	Changes to the gain scheduler screen.	GAIN SCHEDULER
	Changes to the setting screen for the trend display.	TREND SETTING
	Changes to the alarm setting screen.	ALARM SETTING
	Changes to the setting screen for display order for each loop display screen.	DISP SETTING
	Changes to the contrast setting screen, the clock correcting screen, the IC card operating screen, and the user-definable unit entering screen.	CONTROL PANEL
MENU 3/ 3	Selects the communication remote operations.	
	FIX processing.	
	Runs and stops the wafer computation for each loop.	
	System definition.	SYSTEM SETTING
	Configuration.	CONFIGURATION
	Wafer connection.	WAFER CONNECT
	Output connection.	OUT CONNECT
	Communication settings.	COMMUNICATION

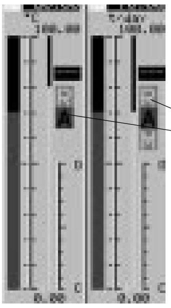
4-4 Operations in operation mode

4.4.1 About operation mode

The operation modes are switched by operating the operation mode select key.
The current operation mode is shown in the field of the mode display in the monitor screen.

The operation mode consists of the following three modes.

[R] or [C]:	Remote mode /Cascade mode Controls by the remote setting input (the RSV input).
[A]:	Auto mode Automatically controls by the SV (the setting value) which is input with the SV up and down keys.
[M]:	Manual mode Manually controls the MV output (the control output) with the MV up and down keys (the secondary control loop only).



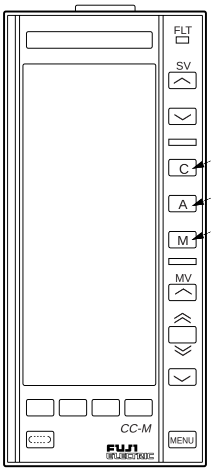
For the primary control loop, the controller operates both in the Auto mode [A] and in the Remote [R] /Cascade [C] mode, but not in the Manual mode [M].

!

The controllers are available in the [R-A-M] (remote) display type and the [C-A-M] (cascade) display type. Although this guide shows both the two types, they are different in just their indications, not in their functions, operations and performances at all. Note that for the [A-M] type, the operations of [R] and [C] keys are not available.

4.4.2 Switching operation modes

Perform the following procedure to switch the operation mode for each control block.



1. Perform the procedure of “Switching monitor screens” explained before to display the monitor screen of the loop whose operation mode is desired to select. This operation is performed on the 2 loop or 1 loop screen.
2. On the 2 loop screen, press the chameleon key [<<] or [>>] to select the control block whose operation mode is desired to select (the tug name changes to blue.).

3. Press the operation mode select key to change the operation mode.

   Press the operation mode select key repeatedly until the operation mode display in the monitor screen is changed.

When the operation mode display in the monitor screen is changed, the controller starts to operate in the displayed operation mode.

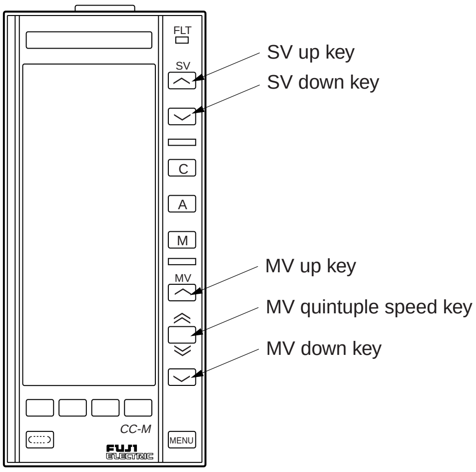
!

The operation mode is locked for each control block so that the press of the operation mode select key may not be accepted, which prevents the operation mode from changing by a mistaken operation.

Locking the operation mode can be set in the SYSTEM SET screen.

4-5 Setting SV (Setting value) / MV (Control output value)

The SV (the setting value) and MV (the control output value) of the primary and secondary control loops are operated manually by pressing the SV up and down keys, and the MV up and down keys in the front section.



4.5.1 Setting the SV

SV up key:	Increases the SV.
SV down key:	Decreases the SV.

- The SV up and down keys can be used for the primary and secondary control loops when the operation mode is Auto [A].
- Pressing each key changes the SV value display and SV scale display in the monitor screen.
- Pressing each key repeatedly increases or decreases the values automatically. (The full-stroke moving time is approx. 40 seconds.)
- The SV can not be set higher than the value set in the SV limit pointer in the monitor screen.

4.5.2 Setting the MV

MV up key:	Increases the MV.
MV down key:	Decreases the MV.
MV quintuple speed key:	Pressing the MV up key or MV down key while pressing this key, quintuples the increasing and decreasing speeds of the MV.

- The MV can be operated for the secondary control loop only.
- The MV can be operated when the operation mode of the secondary loop is Manual [M].
- Pressing each key changes the MV display and MV pointer of the MV scale display in the monitor screen.
- Pressing each key repeatedly increases or decreases the values automatically.

!

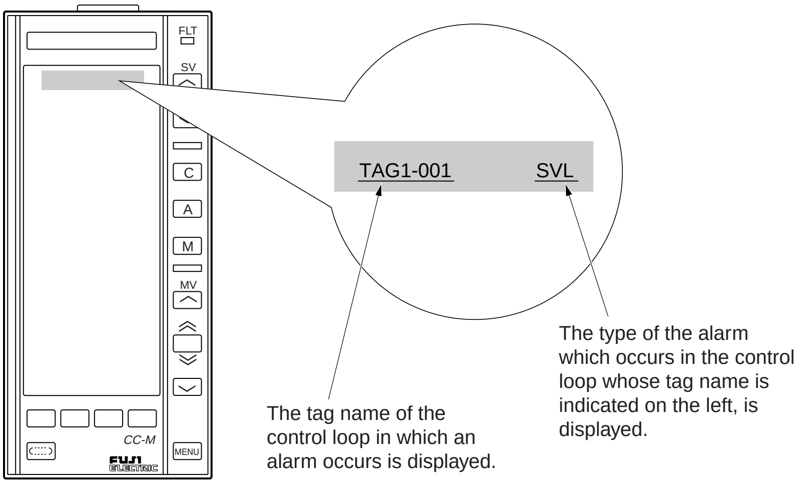
The keys are locked for each control block so that the press of each key may not be accepted, which prevents the SV and MV from changing by a mistaken operation.

Locking the keys can be set in the SYSTEM SET screen.

4-6 Operations at the occurrence of alarm/fault

4.6.1 Display at the occurrence of alarm

When an alarm is detected during running, the alarm type and the name (TAG name) of the control loop in which the alarm occurs, are displayed at the top of the LCD.
Table shows the alarm items that may be detected in the controller.

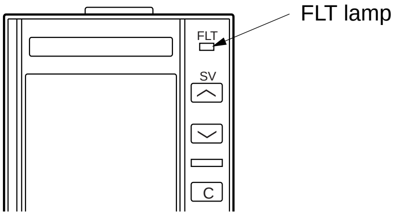


Display	Description
DMV	Control output changing rate alarm
MVL	Control output lower limit alarm (-25.00 to 125.00%)
MVH	Control output upper limit alarm (-25.00 to 125.00%)
DVL	Amount of deviation lower limit alarm (0.00 to 100.00%)
DVH	Amount of deviation lower limit alarm (0.00 to 100.00%)
DPL	Process variable change rate lower limit alarm (0.00 to 100.00%)
DPH	Process variable change rate upper limit alarm (0.00 to 100.00%)
PVL	Process variable lower limit alarm (the setting range varies depending on the industrial values.)
PVH	Process variable upper limit alarm (the setting range varies depending on the industrial values.)
SVL	Setting value lower limit alarm (the setting range varies depending on the industrial values.)
SVH	Setting value upper limit alarm (the setting range varies depending on the industrial values.)

When an alarm occurs, determine the cause of the alarm, and reset the alarm status according to the “Operation under alarm/fault conditions”.
Alarms which occur and are reset in the controller are recorded in the alarm log. The alarm log stores up to 128 cases of alarms in the order in which the alarms occurred.

4.6.2 Display at the occurrence of fault/warning

When a fault/warning is detected during running, the FLT lamp in the front section is lit.
Table shows the fault/warning items that may be detected in the controller.



Display for fault	Description
AI CHECK	Analog input abnormality
DAI CHECK	Thermocouple and resistance bulb direct input abnormality
OPTION AI	Thermocouple and resistance bulb direct input circuit abnormality
MV R-BACK	MV read back error
TLINK FLT	T-link connecting abnormality
Display for warning	**Description**
FLASH WAR	Flash ROM abnormality
OPT COM ER	OPTO22 connecting abnormality
WAF STOP	Wafer stop
CNCT ERROR	Improper connection of wafers

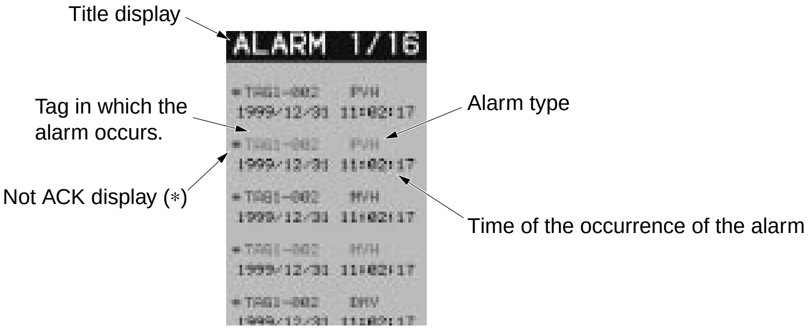
When a fault occurs, determine the cause of the fault, and reset the fault status according to the “Operation under alarm/fault conditions”.
Faults which occur and are reset in the controller are recorded in the fault log. The fault log stores up to 128 cases of faults in the order in which the faults occurred.

4.6.3 Operation under alarm/fault conditions

When an alarm/fault occurs, confirm the alarm/fault types and reset them in the following procedure.

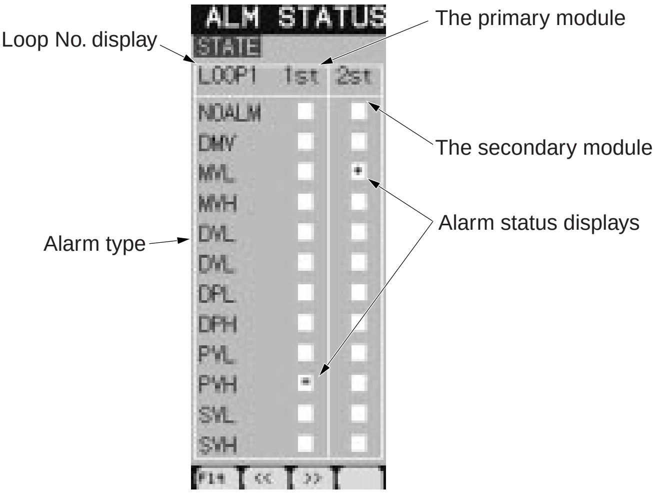
● Confirming the alarm fault types

1. Press the MENU key to display the MENU 1/3 screen.
2. Press the chameleon key [▲] or [▼] repeatedly to move the cursor (blue) to the [ALM/FLT].
3. Press the chameleon key [Sel].
   The list of the alarm log is displayed in the alarm logging display screen.
   The alarm which occurs most recently is displayed on the top of the first page of the logging display screen. “*” is attached to the alarm which is not reset.



```
ALARM 1/16
*TAG1-002   PVH
 1999/12/31 11:02:17
*TAG1-002   PVH
 1999/12/31 11:02:17
*TAG1-002   MVH
 1999/12/31 11:02:17
*TAG1-002   MVH
 1999/12/31 11:02:17
*TAG1-002   DMV
 1999/12/31 11:02:17
```

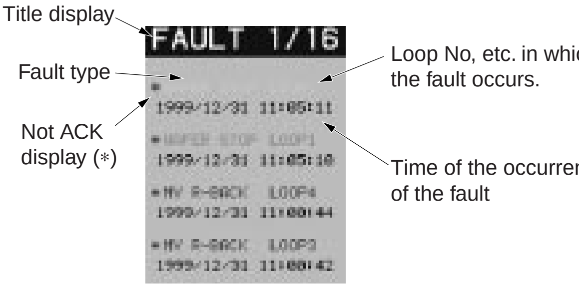
4. Press the chameleon key [AlmS] to display the alarm status display screen.
   “*” is attached to the right of the alarm item which occurs for each loop.



```
ALM STATUS
STATE
LOOP1  1st 2st
NOALM   ☐   ☐
DMV     ☐   ☐
MVL     ☐   *
MVH     ☐   ☐
DVL     ☐   ☐
DVL     ☐   ☐
DPL     ☐   ☐
DPH     ☐   ☐
PVL     ☐   ☐
PVH     *   ☐
SVL     ☐   ☐
SVH     ☐   ☐
Flt  <<  >>
```

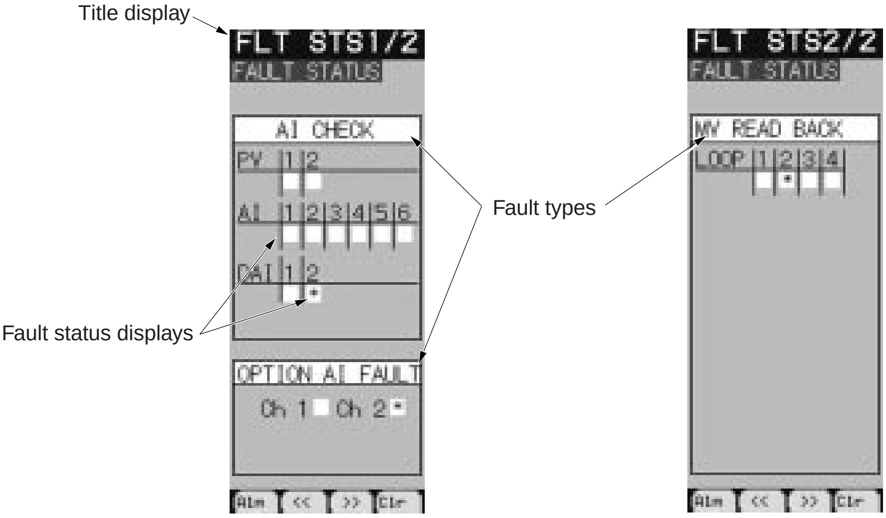
5. When the chameleon key [Flt] is pressed while the alarm status display screen is displayed, a list of the fault logging is displayed in the fault logging display screen.

   The fault which occurs most recently is displayed on the top of the first page of the fault logging display screen. “*” is attached to the fault which is not reset.



```
FAULT 1/16
*
 1999/12/31 11:05:11
*WAFER STOP LOOP1
 1999/12/31 11:05:10
*MV R-BACK  LOOP4
 1999/12/31 11:00:44
*MV R-BACK  LOOP3
 1999/12/31 11:00:42
```

6. Press the chameleon key [FltS] to display the fault status display screen.
   “*” is attached under the input/output terminals in which the fault occurs for each fault item.



```
FLT STS1/2
FAULT STATUS
AI CHECK
PV  |1 |2
     ☐  ☐
AI  |1 |2 |3 |4 |5 |6
     ☐  ☐  ☐  ☐  ☐  ☐
CAI |1 |2
     ☐  *
OPTION AI FAULT
Ch 1 ☐ Ch 2 *
Alm  <<  >>  Clr
```

```
FLT STS2/2
FAULT STATUS
MV READ BACK
LOOP |1 |2 |3 |4
      ☐  *  ☐  ☐
Alm  <<  >>  Clr
```

Fault status 1/2

Fault status 2/2

● Resetting alarm/fault status

When the chameleon key [Ack] is pressed while the alarm logging display screen or the fault logging display screen is displayed, the alarm/fault status is reset, and “*” disappears. (All the “*” in the displayed page disappear.)

4-7 Operations of memory cards

The Compact Flash® memory card can store the logging data (the data displayed in the trend display screen) (option).

Follow the procedure below to use the Compact Flash® memory card.

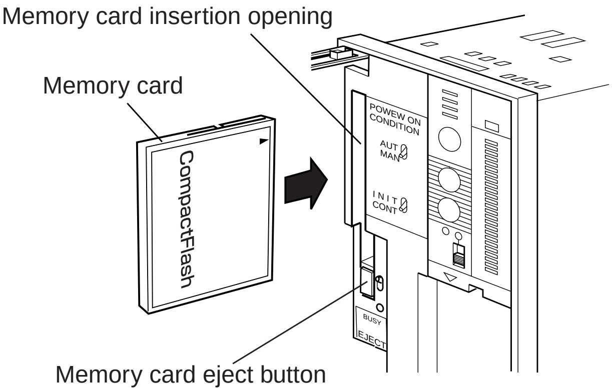
!

Improper handling of the memory card may result in damaging the data stored in the memory card.

4.7.1 Inserting and ejecting the memory card

- **Inserting the memory card**

1. Press the lock button to draw the front section.
2. Confirm that the memory card ON/OFF switch is turned OFF, and insert the memory card into the memory card insertion opening.



3. Turns on the memory card ON/OFF switch.

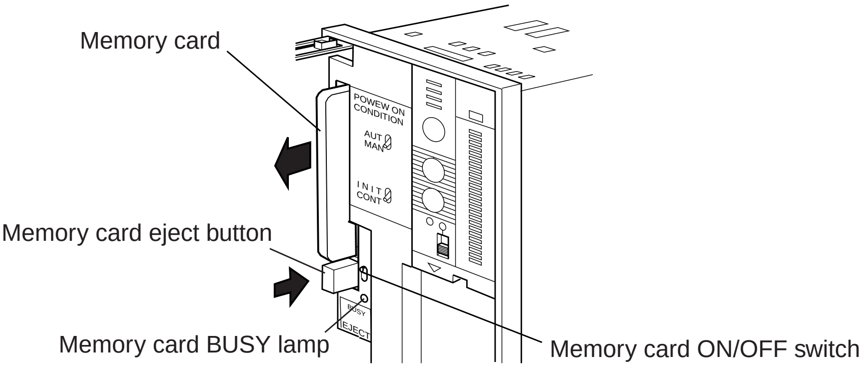
- **Ejecting the memory card**

1. Turns off the memory card ON/OFF switch.
2. Confirm that the memory card BUSY lamp shuts off, and press the memory card eject button. The memory card pops out of the insertion opening.

!

Never eject the memory card while memory card BUSY lamp is lit. Otherwise, stored data may be corrupted.

3. Gently pull out the memory card.



4.7.2 Formatting memory card

Before the logging data is stored in the memory card, it is necessary to format the memory card. Follow the procedure below to format the card.

!

Once the memory card is formatted, the logging data can be stored repeatedly until the capacity of the memory card is full. If the memory card in which the logging data has been stored, is formatted, the data stored in the memory card will be lost.

1. Insert the memory card according to the procedure of the “Inserting the memory card”.
2. Press the MENU key twice to display the MENU2/3 screen.
3. Press the chameleon key [▲] or [▼] to move the cursor (blue) to the [CONTROL PANEL].
4. Press the chameleon key [Sel].
   “CONTROL PANEL menu screen” appears.
5. Press the chameleon key [▲] or [▼] to move the cursor (blue) to the [IC CARD].
6. Press the chameleon key [Sel].
   “IC CARD menu screen” appears.

CARD FORMAT
NONE

7. Confirm that the [READY] (formatting is possible.) in the field of the [CARD FORMAT].
8. Press the chameleon key [Sel].
   The display of [READY] changes to yellow.
9. Press the chameleon key [▲].
   The display of [READY] changes to the yellow [WAIT].
   Formatting is ready.
10. Press the chameleon key [Sel].
    The display of [WAIT] changes to blue.
    Formatting starts.

After a while, the display of [WAIT] changes to the blue [READY], which means that formatting is completed.

!

Never eject the memory card during formatting. Otherwise the card may be damaged.

5 PROGRAMMING FUNCTIONS

This chapter explains the methods of wafer programming: how to write connection specifications, how to program the wafers, and how to input the control parameters and constants.

5-1 Before programming

5.1.1 Flowchart of programming

The following flowchart shows the outline of programming control functions in the controller.
The detailed procedures of programming according to this flowchart are explained in “5.2 Writing connection specifications” and the following chapters.

1 Writing connection specifications	Write a connection specification to suit the desired control functions. When you outsource function programming, write this specification also.
2 Connecting wafers	Connect the input terminals and the wafers according to the connection specification.
3 Connecting output terminals	Connect the wafer output to each of the output terminals according to the connection specification.
4 Setting control parameters	Set the control parameters.
6 Setting constants	Set the control constants.
7 Setting R-ACK	Set the remote acknowledge (cascade mode) to ON or OFF for each loop of the primary and secondary control blocks.
8 Setting monitor screens	Set the display items in the monitor screens.
9 Fixing processing	Write the created program in the Flash memory.

Figure 5-1

The flowchart above shows the steps basic enough to make users to understand the programming procedure.
Before operating the programmed controller as a regulator, it is necessary to set various kinds of settings, such as alarm, etc.
Some operations in the controller can be locked to prevent the settings from changing by a mistaken operation.

For further detailed information on the settings, refer to the Instruction Manual of the controller.

5.1.2 About control and computation wafers

As described in “Chapter 1 General”, the controller combines the function blocks called “wafer” to execute the control functions.
The controller has as many as 100 kinds of computing, control, and processing wafers that can be combined at users’ disposal. (Table 5-1 shows the list of the wafers.)

The following wafers are combined into a control block to execute the control computation functions that are the heart of the controller.

When connecting the wafers, it is advisable that the following control blocks be used for a desired control system.

■ Primary control block

1. Primary PID control block

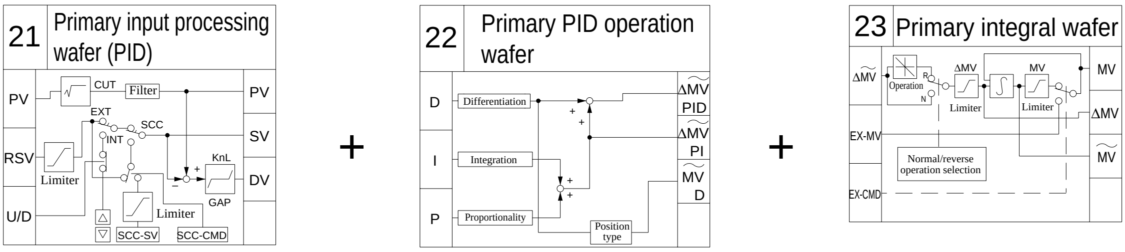


Figure 5-2

Figure 5-2 shows a combination of the wafers which constitute the primary PID control block for the cascade control. The primary input processing wafer (function code 21) has the function to select the SV (the setting value) depending on the control modes.

2. Proportional operation block

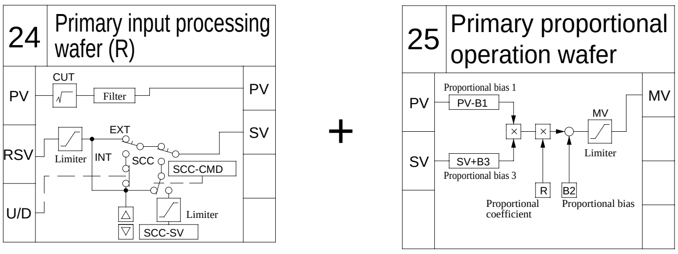


Figure 5-3

Figure 5-3 shows a combination of the wafers which constitute the proportional operation block for the proportional control.
The primary input processing wafer (function code 24) has the function to select the SV (the setting value) depending on the control modes.

3. Program setting block

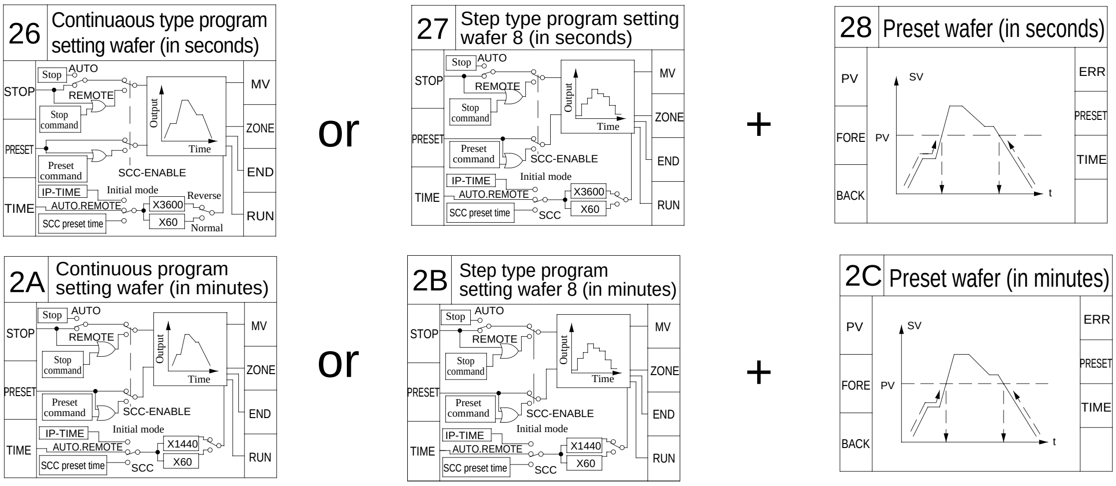


Figure 5-4

Figure 5-4 shows a combination of the wafers which constitute the program setting block for the program control.

■ Secondary control block

Secondary PID position type control block

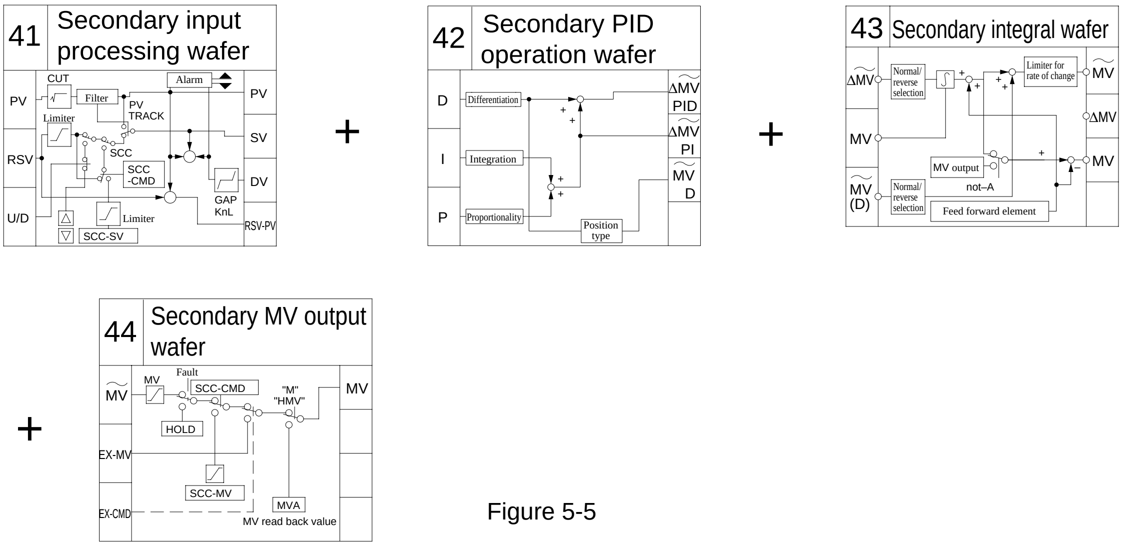


Figure 5-5

Figure 5-5 shows a combination of the wafers which constitute the secondary PID position type control block.

The secondary input processing wafer (function code 41) has the function to select the SV (the setting value) depending on the control modes.

The MV of the secondary MV output wafer (function code 44) is output from the external control output terminals (MI1 through MI4).

Table 5-1

No.	Abbreviation	Wafer name	No.	Abbreviation	Wafer name
06	RFPSUM	PULSE WIDTH INTEGRATION WAFER	73	BIN2_TO_BCD	BIN/BCD CONVERSION 2 WAFER
07	PFTPCM	TEMPERATURE/PRESSURE COMPENSATION WAFER	81	RFDET1	DEAD TIME WAFERS 1
08	RFSLCT	SELECTOR WAFER	82	RFDET2	DEAD TIME WAFERS 2
09	RFABSO	ABSOLUTE VALUE/SIGN INVERSION WAFER	83	RFDET3	DEAD TIME WAFERS 3
0A	RFLNR1	LINEARIZE WAFER 1	84	RFPRDV	LEAD ELEMENT WAFER
0B	RFLNR2	LINEARIZE WAFER 2	85	RFFLAG	LAG ELEMENT WAFER
10	RFGS1	GAIN SCHEDULE WAFER 1	86	RFONF1	ON-OFF WAFER
11	RFGS2	GAIN SCHEDULE WAFER 2	87	RFLIMT	LIMITER WAFER
21	RM1SPV	PRIMARY INPUT PROCESSING WAFER (PID)	88	RFPUGE	PULSE GENERATION WAFER
22	RM1PID	PRIMARY PID OPERATION WAFER	89	RFTIME	TIMER WAFER
23	RM1MVO	PRIMARY INTEGRAL WAFER	8A	RFRAMP	RAMP FUNCTION WAFER (MINUTE)
24	RM1RPV	PRIMARY INPUT PROCESSING WAFER (R)	8B	RFAVRG	ANALOG AVERAGE WAFER
25	RM1 RTO	PRIMARY PROPORTIONAL OPERATION WAFER	8C	RFSUMA	ANALOG INTEGRATION WAFER
26	RM1PGC	CONTINUOUS TYPE PROGRAM SETTING WAFER (IN SECONDS)	8D	RFGAPP	DEAD BAND WAFER
27	RM1PGS	STEP TYPE PROGRAM SETTING WAFER (IN SECONDS)	91	RFLNR1	LINEARIZE WAFER 1
28	RM1PGP	PRESET WAFER (IN SECONDS)	92	RFLNR2	LINEARIZE WAFER 2
2A	RM1PLC	CONTINUOUS TYPE PROGRAM SETTING WAFER (IN MINUTE)	93	RFLNR3	LINEARIZE WAFER 3
2B	RM1PLS	STEP TYPE PROGRAM SETTING WAFER (IN MINUTE)	94	RFLNR4	LINEARIZE WAFER 4
2C	RM1PLP	PRESET WAFER (IN MINUTE)	A5	RFFLIP	FLIP-FLOP WAFER
30	BITCN1	BIT ON/OFF WAFER 1	A6	RFDCOD	DECORDER WAFER
31	BITCN2	BIT ON/OFF WAFER 2	A7	RFLNR3	LINEARIZE WAFER 3
32	BITCN3	BIT ON/OFF WAFER 3	AA	RFRALP	RAMP FUNCTION WAFER (HOUR)
33	BITCN4	BIT ON/OFF WAFER 4	C1	RFADDE	ADDITION/ARITHMETIC OPERATION WAFER
34	BITCN5	BIT ON/OFF WAFER 5	C2	RFSUBE	SUBTRACTION/ARITHMETIC OPERATION WAFER
35	BITCN6	BIT ON/OFF WAFER 6	C3	RFMULE	MULTIPLICATION/ARITHMETIC OPERATION WAFER
36	BITCN7	BIT ON/OFF WAFER 7	C4	RFDIVE	DIVISION/ARITHMETIC OPERATION WAFER
37	BITCN8	BIT ON/OFF WAFER 8	C5	RFPCNT	PULSE NUMBER COUNTER WAFER
38	BITDIV	BIT RESOLUTION WAFER	C6	RFALM1	ALARM WAFER
3C	RM1PR5	PRIMARY PI SETTING WAFER	C7	RFAPUL	PULSE NUMBER OUTPUT WAFER
3D	RM1PR6	PRIMARY D SETTING WAFER	C8	RFLLAG	LEAD/LAG ELEMENT WAFER
41	RM2SPV	SECONDARY INPUT PROCESSING WAFER	C9	RFMAV1	MOVING AVERAGE WAFER 1
42	RM2PID	SECONDARY PID OPERATION WAFER	CA	RFMAV2	MOVING AVERAGE WAFER 2
43	RM2ITG	SECONDARY INTEGRAL WAFER	CC	RFAPWM	POSITION TYPE PULSE WIDTH CONVERSION WAFER
44	RM2MVO	SECONDARY MV OUTPUT WAFER	D0	RFHOLD	SAMPLE HOLD WAFER
48	RM2FFD	SECONDARY FEED FORWARD WAFER	E1	RFDET4	DEAD TIME WAFER 4
5C	RM2PR5	SECONDARY PI SETTING WAFER	E2	RFDET5	DEAD TIME WAFER 5
5D	RM2PR6	SECONDARY D SETTING WAFER	E3	RFDET6	DEAD TIME WAFER 6
61	RFROOT	SQUARE ROOT EXTRACTION WAFER	E4	RFLGC2	LOGICAL OPERATION WAFER 2
62	RFSUMM	ADDITION WAFER	E5	RFLGC3	LOGICAL OPERATION WAFER 3
63	RFSBML	SUBTRACTION/MULTIPLICATION WAFER	E6	RFLGC4	LOGICAL OPERATION WAFER 4
64	RFMULT	MULTIPLICATION/ADDITION WAFER	E7	RFLGC5	LOGICAL OPERATION WAFER 5
65	RFADDV	ADDITION/DIVISION WAFER	E8	RFLGC6	LOGICAL OPERATION WAFER 6
66	RFLOGI	LOGICAL OPERATION WAFER 1	EF	WAFER 1	MEASURING METAL DIAGRAM WAFER 1
67	RFSWCH	CHANGEOVER WAFER	F0	WAFER 2	MEASURING METAL DIAGRAM WAFER 2
68	RFECOD	ENCODER WAFER	F1	WAFER 3	MEASURING METAL DIAGRAM WAFER 3
69	RFSTGE	SAWTOOTH WAVE GENERATION WAFER	F2	WAFER 4	MEASURING METAL DIAGRAM WAFER 4
6A	RFABCD	BCD CONVERSION WAFER	F3	WAFER 5	MEASURING METAL DIAGRAM WAFER 5
70	BCD_TO_ BIN	BCD/BIN CONVERSION WAFER	F4	WAFER 6	MEASURING METAL DIAGRAM WAFER 6
71	BCD_TO_ 2BIN	BCD/BIN CONVERSION WAFER	F5	WAFER 7	MEASURING METAL DIAGRAM WAFER 7
72	BIN_TO_BCD	BIN/BCD CONVERSION WAFER	F6	WAFER 8	MEASURING METAL DIAGRAM WAFER 8

5-2 Writing connection specifications

5.2.1 Format of connection specifications

Before programming the control functions, it is necessary to write a connection specification in which the connections of wafers for a desired control are indicated. Figure 5-6 shows an example of the connection specification.

The format of the connection specification is included at the end of the Instruction Manual. Copy the format if necessary.

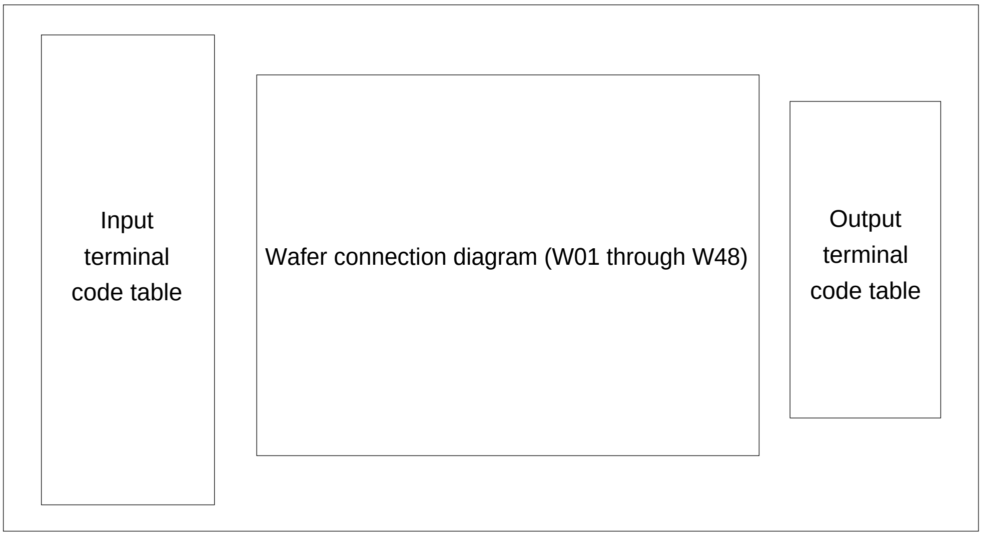


Figure 5-6

The wafer connection diagram shows each wafer as follows:

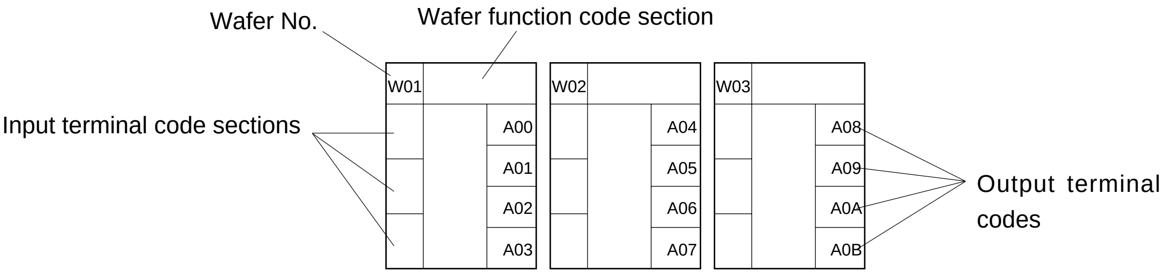


Figure 5-7

Wafer No.:	The number which is assigned to each of the wafer areas. Each loop has 48 wafer areas (No.01 though No.48). This number can not be changed.
Wafer function code section:	Indicate the wafer function code (the hexadecimal two-digit number) in this section. Put the two-digit loop attribute code before the wafer function code.

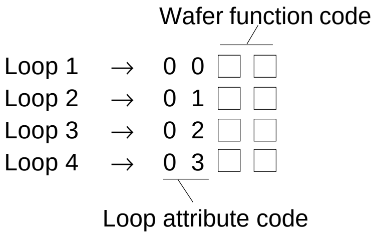


Figure 5-8

Input terminal code section: Indicate the input terminal code of the wafer (a hexadecimal 4-digit number) in this section. The input terminal code is assigned to each of the input terminals at the back of the controller.

When connecting one wafer to another, indicate the output terminals of the former wafer in the input terminal code section of the latter wafer. Also indicate the loop attribute code before the wafer output terminal code. (See Figure 5-9.)

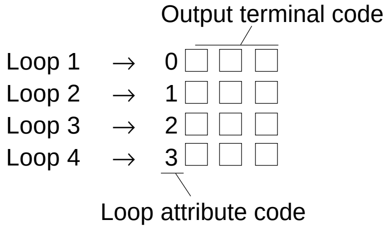


Figure 5-9

Output terminal code: The code (a hexadecimal 3-digit number) that is pre-assigned to each of the output terminals of the wafer areas.

This code is fixed for each of Wafer No., and can not be changed.

Table 5-2 shows the input terminal codes of the connection specifications.

Table 5-2

Terminal name	Code	Input terminal code
Pulse count input 1	FI1	0010
2	FI2	0011
3	FI3	0012
4	FI4	0013
Pulse width input 1	PI1	0014
2	PI2	0015
3	PI3	0016
4	PI4	0017
Process variable input 1	PV1	0030
2	PV2	0031
Analog input 1	AI1	0032
2	AI2	0033
3	AI3	0034
4	AI4	0035
5	AI5	0036
6	AI6	0037
Direct input 1	PVD1	0038
2	PVD2	0039
Digital input 10	DI10	0095
9	DI9	0096
8	DI8	0097
7	DI7	0098
6	DI6	0099
5	DI5	009a
4	DI4	009b
3	DI3	009c
2	DI2	009d
1	DI1	009e
SCC input 1	SCC1	0100
|	|	|
SCC input 16	SCC16	010f
T-link master input data 0	WNO00	0200
|	|	|
T-link master input data 9	WNO99	0263
T-link slave input 1	WNO01	0280
|	|	|
T-link slave input 16	WNO16	028f
Fault information 1-1	FLT1-1	0300
|	|	|
Fault information 16-16	FLT16-16	03ff
Warning 1-1	WAR1-1	0400
|	|	|
Warning 16-16	WAR16-16	04ff
Constant 1	CON1	x880
|	|	|
Constant 48	CON48	x8af

Terminal name	Code	Input terminal code
Primary control mode		
EXM	EXM1	x912
SCC	SCC1	x914
R	R1	x915
L	L1	x916
NORM	NORM1	x918
RREQ (PRE)	RREQ1	x91a
AREQ (PUN)	AREQ1	x91b
NOT-A	NOTA1	x91c
SCC-EN	CEN1	x91d
LS	LS1	x91e
Secondary control mode		
HM	HM2	x930
M	M2	x931
EXM	EXM2	x932
SMAN	SMAN2	x933
SCC	SCC2	x934
R	R2	x935
L	L2	x936
PVTRK	PVTR2	x937
NORM	NORM2	x938
R-REQ	RREQ2	x93a
A-REQ	A-REQ2	x93b
NOT-A	NOTA2	x93c
SCC-EN	CEN2	x93d
LS	LS2	x93e
Primary alarm		
SV-H	SH1	x940
SV-L	SL1	x941
PV-H	PH1	x942
PV-L	PL1	x943
ΔPV-H	ΔPH1	x944
ΔPV-L	ΔPL1	x945
DV-H	DH1	x946
DV-L	DL1	x947
MV-H	MH1	x948
MV-L	ML1	x949
ΔMV-H	ΔMH1	x94c
Secondary alarm		
SV-H	SH2	x950
SV-L	SL2	x951
PV-H	PH2	x952
PV-L	PL2	x953
ΔPV-H	ΔPH2	x954
ΔPV-L	ΔPL2	x955
DV-H	DH2	x956
DV-L	DL2	x957
MV-H	MH2	x958
MV-L	ML2	x959
ΔMV-H	ΔMH2	x95c
Wafer output terminal		xa00
		|
		xabf

5.2.2 Examples of connection specifications

This section explains how to write the connection specification, showing examples for a cascade-controlled regulating module and a proportional controlled regulating module.

■ Example of cascade control

Example 1 shows the block diagram for the cascade-controlled regulating module.

This system controls temperatures in a combustion furnace by controlling the rate of fuel flow, the primary control block (primary PID control) serving as a temperature regulating module, the secondary control block (secondary PID position type control) serving as a flow-rate regulating module.

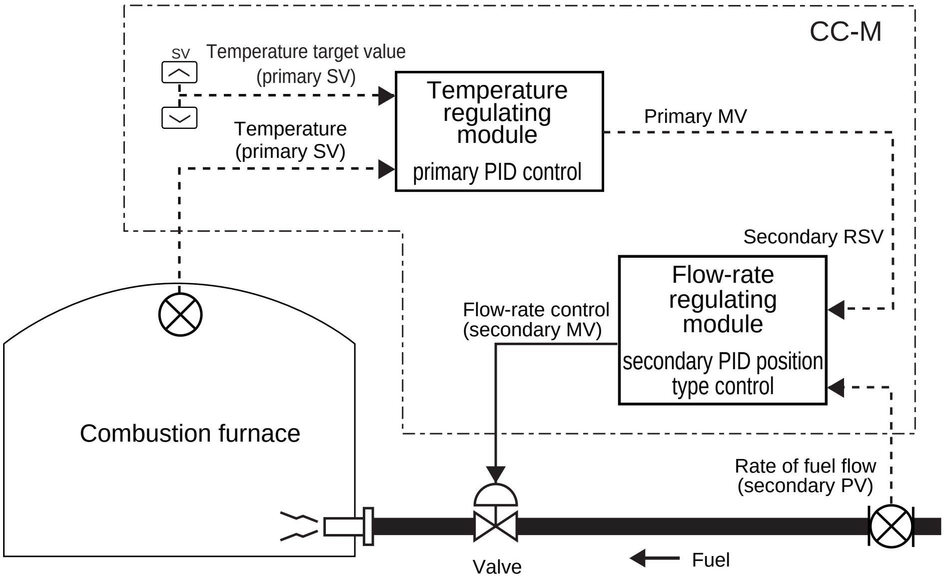


Figure 5-10 Example 1 (example of cascade control)

Figure 5-11 shows the wafer connection diagram of the temperature regulating module that consists of the wafers of the primary control block.

The PV (the temperature in a combustion furnace) is input to analog input terminal 1 (AI1), and the SV (the temperature target value) is entered with the SV up and down keys in the front section.

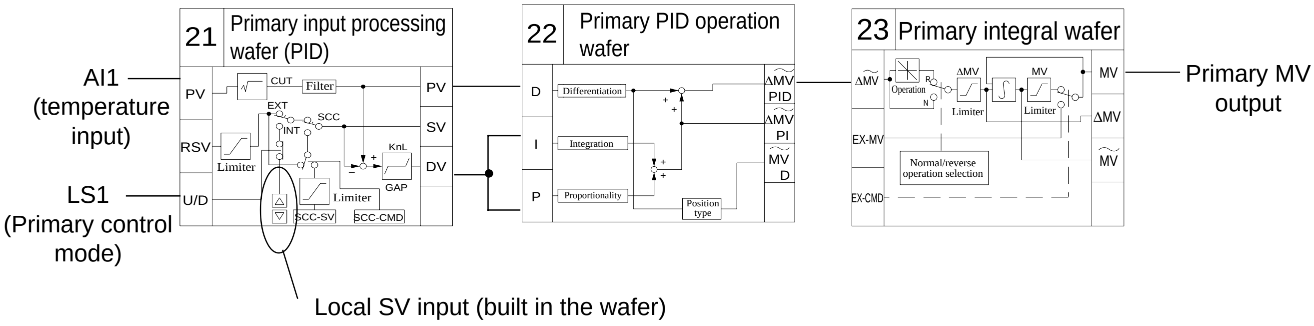


Figure 5-11

Figure 5-12 shows the wafer connection diagram of the flow-rate regulating module that consists of the wafers of the secondary control block.

The PV (the rate of fuel flow) is input to analog input terminal 2 (AI2), and the MV output from the temperature regulating module is input to the RSV. The valve controlling the rate of fuel flow is controlled by the output from control output terminal 1 (MI1) of the controller.

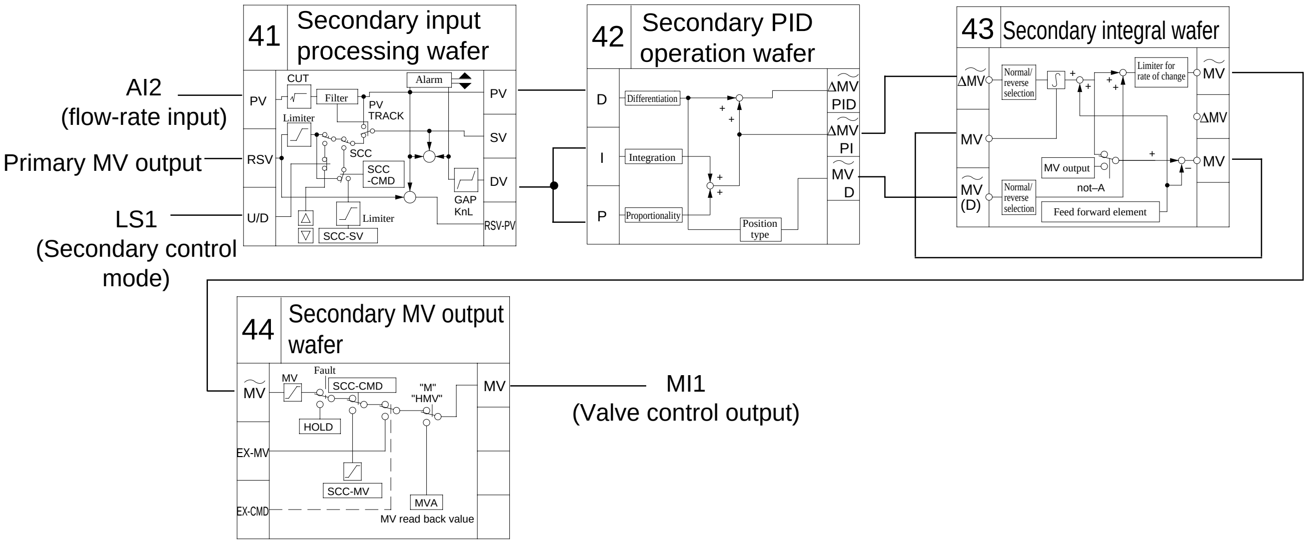


Figure 5-12

Follow the procedure below to rewrite the wafer connection diagram of the temperature regulating module in Figure 5-11 in the format of the connection specification.

1. Write each of the wafer function code of the primary PID control block in the code section of Wafers No.01, No.02, and No.03.

2. Write the input terminal code (0032) of analog input terminal 1 in the input 1 section of Wafer No.01 (the primary input processing wafer).

   Write the input terminal code (091e) that corresponds to the LS signal (LS1) of the primary control mode in the input 3 section of Wafer No.01.

The LS signal input into Input 3 selects whether the SV (the setting value) is input from the local SV (the SV key in the front section) or from the remote SV input (input 2).
The LS signal of the primary control mode is normally input into Input 3.

---

3. Write the output terminal codes of Wafer No.1 and No.2 in the input terminal code sections of Wafers No.2 and No.3 respectively to connect Wafer No.1 through No.3.

Figure 5-13 shows the completed connection specification.

W01	0021		W02	0022		W03	0023	
0032		a00	0a00		a04	0a04		a08
–		a01	0a02		a05	–		a09
		a02			a06			a0a
091e		a03	0a02		a07	–		a0b

Figure 5-13

Follow the procedure below to rewrite the wafer connection diagram of the rate-flow regulating module in Figure 5-12 in the format of the connection specification.

1. Write each of the wafer function code of the secondary PID position type control block in the code section of Wafers No.04, No.05, No.06, and No.7.
2. Write the input terminal code (0033) of analog input terminal 2 in the input 1 section of Wafer No.04 (the secondary input processing wafer).

   Write the output terminal code (0a08) of the MV output of the primary PID control block in the input 2 section of Wafer No.04.

   Write the input terminal code (093e) that corresponds to the LS signal (LS2) of the secondary control mode in the input 3 section of Wafer No.04.

The LS signal input into Input 3 selects whether the remote RSV (the setting value) is input from the local SV (the SV key in the front section) or from the remote SV input (input 2).
The LS signal of the secondary control mode is normally input into Input 3.

---

3. Write the output terminal codes of Wafer No.4 through No.6 in the input terminal code sections of Wafers No.5 through No.7 respectively to connect Wafer No.4 through No.7.

Figure 5-14 shows the completed connection specification.

W04	0041
0033	a0c
0a08	a0d
	a0e
093e	a0f

W05	0042
0a0c	a10
0a0e	a11
	a12
0a0e	a13

W06	0043
0a11	a14
0a16	a15
	a16
0a12	a17

W07	0044
0a14	a18
–	a19
	a1A
–	a1B

Figure 5-14

■ Example of proportional control

Example 2 shows the block diagram for the proportional controlled regulating module.
This system controls temperatures in a gas furnace by keeping a constant air-fuel ratio, the primary control block serving as a proportional operation module (proportional control), the secondary control block serving as a flow-rate regulating module (PID position type control).

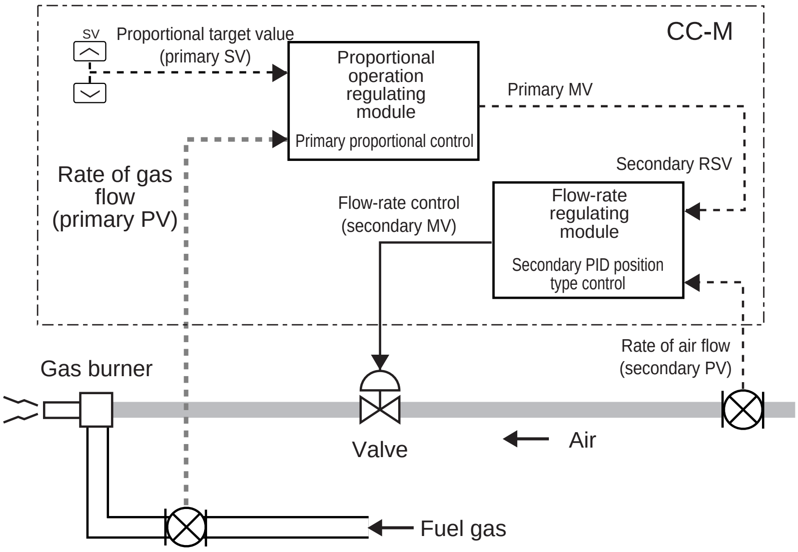


Figure 5-15 Example 2 (example of proportional control)

Figure 5-16 shows the wafer connection diagram of the proportional operation module that consists of the wafers of the primary control block.

The PV (the rate of gas flow) is input to analog input terminal 1 (AI1), and the SV (the proportional setting value) is entered with the SV up and down keys in the front section.

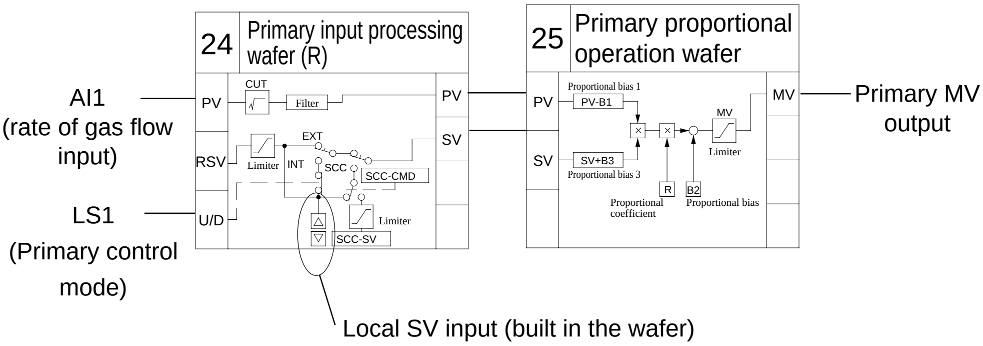


Figure 5-16

Figure 5-17 shows the wafer connection diagram of the flow-rate regulating module that consists of the wafers of the secondary control block.

The PV (the rate of air flow) is input to analog input terminal 2 (AI2), and the MV output from the proportional operating module is input to the RSV. The valve controlling the rate of air flow is controlled by the output from the control output terminal 1 (MI1) of the controller.

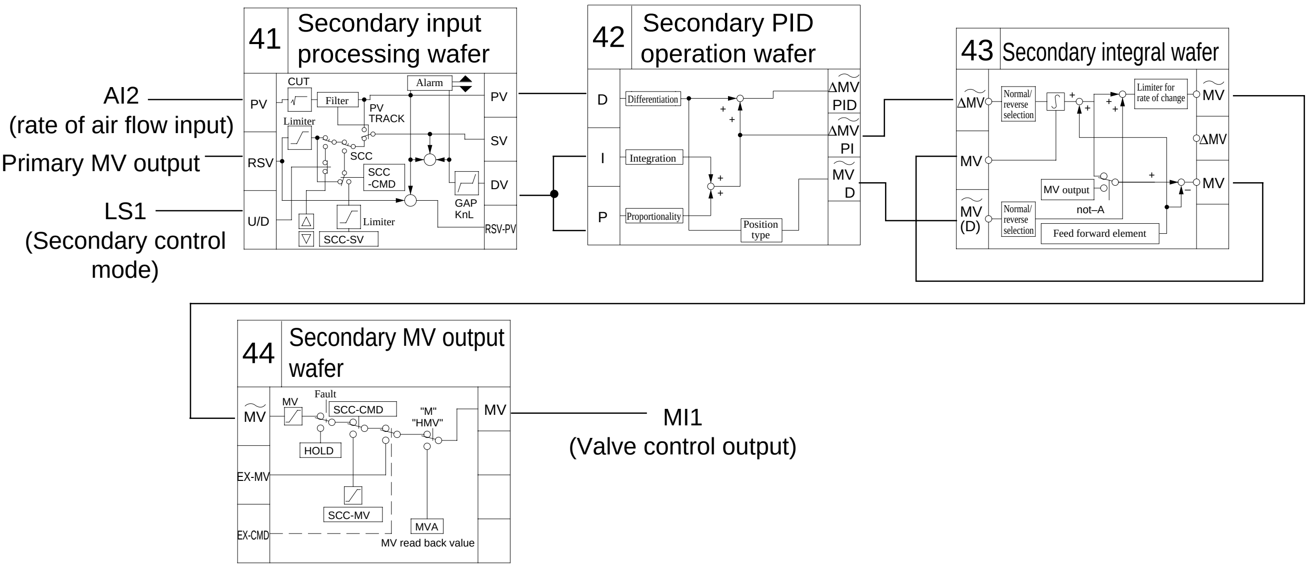


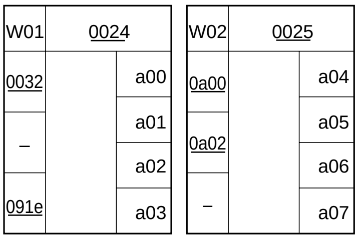
Figure 5-17

Follow the procedure below to rewrite the wafer connection diagram of the proportional operating module in Figure 5-16 in the format of the connection specification.

1. Write each of the wafer function code of the proportional operation block in the code section of Wafers No.01 and No.02.
2. Write the input terminal code (0032) of analog input terminal 1 in the input 1 section of Wafer No.01 (the primary input processing wafer).

   Write the input terminal code (091e) that corresponds to the LS signal (LS1) of the primary control mode in the input 3 section of Wafer No.01.
3. Write the output terminal codes of Wafer No.1 in the input terminal code sections of Wafer No.2 to connect Wafer No.1 and No.2.

Figure 5-18 shows the completed connection specification.



W01	0024	
0032		a00
		a01
–		a02
091e		a03

W02	0025	
0a00		a04
		a05
0a02		a06
–		a07

Figure 5-18

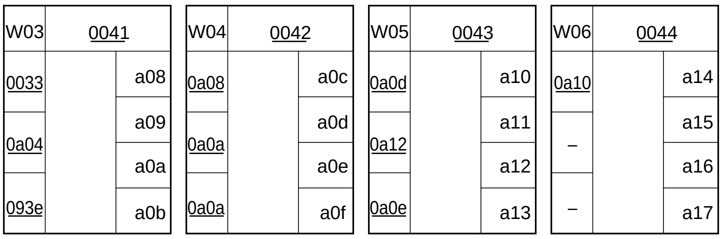
Follow the procedure below to rewrite the wafer connection diagram of the rate-flow regulating module in Figure 5-17 in the format of the connection specification.

1. Write each of the wafer function code of the secondary PID position type control block in the code section of Wafer No.03, No.04, No.05, and No.6.
2. Write the input terminal code (0033) of analog input terminal 2 in the input 1 section of Wafer No.03 (the secondary input processing wafer).

   Write the output terminal code (0a04) of the MV output of the primary PID control block in the input 2 section of Wafer No.03.

   Write the input terminal code (093e) that corresponds to the LS signal (LS2) of the secondary control mode in the input 3 section of Wafer No.03.
3. Write the output terminal codes of Wafer No.3 through No.5 in the input terminal code sections of Wafers No.4 through No.6 respectively to connect Wafer No.3 through No.6.

Figure 5-19 shows the completed connection specification.



W03	0041	
0033		a08
		a09
0a04		a0a
093e		a0b

W04	0042	
0a08		a0c
		a0d
0a0a		a0e
0a0a		a0f

W05	0043	
0a0d		a10
		a11
0a12		a12
0a0e		a13

W06	0044	
0a10		a14
		a15
–		a16
–		a17

Figure 5-19

5-3 Connecting wafers

5.3.1 Display on the WAFER (wafer connection) screen

The connections of the wafers are performed on the WAFER screen selected from the MENU 3/3 screen.

1. Press the MENU key three times to display the MENU 3/3 screen.
2. Press the chameleon key [▼] repeatedly to move the cursor (blue) to the [WAFER CONNECT].
3. Press the chameleon key [Sel].
   The WAFER screen appears.

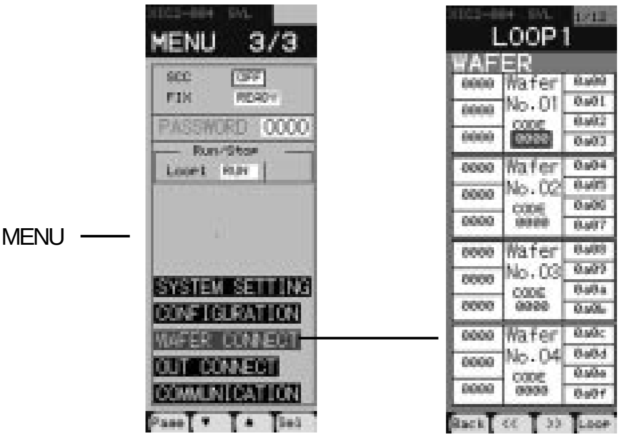


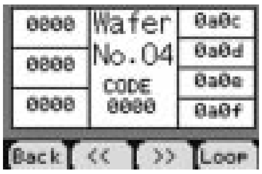
Figure 5-20

Operations on WAFER screen

■ Switching screens

Each WAFER screen has four wafer displays.

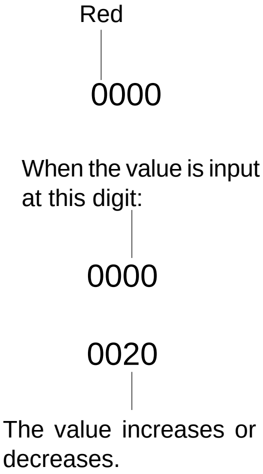
- Pressing the chameleon key [>>] displays the next four wafers, and pressing the chameleon key [<<] displays the previous four wafers.
- Pressing the chameleon key [Loop] advances the loop No. of the WAFER screen as 1→ 2 → 3 → 4 → 1 → · · ·.



■ Setting wafers (how to enter codes)

1. Press the chameleon change key to display the chameleon keys shown in the right figure.
2. Press the chameleon key [▼] to move the cursor (blue) to a desired field. The cursor moves as the [CODE] → the Input 1 section → the Input 2 section → the Input 3 section → the [CODE] of the next wafer.
3. Press the [Ent] key.
   The blue cursor changes to yellow, and the first digit of the code number displayed in red. A desired number is entered into the red digit.
4. Press the chameleon key [>] repeatedly until a desired digit changes to red.
5. Pressing the chameleon key [▲] increases the value of the red digit in 1 increments.
   Pressing the chameleon key [▼] decreases the value of the red digit in 1 decrements.
   Pressing and holding the chameleon key [▲] or [▼] increases or decreases the value automatically.
6. Repeat Steps 4 and 5 to enter values.
   (Enter each code of a hexadecimal 4-digit number in the WAFER screen.)
7. Press the [Ent] key.

- The yellow cursor returns to blue, and the entered codes are set.



The output terminal codes displayed on the right of Wafer Nos. are fixed for each Wafer No., and can not be entered or changed on the WAFER screen.

5.3.2 Procedure of the wafer connections

■ Example 1

Follow the procedure below to perform the wafer connections on the WAFER screen according to the connection specification of example 1 created in “5.2 Writing connection specifications”.

1. Press the chameleon key [▲] or [▼] to move the cursor (blue) to [0000] under the [CODE] of Wafer No.01. (See Figure 5-21.)
2. Press the chameleon key [Ent].
   The blue cursor changes to yellow.

Figure 5-21

3. Enter the wafer function code (0021) in the field of [CODE] of Wafer No.1, and press the [Ent] key.
   The entered code is set, and the yellow cursor returns to blue. (See Figure 5-22.)
   For the method of entering the codes, refer to “Operations on WAFER screen” on the previous page.

Figure 5-22

4. Press the chameleon key [▼] to move the cursor to the input 1 section of Wafer No.01, and press the chameleon key [Ent].
5. Enter the input terminal code (0032) of the AI1 (analog input 1) into the input 1 section of Wafer No.01, and press the chameleon key [Ent]. (See Figure 5-23.)

Figure 5-23

6. Press the chameleon key [▼] to move the cursor to the input 3 section of Wafer No.01, and press the chameleon key [Ent].
7. Enter the input terminal code (091e) of the primary control mode (LS1) into the input 3 section of Wafer No.01, and press the chameleon key [Ent]. (See Figure 5-24.)

Figure 5-24

The setting of Wafer No.01 is completed.

8. Repeat Steps 1 through 7 to enter the wafer function codes and the input terminal codes into Wafers No.02 and No.03.
   Enter all the items (the underlined section in the left figure of Figure 5-25) according to the connection specification.
   The right figure of Figure 5-25 shows the WAFER screen where the connections of the primary control loop of example 1 are completed.

Unused input terminal sections should remain “0000”.

The connections of the primary control loop are completed.

W01	0021	
0032		a00
–		a01
		a02
091e		a03

W02	0022	
0a00		a04
0a02		a05
		a06
0a02		a07

W03	0023	
0a04		a08
–		a09
		a0a
–		a0b

→

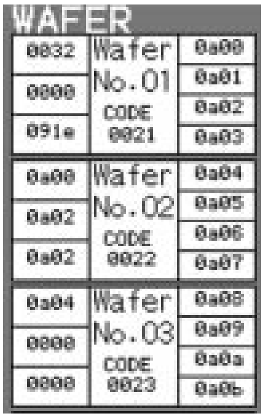
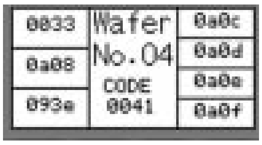


Figure 5-25

Perform the connections of the secondary control loop in the Wafer No.04 or later, using the same procedure.

- In order to change the WAFER screen pages, press the chameleon change key to display the chameleon keys [<<] and [>>], and press either key. Or, pressing the chameleon key [▼] while the cursor (blue) is placed at the input 3 section of the wafer located at the lowermost of the screen, displays the next WAFER screen automatically.

Figure 5-26 shows the WAFER screen where the connection of the secondary control loop are completed.



0033	Wafer	0a0c
0a08	No.04	0a0d
093e	CODE	0a0e
	0041	0a0f

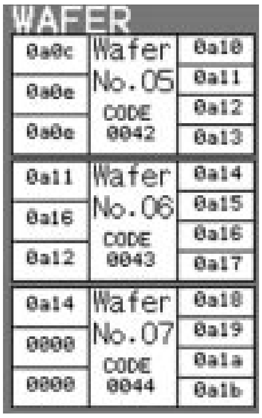
W04	0041	
0033		a0c
0a08		a0d
		a0e
093e		a0f

W05	0042	
0a0c		a10
0a0e		a11
		a12
0a0e		a13

W06	0043	
0a11		a14
0a16		a15
		a16
0a12		a17

W07	0044	
0a14		a18
–		a19
		a1A
–		a1B

→



WAFER

0a0c	Wafer	0a10
0a0e	No.05	0a11
0a0e	CODE	0a12
	0042	0a13
0a11	Wafer	0a14
0a16	No.06	0a15
0a12	CODE	0a16
	0043	0a17
0a14	Wafer	0a18
0000	No.07	0a19
0000	CODE	0a1a
	0044	0a1b

Figure 5-26

■ Example 2

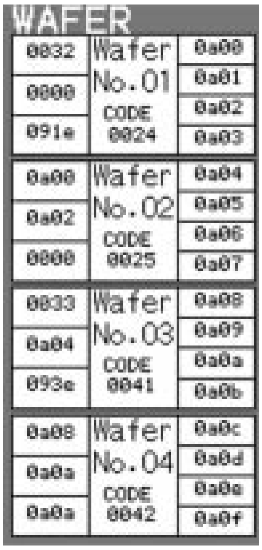
Figure 5-27 shows the WAFER screens where the wafer connections are completed according to the connection specification of example 2 created in “5.2 Writing connection specifications”.

Although the same PID position type control block is used in the secondary control loop for both examples 1 and 2, the input terminal codes set in them are different, since the wafer function codes are set in different Wafer Nos.

W01	0024	
0032		a00
–		a01
		a02
091e		a03

W02	0025	
0a00		a04
0a02		a05
		a06
–		a07

→



WAFER

0032	Wafer	0a00
0000	No.01	0a01
091e	CODE	0a02
	0024	0a03
0a00	Wafer	0a04
0a02	No.02	0a05
0000	CODE	0a06
	0025	0a07
0033	Wafer	0a08
0a04	No.03	0a09
093e	CODE	0a0a
	0041	0a0b
0a08	Wafer	0a0c
0a0a	No.04	0a0d
0a0a	CODE	0a0e
	0042	0a0f

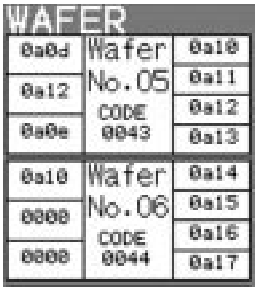
W03	0041	
0033		a08
0a04		a09
		a0a
093e		a0b

W04	0042	
0a08		a0c
0a0a		a0d
		a0e
0a0a		a0f

W05	0043	
0a0d		a10
0a12		a11
		a12
0a0e		a13

W06	0044	
0a10		a14
–		a15
		a16
–		a17

→



WAFER

0a0d	Wafer	0a10
0a12	No.05	0a11
0a0e	CODE	0a12
	0043	0a13
0a10	Wafer	0a14
0000	No.06	0a15
0000	CODE	0a16
	0044	0a17

Figure 5-27

5-4 Connecting output terminals

The MV of loops (the MV of the secondary control loop) is output from each of the external control output terminals (MI1+, MI1- through MI4+, MI4-) (Current output).

When the MV or other signals are output from the analog output terminal (AO1 through AO5) as analog voltages, it is necessary to connect the output terminals, using the following procedure. When the MV of the programmed wafers in the previous section is output from the control output terminals, it is not necessary to follow the procedure below.

5.4.1 Display on the AO CONNECT (analog output connection) screen

The connection of the output terminals can be performed on the AO CONNECT (analog output connection) screen selected from the MENU 3/3 screen.

1. Press the MENU key three times to display the MENU 3/3 screen.
2. Press the chameleon key [▼] repeatedly to move the cursor (blue) to the [OUT CONNECT].
3. Press the chameleon key [Sel]. The OUT CONNECT screen appears.
4. Press the chameleon key [▲] or [▼] to move the cursor to the [AO CONNECT].
5. Press the chameleon key [Sel]. The AO CONNECT screen appears.

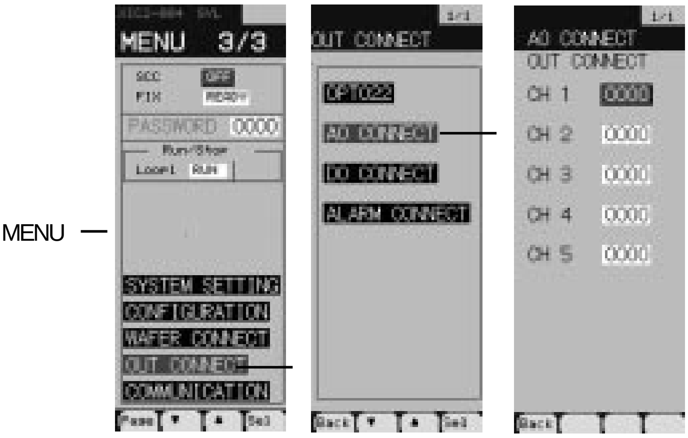
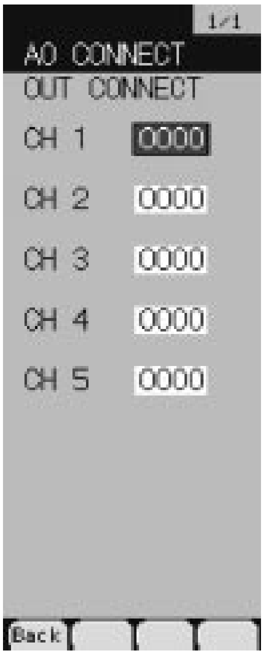


Figure 5-28

5.4.2 Procedure of the connection of the output terminals

1. Press the chameleon change key to display the chameleon key [▲] and [▼].
2. Press the chameleon key [▲] or [▼] to move the cursor (blue) to a desired analog output terminal. The CH No. corresponds to the external output terminal (AO) No.
3. Press the chameleon key [Ent]. The blue cursor changes to yellow.
4. Enter the output terminal code (0a18 for example 1) of the MV output of the secondary MV output wafer.
5. Press the [Ent] key. The entered code is set, and the yellow cursor returns to blue. For the method of entering the codes, refer to “Operations on WAFER screen”.

The MV output of example 1 is output from the analog output terminals.



AO CONNECT
OUT CONNECT
CH 1 0000
CH 2 0000
CH 3 0000
CH 4 0000
CH 5 0000

Figure 5-29

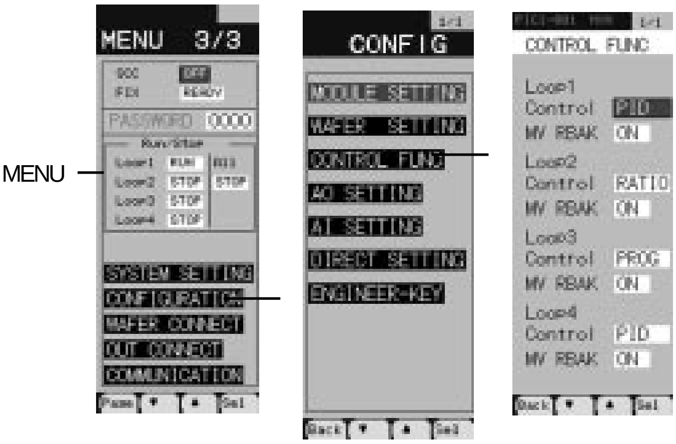
5-5 Setting control parameters

This section explains how to set the control parameters for the programmed (connected) control and computation wafers.
The parameters to be set vary depending on the control functions of the programmed control and computation wafers (the PID control, the proportional control, and the program control).
It is necessary to set the control functions of the loops of the connected wafers before setting the parameters.

5.5.1 Display on the control function setting screen

The control functions are set on the CONTROL FUNC (control function setting) screen selected from the MENU 3/3 screen.

1. Press the MENU key three times to display the MENU 3/3 screen.
2. Press the chameleon key [▼] repeatedly to move the cursor (blue) to the [CONFIGURATION].
3. Press the chameleon key [Sel].
   The CONFIGURATION screen appears.
4. Press the chameleon key [▲] or [▼] to move the cursor to the [CONTROL FUNC].
5. Press the chameleon key [Sel].
   The CONTROL FUNC screen appears.



Loop1
Control PID
MV RBAK ON
Loop2
Control RATIO
MV RBAK ON
Loop3
Control PROG
MV RBAK ON
Loop4
Control PID
MV RBAK ON

Figure 5-30

5.5.2 Procedure of setting control functions

1. Press the chameleon key [▲] or [▼] to move the cursor (blue) to the [Control] of a desired loop.
2. Press the chameleon key [Sel].
   The blue cursor changes to yellow.
3. Press the chameleon key [▲] or [▼] to display a desired control function.
   PID: PID control
   RATIO: Proportional control
   PROG: Program control
   For example 1, select [PID], and for example 2, select [RATIO].
4. Press the chameleon key [Sel].
   The selected control function is set, and the yellow cursor returns to blue.

Once the control function is set, the parameter items to be displayed in the next parameter setting screen will change with the set control function.

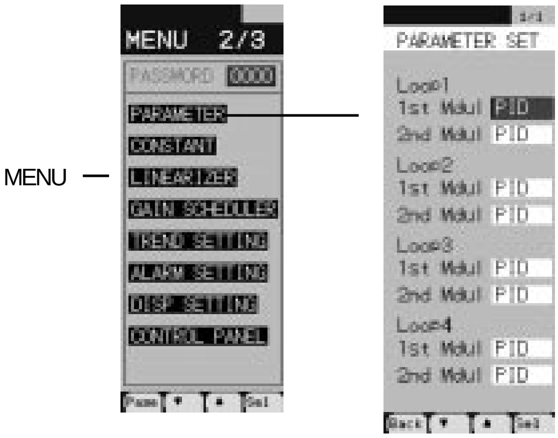
Loop1
Control PID
MV RBAK ON
Loop2
Control RATIO
MV RBAK ON
Loop3
Control PROG
MV RBAK ON
Loop4
Control PID
MV RBAK ON

Figure 5-31

5.5.3 Display on the parameter setting screen

The parameters are set on the PARAMETER SET (parameter setting) screen selected from the MENU 2/3 screen.

1. Press the MENU key twice to display the MENU 2/3 screen.
2. Press the chameleon key [▼] once to move the cursor (blue) to the [PARAMETER].
3. Press the chameleon key [Sel].
   The PARAMETER SET screen appears.



PASSWORD 0000

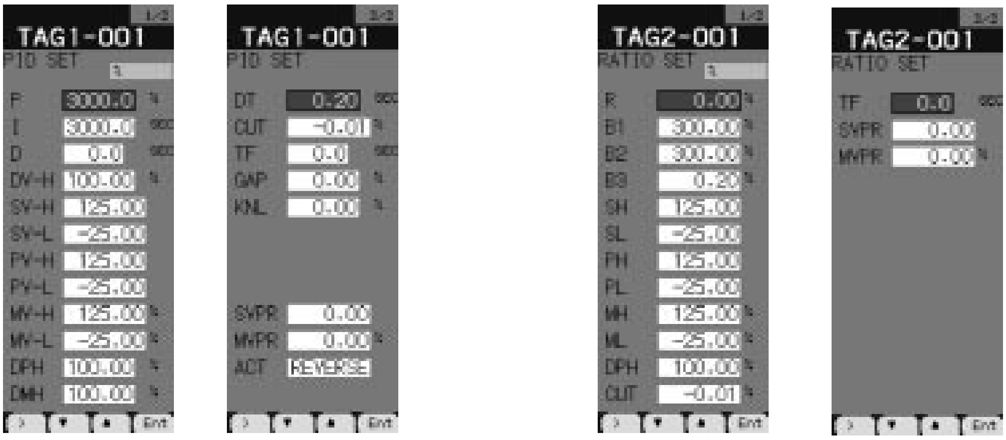
Loop1
1st Modul PID
2nd Modul PID
Loop2
1st Modul PID
2nd Modul PID
Loop3
1st Modul PID
2nd Modul PID
Loop4
1st Modul PID
2nd Modul PID

Figure 5-32

5.5.4 Setting the primary control parameters

The parameters of the primary control loops are set in this section. The parameters to be set vary depending on the control functions set in the CONTROL FUNC screen.

1. Press the chameleon key [▲] or [▼] to move the cursor (blue) to the [1st Modul]. (See Figure 5-32.)
2. Press the chameleon key [Sel].
   The parameter setting screen of the primary control loop appears. (See Figure 5-33.)
3. Press the chameleon key to set each parameter.
   To enter the parameters, use the procedure of "Setting wafers (how to enter codes)" in "Operations on WAFER screen".
   However, the values to be entered are decimal numbers.
   Each parameter setting screen of the PID and the proportional control has two pages. When the chameleon change key is pressed to display [Page] and the [page] key is pressed, the page is changed.



P 3000.0 %
I 3000.0 sec
D 0.0 sec
DV-H 100.00 %
SV-H 125.00
SV-L -25.00
PV-H 125.00
PV-L -25.00
MV-H 125.00 %
MV-L -25.00 %
DPH 100.00 %
DMH 100.00 %

DT 0.20 sec
CUT -0.01 %
TF 0.0 sec
GAP 0.00 %
KNL 0.00 %
SVPR 0.00
MVPR 0.00 %
ACT REVERSE

R 0.00 %
B1 300.00 %
B2 300.00 %
B3 0.20 %
SH 125.00
SL -25.00
PH 125.00
PL -25.00
MH 125.00 %
ML -25.00 %
DPH 100.00 %
CUT -0.01 %

TF 0.0 sec
SVPR 0.00
MVPR 0.00 %

PID control parameter

Proportional control parameter

Figure 5-33

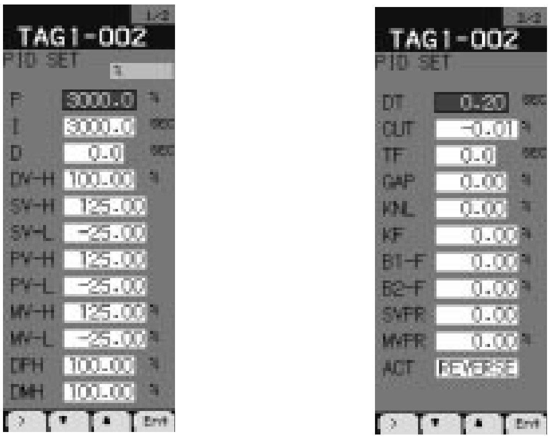
For detailed information on each control parameter, refer to the Instruction Manual.

5.5.5 Setting the secondary control parameters

The parameters of the secondary control loop are set in this section. The control function of the secondary control loop is always the PID control regardless of the setting in the CONTROL FUNC screen.

1. Press the chameleon key [▲] or [▼] on the PARAMETER SET screen to move the cursor (blue) to the [2nd Modul]. (See Figure 5-32.)
2. Press the chameleon key [Sel].
   The parameter setting screen of the secondary control loop appears. (See Figure 5-34.)
   Or, while the parameter setting screen of the primary control loop is displayed, pressing the chameleon key [>>] displays the parameter setting screen of the secondary control loop.
3. Press the chameleon key to set each parameter.
   To enter the parameters, use the procedure of “Setting wafers (how to enter codes)” in “Operations on WAFER screen”.
   However, the values to be entered are decimal numbers.
   The parameter setting screen of the secondary control loop has two pages. When the chameleon change key is pressed to display [Page] and the [page] key is pressed, the page is changed.

For detailed information on each control parameter, refer to the Instruction Manual.



P 3000.0 %
I 3000.0 sec
D 0.0 sec
DV-H 100.00 %
SV-H 125.00
SV-L −25.00
PV-H 125.00
PV-L −25.00
MV-H 125.00 %
MV-L −25.00 %
DPH 100.00 %
DMH 100.00 %

DT 0.20 sec
OUT −0.01 %
TF 0.0 sec
GAP 0.00 %
KNL 0.00 %
KF 0.00 %
B1-F 0.00 %
B2-F 0.00 %
SVPR 0.00
MVPR 0.00 %
ACT REVERSE

Figure 5-34

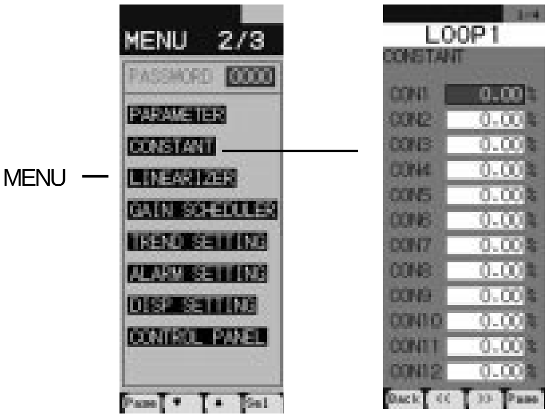
5-6 Setting constants

The 48 constants (CON01 through 48) for each loop can be set. The constants are set into the wafers by entering the input terminal code assigned to each of CON01 through CON48 into the wafer internal terminals.

5.6.1 Display on the constant setting screen

The constants are set on the CONSTANT (constant setting) screen selected from the MENU 2/3 screen.

1. Press the MENU key twice to display the MENU 2/3 screen.
2. Press the chameleon key [▼] repeatedly to move the cursor (blue) to the [CONSTANT].
3. Press the chameleon key [Sel].
   The CONSTANT screen appears.

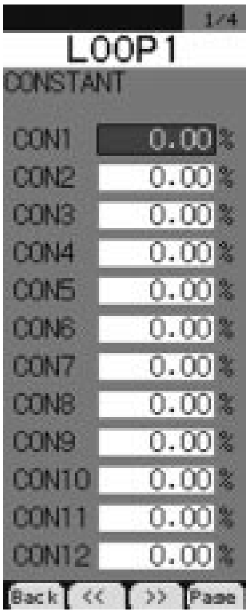


CON1 0.00%
CON2 0.00%
CON3 0.00%
CON4 0.00%
CON5 0.00%
CON6 0.00%
CON7 0.00%
CON8 0.00%
CON9 0.00%
CON10 0.00%
CON11 0.00%
CON12 0.00%

Figure 5-35

5.6.2 Procedure of setting constants

This section explains how to set “0.01” to constant 3 (CON3). This setting is for setting the R-ACK (remote acknowledge) explained in the next section.



CON1 0.00%
CON2 0.00%
CON3 0.00%
CON4 0.00%
CON5 0.00%
CON6 0.00%
CON7 0.00%
CON8 0.00%
CON9 0.00%
CON10 0.00%
CON11 0.00%
CON12 0.00%

Figure 5-36

1. Press the chameleon change key to display the chameleon key [▲] and [▼].
2. Press the chameleon key [▲] or [▼] to move the cursor (blue) to [CON3].
3. Press the chameleon key [Ent].
   The blue cursor changes to yellow.
4. Enter the setting value “0.01” and press the [Ent] key.
   The entered constant is set, and the yellow cursor returns to blue.
   To enter the constants, use the procedure of “Setting wafers (how to enter codes)” in “Operations on WAFER screen”.
   However, the values to be entered are decimal, positive and negative numbers.
   The constant setting screen has four pages for each loop. When the chameleon change key is pressed to display [<<] and [>>], and either key is pressed, the page is changed.

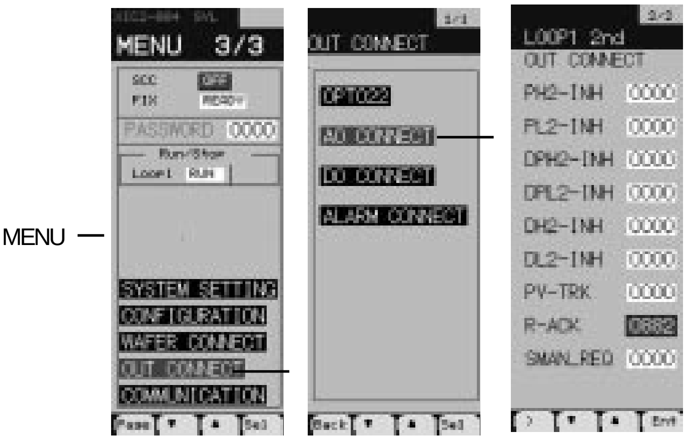
5-7 Setting remote acknowledge (R-ACK)

Before inputting the output of the primary control loop into the RSV (the remote setting value) of the secondary control loop, it is necessary to set the R-ACK (the remote acknowledge) of the secondary control loop to ON. (In case where the R-ACK is set to OFF, even if the [C] (or [R]) key is pressed during running, the cascade mode is not selected, but the cascade standby status is selected.)

5.7.1 Display on the ALARM CONNECT (the internal setting output connection) screen

The R-ACK is set on the ALARM CONNECT (the internal setting output connection) screen selected from the MENU 3/3 screen.

1. Press the MENU key three times to display the MENU 3/3 screen.
2. Press the chameleon key [▼] repeatedly to move the cursor (blue) to the [OUT CONNECT].
3. Press the chameleon key [Sel].
   The OUT CONNECT screen appears.
4. Press the chameleon key [▲] or [▼] to move the cursor to the [ALARM CONNECT].
5. Press the chameleon key [Sel].
   The ALARM CONNECT screen appears.

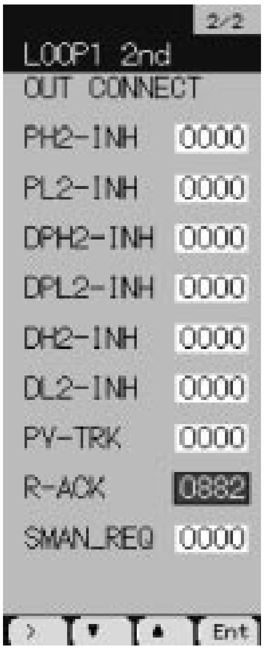


PH2-INH 0000
PL2-INH 0000
DPH2-INH 0000
DPL2-INH 0000
DH2-INH 0000
DL2-INH 0000
PV-TRK 0000
R-ACK 0882
SMAN_REQ 0000

Figure 5-37

5.7.2 Procedure of setting R-ACK

1. Press the chameleon key [Page] to change the ALARM CONNECT screen into the LOOP1 2nd screen.
   This is for setting the R-ACK of the secondary control loop of loop 1.
2. Press the chameleon change key to display the chameleon key [▲] and [▼].
3. Press the chameleon key [▲] or [▼] to move the cursor (blue) to [R-ACK].
4. Press the chameleon key [Ent].
   The blue cursor changes to yellow.
5. Enter the output terminal code (0882) of the constant (CON3) in which “0.01” is set in the previous page.
6. Press the chameleon key [Ent].
   The entered code is set, and the yellow cursor returns to blue.
   To enter the codes, use the procedure of “Setting wafers (how to enter codes)” in “Operations on WAFER screen”.



PH2-INH 0000
PL2-INH 0000
DPH2-INH 0000
DPL2-INH 0000
DH2-INH 0000
DL2-INH 0000
PV-TRK 0000
R-ACK 0882
SMAN_REQ 0000

Figure 5-38

The internal setting output of the R-ACK is connected to constant 3 (CON3).
Setting “0” into CON3 in the procedure on the previous page turns OFF the R-ACK, and setting any number other than “0” turns ON the R-ACK.

5-8 Setting monitor screens

The information to be displayed in the monitor screens is set in this section. It is set for each of the primary and secondary control loops of the loops.

5.8.1 Display on the MODULE SETTING (display module setting) screen.

The information to be displayed on the monitor screens is set on the MODULE SETTING (display module setting) screen selected from the MENU 3/3 screen.

1. Press the MENU key three times to display the MENU 3/3 screen.
2. Press the chameleon key [▼] repeatedly to move the cursor (blue) to the [CONFIGURATION].
3. Press the chameleon key [Sel].
   The CONFIGURATION screen appears.
4. Press the chameleon key [▲] or [▼] to move the cursor to the [MODULE SETTING].
5. Press the chameleon key [Sel].
   The MODULE SETTING screen appears.

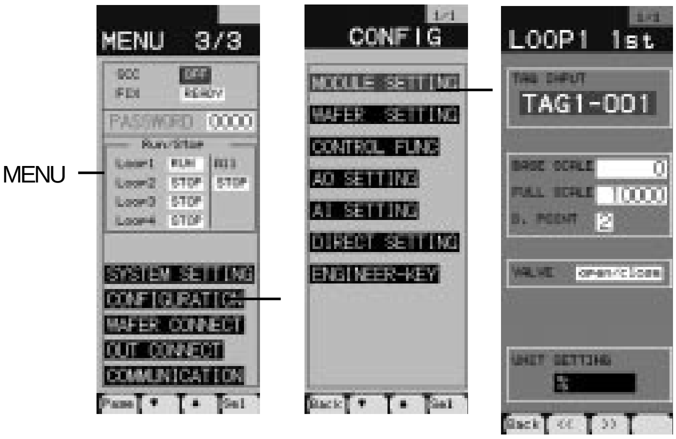


Figure 5-39

5.8.2 Setting items of display modules

The information below can be set on the MODULE SETTING screen.
For more detailed information on the description and the setting method of each item, refer to the Instruction Manual.

TAG INPUT (Tag name):	An eight-character tag name of each module to be displayed in the loop screens or the setting screens are set in this section.
BASE SCALE:	The PV and SV display basic scales with its decimal fraction omitted are set in this section. When the PV and SV is 0 %, the value set here is displayed.
FULL SCALE:	The PV and SV display full scales with its decimal fraction omitted are set in this section. When the PV and SV is 100 %, the value set here is displayed.
DIMENSION:	The decimal points of the PV and SV display scales are set in this section. When “0” value is set, the scales do not have decimal points.
VALVE:	The O/C or C/O that is displayed in the sections 0% and 100% of the MV scale of the 1 loop, 2 loop and 4 loop screens is selected in this section.
MV_ POLARITY:	The polarity of MV output is set in this section. This setting matches the MV instruction with the PV instruction.
UNIT SETTING:	Each module unit in the loop screens and the setting screens is set in this section. The unit can be selected among 173 units registered in the unit table.

5-9 FIX processing

The wafer connections and the set parameters are stored into the Flash memory area from the RAM area in this section. This prevents the wafer connections and the set parameters from being lost due to a failure of power.

5.9.1 Procedure of FIX processing

1. Press the MENU key three times to display the MENU 3/3 screen.
2. Press the chameleon key [▼] repeatedly to move the cursor (blue) to the [READY] on the right of the [FIX].
3. Press the chameleon key [Ent].
   The [READY] changes to yellow.
4. Press the chameleon key [▼].
   The [READY] changes to [WAIT].
5. Press the chameleon key [Ent].
   The yellow [WAIT] changes to blue.
   Several seconds later, the blue [WAIT] changes to the blue [READY], which means that the FIX processing is completed.

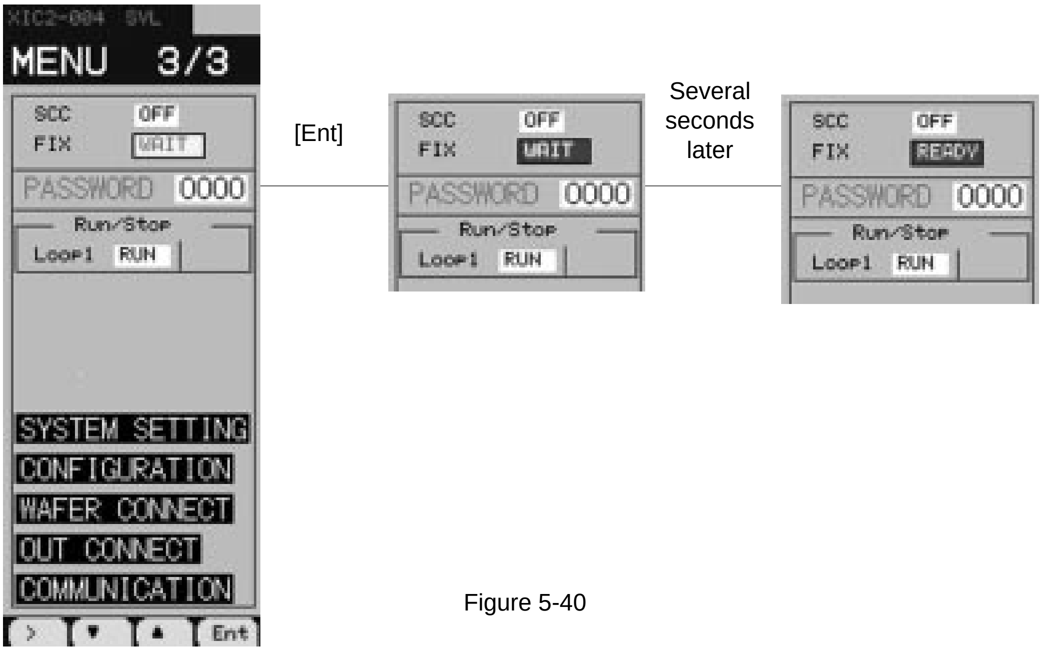


Figure 5-40

CAUTION

Be careful that the power is not cut off during FIX processing. Otherwise, the parameter settings may be lost.

5-10 Executing the wafers

The connected wafers are run and stopped for each loop in this section.

5.10.1 Procedure of running and stopping the wafers

The wafers of loop 1 are set to RUN from STOP to execute the wafers.

1. Press the MENU key three times to display the MENU 3/3 screen.
2. Press the chameleon key [▼] three times to move the cursor (blue) to the field on the right of the [Loop 1].

SCC OFF
FIX READY
PASSWORD 0000
Loop1 RUN
Loop2 STOP
Loop3 STOP
Loop4 STOP
All STOP

Figure 5-41

■ Running the wafers

The display of [STOP] on the right of the [Loop 1] means that the wafers of loop 1 are at rest.
Follow the procedure below to run the wafers.

1. Press the chameleon key [Sel].
   The [STOP] changes to yellow.
2. Press the chameleon key [▼] to display [RUN].
3. Press the chameleon key [Ent].
   The blue [RUN] is highlighted.

Pressing the chameleon key [Ent] in Step 3 runs the wafers.

■ Stopping the wafers

The display of [RUN] on the right of the [Loop 1] means that the wafers of loop 1 is being run.
Follow the procedure below to stop the wafers.

1. Press the chameleon key [Sel].
   The [RUN] changes to yellow.
2. Press the chameleon key [▼] to display [STOP].
3. Press the chameleon key [Ent].
   The blue [STOP] is highlighted.

Pressing the chameleon key [Ent] in Step 3 stops the wafers.

The running wafers (The [RUN] is displayed on the screen.) start to run automatically after a stop, when the power of the controller is turned OFF, and back ON.
For the operations of the wafer during running, refer to “Chapter 4 RUNNING AND OPERATION”.

CAUTION

Changes to the wafer connections and the setting of [OUT CONNECT] become valid when [STOP] changes to [RUN].

5-11 Programming with configuration software

With optional configuration software, programming the wafers, and setting the control parameters and the constants can be performed on a personal computer.

The configuration software executes in general desk-top and note book type personal computers in which Microsoft Windows95 run.
The wafer programs made on a personal computer, downloaded to the Compact Controller M through the serial interface of the personal computer, are executed in the controller.
Note: It is necessary to prepare a transmission connector cable (type: PDZL1001) when connecting a personal computer to the controller. (Refer to Figure 5-42.)

The programs and the parameters that have already made in the controller can be also uploaded to a personal computer. Using a note book type computer, it is possible to modify the programs and change the parameters on the ground.

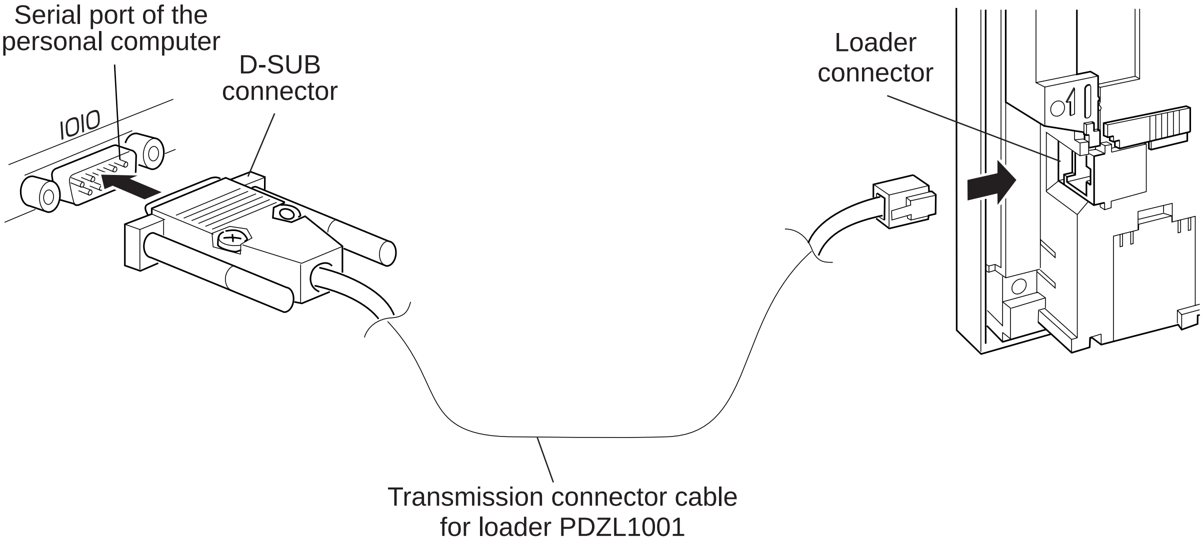


Figure 5-42 Connection of the transmission connector cable for loader

5-12 PLC control with software PLC

With the optional software PLC, programming can be made with the PLC function programming language (ISaGRAF) which conforms to IEC 1131-3.

IEC1131-3 specifies SFC, FBC, LD, ST and IL languages as programming languages. In the controller, SFC (Sequential Function Chart), FBD (Function Block Diagram), and LD (Ladder Diagram) can be used to program control functions.
The SFC can integrate the ladder program created with the LD and the loop control program created with the FBC in sequence.
This is desirable to use when the alarm sequence and operation sequence are programmed.

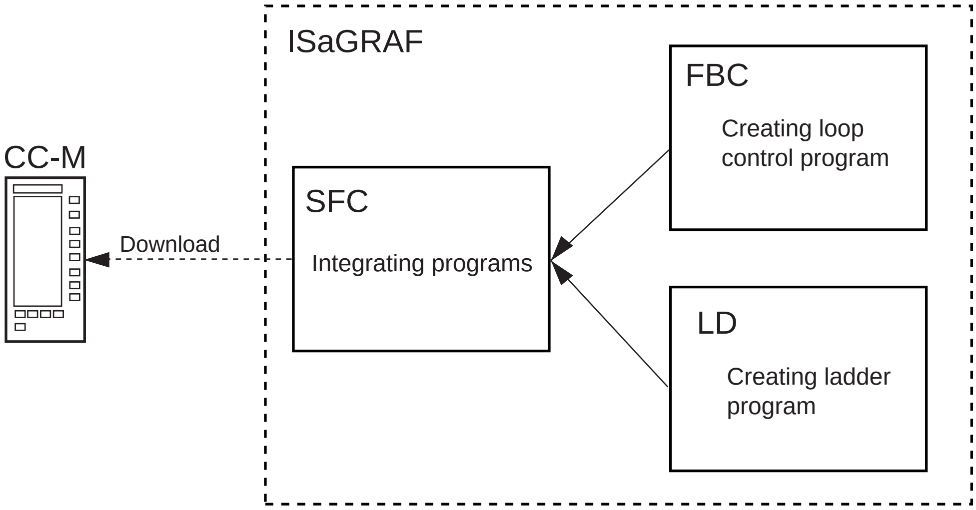


Figure 5-43

The type of the CC-M that can execute the software PLC is different from the type that can not execute the software PLC. The wafer programming is not available in the type of the CC-M that can execute the software PLC.

The software PLC is now under development.

---

6 USE OF NETWORK

6-1 Network functions

The CC-M can be connected to the optional network interfaces for high order communication and low order communication. Connecting those interfaces separately allows the CC-M to adapt to various kinds of network systems.

6.1.1 Network interfaces

The following network interfaces can be connected to the CC-M.

■ T-link interface

The T-link interface is our own information network.
This interface is a serial transmission interface that integrates regulators located at several places and various kinds of I/O modules at high speed in economical way.
The T-link interface has the data transmission ways: the I/O transmission (broadcast transmission) and the message communication. (Refer to page 6-3.)
The CC-M can use the T-link interface for both high order communication and low order communication.

■ Modbus protocol interface (under development)

The Modbus protocol interface is used for high order communication.
The Modbus, an internationally standardized protocol interface, can connect the CC-M to the controllers and personal computers that incorporate the Modbus protocol communication function.

■ OPTO22 interface (under development)

The OPTO22 interface is used for low order communication.
This interface can connect the CC-M to various kinds of OPTO22's SNAP I/O modules.

6.1.2 High order/low order communication networks

The high order communication network allows the CC-M to communicate with hosts, such as programmable controllers and personal computers. The T-link interface and Modbus interface are available for this communication.
Since the T-link interface has the message communication besides the I/O transmission is used as the data transmission way, the CC-M can receive the commands from the high order hosts and can send the data to the hosts.
The CC-M can be also connected to recorders and programmable operation displays, etc of our make.

The low order communication network allows the CC-M to expand the number of input/outputs.
T-link interface or OPTO22 interface (under development) is available depending on the system of the I/O module.
The data transmission way of the T-link interface for low order communication is the I/O transmission only.

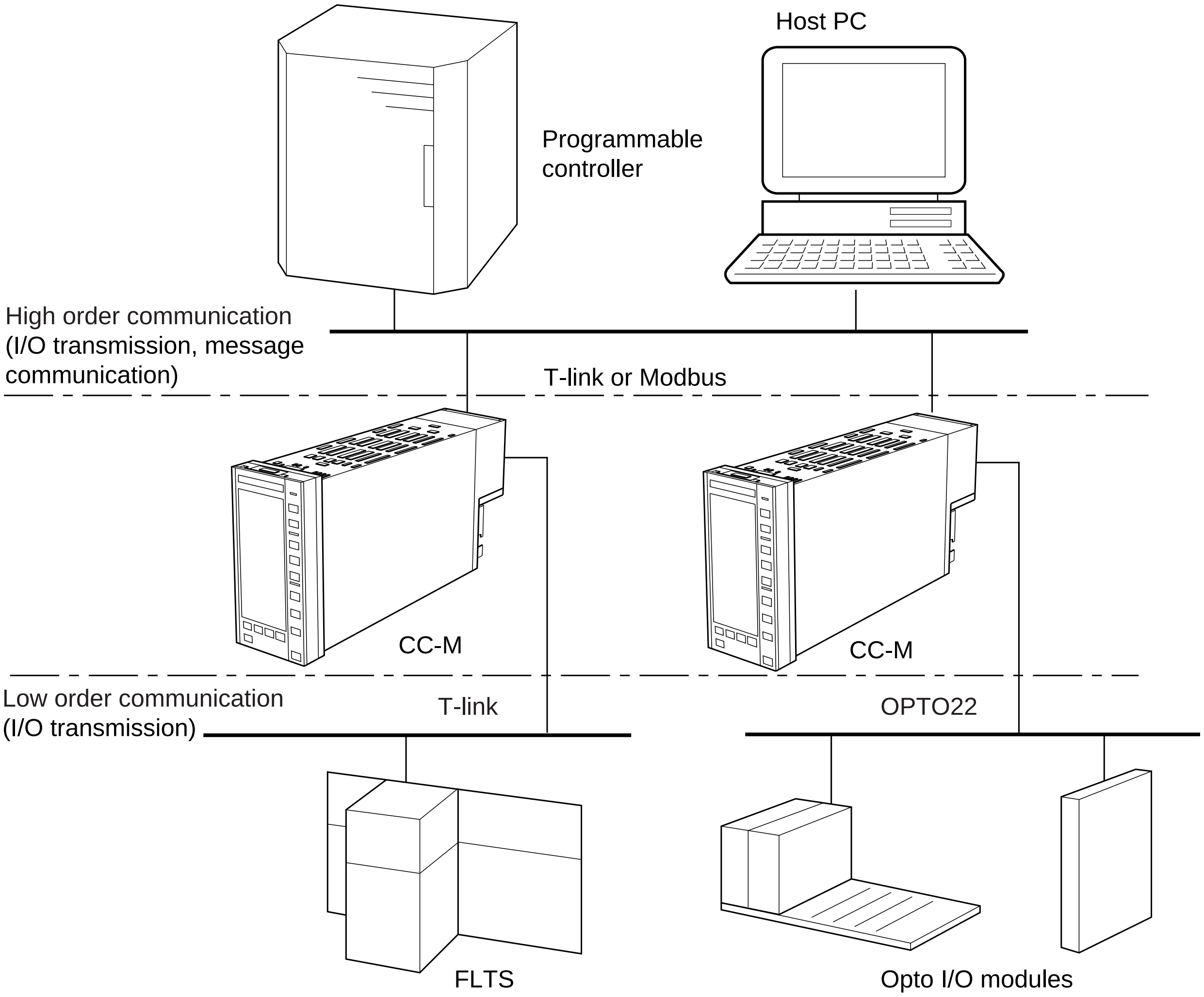


Figure 6-1 High/low order communications

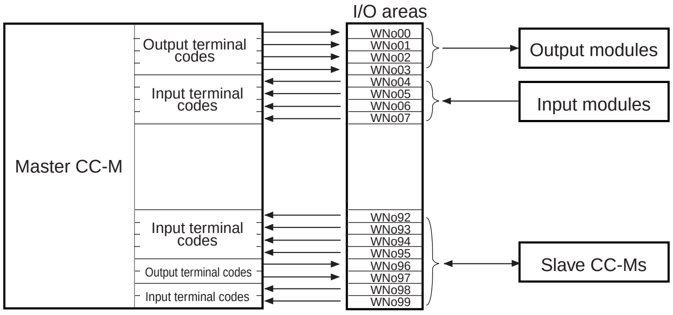
Supplementary

Data transmission ways with T-link

Our T-link interface has two data transmission ways: the I/O transmission (broadcast transmission) and the message communication.
This section explains the outline of those two transmissions.

■ I/O transmission

By the I/O transmission, the data is transmitted among the connected devices at regular time intervals. Figure below shows the concept of the I/O transmission.

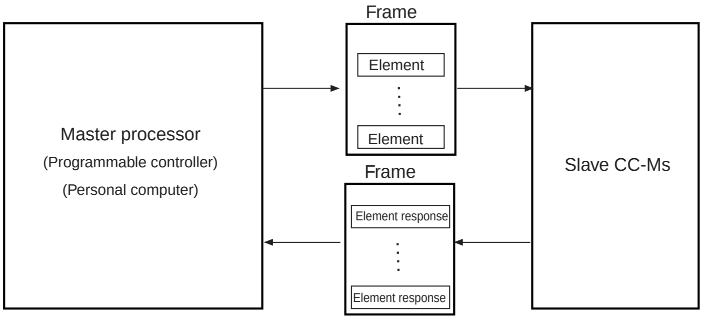


The address of each module that is connected to the master CC-M through the T-link is assigned to each of the 100-word I/O areas. In Figure above, the address of the output module is assigned to WNos.00 through.03, and the input modules to WNos.04 through 7.
By setting the output terminal codes into the I/O areas for the output modules, the data of the output terminals can be written into the I/O areas in the master CC-M. By setting the input terminal codes of I/O areas for the input modules into the wafers, the data written in the I/O areas can be input into the master CC-M.
The data written in WNos.00 through 03 are output from the output module at regular time intervals.
The data from the input module is written in WNos.04 through 07 to input into the master CC-M.

■ Message communications

All the data in the CC-M (various parameters and constants, and control modes, etc.) are stored in files. These files are read and written from the host processor through the message communication function of the T-link. Therefore, the host processor can control the CC-M operations by writing the data in the files, and can acknowledge the CC-M operation status by reading the files.

The data is transmitted whenever the host processor sends the command of communications.
Each message has a frame that consists of several elements as shown in Figure below.



The element is a minimum unit for reading and writing the files. Writing the data into the slave CC-Ms, the master processor writes the data in the element first, and then sends the element to the slave CC-Ms. Reading the data from the slave CC-Ms, the master processor sends the element to specify a file.

The master processor compiles several elements, which are to be read or written at the same time, into a frame and sends the frame into the slave CC-Ms.

Receiving the frame, the slave CC-Ms write and read the data from and into the internal files in accordance with the element command in the frame. Then, the slave CC-Ms compile the response elements (the response (accept or not accept) to the element required by the master processor, or the data of the file) into a frame and send it to the master processor.

The message communication is available with T-link interface for high order communication only.

6-2 Expansion with network

6.2.1 Expanding input/output

If the number of input/outputs of a CC-M is not enough for your use, it can be expanded with the low order communication network.

Using the T-link communication, the CC-M can be connected to I/O modules, recorders and programmable operation displays, etc of our make by the I/O transmission. However, the message communication is not available.

With the OPTO22 communication, the CC-M can communicate with various kinds of OPTO22's SNAP I/O modules.

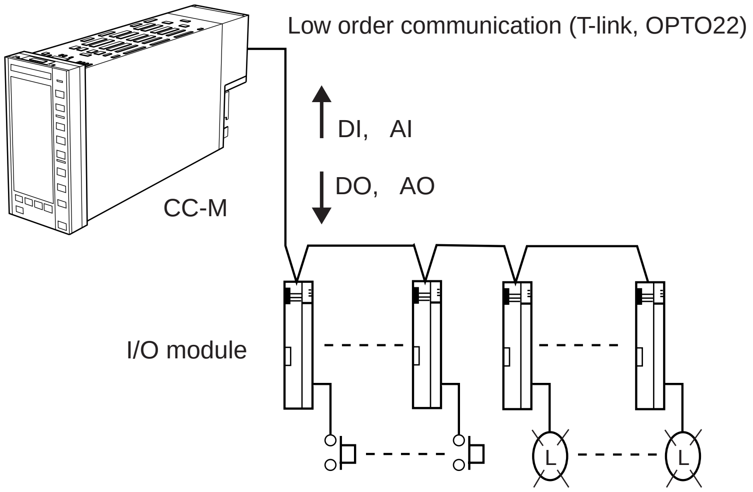


Figure 6-2 Expanding input/output

6.2.2 Connections between multiple CC-Ms

A CC-M being a master controller, and several CC-Ms being slave controllers, the multiple CC-Ms operate at a time.

By the I/O transmission of T-link communication, the master and slave CC-Ms can exchange various information, such as the control modes, the PV, the SV, the MV, and the alarms.

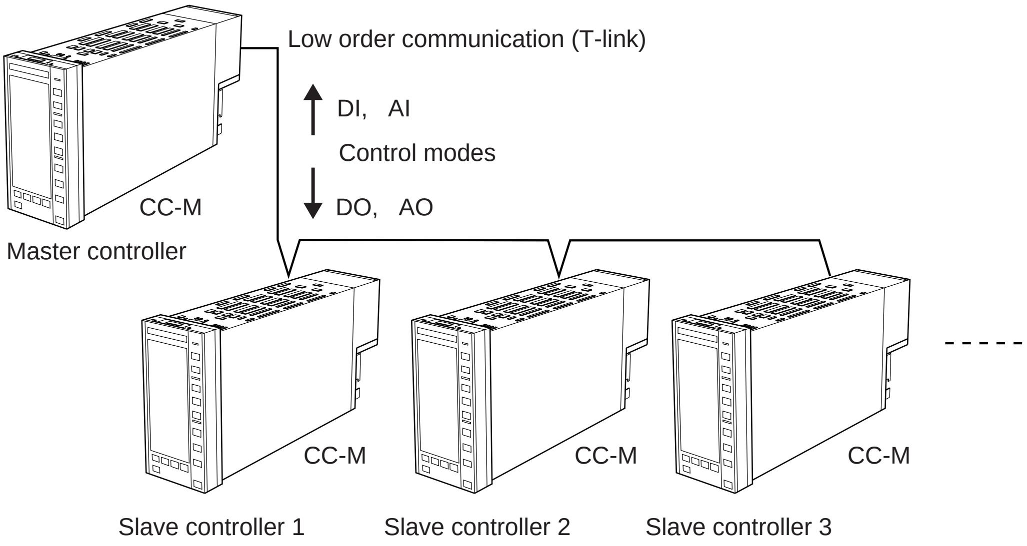


Figure 6-3 Connections between CC-Ms

6.2.3 Connections with hosts (high order systems)

The CC-M, connected to a personal computer and a PLC as high order hosts, combines the sequence control and the loop control.

With the T-link interface, both the I/O transmission and the message communication can be used as transmission ways.

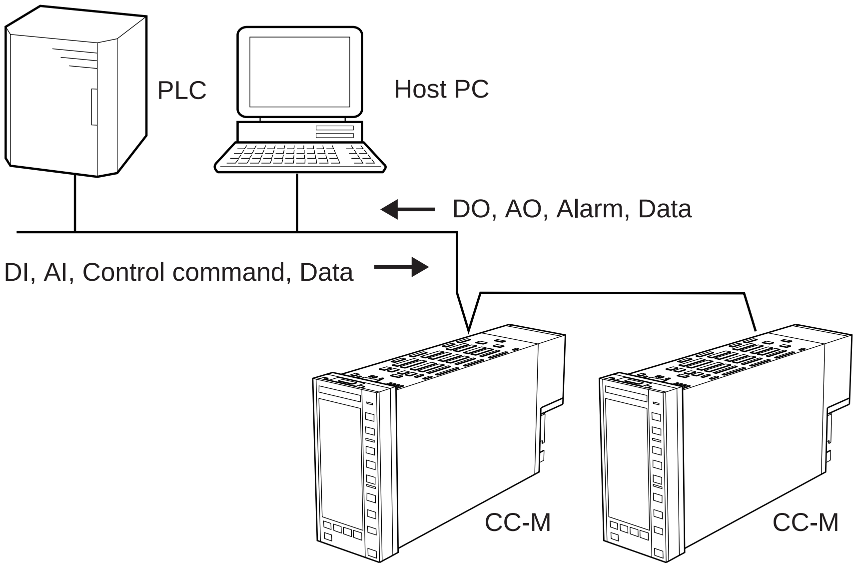


Figure 6-4 Connections with hosts

6.2.4 Integrated system construction

Using the high order and low order communications, it is possible to construct a medium-scale control system. The use of the CC-M Viewer software archives a remote centralized management system of multiple CC-Ms.

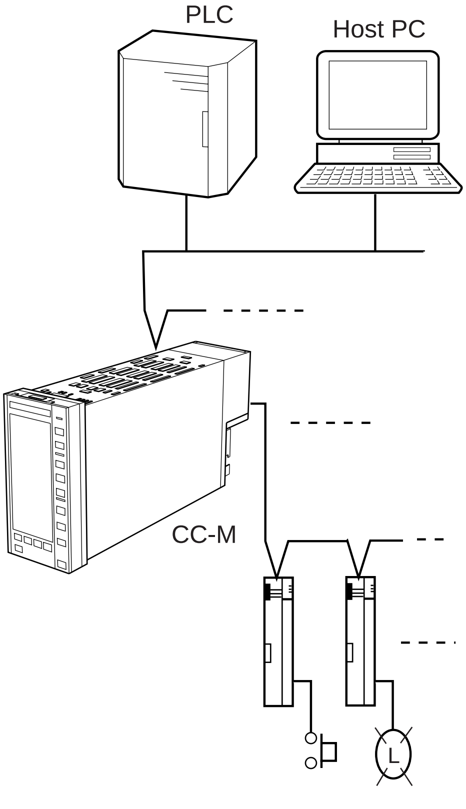


Figure 6-5 Integrated system construction

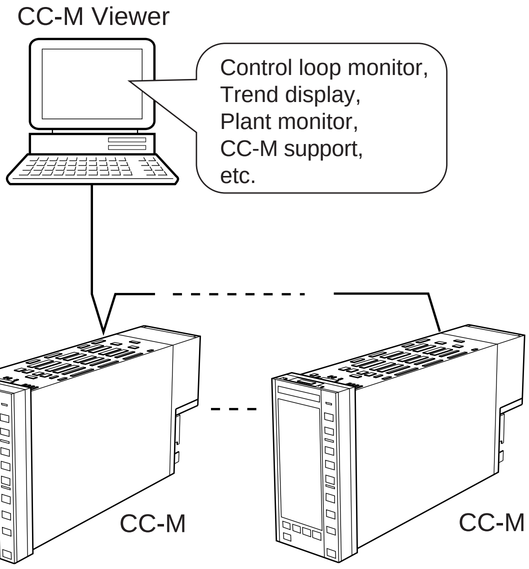


Figure 6-6 CC-M Viewer

7

REFERENCE

This chapter shows the specifications and dimensions of Compact Controller M (CC-M).

7-1 Specifications

1. Control and computation functions

The CC-M combines the function blocks called "Wafers" to execute the control and computation functions. Connecting wafers is called "Wafer connections".

The CC-M has as many as 100 kinds of wafers. Wafer connections are performed by the front key operations or with the configuration software.

(1) PID control

• Number of loops	: Selectable from the following by the type of controller. 1 loop (1 control output) 2 loops (2 control outputs) 4 loops (4 control outputs)
• Proportional band (P)	: 1.0 to 3276.7%, set at 3000.0% for delivery
• Integral time (I)	: 0.1 to 3276.7 sec, set at 3000.0 sec for delivery
• Differential time (D)	: 0.0 to 900.0 sec, set at 0.0 sec for delivery

(2) Programming function

• Programming method	: Wafer connection method Select by the type of controller whether users perform the wafer connections or our company (Fuji Electric Instruments Co., Ltd.) does.
• Program capacity	: 48 wafers x 4 loops (max. 192 wafers) A maximum of 48 wafers for each loop
• Wafer type	: 100 types listed in Table 1

(3) Computation cycle : 200 ms for 4 loop (8PID) control of simplicity PID

(4) Alarm function

• Method	: Alarm can be displayed and output through wafer connection.
• Type	: The upper and lower limit of each of PV, SV, and MV, the PV change rate alarm, the MV change rate alarm, the upper and lower limit of deviations.

2. Input Signals

Performance under reference condition (23 ± 2°C, 55 ± 10%RH, Power voltage and frequency 50/60 Hz)

2-1 Analog input signals

• Number of inputs	: Varies depending on the types of the external terminals, which also vary with types of the controller. Screw terminal: 7 Pressure terminal: 8
• Signal type	: DC voltage, DC current, thermocouple (option), resistance bulb (option) Two thermocouple inputs or two resistance bulb inputs are selectable.

(1) DC voltage/DC current : Input range: Selectable among 0 to 5 V DC, 1 to 5 V DC and 0 to 10 V DC.
Set at 1 to 5 V DC for delivery

: Input accuracy: ± 0.1% of input span ± 1 digit
: Industrial data conversion: Can be set within a range of -32767 to 32767.
Can be set with the decimal places of 1st through 4th , or no decimal place.
Set at 0.00% to 100.00% for delivery
: Industrial unit: A maximum of eight characters.
Usable characters: Uppercase and lowercase alphabetic characters, numeric characters, symbols, such as +, -, and *, etc.
: Input accuracy guarantee range: - 5% to 105% of input range except minus input.
: Maximum permissible voltage: ±35 V
: Input resistance: 1MΩ or more
: Influence by ambient temperature: ±0.1% FS/10°C or less.
: Influence by power supply fluctuation: ±0.1% FS or less.
: Isolation: non-isolated from internal circuit.
: The DC current must be converted into a voltage by the shunt resistor connected to the input terminals.
(The 250Ω shunt resistor is an optional item.)

(2) Thermocouple (option)

: Type and measurable range: See Table 2.
: Input accuracy: ±0.2% FS ± 1 digit
B type: ± 5%FS for 0 to 400°C
S or R type: ± 1%FS for 0 to 500°C
Others: ± 5%FS for below -100°C
: Reference junction compensation error: ±1.0°C (measurable range : -50°C and higher)
: Input accuracy guarantee range: -5% to 105% of input range.
: Input resistance: 1MΩ or more
: Allowable signal source resistance: 100Ω or less (Zener barrier connection unallowable)
: Influence by signal source resistance: Approx. 0.25µV/Ω
: Influence by ambient temperature: ±0.2% FS/10°C ± 1°C or less
: Influence by source fluctuation: ±0.2% FS ± 1°C or less
: Burnout detection: Provided (input bias current : approx. 0.25µA)
: Isolation: Isolated from the internal circuit.
: Reference junction compensation: By the sensor module externally connected to the terminal section

(3) Resisttance bulb (option)

: Type and measurable range: See Table 2.
: Input accuracy: ±0.2% FS ± 1 digit
: Input accuracy guarantee range: -5% to 105% of input range
: Allowable wiring resistance: 10Ω or less per wire, provided wiring resistance must be equal among 3 wires (Zener barrier connection unallowable)
: Influence by ambient temperature: ±0.2% FS or less
: Influence by power supply fluctuation: ±0.2% FS or less
: Burnout detection: Provided (input bias current : approx. 0.17mA)
: Isolation: Isolated from the internal circuit.

FS stands for full span.

- Sampling period : 100 ms

2-2 Digital input signal

- Number of inputs : 10 inputs
- Electrical specifications : No-voltage contact or transistor contact
  ON/0V, OFF/24V, ON current/about 8 mA
  Isolated from the internal circuit with a photocoupler. Not isolated between digital input and output.
- Contact rating : 30 V DC, 10 mA or more
- Signal judgment : No-voltage contact
  Contact resistance; 200Ω max. at ON, 100 kΩ min. at OFF
  : Transistor contact
  1 V max. at ON, leakage current 100µA max. at OFF

3. Output signals

Performance under reference condition (23±2°C, 55±10%RH, power voltage and frequency 50/60Hz)

3-1 Analog output signal

(1) Control output

- Number of outputs : Selectable among 1, 2 and 4 outputs
- Signal type : 4 to 20 mA DC
- Output accuracy : ±0.2% FS
- Load resistance : 600Ω or less
- Output accuracy guarantee range : 2 to 22 mA DC
- Influence by ambient temperature : ±0.2% FS/10°C or less
- Influence by power supply fluctuation : ±0.2% FS or less
- Isolation : Non-isolated from the internal circuit

(2) Auxiliary analog output

- Number of outputs : Varies depending on the types of the external terminals, which also vary with types of the controller.
  Screw terminal: 5
  Pressure terminal: 4
- Signal type : Selectable among 0 to 5 V DC, 1 to 5 V DC and 0 to 10 V DC
  : Set at 1 to 5 V DC for delivery
- Output accuracy : ±0.1% FS
- Load resistance : 15 kΩ or more
- Output guarantee range : 1 to 5V DC: -12.5% to 112.5%
  : 0 to 5V DC: 0% to 112.5%
  : 0 to 10V DC: 0% to 105%
- Influence by power supply fluctuation : ±0.21% FS or less
- Isolation : Non-isolated from the internal circuit

3-2 Digital output signal

- Number of outputs : 10 outputs
- Electrical specifications : Transistor open collector
  1 V max. at ON, 10µA max. at OFF.
  Isolated from the internal circuit with a photocoupler. Not isolated between digital input and output.
- Output rating : 30 V DC, 100 mA max. (resistive load)

3-3 Fault output signal (terminal symbol FLT)

- Number of outputs : 1 outputs
- Electrical specifications : Transistor open collector
  1 V max. at ON, 10µA max at OFF.
  Isolated from the internal circuit with a photocoupler. Not isolated between each digit input and output.
- Output rating : 30 V DC, 100 mA max. (resistance load)

4. Display

- Display unit : Color graphic liquid crystal display, with CFL back light and contrast adjustable function.
- Displays : Menu
  : Loop instrument diagram (1, 2, 4 and 8 loops)
  Bar graph display, digital display, etc. of PV, SV and MV.

  The term “loop” hereby indicates the number of control blocks. It does not mean the number of control outputs.

  : Turning screen
  : Trend display (max. 8 screens)
  : Alarm and alarm history display
  : Analog input/output and digital input/output monitor
  : Wafer connection screen
  : Parameter setting screen

5. Setting and operation

(1) Setting value setting method

- Setting key : Up key/down key
- Setting speed : Approx. 40 sec/FS
- Setting resolution : 0.5% FS/each push operation

(2) Control output operation method

- Operation key : Up key, down key and high-speed key
- Operation speed : Approx. 40 sec/FS (usual), Approx. 8 sec/FS (high speed)

(3) Operation mode

- Operation mode type : C (or R), A, M and HM

C: Cascade mode (operation according to remote set point)
R: Remote mode (operation according to external set point)
A: Auto mode (operation according to the local set point)
M: Manual mode (control output to be manually operation by operator)
HM: Hard manual mode (operation with backup operation unit)

- Setting method : Selectable from the following by the type of controller.
- Changeover
  - C-A-A
  - A-A-M
  - R-A-M
  - : Balance/bumpless for A → R or A→ C.
  - : Balanceless/bumpless for others.

Balance bumpless changeover is a method where each setting value needs to be balanced by operator himself at the time of changeover.
Balanceless bumpless changeover is a method where each setting value is automatically balanced by the controller at the time of changeover.

---

(4) Security

- Method : Text
- Password : Text (within 0000 to FFFF), 0000 set for delivery
- Security : Inhibition of parameter setting

(5) Other setting items

- Tag name : A maximum of eight characters for each control block.
  Uppercase and lowercase alphabetic characters, numeric characters, symbols, such as +, -, and *, etc.

6. Power supply

- Rated voltage : 100V to 240 V AC 50/60 Hz
- Allowable range : 85 V to 264 V AC
- Frequency : 47 to 63 Hz
- Power consumption : 60 VA or less
- External power supply (terminal symbol VP and PC) : 20 V to 30 V DC, 40mA or less

7. General performance and characteristics

- Insulation resistance : 500 V DC, 50 MΩ min.
- Dielectric strength : 2,000 V AC for 1 minute between power terminal and ground terminal
  : 500 V AC for 1 minute between signal communication terminals and ground terminal
- Rush current : 60 A or less.
- Clock : Set and display year, month, day, hour, minute, second
  accuracy: ±10 ppm except time log (less than 1 sec) at power ON/OFF action.
- Memory backup : Protection by lithium battery.
  Programs and parameters are stored in the non-volatile memory.

8. Operating and storage conditions

- Installation location : at room
- Operating temperature : 0 to 50°C
  0 to 40°C when the right and left ones are closely mounted.
  Temperature change rate is 10°C/h or less.

- Transport and storage temperature : -20 to 70°C
  Temperature change rate is 20°C/h or less.
- Operating humidity : 5 to 90%RH, condensation unallowable
- Transport and storage humidity : 5 to 95%RH, condensation unallowable
- Operating continuous vibration : 4.9 m/s^2 (0.5 G) or less.
- Transport and storage shock : Fall of 60 cm max. in packed status.

9. Power failure and restart function

- Permissible duration of momentary power failure : 20 ms at 90 V AC
- Behavior at power failure detection : Control stops at detection of power failure.
- Power recovery mode : Selectable between initial start and continuous start

10. Self-diagnosis

- Control and computation circuit failure : Monitoring with watchdog timer
- Input signal failure : Voltage/current input Monitoring of range over
  : Thermocouple and resistance bulb Monitoring of disconnection
- Control output signal failure : Monitoring of disconnection by read back check
- Behavior at failure : FLT is indicated, FLT lamp lights, FLT output signal ON, control stops and control output is held.

11. Structure

- Enclosure : Plastic (material: PC-ABS)
- Finish color : Front frame and enolosure both gray
- Flame resistance : UL94V-0
- Protection : Front face : IP54 (display unit and operation key)
- External dimensions (W x H x D) : Screw terminal type 72 x 144 x 272 mm
  : Insert terminal type 72 x 144 x 280 mm
- Weight : 1.9 kg or less
- Mounting method : Mount on indoor panel
  Vertical mounting as standard
  Titled mounting allowed within backward angle of 0 to 45°.
  For panel cutout dimension, refer to panel cutout dimensions
- External terminal : Selectable from the following by the type of controller.
  Screw terminal type (M3.5)
  Pressure terminal type

12. Backup function (option)

- Method : With backup operation unit
- Number of control outputs : Selected from 1, 2 and 4 according to type designation
- Output signal : 4 to 20 mA DC
- Display : Control output changeover indication of each loop (mA indication)
- Display system : 21-segment LED
- Display switching : Changeable to each loop by loop selection key
  Loop No. indicated by 1-digit LED
- Operation key : Control output up key, control output down key, loop selection key
- Operation resolution : 5%
- Backup changeover : Changeover has been made by the backup operation unit switch. However, changeover cannot be made when the backup operation unit is faulty.
  In all loops, changeover to the HM mode is balanceless and bumpless.

13. Communications function (option)

13-1 Modbus® protocol interface (under development)

- Communication behavior : High order communication
- Communication protocol : Based on Modbus® protocol
- Physical specification : EIA RS-485
- Communication method : 2-wire system, half duplex, start-stop synchronization
- Connection form : Multi-drop
- Communication rate : 2.4, 4.8, 9.6, 19.2 or 38.4 kbps selectable.
  9.6 kbps set for delivery.
- Communication distance : Max. 500 m in total
- Number of connectable units : Max. 31 units
- Data length : Fixed to 8 bits
- Parity : Odd/ Even /None
- Stop bit : 1 or 2
- Isolation : Isolated from the internal circuit
- Terminal impedance : 100Ω (optional item)
- Communication items : Parameters and process value.

13-2 T-link interface (option)

- Communication behavior : High/low order communication
- High order communication : Connected with CPU capsule
  : I/O transmission
  : 4, 8 and 16-word input/output
  : Message transmission : Single element configuration
- Low order communication : Connection with I/O device
  Connectable models; FTLS, PNA, PYH, PHA (Fuji's products)
  : I/O transmission : input/output area of 100 words
  : (message transmission, transmission with masters, loader transmission, duplex transmission unavailable)
- High/low order communication : Connection form : Multi-drop
- Common specification : Communication rate : 500 kbps
  : Communication distance
  : Max. 500 m in total (high order), max. 50 m in total (low order),
  : Isolation
  : Not isolated from the internal circuit
  : Terminal impedance
  : 100Ω (optional item)

13-3 OPTO22 interface (under development)

- Communication behavior : Low order communication
- Usage : I/O expansion
  Auxiliary analog input/output: Max. 4
  Auxiliary digital input/output: Max. 128
- Communication protocol : OPTO22 interface (MISTIC protocol)
- Physical specification : EIA RS485
- Communication method : 2-wire system, half duplex, start-stop synchronization
- Communication rate : 57.6 kbps
- Communication distance : Max. 50 m in total
- Number of connectable units : Max. 31 units
- Isolation : Isolated from the internal circuit
- Terminal impedance : 100Ω (optional item)
- Communication item : Parameters, process values, etc.

13-4 Loader interface

- Communication protocol : Based on Modbus® protocol
- Physical specification : RS-232C
- Communication distance : Max. 3 m

14. Software PLC function (option) (under development)

The wafer does not operate at software PLC operation.

- Programming method : Based on IEC 1131-3
  available input:
  Ladder diagram (LD)
  Sequential function chart (SFC)
  Function block diagram (FBD)
  Structured text (ST)
  Instruction list (IL)
  : Programming is carried out using the configuration software. (ISaGRAF®)
  Programming and editing on the controller are not allowed
- Number of steps : Corresponding to 2k steps of ladder
- Computation cycle : 200 ms corresponding to 2k steps of ladder

15. Memory card interface function (option)

- Specification : Compact Flash® (based on CFA)
- Compatible memory card : 5 v flash memory card
  Capacity 4, 20 and 30 MB
- Use : For storing the logging data (up to 32 points)
  (or up to 16 points if save cycle is 1 second)
- Saving period : Min. 1 sec
- Data storage capacity

Memory card capacity	Data storage
4 MB	About 180 thousand data
20 MB	About 900 thousand data
30 MB	About 1.35 million data

1 data = 1 point record data.

• Format method	:	Format of this controller
• Data readout	:	Readout by personal computers using PCMCIA card slot
• Recommended memory card	:	Available from PC ship or other distributors. Sandisk models. : SDCFB-4-101-00 (4MB) : SDCFB-20-101-00 (20MB) : SDCFB-30-101-00 (30MB) URL http://www.sandisk.com

16. Standards under conformity

(1) General safety	:	IEC 1010-1 (1990) EN 61010-1 (1993)	
(2) EMC	:	Based on Emission	EN 50081-1 (1994)
		Based on Immunity	EN 50082-2 (1995)

17. Configuration software (optional item) (under development)

17-1 Programming loader software (code symbol: PDZP1001)

- Wafer connection can be entered, edited, uploaded and downloaded.
- Operation parameter can be entered, edited, uploaded and downloaded.

17-2 ISaGRAF® (for software PLC) (under development) (code symbol: PDZG1001)

- Programming method : Based on IEC 1131-3

The program made by this software cannot be changed by the controller itself.

17-3 Recommended personal computer system

• Hardware	:	PC, Pentium 233 MHz or higher Free hard disk capacity 200 MB or more, memory capacity 64 MB or more.
• Operating system	:	Windows 95

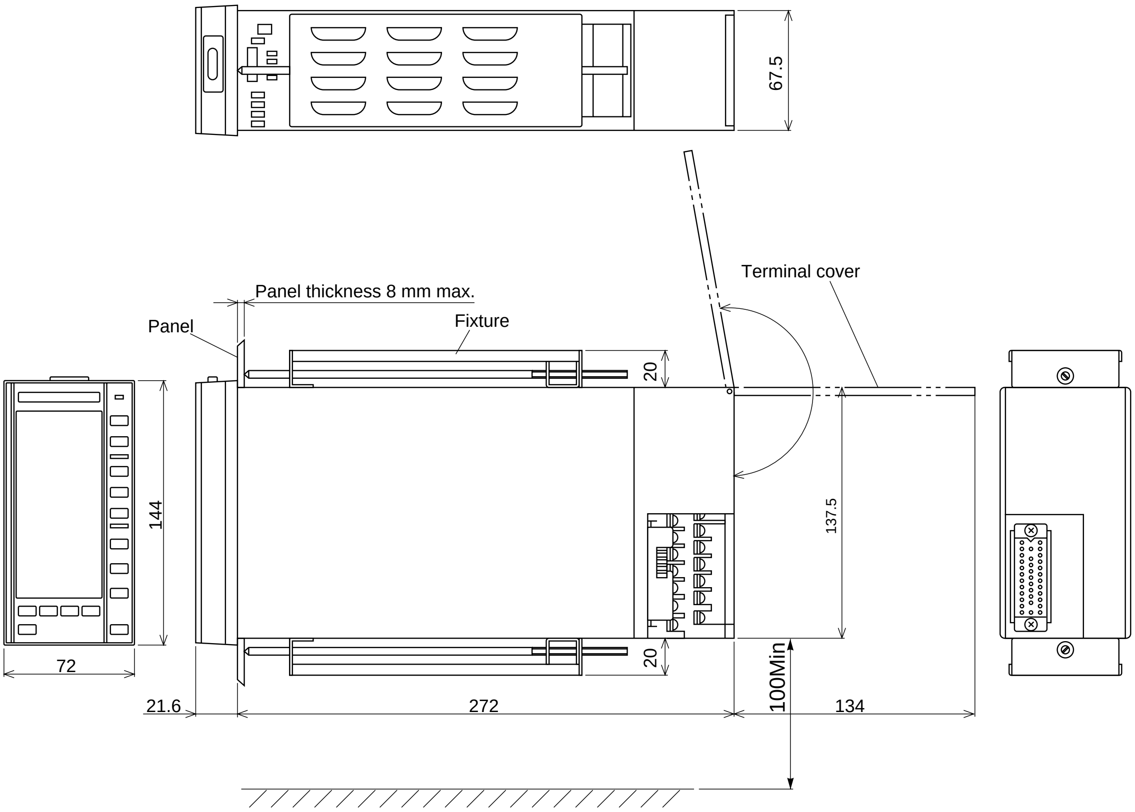
18. Terminal section arrangement

- Screw terminal : For terminal arrangement
- Pressure terminal : For terminal arrangement

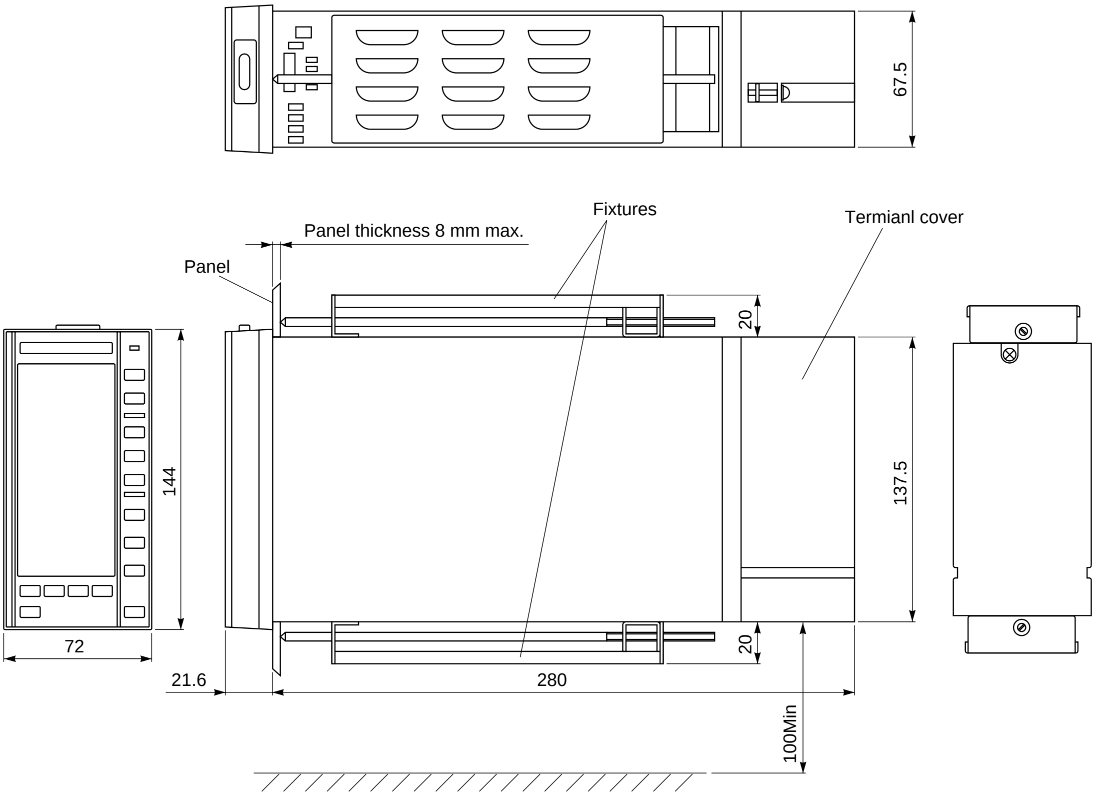
19. Related document

- Communication specifications for compact controller M ... INP-TN512178

7-2 Dimensions



Dimensions of screw terminals



Dimensions of pressure terminals

7-3 Dissimilarities between the CC-M and conventional models

No.	Difference	CC-S/CC-F	CC-M
1	Maximum number of control loops	1 loop (2PID)	4 loops (8PID) (in case type is PDA24...)
2	MV bar graph display	Actual output read back value	Output value (expected)
3	Mode change key operation	Momentary press	Change to upload mode: Hold down 1 second. Change to download mode: Momentary press.
4	Display unit	LED display	Color LCD unit. Back light must be replaced every 2 years.
5	Main frame depth	CC-S: 391 mm, CC-F: 438 mm	Screw terminal: 272 mm Pressure terminal: 280 mm
6	Cubicle	Metal (Black/White)	Plastic resin (gray)
7	HMV operation	Dial setting	UP/DOWN key setting
8	Setting of mode when power is turned on	By parameter/SW	By front SW
9	Mamory backup method	Nonvolatile memory	By battery. Battery must be replaced every 2 years. Program and parameter can be saved in flash memory by FIX operation
10	External terminal	M4 screw terminal +transmission connector type. M4 screw terminal + multi connector + transmission connector type.	M3.5 screw terminal + multi connector type. Pressure terminal type
11	Mass	Approx. 2.9 kg/approx. 5 kg	1.9 kg max.
12	Maximun wafer capacity	48 wafers	48 wafers x 4 loops = 192 wafers (for type PDA 24...)
13	Operation mode	R-A-M type. A-M type.	C-A-M type. R-A-M type. A-M type.
14	Analog input	5 points/7 points	Screw terminal type: 7 points. Pressure terminal type: 8 points. (2 points used also for thermocouple/Pt direct input terminal)
15	Control output	1 point	Up to 4 points
16	Auxiliary analog output	4 point/5 points	Screw terminal type: 5 points. Pressure terminal type: 4 points.
17	Number of digital output points	6 points/6 points (fault output/alarm output of 2 points included)	Screw terminal type: 11 points. Pressure terminal type: 11 points. (Fault output included.)
18	Transmission function	T-link (slave). RS-422A (CC data line slave). RS-485A (CC data line slave).	T-link (master). T-link (slave). RS-485 (MODBUS slave). RS-485 (OPTO 22 MISTIC protocol master).
19	Software PLC function	None	Program down-load available by ISaGRAF. Only CCM of type code 14th digit = 2 is usable. Besides CCM, ISaGRAF software (optional) is necessary.
20	Memory card logging	None	Provided
21	Configurator	CCS data loader	PC loader (optional). * PC loader can be used only for CCM of type code 14th digit = 1. ISaGRAF (optional). * ISaGRAF can be used only for CCM of type code 14th digit = 2.
22	Front structure	IP65	IP54
23	Wafer No. 40. Secondary basic control wafer	Provided	None
24	ALM indication	ALM indicator lamp output available by wafer	ALM indication output unavailable by wafer
25	DC • ∆MV indication	Provided	None
26	Program wafer association	Step counter/time lapse indication, etc. available	Unavailable
27	Operation in SCC mode	Front operation inhibited in SCC mode	Front operation available even in SCC mode. (Operation lock function provided). SCC mode canceled upon selecting the remode/cascade mode.
28	Auto tuning function	Provided	None
29	Analog input error judgment	Judged in terms of input voltage level	-12.5% or lower, 112.5% or higher with respect to input scale

FUJI ELECTRIC

Instruction Manual

COMPACT CONTROLLER M (CC-M)

COMMUNICATION SPECIFICATIONS

TYPE: PDA

Fuji Electric Co.,Ltd.

INTRODUCTION

We thank you very much for purchasing Fuji Electric's Compact Controller M (CC-M Type: PDA).

- Carefully read the instruction manual and sufficiently be familiar with its contents before installing, operating and maintaining the communication device with the compact controller M. Improper handling may cause accidents or injuries.
- The specifications of compact controller M are subject to change without prior notice for improvement of the product.
- It is strictly forbidden to distribute the communication manual of the compact controller M and to make its reproduction without permission. We will not be responsible for any accident attributable to such distribution of the manual and its copies without permission.
- The person in charge of operating the compact controller M is requested to keep the instruction manual.
- After reading the manual, it must be kept at a place always accessible by personnel in charge of its operation.
- An arrangement must be taken so that the instruction manual will be handed over to the end user.
- The contents of this manual have been prepared carefully. However, it should be noted that Fuji is not responsible for any loss caused indirectly from errors in wiring or missing of information.

Note: Windows 95 is the registered trademark of Microsoft Corporation.

Note: Modbus® is the registered trademark of MODICON.

Note: Sandisk and Compact Flash are the trademarks of Sandisk Corporation.

Manufacturer : Fuji Electric Instruments Co., Ltd.

Request

- It is forbidden to transfer a part or the whole of contents of the manual without permission.
- Contents of the manual are subject to change without prior notice.

Issued in January, 2000

SAFETY PRECAUTIONS

Before use, carefully read the safety precautions for correct operation.

- The precautions concern important matters related to safety. Be sure to observe them. The safety matters are ranked to "DANGER", "CAUTION".

Indications and meanings are as follows.

◇! **DANGER**	If the handling is wrong, dangerous situations might occur, causing death or serious injury.
⚠ **CAUTION**	If the handling is wrong, dangerous situations might occur, causing medium or slight degree of injury or physical damage only.

◇! DANGER

- If the fault or anomaly of the device may cause serious accident or troubles to other devices, externally install appropriate emergency stop circuit and protective circuit to avoid accidents.
- For avoiding device breakage and fault, supply a power voltage matching the rating.
- For avoiding electric shock, maloperation and device troubles, do not turn on power until all installation and wiring have ended.
- The instrument is not an intrinsically-safe explosion-proof type. Do not use it in atmosphere of combustible or explosive gases.
- Never disassemble, retouch, remodel nor repair the instrument. Otherwise, abnormal operation, electric shock or fire may occur.
- While turned on, do not touch the terminals. Otherwise, electric shock or maloperation may occur.
- Before engaging or disengaging the module or unit, turn off power. Otherwise, electric shock, maloperation or troubles may occur.
- Periodic maintenance is recommended so that the instrument can be used continuously and safely. Some parts installed on the device have limited service life or are subjected to secular change.
- Do not block the ventilation opening located on the top and bottom of the main unit. Otherwise, fault, abnormal operation, shortened service life or fire may occur.

⚠ CAUTION

- Make sure the product is as specified before use. Otherwise, the product may break or be troubled.
- Install the device so that dust, wire chip, iron powder or other foreign matters will not enter it. Otherwise, maloperation or fault may occur.
- Periodically make sure terminal screws and setscrews are securely tightened. Use at a loosened status may cause fire or maloperation.
- Before changing the setting while operating, forced output, startup, shutdown or other actions, sufficiently check the safety. Wrong operation may break or trouble the machine.
- During the running, the furnished terminal cover must be put on the terminal block. Otherwise, electric shock or fire may occur.
- For using the device, avoid the following place.

  Ambient temperature is beyond 0 to 50°C (0 to 40°C at close mounting sidewise).

  Ambient humidity is beyond 45 to 90% RH.

  A condensation occurs.

  Exposed to corrosive gases (particularly, sulfuric gas, ammonia or the like) or combustible gases.

  Vibration or impact is exerted to the main unit.

  Splashed with water, oil, chemical, steam or vapor

  Exposed to dust, salt or iron excessively.

  Inductive disturbance is so excessive as to easily produce electrostatic charge, magnetic field or noise.

  A heat accumulation occurs by radiation heat, etc.
- If noise from the source is excessive, add an insulating transformer and use a noise filter.
- When discarding the product, handle it as an industrial waste.
- Be sure to carry out grounding. Otherwise, electric shock or maloperation may occur.
- Wiring must be carried out by qualified specialists. Wrong wiring may cause fire, fault or electric shock.

CONTENTS

1. GENERAL

1.1 Foreword

1.1.1 General

This manual deals with the communication functions of Compact Controller M (CC-M Type: PDA), explaining the MODBUS communication function and T-LINK communication function of the controller.

For operation and handling of PDA, MICREX-F and other devices corresponding to the MODBUS communication protocol, refer to the respective instruction manuals.

1.1.2 Precautions

Before reading this manual, pay attention to the following points.

(1) For operation and setting of Compact Controller M (PDA) itself, refer to the instruction manual supplied with the controller.

(2) This manual explains the connections and communication specifications required for utilizing the MODBUS communication function and T-LINK communication function of PDA.

(3) Setting of PDA that is necessary to utilize the MODBUS and T-LINK communication functions, is exempted from this manual.

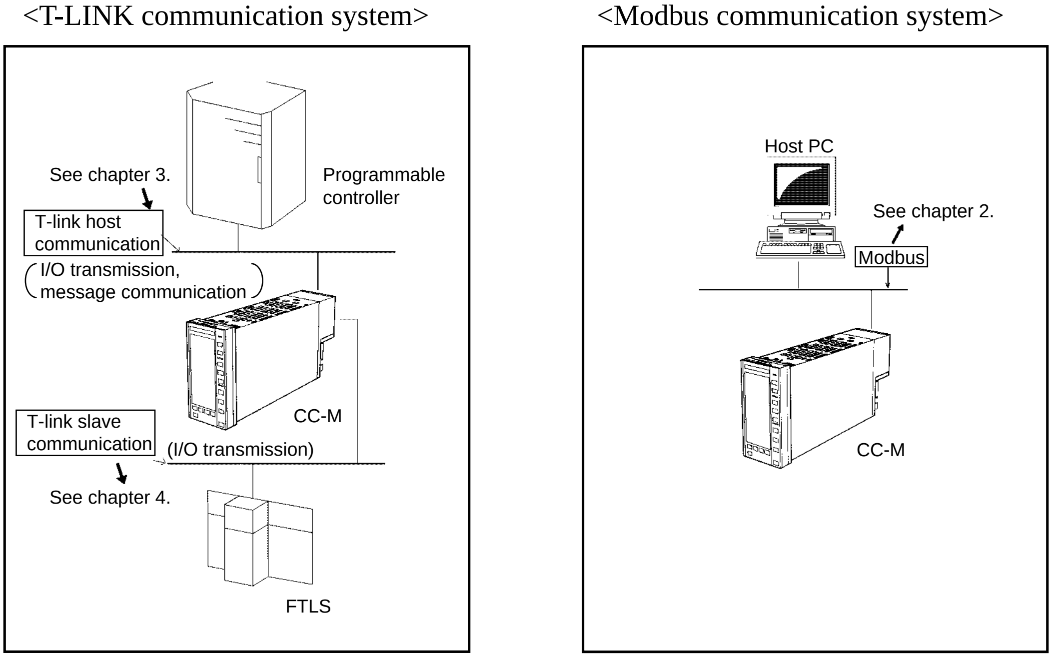
Reference manual

Instruction manual for Compact Controller M	INP-TN1PDA2/3-E

1.2 Communication function

1.2.1 General

The communication functions of Compact Controller M (PDA) contains the MODBUS communication function and T-LINK communication function. This manual explains these functions.



Note) The T-LINK host communication cannot be used for PDA3

Note) The T-LINK slave communication cannot be used for PDA3.

Fig. 1-1 Communication function of Compact Controller M

1.2.2 MODBUS communication function

The MODBUS communication function is a kind of popular serial communications. This function allows the setup of network in a simple manner without using relatively complex communication protocols.

MODBUS of Compact Controller M (PDA) provides host communications and slave communication systems, only the host communication system being explained in this manual. For the slave communication system, refer to the instruction manual supplied with the controller.

Use of the MODBUS communication function allows you to construct a system combined with devices corresponding to the MODBUS protocol.

1.2.3 T-LINK communication function

The T-LINK communication function is one of the basic communication functions for utilizing Fuji PLC devices.

By using both the host and slave communication systems with T-LINK communication function, Compact Controller M is able to utilize Fuji sequencers or a group of slave I/O modules. The use of the T-LINK slave communication function permits expansions of I/O points, and the use of the host communication function allows constructions of small scale systems including sequencers.

The host communication function supports I/O transmission and message transmission functions, while the slave communication function supports I/O transmission alone.

2. MODBUS

2.1 System configuration

2.1.1 General

MODBUS communication functions are explained in this chapter. When RS-485 (host) communication functions are not provided with your CC-M type code, the functions explained in this chapter cannot be used. In this chapter, functions necessary for setting with CC-M are not included. For communication setting with CC-M, refer to the instruction manual for CC-M.

This chapter details the communication specifications for MODBUS communication functions and methods. It also details what are realized with CC-M.

(1) MODBUS for Compact Controller M (CC-M)

MODBUS means a serial communication based on generally used RS-485, having a communication speed of 19200bps, using a simple communication procedure, highly reliable network system can easily be configured.

MODBUS communication functions provided with CC-M, uses the RTU communication protocol based on MODBUS. It should be noted that some points are different on the function codes of standard MODBUS communications. For details, refer to the chapter of MODBUS communication specifications.

(2) Master and slave

The MODBUS system is normally composed of a master unit and a slave unit, one set of master unit is capable of connecting up to 3 l slave units (CC-M). The master unit is available from the market. Personal computers can also be used with the master unit.

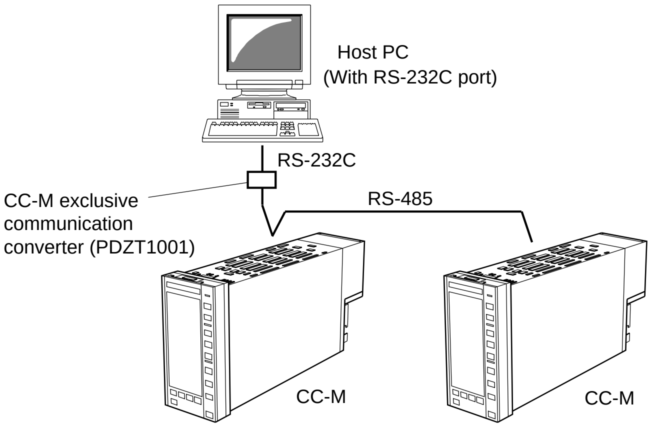
A device having an RS-232C communication port contained in personal computer can be connected to slave units via exclusive communication converter (PDZT1001-option) for CC-M.

(3) Configuration of MODBUS

Fig. 2-l shows the system configuration using MODBUS communication functions.

A simple type of system configuration is a combination of one set of master unit and one set of CC-M (slave unit). In Fig. 2-1, the system configuration is "1:N" units.

Fig. 2-2 shows an arrangement required for MODBUS system configuration. In this configuration, communication cables (Type: PDZK***1), terminating resistors (Type: PDZR1001) and CC-M exclusive communication converter (Type : PDZT1001) are required besides the master unit (personal computer) and CC-M.



*Exclusive communication converter (PDZT1001) for CC-M:

A converter that converts communication signals of RS-232C and RS-485 in both directions. Use this exclusive one for CC-M to perform communication based on MODBUS at a speed of 19.2 kbps.

Fig . 2-1 MODBUS system configuration

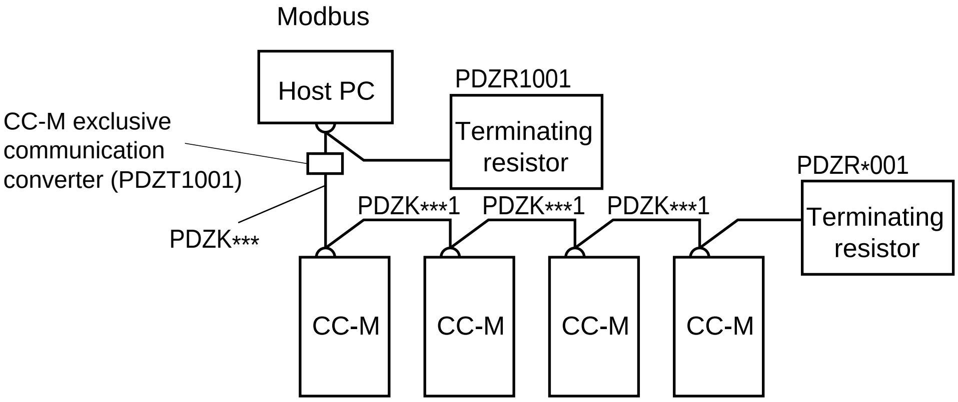


Fig. 2-2 Arrangement

2.2 MODBUS communication specifications

2.2.1 Physical specifications

Table blow shows the specifications for the MODBUS communication functions.

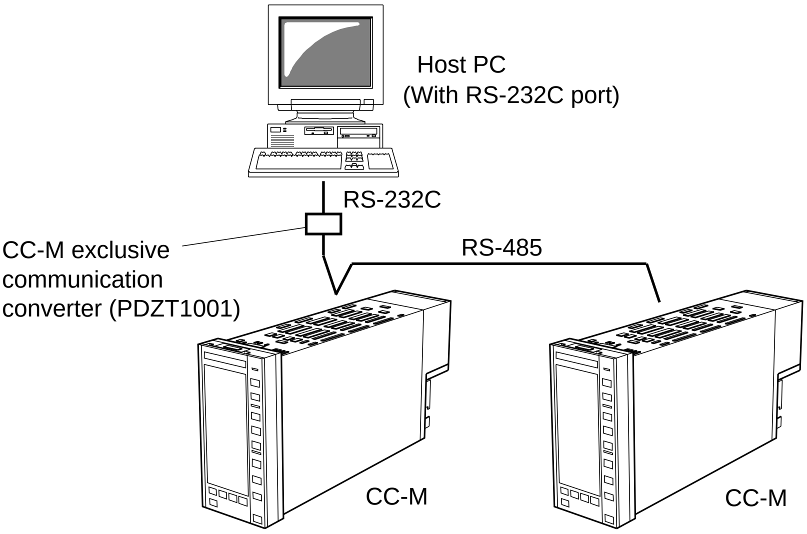
Communication format	Host communication
Communication protocol	Based on MODBUS
Physical specifications	EIA RS-485
Communication method	2-wire, Semi-duplicate, Start-stop synchronous system
Connection format	Multi-drop
Communication speed	19200bps
Communication distance	Total length; 500m Max.
Number of connectable units	Up to 31 units
Communication data	Binary 8-bit (RTU), fixed
Parity	Selected from ODD, EVEN or NONE
Stop bit	Selected from 1 or 2
Insulation	Insulated from internal circuits
Error detection	CRC-16
Time interval of data	To be 24 bit time or less
Communication cable	PDZK***1 (Note 1)

Note 1: *** is the number determined by distance of communication cable.

2.2.2 Wiring method

Here, the method of connecting the master unit to CC-M is explained. Fig. 2-3 shows an overall system configuration, Fig. 2-4 shows the terminal block of CC-M, Fig. 2-5 shows connections of CC-M terminals, and Fig. 2-6 shows connection of terminating resistor.

(1) System congiguration



<Image diagram>

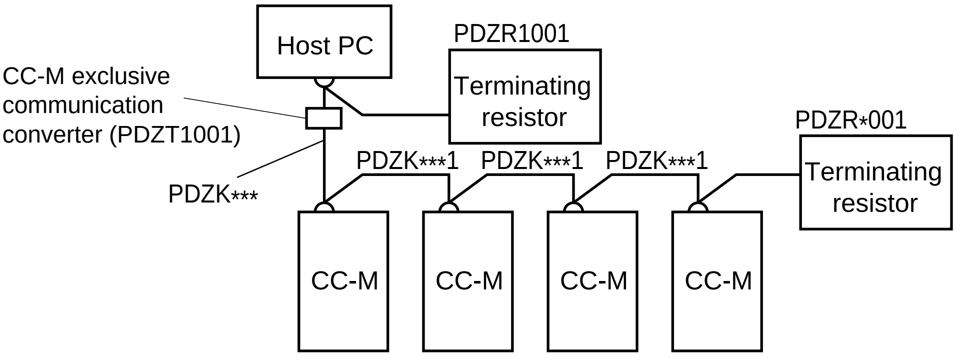
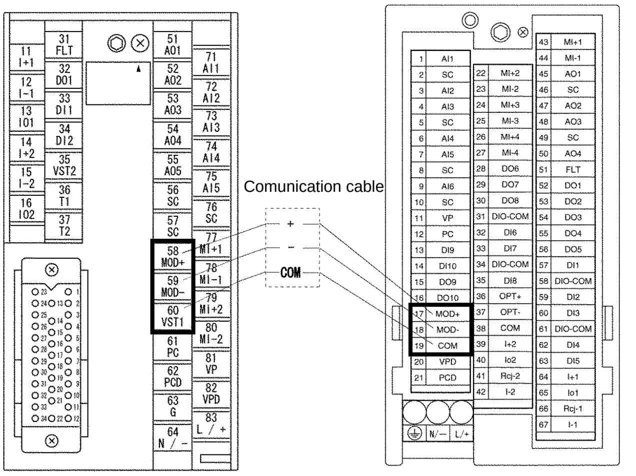


Fig. 2-3 Overall system configuration

(2) Connection of CC-M terminals

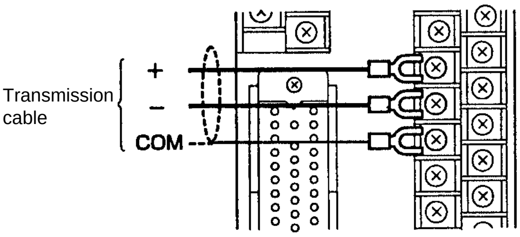


Screw terminal type   Compression terminal type

Fig. 2-4 CC-M terminal block

Screw terminal

Connect transmission cables to host communication terminal MoD+ (Terminal No. 58), Mod– (Terminal No. 59) and host communication cable shield VST1 (Terminal No. 60).



Compression terminal

Connect transmission cables to host communication terminal MoD+ (Terminal No. 17), MoD– (Terminal No. 18) and host communication cable shield COM (Terminal No. 19).

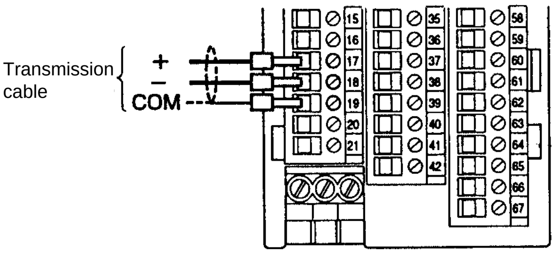


Fig. 2-5 Connection of CC-M terminals

(3) Terminating resistor

Table 2-1 terminating resistor

Item	Type
Terminating resistor, screw terminal	PDZR1001
Terminating resistor, compresion terminal	PDZR2001

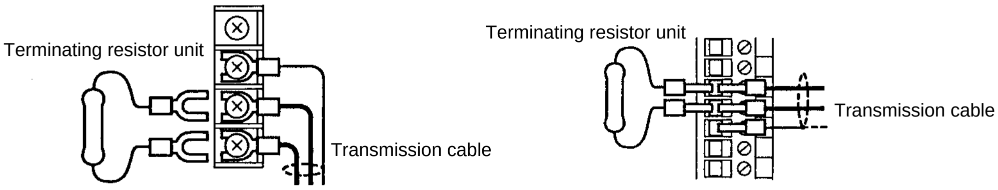


Fig. 2-6 Connection of terminating resistor

Note 1 Use the terminating resistor shown in Table 2-1.

Note 2 Connect terminating resistor to both ends of communication cable.

2.2.3 Frame configuration

Function codes supporting basic frame

Configuration

7 0 bit

Slave address	
Function code	
≈ Data ≈	Data 255 words, Max.
CRC- 1 6 (Hi)	
CRC- 1 6 (Lo)	

Supporting function code

Function code (decimal)	Meaning	Remarks
1	N-bits Output data read-out	For area of address : 00001 to 01728
2	N-bits Input data read-out	For area of address : 10001 to10800
3	N-words Output data read-out	For area of address : 40001 to 40808
4	N-words Input data read-out	For area of address : 30001 to 30067
5	1-bit Output data write-in	For area of address : 00001 to 01728
6	1-word Output data write-in	For area of address : 40001 to 40808
15	N-bits Output data write-in	For area of address : 00001 to 01728
16	N-words Output data write-in	For area of address : 40001 to 40808
17	File transfer command write-in	For file access procedure
18	File transfer read-out	

2.2.4 CC-M response

(1) General

When a communication command is received from the master unit, CC-M takes it in the receiving buffer for error check. When the result of check is normal, the data of the communication command is executed and the normal communication command is returned to the master unit.

Conversely, when the result is abnormal, the data of the command is not accepted and the abnormal communication command is returned to the master unit.

(2) Response at normal command

When the communication command from the master unit is error checked and its result is normal, the communication command corresponding to each function code is transmitted to the master unit. The data of communication command that responds to the master unit is different according to the data of communication command from the master unit.

(3) Response at abnormal command

When the communication command from the master unit is error checked and its result is abnormal (logical error), a communication command as shown in the frame of Fig. 2-7 is transmitted to the master unit.

The response message consists of CC-M station No., function code, error code and error check. On the function code, "l" is given on MSB.

7 0 bit

CC-M station No	
1	Function code
Error code (see Table 2-2)	
CRC-16	

Fig. 2-7 Communication frame at abnormal response

Table 2-2 List of error codes

Error code	Contents
02	Data read-out/write-in address error (outside of range)
03	Data read-out/write-in data No. error (outside of range)

(4) No response

When CC-M comes under any of the following items, no response is obtained.

1) Communication parameters such as baud rate, parity, stop bit, etc. are different.
2) Station No. differs from the set value.
3) Communication command from master unit is not transmitted correctly to CC-M because of external noise, etc.

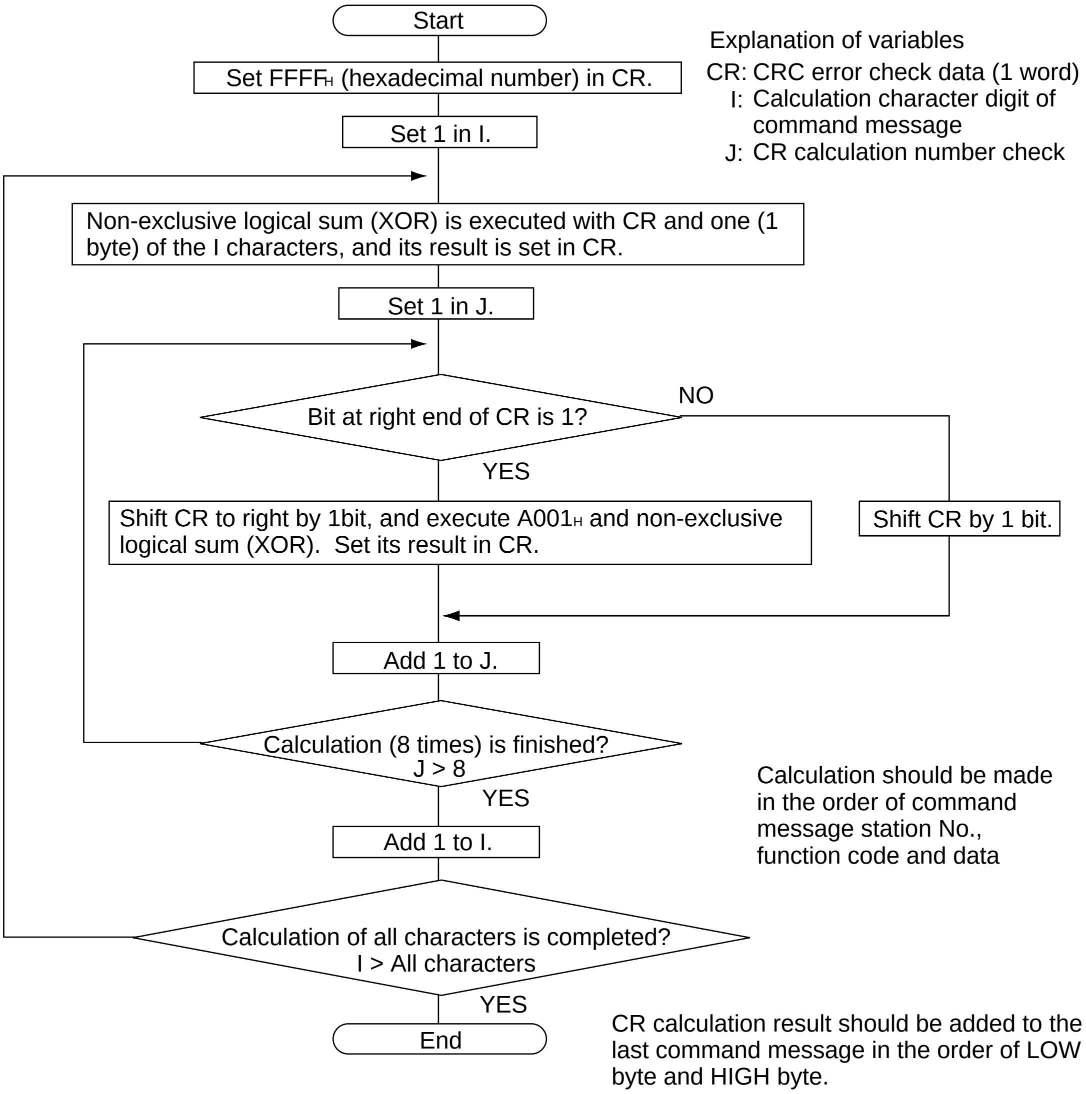
Response from CC-M is normally transmitted in about 200 ms. When communication response does not return within this time, the communication response from the master unit should be transmitted (retry) again.

2.3 Communication function

2.3.1 CRC- 16

The following explains calculation methods of CRC-16.

(1) Flow chart of CRC calculation and examples of calculation



CRC calculation flow chart

2.3.2 Function code

Here, the function codes supported by CC-M are explained in detail.

2.3.2.1 MODBUS function code

Of the generally used function codes based on MODBUS protocol, the 10 kinds shown in the following table are supported.

Table 2-3 Construction of Messsage

Function code (Decimal)	Meaning	Max. data by 1message	Contents of commeand message	Contents of response message
1	Output data read-out	2000 bits	See table below.	See table below.
2	Input data read-out	2000 bits		
3	Output data read-out	125 words		
4	Input data read-out	125 words		
5	Output data write-in	1 bit		
6	Output data write-in	1 word		
15	Output data write-in	1968 bits		
16	Output data write-in	123 words		

Function code (Decimal)	Contents of command message (byte)							Contents of respoinse message (byte)					
	Sta-tion No.	Func-tion code	Data				CRC	Sta-tion No.	Func-tion code	Data			CRC
1	(1)	(1)	Start address (2)	Qantity (2)			(2)	(1)	(1)	Bytes of data (1)	Bit data 1 to 2000 bits		(2)
2	(1)	(1)	Start address (2)	Qantity (2)			(2)	(1)	(1)	Bytes of data (1)	Bit data 1 to 2000 bits		(2)
3	(1)	(1)	Start address (2)	Qantity (2)			(2)	(1)	(1)	Bytes of data (1)	Word data 1 to 125 words		(2)
4	(1)	(1)	Start address (2)	Qantity (2)			(2)	(1)	(1)	Bytes of data (1)	Word data 1 to 125 words		(2)
5	(1)	(1)	Designate address (2)	Designate state (1) Bit ON : FF hex Bit OFF : 00 hex	Fixed value (1) 00 hex		(2)	(1)	(1)	Designate address (2)	Designate state (1) Bit ON : FF hex Bit OFF : 00 hex	Fixed value (1) 00 hex	(2)
6	(1)	(1)	Designate address (2)	Write data (2)			(2)	(1)	(1)	Designate address (2)	Write data (2)		(2)
15	(1)	(1)	Start address (2)	Qantity (2)	Bytes of data (1)	Write data 1 to 1968 bits	(2)	(1)	(1)	Start address (2)	Qantity (2)		(2)
16	(1)	(1)	Start address (2)	Qantity (2)	Bytes of data (1)	Write data (1 to 123)	(2)	(1)	(1)	Start address (2)	Qantity (2)		(2)

(1) Output bit data read-out

Function code	Max. bit number read-out in 1 message	Output bit data area
01	2000 bits	00001 to 01728

① Message composition

Command message composition (byte)

Station No.	
Function code : 01_H	
Read-out start No.	Hi
	Lo
Read-out bit number	Hi
	Lo
CRC data	Hi
	Lo

Read-out bit number: } 0 to 2000

Normal response message composition (byte)

Station No.	
Function code : 01_H	
Read-out byte number	
Initial 8-bit condition	
Next 8-bit condition	
~	~
Last 8-bit condition	
CRC data	Hi
	Lo

Read-out byte number: } Integral number of $\left[\frac{N+7}{8}\right]$

N: Read-out bit number

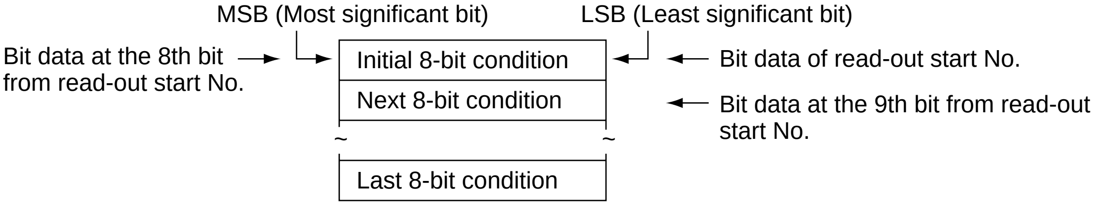
Abnormal response message composition (byte)

Station No.	
Function code : 81_H + 80_H	
Error code : 02_H or 03_H	
CRC data	Hi
	Lo

Error code

02_H	Illegal address
03_H	Illegal bit length

- Read-out bit data row



② Function

Bit data with consecutive read-out bit number can be read from read-out start No.

Slave unit transmits read-out bit data arranged in the order of 8-bit base. When the read-out bit data number is not a multiple of 8, all the bits (MSB side) independent of the last 8-bit condition becomes "0".

③ Example of message transmission

The following shows an example of reading the contents of Loop1-secondary “SCC-M-REQ” and “R-REQ” bit from station No. l slave.

Loop1-secondary “SCC M-REQ” bit address : 00031 Read-out data: 02_H
Loop1-secondary “R-REQ” bit address : 00032

Command message composition (byte)

Station No.		01_H
Function code		01_H
Read-out start No.	Hi	00_H
	Lo	$1E_H$
Read-out bit number	Hi	00_H
	Lo	02_H
CRC data	Hi	DD_H
	Lo	CD_H

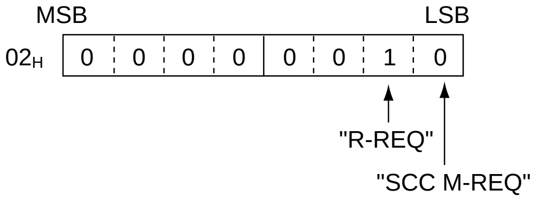
Start No. : 0031－1

Response message composition (byte)

Station No.		01_H
Function code		01_H
Read-out byte number		01_H
8-bit condition		02_H
CRC data	Hi	$D0_H$
	Lo	49_H

- Data number

Read 8-bit data condition



(2) Input bit data

Function code	Max. bit number read-out in 1 message	Output bit data area
02	2000 bits	10001 to 10800

① Message composition

Command message composition (byte)

Station No.		
Function code: 02_{H}		
Read start address (relative)	Hi	
	Lo	
Read bit number	Hi	1 to 2000
	Lo	
CRC data	Hi	
	Lo	

Normal response message composition (byte)

Station No.		
Function code: 02_{H}		
Read byte number		Integer of $\left(\frac{N+7}{8}\right)$ N: Read bit number
State of the first 8 bits		
State of the next 8 bits		
~		
State of the last 8 bits		
CRC data	Hi	
	Lo	

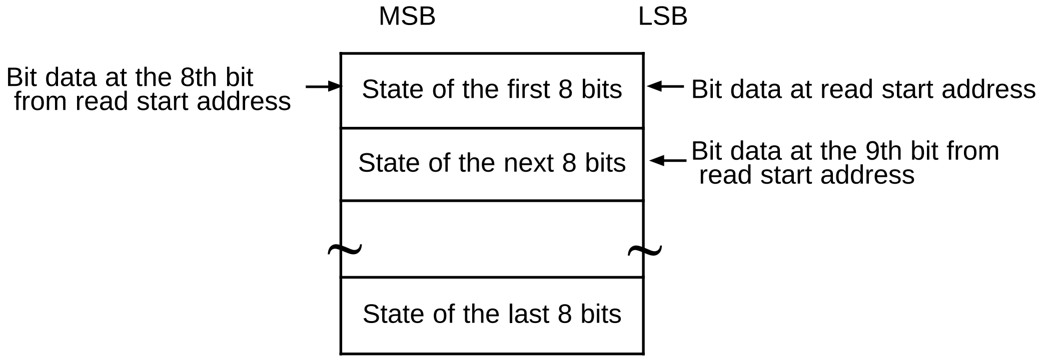
Abnormal response message composition (byte)

Station No.	
Function code : 80_{H} + 82_{H}	
Error code : 02_{H} or 03_{H}	
CRC data	Hi
	Lo

Error code

02H	Illegal address
03H	Illegal bit length

Arrangement of read bit number



② Function explanations

Bit data of continuous bit numbers can be read from read start address. Read bit data are arranged in 8-bit unit and transmitted from slave station. When read bit data number is not a multiple of 8, all the bits (MSB side) not related with the state of the last 8 bits will become “0”.

(3) Output word data read-out

Function code	Max. bit number read-out in 1 message	Output bit data area
03	125 words	40001 to 40808

① Message composition

Command message composition (byte)

Station No.		
Function code : 03_H		
Read start address	Hi	
	Lo	
Read word number	Hi	}1 to 125
	Lo	
CRC data	Hi	
	Lo	

Normal response message composition (byte)

Station No.		
Function code : 03_H		
Read byte number		} Read word number x 2
Initial word data	Hi	
	Lo	
Next word data	Hi	
	Lo	
~	~	
Last word data	Hi	
	Lo	
CRC data	Hi	
	Lo	

Abnormal response message composition (byte)

Station No.	
Function code : 80_H + 83_H	
Error code : 02_H or 03_H	
CRC data	Hi
	Lo

Error code

02_H	Illegal address
03_H	Illegal word length

- Read-out word data row

MSB	LSB
Upper byte of initial word data	
Lower byte of initial word data	
Upper byte of next word data	
Lower byte of next word data	
~	~
Upper byte of last word data	
Lower byte of last word data	

② Function

Word data with consecutive word number can be read from read-out start No. The slave unit transmits read-out word data in the order of upper byte and lower byte.

③ Example of message transmission

The following shows an example of reading Constant (CON 1 and CON 2) values of Loop 1 from the station No. 2 slave.

Constant (CON 1) values od Loop 1 address : 40001

Command message composition (byte)

Station No.		02_H
Function code		03_H
Read-out start No.	Hi	00_H
	Lo	00_H
Read-out word number	Hi	00_H
	Lo	02_H
CRC data	Hi	$C4_H$
	Lo	38_H

Start No. 0001－1

Response message composition (byte)

Station No.		02_H
Function code		03_H
Read-out byte number		04_H
Initial word data	Hi	00_H
	Lo	00_H
Next word data	Hi	03_H
	Lo	$E8_H$
CRC data	Hi	$C9_H$
	Lo	$8D_H$

- Meaning of read-out data

CON 1 of Loop 1 (initial word data) 00 00_H = 0.00%

CON 2 of Loop 1 (initial word data) 03 $E8_H$ = 10.00%

(4) Input word data read

Function code	Max. word number read-out in 1 message	Output word data area
04	125 words	30001 to 30067

① Message composition

Command message composition (byte)

Station No.		
Function code : 04_H		
Read start address	Hi	
	Lo	
Read word number	Hi	1 to 125
	Lo	
CRC data	Hi	
	Lo	

Normal response message composition (byte)

Station No.		
Function code : 04_H		
Read byte number		Read word number x 2
Contents of the first word data	Hi	
	Lo	
Contents of the next word data	Hi	
	Lo	
~	~	
Contents of the last word data	Hi	
	Lo	
CRC data	Hi	
	Lo	

Abnormal response message composition (byte)

Station No.	
Function code : 80_H + 84_H	
Error code : 02_H or 03_H	
CRC data	Hi
	Lo

Error code

02_H	Illegal address
03_H	Illegal word length

- Read word data arrangement

MSB LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
~
Upper byte of contents of the last word data
Lower byte of contents of the last word data

② Function

Word data with consecutive word number can be read from read-out start No. The slave unit transmits read-out word data in the order of upper byte and lower byte.

(5) Output bit data write-in, l bit

Function code	Max. bit number written in 1 message	Output bit data area
05	1 bit	00001 to 01728

① **Message composition**

Command message composition (byte)

Station No.		
Function code : 05$_H$		
Write-in designation No.	Hi	
	Lo	
Write-in designation status	Hi	0000$_H$: OFF FF00$_H$: ON
	Lo	
CRC data	Hi	
	Lo	

Normal response message composition (byte)

Station No.	
Function code : 05$_H$	
Write-in designation No.	Hi
	Lo
Write-in designation status	Hi
	Lo
CRC data	Hi
	Lo

Abnormal response message composition (byte)

Station No.	
Function code : 80$_H$ + 85$_H$	
Error code : 02$_H$	
CRC data	Hi
	Lo

Error code

02$_H$	Illegal address

② **Function**

Data of "0" or "1" can be written in the write-in designation No. bit. When "0" is written, data of "0000$_H$" is transmitted, and when "1" is written, data of "FFOO$_H$" is transmitted.

(6) Output word data write, 1 word

Function code	Max. word number written in one message	Output word data area
06	1 words	40001 to 40808

① Message composition

Command message composition (byte)

Station No.	
Function code : 06$_H$	
Write designate address	Hi
	Lo
Write word data	Hi
	Lo
CRC data	Hi
	Lo

Normal response message composition (byte)

Station No.	
Function code : 06$_H$	
Write designate address	Hi
	Lo
Write word data	Hi
	Lo
CRC data	Hi
	Lo

Abnormal response message composition (byte)

Station No.	
Function code : 80$_H$ + 86$_H$	
Error code : 02$_H$	
CRC data	Hi
	Lo

Error code

02$_H$	Illegal address

② Function explanations

Designated data can be written in the word data of write designate address. Write data are transmitted from master station in the order of upper and lower bytes.

(7) Output bit data write, continuous bit

Function code	Max. bit number read in 1 message	Output bit data area
15	1968 bit	00001 to 01728

① **Message composition**

Command message composition (byte)

Station No.		
Function code : $0F_H$		
Write start address	Hi	
	Lo	
Write bit number	Hi	1 to 1968
	Lo	
Write byte number		Inter of $\left(\frac{N+7}{8}\right)$ N: Write bit number
First 8 bits write data		
Next 8 bits write data		
Last 8 bits write data		
CRC data	Hi	
	Lo	

Normal response message composition (byte)

Station No.	
Function code : $0F_H$	
Write start address	Hi
	Lo
Write bit number	Hi
	Lo
CRC data	Hi
	Lo

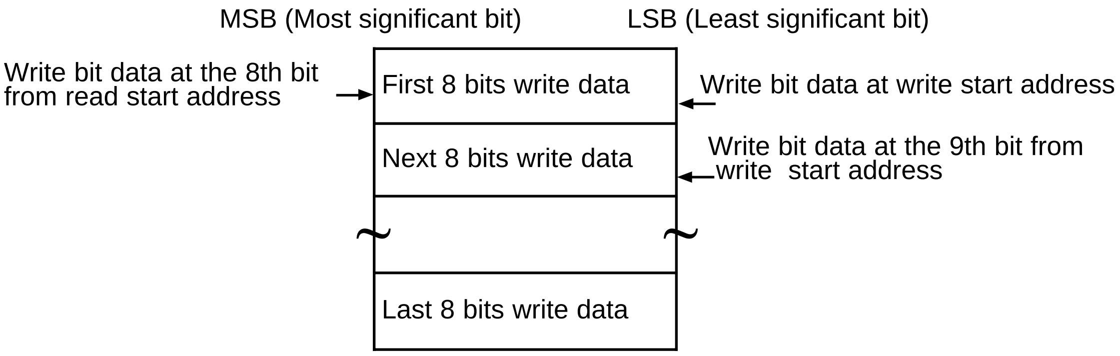
Abnormal response message composition (byte)

Station No.	
Function code : + 80_H : $8F_H$	
Error code : 02_H or 03_H	
CRC data	Hi
	Lo

Error code

02H	Illegal address
03H	Illegal bit length

*Arrangement of write bit number



② **Function explanations**

Bit data of continuous write bits can be written from write start address. Bit data are arranged in the order of 8-bit unit and transmitted from master station.

(8) Output word data write, continuous word

Function code	Max. bit number written in one message	Output word data area
16	123 words	40001 to 40808

① **Message composition**

Command message composition (byte)

Station No.		
Function code : 10H		
Write start address	Hi	
	Lo	
Write word number	Hi	1 to 123
	Lo	
Write byte number		Write word number × 2
First write word data	Hi	
	Lo	
Next write word data	Hi	
	Lo	
~	~	
Last write word data	Hi	
	Lo	
CRC data	Hi	
	Lo	

Normal response message composition (byte)

Station No.	
Function code : 10H	
Write start address	Hi
	Lo
Write word number	Hi
	Lo
CRC data	Hi
	Lo

Abnormal response message composition (byte)

Station No.	
Function code + 80H : 90H	
Error code : 02H or 03H	
CRC data	Hi
	Lo

Error code

02H	Illegal address
03H	Illegal word length

*Arrangement of write word data

MSB LSB

Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
~
Upper byte of contents of the last word data
Lower byte of contents of the last word data

② **Function explanations**

Word data of continuous write word number can be written from write start No. Word data are transmitted from master station in the order of upper and lower bytes.

2.3.3.2 File transfer function code

As the MODBUS protocol regulates basic service only , it is expanded by specific function codes given from each maker. The following items are available by using the function codes explained below.

- Binary file down-load
- Binary file up-load

Procedure

First select the name of file (remote file) in CCM, then select base address (OFFSET from file head) to request read-out (function code l8) /write-in (function code l7).

Function code 17 and 18 examples are explained in the following “item (1)Data write- in and item (2) Data read-in”.

(1) Data write-in

Function code	Max. bit number written in 1 message
17	123 words

① **Message composition**

Command message composition (byte)

Station No.	
Function code : 11_H	
Write-in address	Hi
	Lo
00	
Write-in data number (byte)	
Write-in data number (byte)	
Write-in data	Hi
	Lo
	⋮
CRC-16	Hi
	Lo

Response message composition (byte)

Station No.	
Function code : 11_H	
Write-in address	Hi
	Lo
00	
Write-in data number (byte)	
CRC-16	Hi
	Lo

② **Function**

Write-in data is written in previously designated remote file at the position designated by write-in address.

③ **Example of message transmission**

Write 100.00 and -0.01 in the constant No. 1 and No. 2 respectively. CC-M station No. is 1.

Command message composition (byte)

Station No.	01_H
Function code	11_H
Write-in address	00_H
	00_H
00	00_H
Write-in data number	04_H
Write-in data number	04_H
Write-in data	10_H
	27_H
	FF_H
	FF_H
CRC-16	17_H
	77_H

Response message composition (byte)

Station No.	01_H
Function code	11_H
Write-in address	00_H
	00_H
00	00_H
Write-in data number	04_H
CRC-16	FC_H
	$0A_H$

(2) Data read-in

Function code	Max. bit number read in 1 message
18	125 words

① Message composition

Command message composition (byte)

Station No.	
Function code : 12_H	
Read-in address	Hi
	Lo
00	
Read-in data number (byte)	
CRC-16	Hi
	Lo

Response message composition (byte)

Station No.		
Function code : 12_H		
Read-in address	Hi	
	Lo	
Read-in data	Hi	Head data
	Lo	
	⋮	
CRC-16	Hi	
	Lo	

② Function

Read-in data is written in previously designated remote file at the position designated by read-in address.

③ Example of message transmission

100. 00 and -0. 01 are set in the constant No. 1 and No. 2, respectively, for reading the values of No. 1 and No. 2. CC-M station No. is 1.

Command message composition (byte)

Station No.	01_H
Function code	12_H
Read-in address	00_H
	00_H
00	00_H
Read-in data number	04_H
	$B8_H$
CRC-16	$0A_H$

Response message composition (byte)

Station No.	01_H
Function code	12_H
Read-in data number	04_H
Read-in data	10_H
	27_H
	FF_H
	FF_H
CRC-16	$4C_H$
	09_H

2.4 Example of application: CC-M constant read-in/write-in

Remote file name: Selection of "CONSTANT"

Question	01	11	F0	00	00	09	09	43	4F	4E	53	54	41	4E	54	00	18	2C

Answer	01	11	F0	00	00	09	0E	CF

Selection of base address "0000H "

Question	01	11	F0	02	00	04	04	00	00	00	00	27	D1

Answer	01	11	F0	02	00	04	6E	CA

4-byte write-in: Loop 1 constant No. 3 write-in, CON03=100. 00 write-in

Question	01	11	00	04	00	02	02	10	27	2B	86

Answer	01	11	00	04	00	02	3D	C9

4-byte read-out: Loop 1 constant No. 3 read-out, CON03=100. 00

Question	01	12	00	04	00	02	79	C9

Answer	01	12	02	10	27	F0	A2

Note 1 Question: Master unit → CC-M
Answer: CC-M → Master unit
Note 2 CC-M unit station No.: 1

2.5 Sample program

The following shows a sample program of Modbus communication functions. This sample can be used for reference of user’s applications.

```
’  Modbus transmission sample program for Compact Controller M; prepared on August 10, 1999.
’
’  This sample program has been prepared according to Visual Basic 5.0 of Microsoft Corp.
’  This sample program is attached to Visual Basic 5.0.
’ Communication control (MS Comm control) is used.
’
’ Explanation of program operation
’ CONSTANT (CON1) is read from CC-M (station No.1) and is displayed on dialogue.
’ Communication setting: COM1, 19200bps, Odd, 1Stop.
’
’
’ Caution on handling this sample program (this must be read without fail)
’
’ This sample program is offered for reference to development of user’s communication applica-
   tions.  Fuji does not guarantee the operation with the communications.
’ When any damage or loss arises with the user or a third party through use or application of this
   sample program, Fuji is not responsible for such a damage or loss.
’ This sample program must be used under user’s responsibility.
’ Fuji does not support any inquiry about this sample program.
’ It should be noted that Fuji will not accept inquiries about the program when received.
’ Distribution and sales of this program without permission are strictly prohibited.
’ When the above items cannot be agreed, reference and use of this program are not allowed to
   users.
’ When this program is used for reference, it is regarded that the above items have been agreed.
```

```
Private Sub Form_Load ( )

        '  Variables declaration
***************************************************************************************
        Dim Txdat (255) As Byte                  ' For storage of send data
        Dim Txbuff (0) As Byte                   ' Send data buffer
        Dim Ansdat ( ) As Byte                   ' For storage of response data
        Dim Rxbuff As Variant                    ' Receive data buffer


        '  Communication counter initialize
***************************************************************************************
        Send = 0                                 ' Number of send communications
        Noans = 0                                ' No response
        CRCErr = 0                               ' CRC error

        '  Communication port setting
***************************************************************************************
        Comm_port = 1                            ' Transmission port = COM1
        Comm_speed = “19200”                     ' Transmission speed = 19200bps
        PauseTime = 0.5                          ' Setting of waiting time (0.5sec)
                                                 ' Required waiting time varies with transmission
                                                   speed and transmission frame length.

        '  Communication port opening
***************************************************************************************
        MSComm1.CommPort = Comm_port             ' COM port setting
        MSComm1.Settings = Comm_speed &”,O,8,1”  ' Speed / Odd Party / Stop-1bit setting
        MSComm1.PortOpen = True                  ' Port open

        '  Setting of station No. of communication party
***************************************************************************************
        Stno = 1                                 ' Communication station No. = 1

        '  Send of file name to CC-M
***************************************************************************************
        ' Display of file name send message
        MsgBox “File name is sent ! (CONSTANT)”

        '  Send and setting of access file name (“CONSTANT”)
        Txdat (0) = Stno                         ' Station No.
        Txdat (1) = &H11                         ' cmd1
        Txdat (2) = &HF0                         ' cmd2
        Txdat (3) = &H0                          ' cmd3
        Txdat (4) = &H0                          ' cmd4
        Txdat (5) = &H9                          ' nbb
        Txdat (6) = &H9                          ' nbb
        Txdat (7) = &H43                         ' C
        Txdat (8) = &H4F                         ' O
        Txdat (9) = &H4E                         ' N
        Txdat (10) = &H53                        ' S
        Txdat (11) = &H54                        ' T
        Txdat (12) = &H41                        ' A
        Txdat (13) = &H4E                        ' N
        Txdat (14) = &H54                        ' T
        Txdat (15) = &H0                         ' Null character
```

```
'   Preparation of send data CRC
Txsu = 15                                        ' Number of send data
GoSub 1000                                       ' CRC calculation
Txdat(Txsu + 1) = CRC1                           '
Txdat(Txsu + 2) = CRC2                           '

'   Send of prepared file name data
For I = 0 to (Txsu + 2) Step 1
    Txbuff(0) = Txdat(I)                         ' Data is set in send buffer.
    MSComm1.Output = Txbuff                      ' 1 byte is sent.
Next I

'   Waiting until all response data are received from CC-M
Start = Timer                                    ' Waiting start time is recorded
Do While Timer < Start + PauseTime               ' Setting time is terminated?
    DoEvents                                     ' Transfer of control to another process
Loop

'   CC-M response data taken in byte array
MSComm1.InputMode = comInputModeBinary           ' Binary mode designation
length = MSComm1.InBufferCount                   ' Acquisition of receive data byte number
MSComm1.InputLen = 0                             ' Designation of all data acquisition
Rxbuff = MSComm1.Input                           ' Receive data are taken in receive buffer.
Ansdat = Rxbuff                                  ' Substitution of receive data for byte array

'   CRC calculation of receive data
Ansu = length - 3                                ' Receive data length
GoSub 2000                                       ' CRC calculation

'   Error check
If (length = 0) Then                             ' No response?
    Noans = Noans + 1                            '
ElseIf ((Ansdat(length - 2) < > CRC1) + (Ansdat(length - 1) < > CRC2)) Then ' CRC error?
    CRCErr = CRCErr + 1                          '
Else                                             ' Normal communication !
    Send = Send +1                               '
End If
```

```
’   Send of base address
***************************************************************************************************
’  Display of base address send message
MsgBox “Base address is sent ! (&H00000000)”

’   Setting of base address send data
Txdat (0) = Stno                                  ’ Station No.
Txdat (1) = &H11                                  ’ cmd1
Txdat (2) = &HF0                                  ’ cmd2
Txdat (3) = &H2                                   ’ cmd3
Txdat (4) = &H0                                   ’ cmd4
Txdat (5) = &H4                                   ’ nbb (4, fixed)
Txdat (6) = &H4                                   ’ nbb (4, fixed)
Txdat (7) = &H0                                   ’ Base HH
Txdat (8) = &0                                    ’ Base H
Txdat (9) = &0                                    ’ Base L
Txdat (10) = &0                                   ’ Base LL
’   Preparation of send data CRC
Txsu = 10                                         ’ Send data number
GoSub 1000                                        ’ CRC calculation
Txdat(Txsu + 1) = CRC1                            ’
Txdat(Txsu + 2) = CRC2                            ’

’   Data send
For I = 0 to (Txsu + 2) Step 1
    Txbuff(0) = Txdat(I)                          ’ Setting of data in send buffer
    MSComm1.Output = Txbuff                       ’ Send of 1byte
Next I

’   Waiting until all response data are received from CC-M
Start = Timer                                     ’ Waiting start time is recorded.
Do While Timer < Start + PauseTime                ’ Setting time is terminated?
    DoEvents                                      ’ Transfer of control to another process
Loop

’   CC-M response data taken in byte array
MSComm1.InputMode = comInputModeBinary            ’ Binary mode designation
length = MSComm1.InBufferCount                    ’ Acquisition of receive data byte number
MSComm1.InputLen = 0                              ’ Designation of all data acquisition
Rxbuff = MSComm1.Input                            ’ Receive data are taken in receive buffer.
Ansdat = Rxbuff                                   ’ Substitution of receive data for byte array

’   CRC calculation of receive data
Ansu = length - 3                                 ’ Receive data length
GoSub 2000                                        ’ CRC calculation

’   Error check
If (length = 0) Then                              ’ No response?
    Noans = Noans + 1                             ’
ElseIf ((Ansdat(length - 2) < > CRC1) + (Ansdat(length - 1) < > CRC2))  Then        ’ CRC error?
    CRCErr = CRCErr + 1                           ’
Else                                              ’ Normal communication !
    Send = Send +1                                ’
End If
```

```
    '  CON1 data readout
**********************************************************************************
    '  Display of CC-M send message
    MsgBox “CON1 data readout !”

    '  Polling of CONSTANT
    Txdat (0) = Stno                              ' Station No.
    Txdat (1) = &H12                              ' cmd1
    Txdat (2) = &H0                               ' addH
    Txdat (3) = &H0                               ' addL
    Txdat (4) = &H0                               ' “00” fixed
    Txdat (5) = &H2                               ' Readout data length
    '  Preparation of send data CRC
    Txsu = 5                                      ' Send data number
    GoSub 1000                                    ' CRC calculation
    Txdat(Txsu + 1) = CRC1                        '
    Txdat(Txsu + 2) = CRC2                        '

    '  Byte data (13 bytes) send
    For I = 0 to (Txsu + 2) Step 1
        Txbuff(0) = Txdat(I)                      ' Setting of data in send buffer
        MSComm1.Output = Txbuff                   ' 1 byte is sent.
    Next I

    '  Waiting until all response data are received from CC-M
    Start = Timer                                 ' Waiting start time is recorded.
    Do While Timer < Start + PauseTime            ' Setting time is terminated?
        DoEvents                                  ' Transfer of control to another process
    Loop

    '  CC-M response data taken in byte array
    MSComm1.InputMode = comInputModeBinary        ' Binary mode designation
    length = MSComm1.InBufferCount                ' Acquisition of receive data byte number
    MSComm1.InputLen = 0                          ' Designation of all data acquisition
    Rxbuff = MSComm1.Input                        ' Receive data are taken in receive buffer.
    Ansdat = Rxbuff                               ' Substitution of receive data for byte array

    '  CRC calculation of receive data
    Ansu = length - 3                             ' Receive data length
    GoSub 2000                                    ' CRC calculation

    '  Error check
    If (length = 0) Then                          ' No response?
        Noans = Noans + 1                         '
    ElseIf ((Ansdat(length - 2) < > CRC1) + (Ansdat(length - 1) < > CRC2))      Then  ' CRC error?
        CRCErr = CRCErr + 1 : MsgBox “CRCErr!” : End  '
    Else                                          ' Normal communication !
        Send = Send +1                            '
    End If

    Con1 = (Ansdat(4) * 256 + Ansdat(3)) / 100
    A$ = “CON1” = “& Str(Con1) & “%”
    MsgBox A$

    '  Closing of serial port
    MSComm1.PortOpen = False                      ' Port closed

    End
```

```
     '
***************************************************************************************
     1000     ' CRC calculation sub-routine IN:Txdat(Txsu) / OUT CRC1,CRC2
***************************************************************************************
          CRC = &HFFFF
          For I = 0 To Txsu Step 1
               CRC = CRC Xor Txdat(I)
               For J = 1 To 8 Step 1
                    CT = CRC And &H1
                    If CRC < 0 Then CH = 1 Else: CH = 0: GoTo 1100
                    CRC = CRC And &H7FFF
     1100           CRC = Int(CRC / 2)
                    If CH = 1 Then CRC = CRC 0r &H4000
                    If CT = 1 Then CRC = CRC Xor &HA001
               Next J
          Next I
          CRC1 = CRC And &HFF
          CRC2 = ((CRC And &HFF00) / 256 And &HFF)
          Return

     2000     ' CRC calculation sub-routine IN:Ansdat(Ansu) / OUT CRC1,CRC2
***************************************************************************************
          CRC = &HFFFF
          For I = 0 To Ansu Step 1
               CRC = CRC Xor Ansdat(I)
               For J = 1 To 8 Step 1
                    CT = CRC And &H1
                    If CRC < 0 Then CH = 1 Else: CH = 0: GoTo 2100
                    CRC = CRC And &H7FFF
     2100           CRC = Int(CRC / 2)
                    If CH = 1 Then CRC = CRC 0r &H4000
                    If CT = 1 Then CRC = CRC Xor &HA001
               Next J
          Next I
          CRC1 = CRC And &HFF
          CRC2 = ((CRC And &HFF00) / 256 And &HFF)
          Return

          End Sub
```

3. T-LINK (HOST COMMUNICATION)

3.1 System configuration

3.1.1 General

This chapter explains the T-LINK communication functions.

When the T-LINK (host) communication functions are not provided with user’s Compact Controller M (CC-M), the functions given in this chapter cannot be used. Since the setting of T-LINK host communication with the CC-M main unit is not given, the setting of communication parameters of the CC-M main unit should be referred to the instruction manual for the main unit.

In this chapter, communication specifications for T-LINK host communication functions, communication methods are explained.

(1) T-LINK (host communication) of CC-M

The word T-LINK is the name of Fuj i’s data network that is an interface of serial transmission systems capable of coupling digital devices quickly at low cost, which are installed at a number of places of operating site.

By using the T-LINK interface and by connecting Fuj i ' Programmable Controller MICREX-F, a composite control system with a sequencer, Compact Controller M, T-LINK I/O module, etc., can be constructed.

(2) Slave function

The T-LINK function of CC-M contains the T-LINK host communication function (CC-M; slave) and T-LINK slave communication function (CC-M; master). Communications with the sequencer are performed by the T-LINK host communication function explained in this chapter, while the CC-M host communication is used for I/O transmission and message transmission.

(3) T-LINK (host communication) configuration

Fig. 3-1 shows a configuration of the system utilizing T-LINK communication functions. The simplest system configuration is composed of one sequencer (master) and one CC-M (slave).

The system configuration (1: N units) is shown in Fig. 3-1.

Fig. 3-2 shows accessory devices required for T-LINK communication functions. Besides the sequencer and CC-M main unit, transmission cables (Type: PDZK ＊＊＊ 1) and terminating resistors (Type: PDZR ＊ 001) are required.

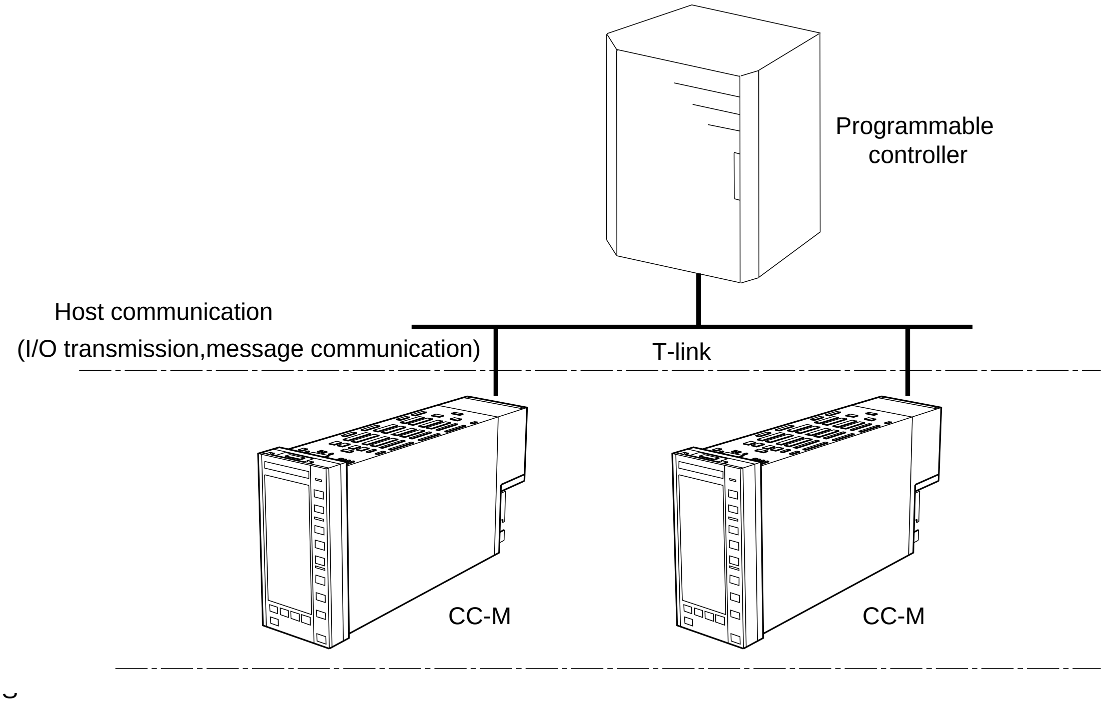


Fig. 3-1 T-LINK system configuration

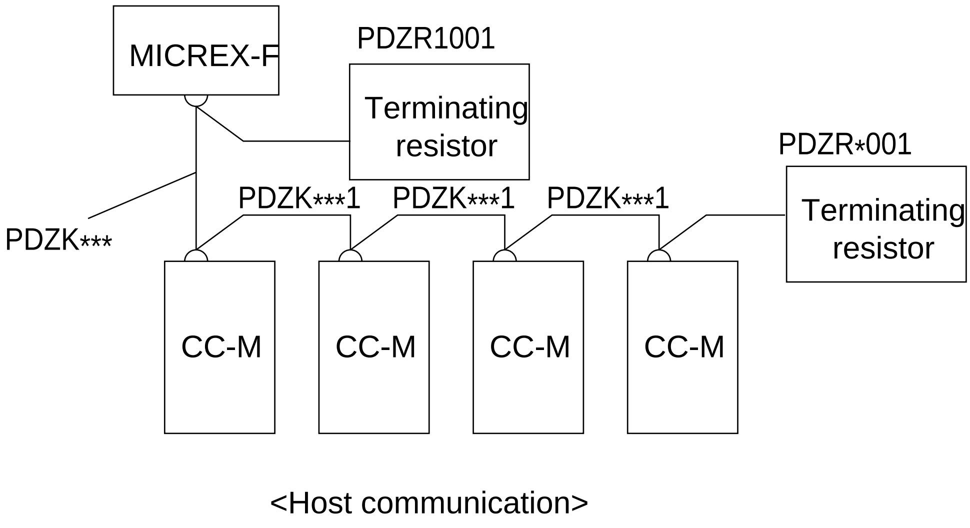


Fig. 3-2 Accessory devices

3.1.2 Features

The T-LINK system has the following features.

(1) Loop control (temperature, pressure, flow rate, etc.) and coupling of sequence

Formerly, the loop control was a controller and the sequence control was a sequencer. But, a system synchronized with loop data at the time of designing a sequence, is available through communications on Fuji's data transmission line (T-link transmission).

(2) Capability of optional system configuration

A number of types of MICREX-F, Compact Controller M, Micro-jet Recorder and display setting units are available from Fuji, providing optional system configurations on the basis of prices and functions.

(3) Unit base distribution

A number of digital and analog input/output devices such as the capsule modules of the distributed type program Controller (MICREX-F) can be connected to the same transmission line (T-link).

(4) System safety

If trouble arises with one of Compact Controller M, other Compact Controller M and I/O device are not affected by the trouble. Conversely, if trouble arises with host computers or PC processors, each Compact Controller M is able to perform control (local operation) individually, thereby ensuring completely safe operation.

(5) Easy expansion of system

The T-link uses a multi-point transmission (series connection) system, allowing the number of controllers and capsules to be increased or decreased with ease.Supposing that furnaces controlled at present have increased from 10 to 11 units and one more controller is required, it can easily be connected to T-link using a twist-pair cable.

3.2 Specifications for host communication

3.2.1 Physical specifications

The outline specifications for T-link are shown below.

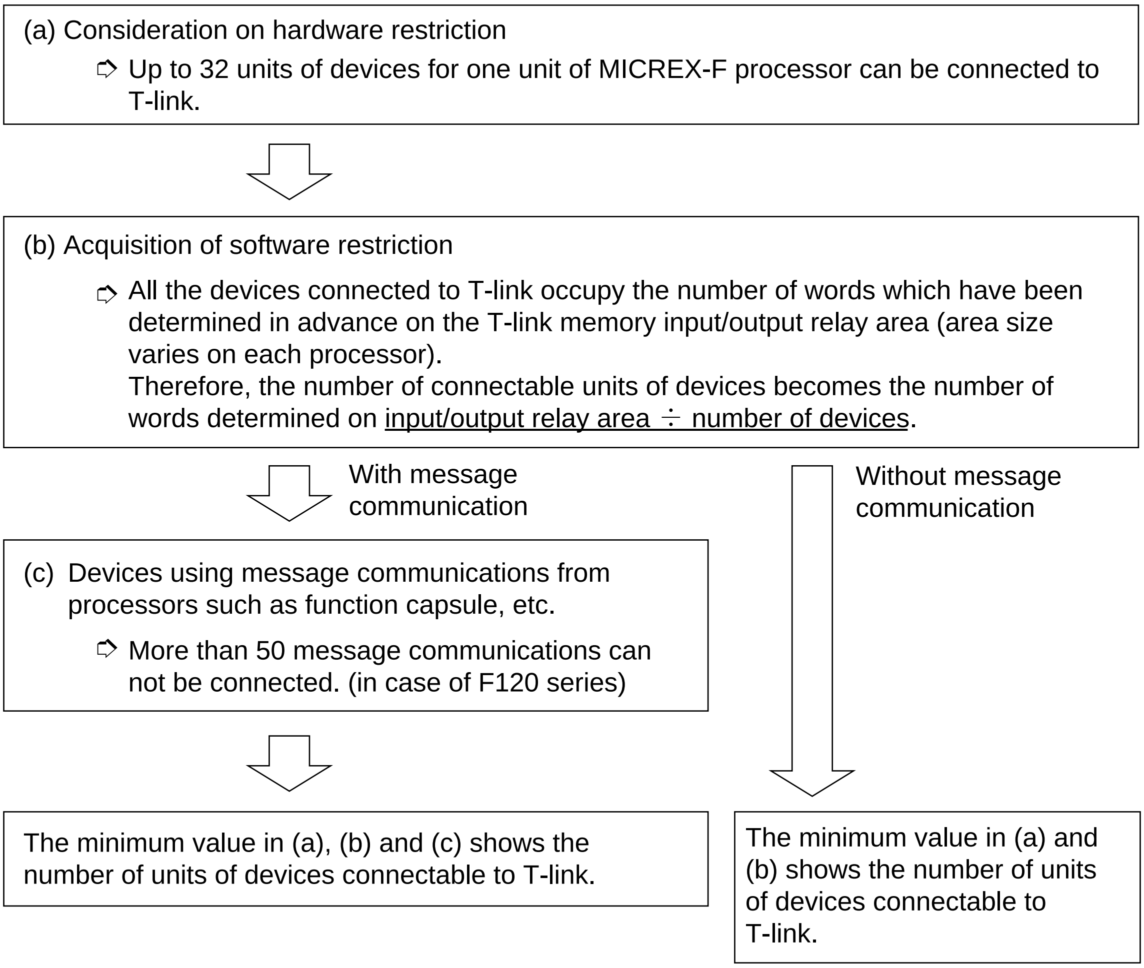
Transmission speed	500kbps			
Transmission distance (MAX.)	500m (optical adaptor can be used for extension)			
Connecting cable	Communication cable (Note 1)			
	Between screw terminal PDA and PDA	PDZK1xx1	With M3.5 crimp style teminal on both ends	1
	Between screw terminal PDA and PLC	PDZK2xx1	With M3.5 crimp style teminal on both ends	1
	Between screw terminal PDA and PC	PDZK3xx1	9-pin connector on PC side	1
	Between screw terminal PDA and PDA	PDZK4xx1	With plug-in type teminal on both ends	1
	Between screw terminal PDA and PLC	PDZK5xx1	With M3.5 crimp style teminal on PLC side	1
	Between screw terminal PDA and PC	PDZK6xx1	9-pin connector on PC side	1
	(Note 1) Transmission cable for T-link and Modbus^{R} : the cable length should be specified.			
Refresh time	10ms (at 512 points of digital input/output)			

3.2.2 Connectable devices

A group of the following devices can be connected to T-link.

- **MICREX-F**
  - Processor F-70S, F- 120S
- **Controller**
  - Compact Controller M
- **Recorder**
  - Micro-jet Recorder

3.2.3 To obtain the number of devices for connection



(a) Consideration on hardware restriction

➩ Up to 32 units of devices for one unit of MICREX-F processor can be connected to T-link.

(b) Acquisition of software restriction

➩ All the devices connected to T-link occupy the number of words which have been determined in advance on the T-link memory input/output relay area (area size varies on each processor).
Therefore, the number of connectable units of devices becomes the number of words determined on input/output relay area ÷ number of devices.

(c) Devices using message communications from processors such as function capsule, etc.

➩ More than 50 message communications can not be connected. (in case of F120 series)

The minimum value in (a), (b) and (c) shows the number of units of devices connectable to T-link.

The minimum value in (a) and (b) shows the number of units of devices connectable to T-link.

[Example 1]

Connection to MICREX-F processor (F120 series) (message communication used)

(a) Restriction on hardware:
32 units

(b) Restriction on software:
100W (input/output relay area of F120 series) ÷ 8W (occupied number of words of connectable devices) = 12 units

(c) Message communication restriction:
50 modules (number of message communication modules of F120 series) ÷ 2 modules (each of connectable devices are used for send/receive communications) = 25 units.

Therefore, the maximum number of units of connectable devices is the minimum value (12 units) in a), b) and c).

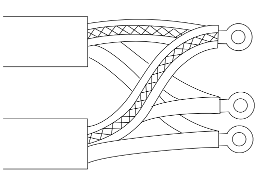
3.2.4 Wiring method

(1) Transmission cable

The twist-pair cable (Type: PDZK ∗ 001) should be treated at both ends as shown below, and connected to the T-link terminal blocks. The total length of the T-link twist-pair cable is less than 500m.

① Remove the cable sheath. ② Connect to the press-fit terminal.

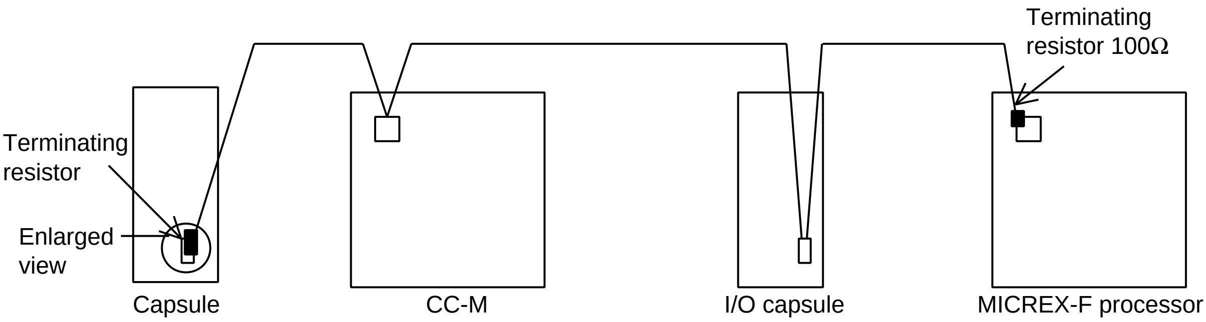
Supplement:
When wiring T-link, arrange 2 T-link cables together and connect each cable to the press-fit terminal for convenience.

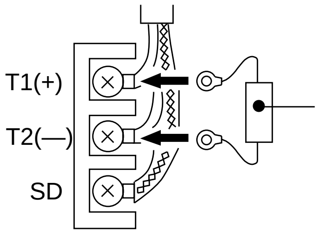


Note 1: When connecting directly to terminal block without using press-fit terminals, it will cause a poor contact which results in T-link transmission error. Be sure to use press-fit terminals.

Maker	Type
JST (Nichiatsu)	2-M3
Toei	2-3, 5, 2-4S

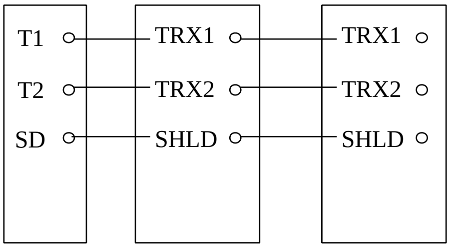
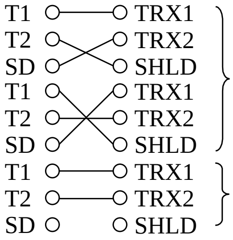
(2) Wiring





Note 1: Cables should be wired in one line.
Note 2: Both ends of T-link should be connected using the terminating resistor (100Ω) supplied with the processor. **When the cable length exceeds 500m, the waveform will be distorted due to external noise or signal attenuation, causing failure of correct transmission of signals and resulting in system down or malfunction.**
Note 3: If the transmission terminals (⊕and⊝) are shorted, the transmission circuit may be damaged.

(3) Example of incorrect wiring of T-link

	Correct	Wrong		
T1/T2 SD terminal		Example 1 Example 2 Example 3		Inner parts will not be damaged,but normal transmission cannot be made. Normal transmission cannot be made even at a short distance (without shield wire).

3.3 Communication function

3.3.1 Host communication (I/O transmission)

I/O transmission is a method of periodical transfer of data between processor and connected devices. It uses the T-link input/output relay area. The number of special words of I/O area is as follows.

Number of special words	No.	I/O transmission direction	Remark
4 words	1	Processor → CC-M	4-word input type
	2	Processor ← CC-M	4-word output type
	3	Processor ↔ CC-M	4-word input/output type
8 words	4	Processor → CC-M	8-word input type
	5	Processor ← CC-M	8-word output type
	6	Processor ↔ CC-M	4-word input/output type
16 words	7	Processor → CC-M	16-word input type
	8	Processor ← CC-M	16-word output type
	9	Processor ↔ CC-M	16-word input/output type

The number of words occupied in the I/O transmission area can be used by selecting any of the above mentioned No. 1 to 9 as set by CC-M. The input data from the processor is transferred to the T-link input terminal board in CC-M, while the data from CC-M is outputted to the processor through the CC-M T-link output wafer.

Therefore, they can be used freely by connecting the wafer of CC-M or using Software PLC function.

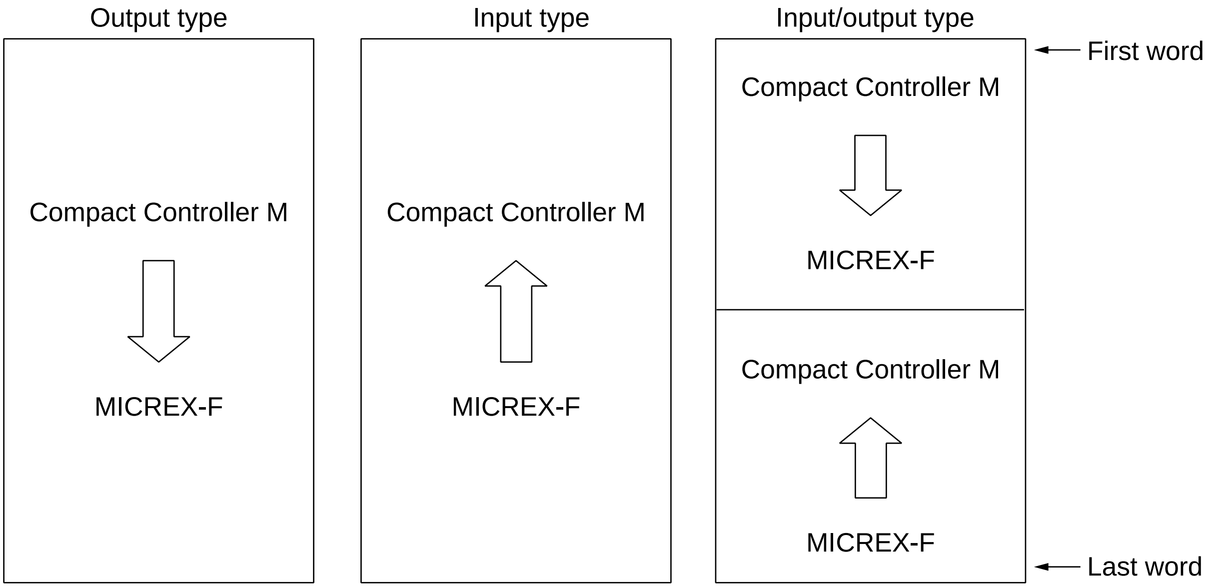


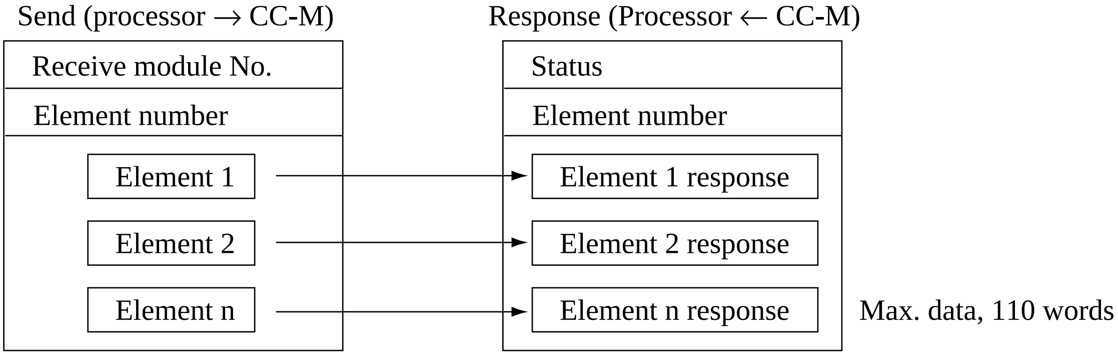
Fig. 3-3 Data format

Note) On any type of data, the internal composition of data is specified according to wafer connections.

3.3.2 Host communication (message transmission)

(1) Frame configuration

CC-M data are stocked in CC-M file which can be read for READ/WRITE with the message transmission function.



(2) Details of element

(a) File name initialize

7 0

X'11'
X'F0'
X'00'
00
nbb
nbb
F1
F2
.
.

(Send)

⇒

7 0

X'11'
X'F0'
X'00'
00
nbb
nbb

(Response)

SLV:	Slave address
nbb:	The number of characters of file name shown by vH, vL, ...are designated. When a file name is odd number, the last of the file name is X’00’, including its number.
F1, F2 ...:	File name for write-in and read-in

Note) X’ is a numeric value of Hex notation.

(b) Base address designation

7 0

X'11'
X'F0'
X'02'
00
nbb
nbb
base(HH)
base(H)
base(L)
base(LL)

(Send)

⇒

7 0

X'11'
X'F0'
X'02'
00
nbb
nbb

(Response)

nbb: 4, fixed

base: Base address in file, designated by 32 bits.

(c) Data write-in

7 0

X'11'
addH'
addL'
00
nbb
nbb
V
V
.
.

(Send)

⇒

7 0

X'11'
addH
addL
00
nbb
nbb

(Response)

addH, addL:	Data write-in address; data write-in is started from the address in which this value has been added to the base address designated by (b). It should be less than F000.
V...:	Write-in data; V field data is written in the above address in that order.

(d) Data read-in

7 0
X'12'
addH'
addL
00
nbb
nbb

(Send)

⇨

7 0
X'11'
X'F0'
X'02'
00
nbb
nbb
V
V
.
.

(Response)

addH, addL: Data read-in address; data read-in is started from the address in which this value has been added to the base address designated by (b). It should be less than F000.

V...: Read-in data; data in this file is written in that order.

3.4 Example of application

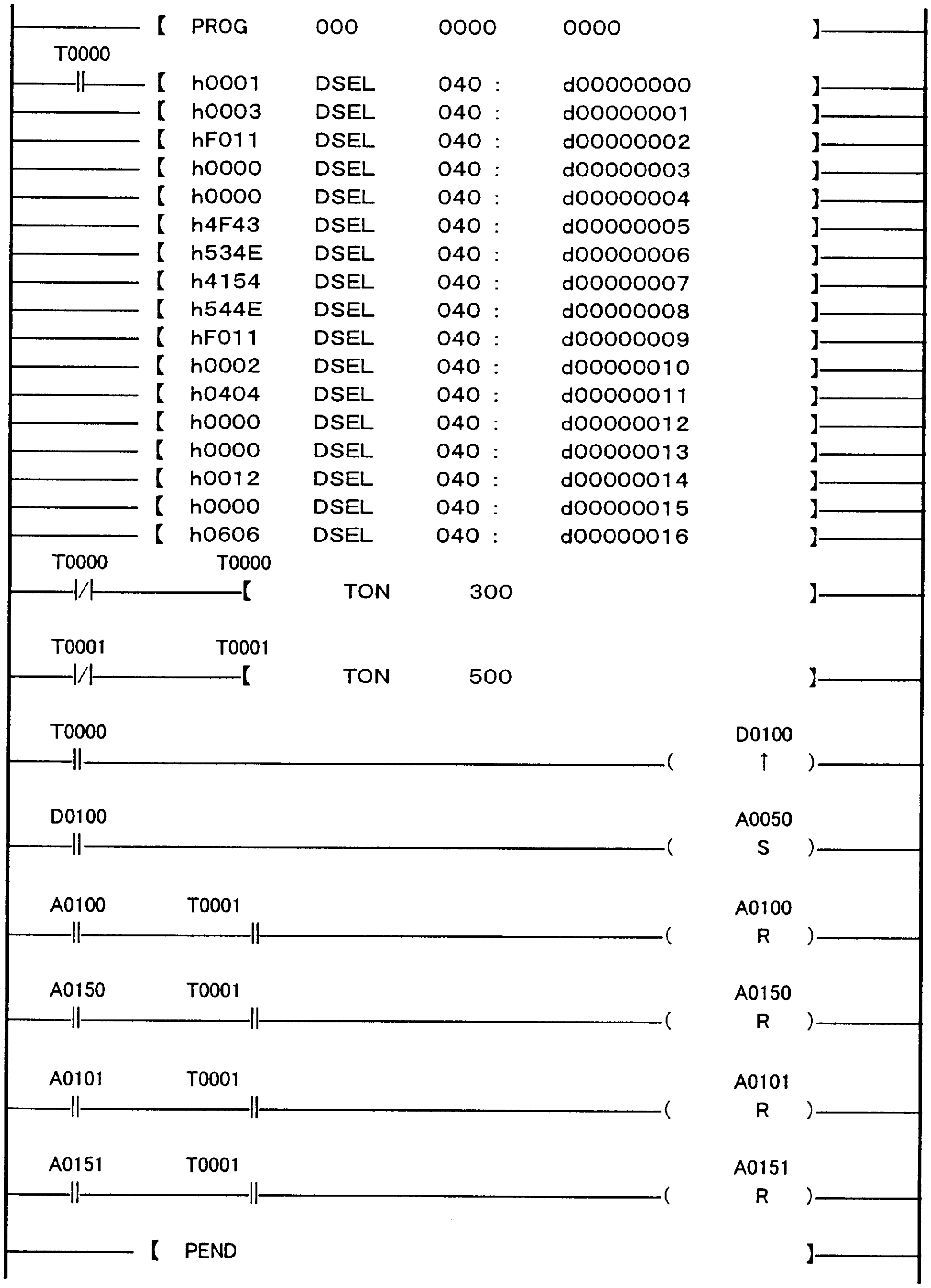
3.4.1 CC-M and sequencer

The following shows an example of message transmission from sequencer (F70S) to CC-M.

(1) Read-in of constant

Program of reading CON1 to CON3 of Loop 1 in a given cycle CONSTANT read-in

① Read-in of CONSTANT



```
[ PROG   000    0000   0000       ]
T0000
[ h0001  DSEL   040 :  d00000000  ]
[ h0003  DSEL   040 :  d00000001  ]
[ hF011  DSEL   040 :  d00000002  ]
[ h0000  DSEL   040 :  d00000003  ]
[ h0000  DSEL   040 :  d00000004  ]
[ h4F43  DSEL   040 :  d00000005  ]
[ h534E  DSEL   040 :  d00000006  ]
[ h4154  DSEL   040 :  d00000007  ]
[ h544E  DSEL   040 :  d00000008  ]
[ hF011  DSEL   040 :  d00000009  ]
[ h0002  DSEL   040 :  d00000010  ]
[ h0404  DSEL   040 :  d00000011  ]
[ h0000  DSEL   040 :  d00000012  ]
[ h0000  DSEL   040 :  d00000013  ]
[ h0012  DSEL   040 :  d00000014  ]
[ h0000  DSEL   040 :  d00000015  ]
[ h0606  DSEL   040 :  d00000016  ]
T0000      T0000
           [   TON   300          ]
T0001      T0001
           [   TON   500          ]
T0000                       D0100
                            ( ↑ )
D0100                       A0050
                            ( S )
A0100      T0001            A0100
                            ( R )
A0150      T0001            A0150
                            ( R )
A0101      T0001            A0101
                            ( R )
A0151      T0001            A0151
                            ( R )
[ PEND                            ]
```

Sequencer send buffer

Address	Send data		
	Host	Slave	
00	00	01	Station No.
01	00	03	Element number
02	F0	11	Designation of remote file "CONSTANT"
03	00	00	
04	08	08	
05	4F	43	
06	53	4E	
07	41	54	
08	54	4E	
09	F0	11	Read-in address setting "0000"
0A	00	02	
0B	04	04	
0C	00	00	
0D	00	00	
0E	00	12	Read-in data length "6" byte corresponds to CON1 to CON3.
0F	00	00	
10	06	06	

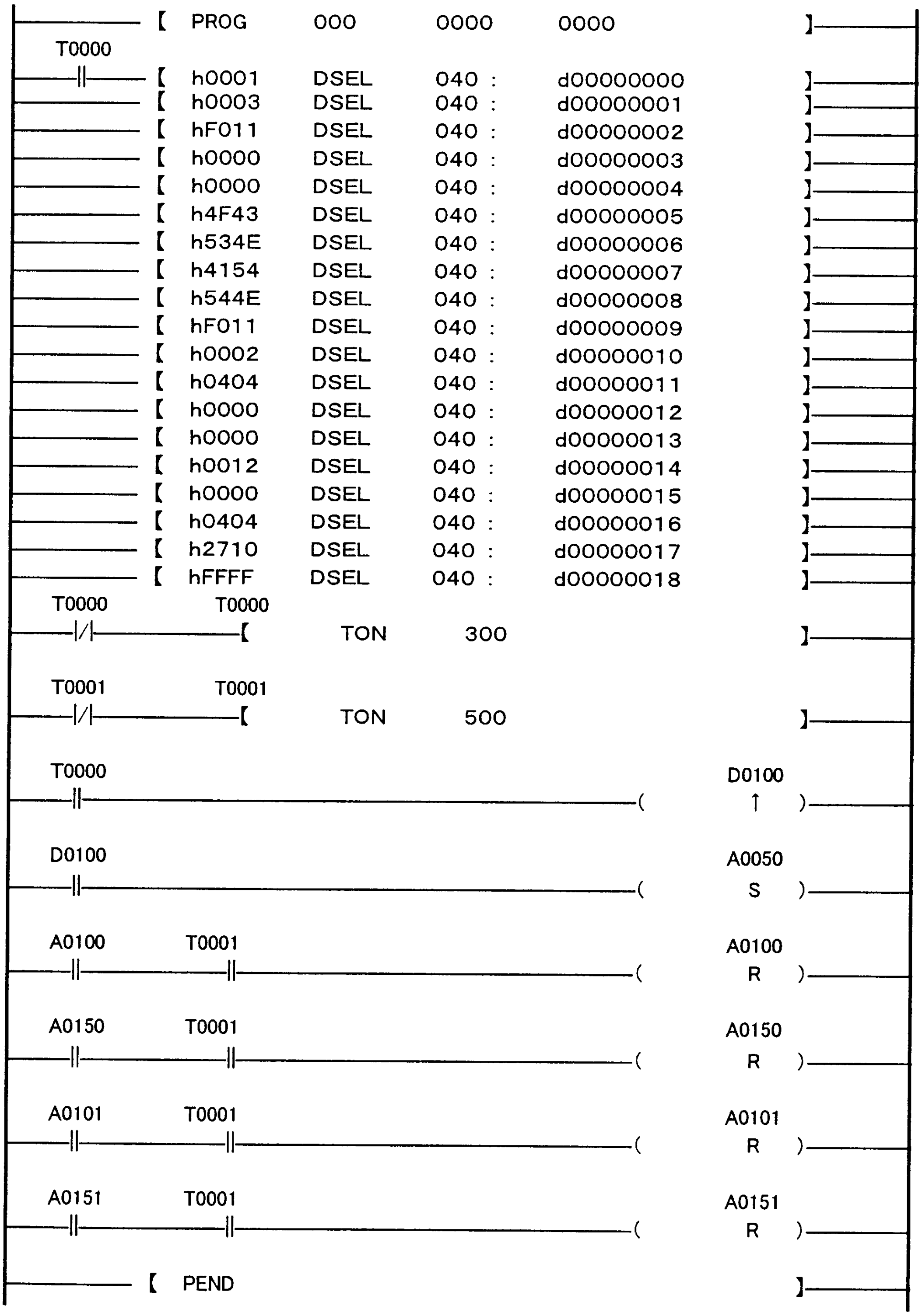
Sequencer receive buffer

Address	Receive data		
	Host	Slave	
00	00	00	
01	00	03	
02	F0	11	Remote file designation, normal end
03	00	00	
04	00	00	
05	F0	11	Read-in address designation, normal end
06	00	02	
07	00	00	
08	F0	11	CONSTANT read-in
09	00	02	
0A	06	06	
0B	7F	FF	→ CON1: 327.67
0C	80	01	→ CON2: -327.67
0D	00	01	→ CON3: 0.01

(2) Constant write-in

100.00 and -0.01 are written in CON1 and CON2 of LOOP 1, respectively.

② Write-in of CONSTANT



Sequencer send buffer

Address	Send data		
	Host	Slave	
00	00	01	Station No.
01	00	03	Element number
02	F0	11	Designation of remote file "CONSTANT"
03	00	00	
04	08	08	
05	4F	43	
06	53	4E	
07	41	54	
08	54	4E	
09	F0	11	Write-in address setting "0000"
0A	00	02	
0B	04	04	
0C	00	00	
0D	00	00	
0E	00	11	Write-in data
0F	00	00	
10	04	04	
11	27	10	
12	FF	FF	

CON1: 100.00
CON2: -0.01

Sequencer receive buffer

Address	Receive data		
	Host	Slave	
00	00	00	
01	00	03	
02	F0	11	Remote file designation, normal end
03	00	00	
04	00	00	
05	F0	11	Write-in address designation, normal end
06	00	02	
07	00	00	
08	00	11	Write-in, normal end
09	00	00	
0A	00	00	

4. T-LINK (SLAVE COMMUNICATION)

4.1 System configuration

4.1.1 General

This chapter explains T-LINK slave communication function.

When the T-LINK (slave) communication function is not provided with user's Compact Controller M (CC-M), the functions given in this chapter cannot be used. Since the setting of T-LINK slave communication with the CC-M main unit is not given, the setting of communication parameters of the CC-M main unit should be referred to the instruction manual for the main unit.

In this chapter, communication specifications for T-LINK slave communication function, communication methods, and what is realized with CC-M using the T-LINK slave communication function are mainly explained.

For details of the T-LINK (host) communication function, refer to the chapter "T-LINK slave communication setting panel" in the instruction manual for the CC-M main unit.

(1) T-LINK (slave communication) of CC-M

The word T-LINK is the name of Fuji's unique data network.It is an interface of serial transmission systems for coupling quickly and economically the digital systems distributed in operating sites. By connecting to Fuji's T-LINK I/O module, etc. using the T-LINK interface, a multi-point control system utilizing the T-LINK I/O module, etc. can be constructed.

(2) Master function

The CC-M T-LINK function contains T-LINK host communication function (CC-M; slave) and T-LINK slave communication function (CC-M; master). By using the T-LINK slave communication function, the T-LINK I/O module can be connected, increasing the number of I/O points of CC-M. The CC-M slave communication is used only for I/O transmission.

(3) T-LINK (slave communication) configuration

Fig. 4-1 (the next page) shows a configuration of system using the T-LINK communication function. The simplest system configuration is composed of one I/O module (slave) for one unit of CC-M (master). The system configuration (1:N units) is shown in Fig. 4-1.

Fig. 4-2 shows accessory devices required to realize T-LINK communication systems. Besides the CC-M main unit and I/O module, transmission cables (Type: PDZK***1) and terminating resistors (Type: PDZR*001) are required separately.

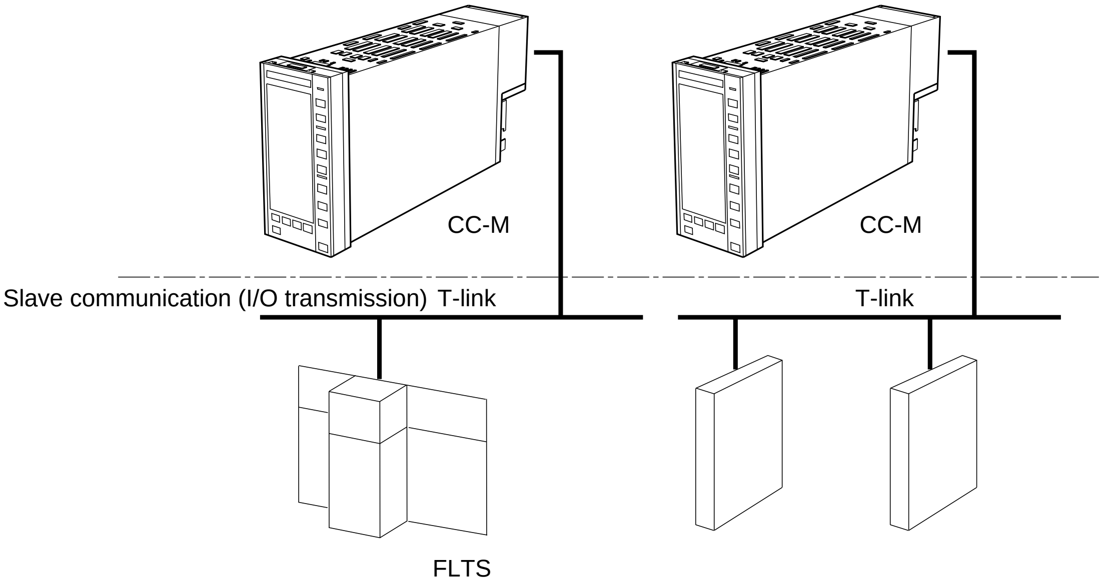


Fig. 4-1 T-LINK system configuration

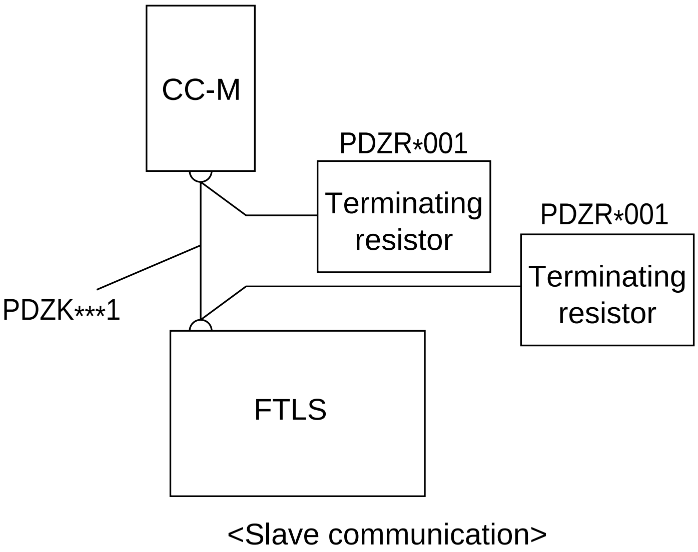


Fig. 4-2 Accessory devices

4.2 Specifications for slave communication

4.2.1 Physical speclflcatlons

Transmission speed	500kbps			
Transmission distance (MAX.)	Max. 50m			
Connecting cable	Communication cable			
	Between screw terminal PDA and PDA	PDZK1xx1	With M3.5 crimp style teminal on both ends	1
	Between screw terminal PDA and PLC	PDZK2xx1	With M3.5 crimp style teminal on both ends	1
	Between screw terminal PDA and PC	PDZK3xx1	9-pin connector on PC side	1
	Between screw terminal PDA and PDA	PDZK4xx1	With plug-in type teminal on both ends	1
	Between screw terminal PDA and PLC	PDZK5xx1	With M3.5 crimp style teminal on PLC side	1
	Between screw terminal PDA and PC	PDZK6xx1	9-pin connector on PC side	1
	Min. 10msec; time width varies with connecting conditions			
Max.number of connections	20 units; total address should be within 100 words.			

4.2.2 Connectable types of devices

The table below shows the kinds of devices used for CC-M slave communication.

Kind	Type	Data area (Word)	I/O transmission		
			IN	OUT	IN/OUT
Other	PDA (CC-M)	4, 8, 16	—	—	—
	PNA (CC-S)	4, 8, 16	○	○	○
	PYH	4, 8	—	—	○
FTLS	NC1X1604	1	○	—	—
	NC1YU16T0502	1	—	○	—
	NC1AX04-MR	4, 8	○	—	○
	NC1AY02-MR	4	—	○	—
	NC1W6406T	4	—	—	○
FTL 010H	FTU226B	2	—	○	—
	FTU263B	1	○	—	—
	FTU221B	2	—	○	—
	FTU223B	2	—	○	—
	FTU340A	8	○	—	—
	FTU440A	8	—	○	—
	FTU512A	4	—	—	○
	FTU910A	1, 2, 4	—	—	—
FTK	FTK410A-C10	4	—	○	—
	FTK414A-C10	4	—	○	—
	FTK320A-C10	8	○	—	—
	FTK260A-C10	1	—	○	—

4.2.3 Acquisition of the number of connectable units

This is the same as the case of host communications, except that it is limited up to 20 units.

(a) Consideration on hardware restriction

⇨ Up to 32 units of devices for one unit of CC-M can be connected to T-link.

(b) Acquisition of software restriction

⇨ All the devices connected to T-link occupy the number of words which have been determined in advance on the T-link memory input/output relay area (area size varies on each processor).
Therefore, the number of connectable units of devices becomes the number of words determined on <u>input/output relay area ÷ number of devices</u>.

Without message communication

The minimum value in (a) and (b) shows the number of units of devices connectable to T-link.

[Example 1]

Connection to CC-M

(a) Restriction on hardware:
20 units

(b) Restriction on software:
100W (input/output terminal area) ÷ 8W (occupied number of words of connectable devices) = 12 units

Therefore, the maximum number of units of connectable devices is the minimum value (12 units) in a) and b).

4.2.4 Wiring method

This is the same as the case of host communications, except that it is limited up to 20 units.

Refer to Item 3.2.4 “Wiring method”.

5. FILE SPECIFICATIONS

5.1 Details of all Modbus address table

DIGITAL DATA MONITORING AND MODIFICATION AREA (Address : 00001 to 01728)

SCC FILE

This area is used in order to change control mode via communication.
If write-in this area, CC-M is needed to set “ON” to “SCC” parameter in MENU 3/3 display.

Address	Type	Data	Meaning	Attribute	
		·	(Reserve)		Loop1-primary
00016	Bit	EXT-REQ	External(Remote)-SV request (0:None/1:Request)	Read/Write	
		·	(Reserve)		Loop1-secondary
00031	Bit	SCCM-REQ	Manual-mode request (0:None/1:Request)	Read/Write	
00032	Bit	R-REQ	Remote-mode request (0:None/1:Request)	Read/Write	
		·	(Reserve)		Loop2-primary
00048	Bit	EXT-REQ	External(Remote)-SV request (0:None/1:Request)	Read/Write	
		·	(Reserve)		Loop2-secondary
00063	Bit	SCCM-REQ	Manual-mode request (0:None/1:Request)	Read/Write	
00064	Bit	R-REQ	Remote-mode request (0:None/1:Request)	Read/Write	
		·	(Reserve)		Loop3-primary
00080	Bit	EXT-REQ	External(Remote)-SV request (0:None/1:Request)	Read/Write	
		·	(Reserve)		Loop3-secondary
00095	Bit	SCCM-REQ	Manual-mode request (0:None/1:Request)	Read/Write	
00096	Bit	R-REQ	Remote-mode request (0:None/1:Request)	Read/Write	
		·	(Reserve)		Loop4-primary
00112	Bit	EXT-REQ	External(Remote)-SV request (0:None/1:Request)	Read/Write	
		·	(Reserve)		Loop4-secondary
00127	Bit	SCCM-REQ	Manual-mode request (0:None/1:Request)	Read/Write	
00128	Bit	R-REQ	Remote-mode request (0:None/1:Request)	Read/Write	

FREE DATA AREA (100 Words)

This area is free I/O terminal board in order to access each word by bit.
It is equivalent to free data area address from 40709.
This is the common area shared with each communications (Modbus, OPTO, etc.).

Address	Size	Data	Meaning	Attribute
00129	Bit	Wno_00 - bit 0	Free I/O terminal Word No.00 - bit 0	Read/Write
00130	Bit	Wno_00 - bit 1	Free I/O terminal Word No.00 - bit 1	Read/Write
00131	Bit	Wno_00 - bit 2	Free I/O terminal Word No.00 - bit 2	Read/Write
00132	Bit	Wno_00 - bit 3	Free I/O terminal Word No.00 - bit 3	Read/Write
00133	Bit	Wno_00 - bit 4	Free I/O terminal Word No.00 - bit 4	Read/Write
00134	Bit	Wno_00 - bit 5	Free I/O terminal Word No.00 - bit 5	Read/Write
00135	Bit	Wno_00 - bit 6	Free I/O terminal Word No.00 - bit 6	Read/Write
00136	Bit	Wno_00 - bit 7	Free I/O terminal Word No.00 - bit 7	Read/Write
00137	Bit	Wno_00 - bit 8	Free I/O terminal Word No.00 - bit 8	Read/Write
00138	Bit	Wno_00 - bit 9	Free I/O terminal Word No.00 - bit 9	Read/Write
00139	Bit	Wno_00 - bit 10	Free I/O terminal Word No.00 - bit 10	Read/Write
00140	Bit	Wno_00 - bit 11	Free I/O terminal Word No.00 - bit 11	Read/Write
00141	Bit	Wno_00 - bit 12	Free I/O terminal Word No.00 - bit 12	Read/Write
00142	Bit	Wno_00 - bit 13	Free I/O terminal Word No.00 - bit 13	Read/Write
00143	Bit	Wno_00 - bit 14	Free I/O terminal Word No.00 - bit 14	Read/Write
00144	Bit	Wno_00 - bit 15	Free I/O terminal Word No.00 - bit 15	Read/Write
·	·	·		·
01713	Bit	Wno_99 - bit 0	Free I/O terminal Word No.99 - bit 0	Read/Write
01714	Bit	Wno_99 - bit 1	Free I/O terminal Word No.99 - bit 1	Read/Write
01715	Bit	Wno_99 - bit 2	Free I/O terminal Word No.99 - bit 2	Read/Write
01716	Bit	Wno_99 - bit 3	Free I/O terminal Word No.99 - bit 3	Read/Write
01717	Bit	Wno_99 - bit 4	Free I/O terminal Word No.99 - bit 4	Read/Write
01718	Bit	Wno_99 - bit 5	Free I/O terminal Word No.99 - bit 5	Read/Write
01719	Bit	Wno_99 - bit 6	Free I/O terminal Word No.99 - bit 6	Read/Write
01720	Bit	Wno_99 - bit 7	Free I/O terminal Word No.99 - bit 7	Read/Write
01721	Bit	Wno_99 - bit 8	Free I/O terminal Word No.99 - bit 8	Read/Write
01722	Bit	Wno_99 - bit 9	Free I/O terminal Word No.99 - bit 9	Read/Write
01723	Bit	Wno_99 - bit 10	Free I/O terminal Word No.99 - bit 10	Read/Write
01724	Bit	Wno_99 - bit 11	Free I/O terminal Word No.99 - bit 11	Read/Write
01725	Bit	Wno_99 - bit 12	Free I/O terminal Word No.99 - bit 12	Read/Write
01726	Bit	Wno_99 - bit 13	Free I/O terminal Word No.99 - bit 13	Read/Write
01727	Bit	Wno_99 - bit 14	Free I/O terminal Word No.99 - bit 14	Read/Write
01728	Bit	Wno_99 - bit 15	Free I/O terminal Word No.99 - bit 15	Read/Write

DIGITAL DATA MONITORING AREA (Address : 10001 to 10800)

DIGITAL INPUT STATUS

This area shows digital input status. (DI1 to10)

Address	Size	Data	Meaning	Attribute
10002	Bit	DI1	Digital input (DI1) status (0:OFF/1:ON)	Read
10003	Bit	DI2	Digital input (DI2) status (0:OFF/2:ON)	Read
10004	Bit	DI3	Digital input (DI3) status (0:OFF/3:ON)	Read
10005	Bit	DI4	Digital input (DI4) status (0:OFF/4:ON)	Read
10006	Bit	DI5	Digital input (DI5) status (0:OFF/5:ON)	Read
10007	Bit	DI6	Digital input (DI6) status (0:OFF/6:ON)	Read
10008	Bit	DI7	Digital input (DI7) status (0:OFF/7:ON)	Read
10009	Bit	DI8	Digital input (DI8) status (0:OFF/8:ON)	Read
10010	Bit	DI9	Digital input (DI9) status (0:OFF/9:ON)	Read
10011	Bit	DI10	Digital input (DI10) status (0:OFF/10:ON)	Read

DIGITAL OUTPUT STATUS

This area shows digital output status. (DO1 to 10)

Address	Size	Data	Meaning	Attribute
10017	Bit	DO1	Digital output (DO1) status (0:OFF/1:ON)	Read
10018	Bit	DO2	Digital output (DO2) status (0:OFF/2:ON)	Read
10019	Bit	DO3	Digital output (DO3) status (0:OFF/3:ON)	Read
10020	Bit	DO4	Digital output (DO4) status (0:OFF/4:ON)	Read
10021	Bit	DO5	Digital output (DO5) status (0:OFF/5:ON)	Read
10022	Bit	DO6	Digital output (DO6) status (0:OFF/6:ON)	Read
10023	Bit	DO7	Digital output (DO7) status (0:OFF/7:ON)	Read
10024	Bit	DO8	Digital output (DO8) status (0:OFF/8:ON)	Read
10025	Bit	DO9	Digital output (DO9) status (0:OFF/9:ON)	Read
10026	Bit	DO10	Digital output (DO10) status (0:OFF/10:ON)	Read

SYSTEM FAULT STATUS

This area shows various system-fault status.

Address	Size	Data	Meaning	Attribute
10065	Bit	Ai fault PV-1ch	Process value input1 (Voltage input) fault status (0:Normal/1:Fault)	Read
10066	Bit	Ai fault PV-2ch	Process value input2 (Voltage input) fault status (0:Normal/1:Fault)	Read
10067	Bit	Ai fault Ai-1ch	AI1 input fault status (0:Normal/1:Fault)	Read
10068	Bit	Ai fault Ai-2ch	AI2 input fault status (0:Normal/1:Fault)	Read
10069	Bit	Ai fault Ai-3ch	AI3 input fault status (0:Normal/1:Fault)	Read
10070	Bit	Ai fault Ai-4ch	AI4 input fault status (0:Normal/1:Fault)	Read
10071	Bit	Ai fault Ai-5ch	AI5 input fault status (0:Normal/1:Fault)	Read
10072	Bit	Ai fault Ai-6ch	AI6 input fault status (0:Normal/1:Fault)	Read
10097	Bit	Ai fault - TC,Pt direct input - 1ch	Process value input1 (TC,Pt100 input) fault status (0:Normal/1:Fault)	Read
10098	Bit	Ai fault - TC,Pt direct input - 2ch	Process value input2 (TC,Pt100 input) fault status (0:Normal/1:Fault)	Read
10113	Bit	MV read back fault - MI1	MI1 output fault status (0:Normal/1:Fault)	Read
10114	Bit	MV read back fault - MI2	MI2 output fault status (0:Normal/1:Fault)	Read
10115	Bit	MV read back fault - MI3	MI3 output fault status (0:Normal/1:Fault)	Read
10116	Bit	MV read back fault - MI4	MI4 output fault status (0:Normal/1:Fault)	Read
10129	Bit	Master T-Link heavy fault	Master T-Link communication heavy fault status (0:Normal/1:Fault)	Read

SYSTEM WARNING STATUS

This area shows various system-warning status.

Address	Size	Data	Meaning	Attribute
10305	Bit	Flash ROM erase error	Flash ROM erase error status (0:Normal/1:Error)	Read
10306	Bit	Flash ROM write error	Flash ROM write error status (0:Normal/1:Error)	Read
10307	Bit	Basic cycle over	Basic cycle over status (0:Normal/1:Error)	Read
10308	Bit	Flash ROM first area error	Flash ROM first area error status (0:Normal/1:Error)	Read
10309	Bit	Flash ROM secondary area error	Flash ROM secondary area error status (0:Normal/1:Error)	Read
10321	Bit	Loop1 wafer calculation STOP	Loop1 wafer calculation status (0:RUN/1:STOP)	Read
10322	Bit	Loop2 wafer calculation STOP	Loop2 wafer calculation status (0:RUN/1:STOP)	Read
10323	Bit	Loop3 wafer calculation STOP	Loop3 wafer calculation status (0:RUN/1:STOP)	Read
10324	Bit	Loop4 wafer calculation STOP	Loop4 wafer calculation status (0:RUN/1:STOP)	Read
10337	Bit	Loop1 Wafer connection error	Loop1 Wafer connection error status (0:Normal/1:Error)	Read
10338	Bit	Loop2 Wafer connection error	Loop2 Wafer connection error status (0:Normal/1:Error)	Read
10339	Bit	Loop3 Wafer connection error	Loop3 Wafer connection error status (0:Normal/1:Error)	Read
10340	Bit	Loop4 Wafer connection error	Loop4 Wafer connection error status (0:Normal/1:Error)	Read
10353	Bit	OPTO communication error	OPTO communication error status (0:Normal/1:Error)	Read
10369	Bit	Soft logic calculation STOP	Soft logic calculation status (0:RUN/1:STOP)	Read

CONTROL STATUS

This area shows various control status. (Loop1 to 4)

Address	Size	Data	Meaning	Attribute	
10545	Bit	FLT	System fault status (0:Normal/1:Fault) [*1]	Read	Loop1-Primary
10546	Bit	LS	LS(Local or SCC) mode status (0:Not-LS/1:LS)	Read	
10547	Bit	SCC-enable	SCC(Control from communication) enable status (0:disable/1:enable)	Read	
10548	Bit	NOT-A	NOT-A(Not auto mode) status (0:Auto/1:Not-Auto)	Read	
10549	Bit	L-REQ	L-REQ(Local request) status (0:Non-request/1:Request-local)	Read	
10550	Bit	EXT-REQ	EXT-REQ(External(Remote)-SV request) status (0:Non-request/1:Request-external)	Read	
10551	Bit	•	(Reserve)		
10552	Bit	NORM	Control action status (0:Reverse/1:Normal)	Read	
		•	(Reserve)		
10554	Bit	L-mode	Local-mode status (0:Not-local/1:Local)	Read	
10555	Bit	EXT-mode	External(Remote)-SV mode status (0:Not-external SV/1:External SV)	Read	
		•	(Reserve)		
10558	Bit	EX-M	External-MV mode status (0:Not-external-MV/1:External-MV)	Read	
		•	(Reserve)		
10564	Bit	MV variation absolute high limit	MV variation absolute high alarm status (0:OFF/1:ON)	Read	
		•	(Reserve)		
10567	Bit	MVL	MV-lower alarm status (0:OFF/1:ON)	Read	
10568	Bit	MVH	MV-upper alarm status (0:OFF/1:ON)	Read	
10569	Bit	DVL	DV-lower alarm status (0:OFF/1:ON)	Read	
10570	Bit	DVH	DV-upper alarm status (0:OFF/1:ON)	Read	
10571	Bit	PV variation low limit	PV variation low alarm status (0:OFF/1:ON)	Read	
10572	Bit	PV variation high limit	PV variation high alarm status (0:OFF/1:ON)	Read	
10573	Bit	PVL	PV-lower alarm status (0:OFF/1:ON)	Read	
10574	Bit	PVH	PV-upper alarm status (0:OFF/1:ON)	Read	
10575	Bit	SVL	SV-lower alarm status (0:OFF/1:ON)	Read	
10576	Bit	SVH	SV-upper alarm status (0:OFF/1:ON)	Read	
10577	Bit	FLT	Same as address 10545 [*1]	Read	Loop1-Secondary
10578	Bit	LS	LS(Local or SCC) mode status (0:Not-LS/1:LS)	Read	
10579	Bit	SCC-enable	SCC(Control from communication) enable status (0:disable/1:enable)	Read	
10580	Bit	NOT-A	NOT-A(Not auto mode) status (0:Auto/1:Not-Auto)	Read	
10581	Bit	A-REQ	A-REQ(Auto-mode request) status (0:Non-request/1:Request-auto)	Read	
10582	Bit	R-REQ	R-REQ(Remote-SV request) status (0:Non-request/1:Request-remote)	Read	
10583	Bit	•	(Reserve)	Read	
10584	Bit	NORM	Control action status (0:Reverse/1:Normal)	Read	
10585	Bit	PV-TRACK	PV-TRACK(PV tracking) status (0:Not-PVtracking/1:Pvtracking)	Read	
10586	Bit	L-mode	Local-mode status (0:Not-local/1:Local)	Read	
10587	Bit	R-mode	Remote mode status (0:Not-remote/1:Remote mode)	Read	
10588	Bit	SCC-mode	SCC-mode status (0:Not-SCCmode/1:SCCmode)	Read	
10589	Bit	SMAN	SMAN(Software-Manual) status (0:Not-SMAN/1:SMAN)	Read	
10590	Bit	EX-M	External-MV mode status (0:Not-external-MV/1:External-MV)	Read	
10591	Bit	M-mode	Manual mode status (0:Not-Manual/1:Manual mode)	Read	
10592	Bit	HM	Hard manual (Backup) mode (0:Not-HM/1:Backup manual)	Read	
		•	(Reserve)		
10596	Bit	MV variation absolute high limit	MV variation absolute high alarm status (0:OFF/1:ON)	Read	
		•	(Reserve)		
10599	Bit	MVL	MV-lower alarm status (0:OFF/1:ON)	Read	
10600	Bit	MVH	MV-upper alarm status (0:OFF/1:ON)	Read	
10601	Bit	DVL	DV-lower alarm status (0:OFF/1:ON)	Read	
10602	Bit	DVH	DV-upper alarm status (0:OFF/1:ON)	Read	
10603	Bit	PV variation low limit	PV variation low alarm status (0:OFF/1:ON)	Read	
10604	Bit	PV variation high limit	PV variation high alarm status (0:OFF/1:ON)	Read	
10605	Bit	PVL	PV-lower alarm status (0:OFF/1:ON)	Read	
10606	Bit	PVH	PV-upper alarm status (0:OFF/1:ON)	Read	
10607	Bit	SVL	SV-lower alarm status (0:OFF/1:ON)	Read	
10608	Bit	SVH	SV-upper alarm status (0:OFF/1:ON)	Read	
10609	Bit			Read	Loop2-primary
		Ditto			
10640	Bit			Read	
10641	Bit			Read	Loop2-secondary
		Ditto			
10672	Bit			Read	
10673	Bit			Read	Loop3-primary
		Ditto			
10704	Bit			Read	
10705	Bit			Read	Loop3-secondary
		Ditto			
10736	Bit			Read	
10737	Bit			Read	Loop4-primary
		Ditto			
10768	Bit			Read	
10769	Bit			Read	Loop4-secondary
		Ditto			
10800	Bit			Read	

ANALOG DATA MONITORING AREA (Address : 30001 to 30067)

ANALOG INPUT STATUS

This area shows analog input status.

Address	Size	Data	Meaning	Attribute	Unit
30001	Word	PV1	Process value input1 (Voltage input)	Read	0.01%fs/digit
30002	Word	PV2	Process value input2 (Voltage input)	Read	0.01%fs/digit
30003	Word	AI1	Analog input AI1 input	Read	0.01%fs/digit
30004	Word	AI2	Analog input AI2 input	Read	0.01%fs/digit
30005	Word	AI3	Analog input AI3 input	Read	0.01%fs/digit
30006	Word	AI4	Analog input AI4 input	Read	0.01%fs/digit
30007	Word	AI5	Analog input AI5 input	Read	0.01%fs/digit
30008	Word	AI6	Analog input AI6 input	Read	0.01%fs/digit
30009	Word	Direct input PVD1	Process value input1 (TC,Pt100 input)	Read	0.01%fs/digit
30010	Word	Direct input PVD2	Process value input2 (TC,Pt100 input)	Read	0.01%fs/digit

ANALOG OUTPUT STATUS

This area shows analog output status.

Address	Size	Data	Meaning	Attribute	Unit
30011	Word	MI1	4 to 20mADC MI1 output	Read	0.01%/digit
30012	Word	MI2	4 to 20mADC MI2 output	Read	0.01%/digit
30013	Word	MI3	4 to 20mADC MI3 output	Read	0.01%/digit
30014	Word	MI4	4 to 20mADC MI4 output	Read	0.01%/digit
30015	Word	AO1	1 to 5VDC AO1 output	Read	0.01%/digit
30016	Word	AO2	1 to 5VDC AO2 output	Read	0.01%/digit
30017	Word	AO3	1 to 5VDC AO3 output	Read	0.01%/digit
30018	Word	AO4	1 to 5VDC AO4 output	Read	0.01%/digit
30019	Word	AO5	1 to 5VDC AO5 output	Read	0.01%/digit

CONTROL VARIABLE STATUS

This area shows various control variable status.

Address	Size	Data	Meaning	Attribute	Unit	
30020	Word	PV	Loop1-primary PV	Read	0.01%fs/digit	Loop1-primary
30021	Word	SV	Loop1-primary SV	Read	0.01%fs/digit	
30022	Word	MV	Loop1-primary MV	Read	0.01%/digit	
30023	Word	R-SV	Loop1-primary R-SV	Read	0.01%fs/digit	
30024	Word	DV	Loop1-primary DV	Read	0.01%fs/digit	
30025	Word	DMV	Loop1-primary ΔMV	Read	0.01%fs/diigt	
30026	Word	PV	Loop1-secondary PV	Read	0.01%fs/digit	Loop1-secondary
30027	Word	SV	Loop1-secondary SV	Read	0.01%fs/digit	
30028	Word	MV	Loop1-secondary MV	Read	0.01%/digit	
30029	Word	CAS-SV	Loop1-secondary R-SV	Read	0.01%fs/digit	
30030	Word	DV	Loop1-secondary DV	Read	0.01%fs/digit	
30031	Word	DMV	Loop1-secondary ΔMV	Read	0.01%fs/diigt	
30032	Word	PV	Loop2-primary PV	Read	0.01%fs/digit	Loop2-primary
30033	Word	SV	Loop2-primary SV	Read	0.01%fs/digit	
30034	Word	MV	Loop2-primary MV	Read	0.01%/digit	
30035	Word	CAS-SV	Loop2-primary R-SV	Read	0.01%fs/digit	
30036	Word	DV	Loop2-primary DV	Read	0.01%fs/digit	
30037	Word	DMV	Loop2-primary ΔMV	Read	0.01%fs/diigt	
30038	Word	PV	Loop2-secondary PV	Read	0.01%fs/digit	Loop2-secondary
30039	Word	SV	Loop2-secondary SV	Read	0.01%fs/digit	
30040	Word	MV	Loop2-secondary MV	Read	0.01%/digit	
30041	Word	CAS-SV	Loop2-secondary R-SV	Read	0.01%fs/digit	
30042	Word	DV	Loop2-secondary DV	Read	0.01%fs/digit	
30043	Word	DMV	Loop2-secondary ΔMV	Read	0.01%fs/diigt	
30044	Word	PV	Loop3-primary PV	Read	0.01%fs/digit	Loop3-primary
30045	Word	SV	Loop3-primary SV	Read	0.01%fs/digit	
30046	Word	MV	Loop3-primary MV	Read	0.01%/digit	
30047	Word	CAS-SV	Loop3-primary R-SV	Read	0.01%fs/digit	
30048	Word	DV	Loop3-primary DV	Read	0.01%fs/digit	
30049	Word	DMV	Loop3-primary ΔMV	Read	0.01%fs/diigt	
30050	Word	PV	Loop3-secondary PV	Read	0.01%fs/digit	Loop3-secondary
30051	Word	SV	Loop3-secondary SV	Read	0.01%fs/digit	
30052	Word	MV	Loop3-secondary MV	Read	0.01%/digit	
30053	Word	CAS-SV	Loop3-secondary R-SV	Read	0.01%fs/digit	
30054	Word	DV	Loop3-secondary DV	Read	0.01%fs/digit	
30055	Word	DMV	Loop3-secondary ΔMV	Read	0.01%fs/diigt	
30056	Word	PV	Loop4-primary PV	Read	0.01%fs/digit	Loop4-primary
30057	Word	SV	Loop4-primary SV	Read	0.01%fs/digit	
30058	Word	MV	Loop4-primary MV	Read	0.01%/digit	
30059	Word	CAS-SV	Loop4-primary R-SV	Read	0.01%fs/digit	
30060	Word	DV	Loop4-primary DV	Read	0.01%fs/digit	
30061	Word	DMV	Loop4-primary ΔMV	Read	0.01%fs/diigt	
30062	Word	PV	Loop4-secondary PV	Read	0.01%fs/digit	Loop4-secondary
30063	Word	SV	Loop4-secondary SV	Read	0.01%fs/digit	
30064	Word	MV	Loop4-secondary MV	Read	0.01%/digit	
30065	Word	CAS-SV	Loop4-secondary R-SV	Read	0.01%fs/digit	
30066	Word	DV	Loop4-secondary DV	Read	0.01%fs/digit	
30067	Word	DMV	Loop4-secondary Δ MV	Read	0.01%fs/diigt	

ANALOG DATA MONITORING AND MODIFICATION AREA (Address : 40001 to 40808)

CONSTANT

This area is Constant parameter setting area. (Loop1 to 4)

Address	Size	Data	Meaning	Attribute	Unit	
40001	Word	CON01	Loop1 constant (CON01)	Read/Write	0.01%/digit	Loop1
40002	Word	CON02	Loop1 constant (CON02)	Read/Write	0.01%/digit	
40003	Word	CON03	Loop1 constant (CON03)	Read/Write	0.01%/digit	
40004	Word	CON04	Loop1 constant (CON04)	Read/Write	0.01%/digit	
40005	Word	CON05	Loop1 constant (CON05)	Read/Write	0.01%/digit	
40006	Word	CON06	Loop1 constant (CON06)	Read/Write	0.01%/digit	
40007	Word	CON07	Loop1 constant (CON07)	Read/Write	0.01%/digit	
40008	Word	CON08	Loop1 constant (CON08)	Read/Write	0.01%/digit	
40009	Word	CON09	Loop1 constant (CON09)	Read/Write	0.01%/digit	
40010	Word	CON10	Loop1 constant (CON10)	Read/Write	0.01%/digit	
40011	Word	CON11	Loop1 constant (CON11)	Read/Write	0.01%/digit	
40012	Word	CON12	Loop1 constant (CON12)	Read/Write	0.01%/digit	
40013	Word	CON13	Loop1 constant (CON13)	Read/Write	0.01%/digit	
40014	Word	CON14	Loop1 constant (CON14)	Read/Write	0.01%/digit	
40015	Word	CON15	Loop1 constant (CON15)	Read/Write	0.01%/digit	
40016	Word	CON16	Loop1 constant (CON16)	Read/Write	0.01%/digit	
40017	Word	CON17	Loop1 constant (CON17)	Read/Write	0.01%/digit	
40018	Word	CON18	Loop1 constant (CON18)	Read/Write	0.01%/digit	
40019	Word	CON19	Loop1 constant (CON19)	Read/Write	0.01%/digit	
40020	Word	CON20	Loop1 constant (CON20)	Read/Write	0.01%/digit	
40021	Word	CON21	Loop1 constant (CON21)	Read/Write	0.01%/digit	
40022	Word	CON22	Loop1 constant (CON22)	Read/Write	0.01%/digit	
40023	Word	CON23	Loop1 constant (CON23)	Read/Write	0.01%/digit	
40024	Word	CON24	Loop1 constant (CON24)	Read/Write	0.01%/digit	
40025	Word	CON25	Loop1 constant (CON25)	Read/Write	0.01%/digit	
40026	Word	CON26	Loop1 constant (CON26)	Read/Write	0.01%/digit	
40027	Word	CON27	Loop1 constant (CON27)	Read/Write	0.01%/digit	
40028	Word	CON28	Loop1 constant (CON28)	Read/Write	0.01%/digit	
40029	Word	CON29	Loop1 constant (CON29)	Read/Write	0.01%/digit	
40030	Word	CON30	Loop1 constant (CON30)	Read/Write	0.01%/digit	
40031	Word	CON31	Loop1 constant (CON31)	Read/Write	0.01%/digit	
40032	Word	CON32	Loop1 constant (CON32)	Read/Write	0.01%/digit	
40033	Word	CON33	Loop1 constant (CON33)	Read/Write	0.01%/digit	
40034	Word	CON34	Loop1 constant (CON34)	Read/Write	0.01%/digit	
40035	Word	CON35	Loop1 constant (CON35)	Read/Write	0.01%/digit	
40036	Word	CON36	Loop1 constant (CON36)	Read/Write	0.01%/digit	
40037	Word	CON37	Loop1 constant (CON37)	Read/Write	0.01%/digit	
40038	Word	CON38	Loop1 constant (CON38)	Read/Write	0.01%/digit	
40039	Word	CON39	Loop1 constant (CON39)	Read/Write	0.01%/digit	
40040	Word	CON40	Loop1 constant (CON40)	Read/Write	0.01%/digit	
40041	Word	CON41	Loop1 constant (CON41)	Read/Write	0.01%/digit	
40042	Word	CON42	Loop1 constant (CON42)	Read/Write	0.01%/digit	
40043	Word	CON43	Loop1 constant (CON43)	Read/Write	0.01%/digit	
40044	Word	CON44	Loop1 constant (CON44)	Read/Write	0.01%/digit	
40045	Word	CON45	Loop1 constant (CON45)	Read/Write	0.01%/digit	
40046	Word	CON46	Loop1 constant (CON46)	Read/Write	0.01%/digit	
40047	Word	CON47	Loop1 constant (CON47)	Read/Write	0.01%/digit	
40048	Word	CON48	Loop1 constant (CON48)	Read/Write	0.01%/digit	
40049	Word	CON01	Loop2 constant (CON01)	Read/Write	0.01%/digit	Loop2
	to	to	to	·	·	
40096	Word	CON48	Loop2 constant (CON48)	Read/Write	0.01%/digit	
40097	Word	CON01	Loop3 constant (CON01)	Read/Write	0.01%/digit	Loop3
	to	to	to	·	·	
40144	Word	CON48	Loop3 constant (CON48)	Read/Write	0.01%/digit	
40145	Word	CON01	Loop4 constant (CON01)	Read/Write	0.01%/digit	Loop4
	to	to	to	·	·	
40192	Word	CON48	Loop4 constant (CON48)	Read/Write	0.01%/digit	

CONTROL PARAMETER(PRIMARY-PID,RATIO,PROGRAM/SECONDARY-PID)

This area is the setting area concerning action of PID control wafer. (Loop1 to 4)

Address	Size	Data	Meaning	Attribute	Unit	
40193	Word	Deviation high limit alarm	Deviation high limit alarm setting	Read/Write	0.01%fs/digit	Loop1-primary *(When PID)
40194	Word	SV high limit alarm SV-H	SV high limit alarm SV-H setting	Read/Write	0.01%fs/digit	
40195	Word	SV low limit alarm SV-L	SV low limit alarm SV-L setting	Read/Write	0.01%fs/digit	
40196	Word	PV high limit alarm PV-H	PV high limit alarm PV-H setting	Read/Write	0.01%fs/digit	
40197	Word	PV low limit alarm PV-L	PV low limit alarm PV-L setting	Read/Write	0.01%fs/digit	
40198	Word	MV high limit alarm MV-H	MV high limit alarm MV-H setting	Read/Write	0.01%/digit	
40199	Word	MV low limit alarm MV-L	MV low limit alarm MV-L setting	Read/Write	0.01%/digit	
40200	Word	PV variation ratio alarm	PV variation ratio alarm setting	Read/Write	0.01%fs/digit	
40201	Word	DT Lo-word	DT(calculation period) Lower-word setting	Read/Write	0.01sec/digit	
40202	Word	DT Hi-word	DT(calculation period) upper-word setting	Read/Write	655.36sec/digit	
40203	Word	P	Proportional band setting	Read/Write	0.1%/digit	
40204	Word	I	Integration setting	Read/Write	0.1sec/digit	
40205	Word	D	Differential time setting	Read/Write	0.1sec/digit	
40206	Word	TF	Digital filter time constant setting	Read/Write	0.1sec/digit	
40207	Word	GAP		Read/Write	0.01%fs/digit	
40208	Word	DMH	Δ MV limit setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	
40210	Word	Knl	Non-liner gain setting	Read/Write	%	
40211	Word	CUT	Rooter cut away point setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	
40216	Word	SVPR	Preset SV	Read/Write	0.01%fs/digit	
40217	Word	MVPR	Preset MV	Read/Write	0.01%fs/digit	
40218	Word	Normal/Reverse	Control action	Read/Write	0:Norm/1:Revrs	
·	·	·	(Reserve)	·	·	Loop1-primary *(When Ratio)
40194	Word	SV high limit alarm SV-H	SV high limit alarm SV-H setting	Read/Write	0.01%fs/digit	
40195	Word	SV low limit alarm SV-L	SV low limit alarm SV-L setting	Read/Write	0.01%fs/digit	
40196	Word	PV high limit alarm PV-H	PV high limit alarm PV-H setting	Read/Write	0.01%fs/digit	
40197	Word	PV low limit alarm PV-L	PV low limit alarm PV-L setting	Read/Write	0.01%fs/digit	
40198	Word	MV high limit alarm MV-H	MV high limit alarm MV-H setting	Read/Write	0.01%/digit	
40199	Word	MV low limit alarm MV-L	MV low limit alarm MV-L setting	Read/Write	0.01%/digit	
40200	Word	PV variation ratio alarm	PV variation ratio alarm setting	Read/Write	0.01%fs/digit	
40201	Word	Ratio bias 3 B3	Ratio bias 3 B3 setting	Read/Write	0.01%/digit	
40202	Word	Ratio factor R	Ratio factor R setting	Read/Write	0.01%/digit	
40203	Word	Ratio bias 1 B1	Ratio bias 1 B1 setting	Read/Write	0.01%/digit	
40204	Word	Ratio bias 2 B2	Ratio bias 2 B2 setting	Read/Write	0.01%/digit	
·	·	(Reserve)	·	·		
40206	Word	TF	Digital filter time constant setting	Read/Write	0.1sec/digit	
·	·	(Reserve)	·	·		
40211	Word	CUT	Rooter cut away point setting	Read/Write	0.01%/digit	
·	·	(Reserve)	·	·		
40216	Word	SVPR	Preset SV	Read/Write	0.01%fs/digit	
40217	Word	MVPR	Preset MV	Read/Write	0.01%fs/digit	
·	·	(Reserve)	·	·		
40193-Hi	Byte	ZONE- END No.	ZONE- END No. setting	Read/Write		Loop1-primary *(When Program)
40193-Lo	Byte	ZONE- START No.	ZONE- START No. setting	Read/Write		
40194	Word	PROG-SV0	PROG-SV0 setting	Read/Write	0.01%fs/digit	
40195	Word	PROG-SV1	PROG-SV1 setting	Read/Write	0.01%fs/digit	
40196	Word	PROG-SV2	PROG-SV2 setting	Read/Write	0.01%fs/digit	
40197	Word	PROG-SV3	PROG-SV3 setting	Read/Write	0.01%fs/digit	
40198	Word	PROG-SV4	PROG-SV4 setting	Read/Write	0.01%fs/digit	
40199	Word	PROG-SV5	PROG-SV5 setting	Read/Write	0.01%fs/digit	
40200	Word	PROG-SV6	PROG-SV6 setting	Read/Write	0.01%fs/digit	
40201	Word	PROG-SV7	PROG-SV7 setting	Read/Write	0.01%fs/digit	
40202	Word	TIME0	TIME0 setting	Read/Write	0.01sec or min / digit	
40203	Word	TIME1	TIME1 setting	Read/Write	0.01sec or min / digit	
40204	Word	TIME2	TIME2 setting	Read/Write	0.01sec or min / digit	
40205	Word	TIME3	TIME3 setting	Read/Write	0.01sec or min / digit	
40206	Word	TIME4	TIME4 setting	Read/Write	0.01sec or min / digit	
40207	Word	TIME5	TIME5 setting	Read/Write	0.01sec or min / digit	
40208	Word	TIME6	TIME6 setting	Read/Write	0.01sec or min / digit	
·	·	(Reserve)	·	·		
40216	Word	Preset Time	Preset Time setting	Read/Write	0.01sec or min / digit	
·	·	(Reserve)	·	·		
40218	Word	Normal/Reverse	Preset time divider selector	Read/Write	0:Norm/1:Revrs	

CONTROL VARIABLE STATUS

This area shows various control variable status.

Address	Size	Data	Meaning	Attribute	Unit	
40219	Word	Deviation high limit alarm	Deviation high limit alarm setting	Read/Write	0.01%fs/digit	Loop1-secondary
40220	Word	SV high limit alarm SV-H	SV high limit alarm SV-H setting	Read/Write	0.01%fs/digit	
40221	Word	SV low limit alarm SV-L	SV low limit alarm SV-L setting	Read/Write	0.01%fs/digit	
40222	Word	PV high limit alarm PV-H	PV high limit alarm PV-H setting	Read/Write	0.01%fs/digit	
40223	Word	PV low limit alarm PV-L	PV low limit alarm PV-L setting	Read/Write	0.01%fs/digit	
40224	Word	MV high limit alarm MV-H	MV high limit alarm MV-H setting	Read/Write	0.01%/digit	
40225	Word	MV low limit alarm MV-L	MV low limit alarm MV-L setting	Read/Write	0.01%/digit	
40226	Word	PV variation ratio alarm	PV variation ratio alarm setting	Read/Write	0.01%fs/digit	
40227	Word	DT- Lo word	DT(calculation period) Lower-word setting	Read/Write	0.01sec/digit	
40228	Word	DT- Hi word	DT(calculation period) upper-word setting	Read/Write	655.36sec/digit	
40229	Word	P	Proportional band setting	Read/Write	0.1%/digit	
40230	Word	I	Integration setting	Read/Write	0.1sec/digit	
40231	Word	D	Differential time setting	Read/Write	0.1sec/digit	
40232	Word	TF	Digital filter time constant setting	Read/Write	0.1sec/digit	
40233	Word	GAP		Read/Write	0.01%fs/digit	
40234	Word	DMH	Δ MV limit setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	
40236	Word	Knl	Non-liner gain setting	Read/Write	%	
40237	Word	CUT	Rooter cut away point setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	
40239	Word	KF	Feed forward gain KF setting	Read/Write	0.01%/digit	
40240	Word	B1F	Feed forward bias1 B1F setting	Read/Write	0.01%/digit	
40241	Word	B2F	Feed forward bias2 B2F setting	Read/Write	0.01%/digit	
40242	Word	SVPR	Preset SV	Read/Write	0.01%fs/digit	
40243	Word	MVPR	Preset MV	Read/Write	0.01%fs/digit	
40244	Word	Normal/Reverse	Control action	Read/Write	0:Norm/1:Revrs	
40245	Word			Read/Write		Loop2-primary
		Ditto				
40270	Word			Read/Write		
40271	Word			Read/Write		Loop2-secondary
		Ditto				
40296	Word			Read/Write		
40297	Word			Read/Write		Loop3-primary
		Ditto				
40322	Word			Read/Write		
40323	Word			Read/Write		Loop3-secondary
		Ditto				
40348	Word			Read/Write		
40349	Word			Read/Write		Loop4-primary
		Ditto				
40374	Word			Read/Write		
40375	Word			Read/Write		Loop4-secondary
		Ditto				
40400	Word			Read/Write		

TREND SETTING

This area is setting concerning action of trend function. (TREND 1 to 8)

Address	Size	Data	Meaning	Attribute	Unit	
40401-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 1**
40401-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40402-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40402-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	
40403-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 2**
40403-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40404-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40404-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	
40405-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 3**
40405-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40406-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40406-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	
40407-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 4**
40407-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40408-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40408-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	
40409-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 5**
40409-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40410-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40410-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	
40411-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 6**
40411-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40412-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40412-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	
40413-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 7**
40413-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40414-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40414-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	
40415-Hi	Byte	Interval Time	Interval Time code setting	Read/Write	0:1sec/1:2sec/2:5sec/3:10sec 4:15sec/5:30sec/6:1min/7:2min 8:5min/9:10min/10:15min 11:30min/12:1hr/13:2hr	**TREND 8**
40415-Lo	Byte	Command	Command code setting	Read/Write	0:RESET/1:START/2:STOP	
40416-Hi	Byte	Sampling Method	Sampling Method code setting	Read/Write	0:POINT/1:MIN-MAX	
40416-Lo	Byte	Logging-type	Logging-type code setting	Read/Write	0:FILL/1:ROUND	

LINER TABLE PARAMETER

This area is Linearise function table area. (Loop1-LIN1, Loop2-LIN1, Loop3-LIN1, Loop4-LIN1)

Address	Size	Data	Meaning	Attribute	Unit	
40433	Word	X01	Loop1-LIN1 linearize table X01 setting	Read/Write	0.01%/digit	Loop1-LIN1 (For Wno.=000A or 0091)
40434	Word	X02	Loop1-LIN1 linearize table X02 setting	Read/Write	0.01%/digit	
40435	Word	X03	Loop1-LIN1 linearize table X03 setting	Read/Write	0.01%/digit	
40436	Word	X04	Loop1-LIN1 linearize table X04 setting	Read/Write	0.01%/digit	
40437	Word	X05	Loop1-LIN1 linearize table X05 setting	Read/Write	0.01%/digit	
40438	Word	X06	Loop1-LIN1 linearize table X06 setting	Read/Write	0.01%/digit	
40439	Word	X07	Loop1-LIN1 linearize table X07 setting	Read/Write	0.01%/digit	
40440	Word	X08	Loop1-LIN1 linearize table X08 setting	Read/Write	0.01%/digit	
40441	Word	X09	Loop1-LIN1 linearize table X09 setting	Read/Write	0.01%/digit	
40442	Word	X10	Loop1-LIN1 linearize table X10 setting	Read/Write	0.01%/digit	
40443	Word	X11	Loop1-LIN1 linearize table X11 setting	Read/Write	0.01%/digit	
40444	Word	X12	Loop1-LIN1 linearize table X12 setting	Read/Write	0.01%/digit	
40445	Word	X13	Loop1-LIN1 linearize table X13 setting	Read/Write	0.01%/digit	
40446	Word	X14	Loop1-LIN1 linearize table X14 setting	Read/Write	0.01%/digit	
40447	Word	X15	Loop1-LIN1 linearize table X15 setting	Read/Write	0.01%/digit	
40448	Word	X16	Loop1-LIN1 linearize table X16 setting	Read/Write	0.01%/digit	
40449	Word	Y01	Loop1-LIN1 linearize table Y01 setting	Read/Write	0.01%/digit	
40450	Word	Y02	Loop1-LIN1 linearize table Y02 setting	Read/Write	0.01%/digit	
40451	Word	Y03	Loop1-LIN1 linearize table Y03 setting	Read/Write	0.01%/digit	
40452	Word	Y04	Loop1-LIN1 linearize table Y04 setting	Read/Write	0.01%/digit	
40453	Word	Y05	Loop1-LIN1 linearize table Y05 setting	Read/Write	0.01%/digit	
40454	Word	Y06	Loop1-LIN1 linearize table Y06 setting	Read/Write	0.01%/digit	
40455	Word	Y07	Loop1-LIN1 linearize table Y07 setting	Read/Write	0.01%/digit	
40456	Word	Y08	Loop1-LIN1 linearize table Y08 setting	Read/Write	0.01%/digit	
40457	Word	Y09	Loop1-LIN1 linearize table Y09 setting	Read/Write	0.01%/digit	
40458	Word	Y10	Loop1-LIN1 linearize table Y10 setting	Read/Write	0.01%/digit	
40459	Word	Y11	Loop1-LIN1 linearize table Y11 setting	Read/Write	0.01%/digit	
40460	Word	Y12	Loop1-LIN1 linearize table Y12 setting	Read/Write	0.01%/digit	
40461	Word	Y13	Loop1-LIN1 linearize table Y13 setting	Read/Write	0.01%/digit	
40462	Word	Y14	Loop1-LIN1 linearize table Y14 setting	Read/Write	0.01%/digit	
40463	Word	Y15	Loop1-LIN1 linearize table Y15 setting	Read/Write	0.01%/digit	
40464	Word	Y16	Loop1-LIN1 linearize table Y16 setting	Read/Write	0.01%/digit	
40465	Word	X01	Loop2-LIN1 linearize table X01 setting	Read/Write	0.01%/digit	Loop2-LIN1 (For Wno.=010A or 0191)
·	to	·	·	·	·	
40480	Word	X16	Loop2-LIN1 linearize table X16 setting	Read/Write	0.01%/digit	
40481	Word	Y01	Loop2-LIN1 linearize table Y01 setting	Read/Write	0.01%/digit	
·	to	·	·	·	·	
40496	Word	Y16	Loop2-LIN1 linearize table Y16 setting	Read/Write	0.01%/digit	
40497	Word	X01	Loop3-LIN1 linearize table X01 setting	Read/Write	0.01%/digit	Loop3-LIN1 (For Wno.=020A or 0291)
·	to	·	·	·	·	
40512	Word	X16	Loop3-LIN1 linearize table X16 setting	Read/Write	0.01%/digit	
40513	Word	Y01	Loop3-LIN1 linearize table Y01 setting	Read/Write	0.01%/digit	
·	to	·	·	·	·	
40528	Word	Y16	Loop3-LIN1 linearize table Y16 setting	Read/Write	0.01%/digit	
40529	Word	X01	Loop4-LIN1 linearize table X01 setting	Read/Write	0.01%/digit	Loop4-LIN1 (For Wno.=030A or 0391)
·	to	·	·	·	·	
40544	Word	X16	Loop4-LIN1 linearize table X16 setting	Read/Write	0.01%/digit	
40545	Word	Y01	Loop4-LIN1 linearize table Y01 setting	Read/Write	0.01%/digit	
·	to	·	·	·	·	
40560	Word	Y16	Loop4-LIN1 linearize table Y16 setting	Read/Write	0.01%/digit	

GAIN SCHEDULE PARAMETER

This area is Gain-scheduler function table area. (Loop1 to 4 Gain scheduler1)

Address	Size	Data	Meaning	Attribute	Unit	
40561	Word	X01	Loop1-Gain schedule table1 X01 setting	Read/Write	0.01%/digit	Loop1 Gain scheduler1 (For Wno.=0010)
40562	Word	X02	Loop1-Gain schedule table1 X02 setting	Read/Write	0.01%/digit	
40563	Word	X03	Loop1-Gain schedule table1 X03 setting	Read/Write	0.01%/digit	
40564	Word	X04	Loop1-Gain schedule table1 X04 setting	Read/Write	0.01%/digit	
40565	Word	X05	Loop1-Gain schedule table1 X05 setting	Read/Write	0.01%/digit	
40566	Word	X06	Loop1-Gain schedule table1 X06 setting	Read/Write	0.01%/digit	
40567	Word	X07	Loop1-Gain schedule table1 X07 setting	Read/Write	0.01%/digit	
40568	Word	X08	Loop1-Gain schedule table1 X08 setting	Read/Write	0.01%/digit	
40569	Word	P01	Loop1-Gain schedule table1 P01 setting	Read/Write	0.1%/digit	
40570	Word	P02	Loop1-Gain schedule table1 P02 setting	Read/Write	0.1%/digit	
40571	Word	P03	Loop1-Gain schedule table1 P03 setting	Read/Write	0.1%/digit	
40572	Word	P04	Loop1-Gain schedule table1 P04 setting	Read/Write	0.1%/digit	
40573	Word	P05	Loop1-Gain schedule table1 P05 setting	Read/Write	0.1%/digit	
40574	Word	P06	Loop1-Gain schedule table1 P06 setting	Read/Write	0.1%/digit	
40575	Word	P07	Loop1-Gain schedule table1 P07 setting	Read/Write	0.1%/digit	
40576	Word	P08	Loop1-Gain schedule table1 P08 setting	Read/Write	0.1%/digit	
40577	Word	I 01	Loop1-Gain schedule table1 I01 setting	Read/Write	0.1sec/digit	
40578	Word	I 02	Loop1-Gain schedule table1 I02 setting	Read/Write	0.1sec/digit	
40579	Word	I 03	Loop1-Gain schedule table1 I03 setting	Read/Write	0.1sec/digit	
40580	Word	I 04	Loop1-Gain schedule table1 I04 setting	Read/Write	0.1sec/digit	
40581	Word	I 05	Loop1-Gain schedule table1 I05 setting	Read/Write	0.1sec/digit	
40582	Word	I 06	Loop1-Gain schedule table1 I06 setting	Read/Write	0.1sec/digit	
40583	Word	I 07	Loop1-Gain schedule table1 I07 setting	Read/Write	0.1sec/digit	
40584	Word	I 08	Loop1-Gain schedule table1 I08 setting	Read/Write	0.1sec/digit	
40585	Word	D 01	Loop1-Gain schedule table1 D01 setting	Read/Write	0.1sec/digit	
40586	Word	D 02	Loop1-Gain schedule table1 D02 setting	Read/Write	0.1sec/digit	
40587	Word	D 03	Loop1-Gain schedule table1 D03 setting	Read/Write	0.1sec/digit	
40588	Word	D 04	Loop1-Gain schedule table1 D04 setting	Read/Write	0.1sec/digit	
40589	Word	D 05	Loop1-Gain schedule table1 D05 setting	Read/Write	0.1sec/digit	
40590	Word	D 06	Loop1-Gain schedule table1 D06 setting	Read/Write	0.1sec/digit	
40591	Word	D 07	Loop1-Gain schedule table1 D07 setting	Read/Write	0.1sec/digit	
40592	Word	D 08	Loop1-Gain schedule table1 D08 setting	Read/Write	0.1sec/digit	
40593	Word	X01	Loop2-Gain schedule table1 X01 setting	Read/Write	0.01%/digit	Loop2 Gain scheduler1 (For Wno.=0110)
·	to	·	·	·	·	
40600	Word	X08	Loop2-Gain schedule table1 X08 setting	Read/Write	0.01%/digit	
40601	Word	P01	Loop2-Gain schedule table1 P01 setting	Read/Write	0.1%/digit	
·	to	·	·	·	·	
40608	Word	P08	Loop2-Gain schedule table1 P08 setting	Read/Write	0.1%/digit	
40609	Word	I 01	Loop2-Gain schedule table1 I01 setting	Read/Write	0.1sec/digit	
·	to	·	·	·	·	
40616	Word	I 08	Loop2-Gain schedule table1 I08 setting	Read/Write	0.1sec/digit	
40617	Word	D 01	Loop2-Gain schedule table1 D01 setting	Read/Write	0.1sec/digit	
·	to	·	·	·	·	
40624	Word	D 08	Loop2-Gain schedule table1 D08 setting	Read/Write	0.1sec/digit	
40625	Word	X01	Loop3-Gain schedule table1 X01 setting	Read/Write	0.01%/digit	Loop3 Gain scheduler1 (For Wno.=0210)
·	to	·	·	·	·	
40632	Word	X08	Loop3-Gain schedule table1 X08 setting	Read/Write	0.01%/digit	
40633	Word	P01	Loop3-Gain schedule table1 P01 setting	Read/Write	0.1%/digit	
·	to	·	·	·	·	
40640	Word	P08	Loop3-Gain schedule table1 P08 setting	Read/Write	0.1%/digit	
40641	Word	I 01	Loop3-Gain schedule table1 I01 setting	Read/Write	0.1sec/digit	
·	to	·	·	·	·	
40648	Word	I 08	Loop3-Gain schedule table1 I08 setting	Read/Write	0.1sec/digit	
40649	Word	D 01	Loop3-Gain schedule table1 D01 setting	Read/Write	0.1sec/digit	
·	to	·	·	·	·	
40656	Word	D 08	Loop3-Gain schedule table1 D08 setting	Read/Write	0.1sec/digit	
40657	Word	X01	Loop4-Gain schedule table1 X01 setting	Read/Write	0.01%/digit	Loop4 Gain scheduler1 (For Wno.=0310)
·	to	·	·	·	·	
40664	Word	X08	Loop4-Gain schedule table1 X08 setting	Read/Write	0.01%/digit	
40665	Word	P01	Loop4-Gain schedule table1 P01 setting	Read/Write	0.1%/digit	
·	to	·	·	·	·	
40672	Word	P08	Loop4-Gain schedule table1 P08 setting	Read/Write	0.1%/digit	
40673	Word	I 01	Loop4-Gain schedule table1 I01 setting	Read/Write	0.1sec/digit	
·	to	·	·	·	·	
40680	Word	I 08	Loop4-Gain schedule table1 I08 setting	Read/Write	0.1sec/digit	
40681	Word	D 01	Loop4-Gain schedule table1 D01 setting	Read/Write	0.1sec/digit	
·	to	·	·	·	·	
40688	Word	D 08	Loop4-Gain schedule table1 D08 setting	Read/Write	0.1sec/digit	

SCC FILE

This area is used in order to change control variable via communication.

If write-in this area, CC-M is needed to set "ON" to "SCC" parameter in MENU 3/3 display.

Address	Size	Data	Meaning	Attribute	Unit	
40689	Word	Primary SV	Loop1-Primary SV setting	Read/Write	0.01%fs/digit	Loop1
40690	Word	Secondary SV	Loop1-Secondary SV setting	Read/Write	0.01%fs/digit	
40691	Word	Secondary MV	Loop1-Secondary MV setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	
40694	Word	Primary SV	Loop2-Primary SV setting	Read/Write	0.01%fs/digit	Loop2
40695	Word	Secondary SV	Loop2-Secondary SV setting	Read/Write	0.01%fs/digit	
40696	Word	Secondary MV	Loop2-Secondary MV setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	
40699	Word	Primary SV	Loop3-Primary SV setting	Read/Write	0.01%fs/digit	Loop3
40700	Word	Secondary SV	Loop3-Secondary SV setting	Read/Write	0.01%fs/digit	
40701	Word	Secondary MV	Loop3-Secondary MV setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	
40704	Word	Primary SV	Loop4-Primary SV setting	Read/Write	0.01%fs/digit	Loop4
40705	Word	Secondary SV	Loop4-Secondary SV setting	Read/Write	0.01%fs/digit	
40706	Word	Secondary MV	Loop4-Secondary MV setting	Read/Write	0.01%/digit	
·	·	·	(Reserve)	·	·	

FREE DATA AREA (100 Words)

This area is free I/O terminal board in order to access each word.

It is equivalent to free data area address from 00129.

This is the common area shared with each communications (Modbus, OPTO, etc.).

Address	Size	Data	Meaning	Attribute
40709	Word	Wno_00	Free I/O terminal Word No.00	Read/Write
40710	Word	Wno_01	Free I/O terminal Word No.01	Read/Write
·	·	·	·	·
40807	Word	Wno_98	Free I/O terminal Word No.98	Read/Write
40808	Word	Wno_99	Free I/O terminal Word No.99	Read/Write

5.2 Details of all file specification

File No.	File name		Size (byte)
1	SCC file	SCC_FIL	16 × LOOP

File composition

The primary/secondary module is used for SCC operation through communications, defined as Loop 1 to 4, a total of 4 blocks.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Primary mode select command	2				8000 bit on: EXT request 0040 bit on: Preset request (at primary PG) 0020 bit on: Stop request (at primary PG)	
02	Primary set value	2	-32767	32767	%	0 to 10000 corresponds to 0.00 to 100.00.	
04	Secondary mode select command	2				8000 bit on: R request 4000 bit on: SCCM request	
06	Secondary set value	2	-32767	32767	%	0 to 10000 corresponds to 0.00 to 100.00.	
08	Secondary manipulation output	2	-32767	32767	%	0 to 10000 corresponds to 0.00 to 100.00.	
0A	Primary preset time	4				0 to 10000 corresponds to 0 to 100 min, 0 to 100 hr or 0 to 100 days (depends on wafer)	
0E	Blank	2					
10 |	Loop 2 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
20 |	Loop 3 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
30 |	Loop 4 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	

* Percent (%) data 0 to 10000 corresponds to 0.00 to 100.00%.

* Primary/secondary set value on the main unit side is indicated by industrial value.

File No.	File name		Size (byte)
2	Primary module file	MODFIL1	28 × LOOP

File composition

Primary control data of each loop is stocked in this file, divided into Loop 1 to 4, a total 4 loops. The file composition is different between primary block PID (or R) and program control.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Control mode	2	—	—	—	(as shown on the next page)	
02	Alarm	2	—	—	—	(as shown on the next page)	
04	Measured value	2	—	—	*	0 to 10000 corresponds to industrial value base to full scale	
06	Set value	2	—	—	*	0 to 10000 corresponds to industrial value base to full scale	
08	Manipulation output	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00.	
0A	Remote set value	2	—	—	*	Primary input wafer input 2.0 to 10000 is base to full.	
0C	Deviation	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00.	
0E	Manipulation output variation	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00.	
10	Wafer request control mode	2	—	—	—	(for internal processing)	
12	Alarm-in bit information	2	—	—	—	(for internal processing)	
14	Module code	2	—	—	—	(not used)	
16	Spare	2	—	—	—		
18	Blank	4	—	—	—		
1C |	Loop 2 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
38 |	Loop 3 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
54 |	Loop 4 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	

∗ : Industrial value

When the primary block is program control, the file composition is as follows.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Control mode	2	—	—		(as shown below)	
02	Alarm	2	—	—		(as shown below)	
04	Measured value	2	—	—	*		
06	Program step	2	—	—	—	Program step	
08	Program output	2	—	—	*	PRG wafer output 1	
0A	Module code	2	—	—		(not used)	
0C	Wafer preset time	4	—	—		0 to 10000 corresponds to 0 to 100min/hr/day.	
10	(Blank)	4	—	—			
14	Preset time	4	—	—		0 to 10000 corresponds to 0 to 100min/hr/day.	
18	Time lapse	4	—	—		0 to 10000 corresponds to 0 to 10000sec/min.	

* : Industrial value

Primary control

8000 bit	
4000 bit	
2000 bit	EX-M (external MV mode)
1000 bit	
0800 bit	SCC (SCC mode)
0400 bit	R (R mode)
0200 bit	L (L mode)
0100 bit	
0080 bit	NORM (normal action)
0040 bit	AT (auto-tuning)
0020 bit	R-REQ (remote request) (preset request at program control)
0010 bit	L-REQ (auto request) (run at program control)
0008 bit	NOT-A (not auto mode)
0004 bit	SCC-ENABLE (SCC permit)
0002 bit	LS (local or SCC)
0001 bit	FLT (fault)

Primary control

8000 bit	SVH (set value high limit)
4000 bit	SVL (set value low limit)
2000 bit	PVH (measured value high limit)
1000 bit	PVL (measured value low limit)
0800 bit	PVH (measured value variation high limit)
0400 bit	PVL (measured value variation low limit)
0200 bit	DVH (deviation high limit)
0100 bit	DVL (deviation low limit)
0080 bit	MVH (manipulation output high limit)
0040 bit	MVL (manipulation output low limit)
0020 bit	
0010 bit	
0008 bit	MV alm (manipulation output variation absolute high limit)
0004 bit	
0002 bit	
0001 bit	

File No.	File name		Size (byte)
3	Secondary module file	MODFIL2	28 × LOOP

File composition

Secondary control data of each loop is stocked in this loop, divided into Loop 1 to 4, a total 4 loops

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Control mode	2	—	—	—	(as shown below)	
02	Alarm	2	—	—	—	(as shown below)	
04	Measured value	2	—	—	*	0 to 10000 corresponds to industrial value base to full scale	
06	Set value	2	—	—	*	0 to 10000 corresponds to industrial value base to full scale	
08	Manipulation output	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00.	
0A	Remote set value	2	—	—	*	Secondary input wafer input 2.0 to 10000 is base to full.	
0C	Deviation	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00.	
0E	Manipulation output variation	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00.	
10	Wafer request control mode	2	—	—	—	(for internal processing)	
12	Alarm-in bit information	2	—	—	—	(for internal processing)	
14	Module code	2	—	—	—	(not used)	
16	Spare	2	—	—	—		
18	Blank	4	—	—	—		
1C |	Loop 2 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
38 |	Loop 3 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
54 |	Loop 4 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	

* : Industrial value

Secondary control

8000 bit	HM (hard manual mode)
4000 bit	M (manual mode)
2000 bit	EX-M (external MV mode)
1000 bit	SMAN (external MV mode)
0800 bit	SCC (SCC mode)
0400 bit	R (remote mode)
0200 bit	L (local mode)
0100 bit	PV-TRACK (PV tracking)
0080 bit	NORM (normal action)
0040 bit	AT (auto-tuning)
0020 bit	R-REQ (remote request)
0010 bit	A-REQ (auto request)
0008 bit	NOT-A (not auto mode)
0004 bit	SCC-ENABLE (SCC permit)
0002 bit	LS (local or SCC)
0001 bit	FLT (fault)

Secondary alarm

8000 bit	SVH (set value high limit)
4000 bit	SVL (set value low limit)
2000 bit	PVH (measured value high limit)
1000 bit	PVL (measured value low limit)
0800 bit	PVH (measured value variation high limit)
0400 bit	PVL (measured value variation low limit)
0200 bit	DVH (deviation high limit)
0100 bit	DVL (deviation low limit)
0080 bit	MVH (manipulation output high limit)
0040 bit	MVL (manipulation output low limit)
0020 bit	
010 bit	
0008 bit	MV alm (manipulation output variation absolute high limit)
0004 bit	
0002 bit	
0001 bit	

File No.	File name		Size (byte)
4	Primary parameter file	MODPARM1	52 × LOOP

File composition

The primary block parameters of each loop can be set (for 4 loops). The parameter composition varies with the kinds of primary block (the kinds of primary block are designated by system table).

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Deviation high limit alarm	2	0.0	100.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	100.00
02	SV high limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	125.00
04	SV low limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	-25.00
06	PV high limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	125.00
08	PV low limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	-25.00
0A	MV high limit alarm	2	-25.0	125.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	125.00
0C	MV low limit alarm	2	-25.0	125.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	-25.00
0E	PV variation ratio alarm	2	0.00	100.00	%	0 to 10000 corresponds to 0.00 to 100.00%.	100.00
10	Sampling cycle	4	0.1	9999.9	sec	0 to 10000 corresponds to 0.0 to 100.0%.	0.2
14	Ratio factor	2	1.0	3276.7	%	0 to 10000 corresponds to 0.0 to 1000.0%.	3000.0
16	Integration time	2	0.1	3276.7	sec	0 to 10000 corresponds to 0.0 to 1000.0sec.	3000.0
18	Differentiation time	2	0.0	900.0	sec	0 to 10000 corresponds to 0.0 to 1000.0sec.	0.0
1A	Primary filter	2	0.0	900.0	sec	0 to 10000 corresponds to 0.0 to 1000.0sec.	0.0
1C	Dead zone	2	0.00	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
1E	MV variation ratio alarm	2	0.00	100.00	%	0 to 10000 corresponds to 0.00 to 100.00%.	100.00
20		2					
22	Non-linear gain	2	0.00	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
24	Router cut point	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	-0.01
26		2					
28		2					
2A		2					
2C		2					
2E	SV preset	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
30	MV preset	2	-25.00	125.00	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
32	Normal/reverse action	2	NORMAL	REVERSE	—	1: Reverse action 0: Normal action	reverse
34 │	Loop 2 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
68 │	Loop 3 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
9C │	Loop 4 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	

∗ : Industrial value

When primary block is “ratio”, each loop composition is as follows.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	(blank)	2					
02	SV high limit alarm	2	*	*	*	0 to 1000 corresponds to industrial value base to full scale	125.00
04	SV low limit alarm	2	*	*	*	0 to 1000 corresponds to industrial value base to full scale	-25.00
06	PV high limit alarm	2	-25.0	125.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	125.00
08	PV low limit alarm	2	-25.0	125.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	-25.00
0A	MV high limit alarm	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.0%.	125.00
0C	MV low limit alarm	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	-25.00
0E	PV variation ratio alarm	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	100.00
10	Bias 3	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
12	Ratio factor	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	100.00
14	Bias 1	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
16	Bias 2	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
18	(Blank)	2					
1A	Primary filter	2	0.0	900.0	sec.	0 to 10000 corresponds to 0.00 to 100.0sec.	0.0
1C	(Blank)	2					
1E	(Blank)	2					
20	(Blank)	2					
22	(Blank)	2					
24	Router cut point	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	-0.01
26	(Blank)	2					
28	(Blank)	2					
2A	(Blank)	2					
2C	(Blank)	2					
2E	SV preset	2	*	*	*	0 to 1000 corresponds to industrial value base to full scale	0.00
30	(Blank)	2					

＊: Industrial value

When the primary block is program control, each loop composition is as follows.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Start zone	1	0	6	—	Signal start zone in 0 to 6 zones	0
01	End zone	1	0	7	—	Signal end zone in 0 to 7 zones	0
02	Output value 0	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
04	Output value 1	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
06	Output value 2	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
08	Output value 3	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
0A	Output value 4	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
0C	Output value 5	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
0E	Output value 6	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
10	Output value 7	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
12	Time width 0	2	0	32767	sec, min	0 to 10000 corresponds to 0 to 10000sec/min.	0
14	Time width 1	2	0	32767	sec, min	0 to 10000 corresponds to 0 to 10000sec/min.	0
16	Time width 2	2	0	32767	sec, min	0 to 10000 corresponds to 0 to 10000sec/min.	0
18	Time width 3	2	0	32767	sec, min	0 to 10000 corresponds to 0 to 10000sec/min.	0
1A	Time width 4	2	0	32767	sec, min	0 to 10000 corresponds to 0 to 10000sec/min.	0
1C	Time width 5	2	0	32767	sec, min	0 to 10000 corresponds to 0 to 10000sec/min.	0
1E	Time width 6	2	0	32767	sec, min	0 to 10000 corresponds to 0 to 10000sec/min.	0
20	(Blank)	2					
22	(Blank)	2					
24	(Blank)	2					
26	(Blank)	2					
28	(Blank)	2					
2A	(Blank)	2					
2C	(Blank)	2					
2E	Preset time	2	0	327.67	min/ hr/ day	0 to 327.67min/hr (PGC/PGS) 0 to 327.67hr/ day (PIC/PLS)	0.00
30	(Blank)	2					
32	Normal/reverse action	2	NORMAL	REVERSE	—	1: Reverse action 0: Normal action	reverse

＊: Industrial value

File No.	File name		Size (byte)
5	Secondary parameter file	MODPARM2	52 × LOOP

File composition

Primary block parameters of each loop can be set (for 4 loops).

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Deviation high limit alarm	2	0.0	100.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	100.00
02	SV high limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	125.00
04	SV low limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	-25.00
06	PV high limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	125.00
08	PV low limit alarm	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	-25.00
0A	MV high limit alarm	2	-25.0	125.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	125.00
0C	MV low limit alarm	2	-25.0	125.0	%	0 to 10000 corresponds to 0.0 to 100.0%.	-25.00
0E	PV variation ratio alarm	2	0.00	100.00	%	0 to 10000 corresponds to 0.00 to 100.00%.	100.00
10	Sampling cycle	2	0.1	9999.9	sec	0 to 10000 corresponds to 0.0 to 100.0%.	0.2
14	Ratio factor	2	1.0	3276.7	%	0 to 10000 corresponds to 0.0 to 1000.0%.	3000.0
16	Integration time	2	0.1	3276.7	sec	0 to 10000 corresponds to 0.0 to 1000.0sec.	3000.0
18	Differentiation time	2	0.0	900.0	sec	0 to 10000 corresponds to 0.0 to 1000.0sec.	0.0
1A	Primary filter	2	0.0	900.0	sec	0 to 10000 corresponds to 0.0 to 1000.0sec.	0.0
1C	Dead zone	2	0.00	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
1E	MV variation ratio alarm	2	0.00	100.00	%	0 to 10000 corresponds to 0.00 to 100.00%.	100.00
20	(PO full-stroke)	2					
22	Non-linear gain	2	0.00	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
24	Router cut point	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	-0.01
26		2					
28	Feed forward gain	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
2A	Bias 1	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
2C	Bias 2	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
2E	SV preset	2	*	*	*	0 to 10000 corresponds to industrial value base to full scale	0.00
30	MV preset	2	-25.00	125.00	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
32	Normal/reverse action	2	NORMAL	REVERSE	—	1: Reverse action 0: Normal action	reverse
34 |	Loop 2 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
68 |	Loop 3 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
9C |	Loop 4 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	

∗ : Industrial value

File No.	File name		Size (byte)
6	Wafer output	WAF_OUT	16 × 48 × LOOP

File composition

Wafer output data storage zone

The wafer output terminal data has a zone for 48 wafers x 4 loops.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Wafer 1 Output 1	4	—	—	—	0 to 10000 corresponds to 0 to 100.00%.	
04	Output 2	4	—	—	—	│	
08	Output 3	4	—	—	—	│	
0C	Output 4	4	—	—	—	│	
│	│	│				│	
2F0	Wafer 48 Output 1	4				│	
2F4	Output 2	4				│	
2F8	Output 3	4				│	
2FC	Output 4	4				│	
300 │	Loop 2 Ditto	Ditto				│	
600 │	Loop 3 Ditto	Ditto				│	
900 │	Loop 4 Ditto	Ditto				↓	

File No.	File name		Size (byte)
7	Constant file	CONSTANT	96 × LOOP

File composition

Table for setting constant used as wafer input; each of 48 loops can be set.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Constant 1	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0.00
│	│	│	│	│	│	│	
5C	Constant 48	2	-327.67	327.67	%	│	0.00
60 │	Loop 2 Ditto	Ditto	Ditto	Ditto		│	
C0 │	Loop 3 Ditto	Ditto	Ditto	Ditto		│	
120 │	Loop 4 Ditto	Ditto	Ditto	Ditto		↓	

File No.	File name		Size (byte)
8	AI terminal board	AI_FILE	16

File composition

Read-in value of 0 to 10V voltage input given to main board is stocked.

Stocked data is converted into 0 to 100% according to AI range designation.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Analog input 1	2	—	—	%	0 to 10000 corresponds to 0 to 100.00%.	
02	Analog input 2	↓	↓	↓	↓	↓	
04	Analog input 3						
06	Analog input 4						
08	Analog input 5						
0C	Analog input 6						
0E	Analog input 7						
10	Analog input 8						

File No.	File name		Size (byte)
9	PI terminal board	PI_FILE	8

File composition

PI data is stocked.

Pulse width: Value converted into % by PI full-stroke (input value at each basic cycle)

Pulse number: Value converted into % by PI max pulse number.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Pulse input 1	2	—	—	%	0 to 10000 corresponds to 0 to 100.00%.	
02	Pulse input 2	↓	↓	↓	↓	↓	
04	Pulse input 3						
06	Pulse input 4						

File No.	File name		Size (byte)
10	PI terminal board	PWI_FILE	8

File composition

PI (pulse width) data is stocked. Value converted into % by PI full-stroke (input value at each basic cycle)

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Pulse input 1 (DI1, 2)	2	—	—	%	0 to 10000 corresponds to 0 to 100.00%.	
02	Pulse input 2 (DI3, 4)	↓	↓	↓	↓	↓	
04	Pulse input 3 (DI5, 6)						
06	Pulse input 4 (DI7, 8)						

File No.	File name		Size (byte)
11	Direct input terminal board	DAI_FILE	4

File composition

Direct input data for 2CH are stocked. Data converted into % according to input range designation.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Direct input 1	2	—	—	%	0 to 10000 corresponds to 0 to 100.00%.	
02	Direct input 2	2	—	—	%	0 to 10000 corresponds to 0 to 100.00%.	

File No.	File name		Size (byte)
12	DI terminal board	DI_TERMINAL	2

File composition

DI read-in value is stocked. Read-in cycle;

Data from this terminal is used by wafer wiring.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	DI	2	—	—	—	as mentioned below	

DI

8000 bits ----
4000 bits ----
2000 bits ----
1000 bits ----
0800 bits ----
0400 bits ---- Di10
0200 bits ---- Di9
0100 bits ---- Di8
0080 bits ---- Di7
0040 bits ---- Di6
0020 bits ---- Di5
0010 bits ---- Di4
0008 bits ---- Di3
0004 bits ---- Di2
0002 bits ---- Di1
0001 bits

File No.	File name		Size (byte)
13	Linearize file	LINER_TBL	64 × 8 × LOOP

File composition

Setting of segmented line proximity table data, capable of setting up to 8 tables on each loop. In practice, 4 blocks at head of each loop are used.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop1 Table1 X-axis X01	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	-25.00
02	X02	2	-327.67	327.67	%	↓	125.00
│	│	│	│	│	│		│
1E	X16	2	-327.67	327.67	%		125.00
20	Y-axis Y01	2	-327.67	327.67	%		-25.00
22	Y02	2	-327.67	327.67	%		125.00
│	│	│	│	│	│		│
3E	Y16	2	-327.67	327.67	%		125.00
40	Loop 1 Table 2	Ditto	↓	↓	↓		
80	Loop 1 Table 3	Ditto					
C0	Loop 1 Table 4	Ditto					
100	Loop 1 Table 5	Ditto					
140	Loop 1 Table 6	Ditto					
180	Loop 1 Table 7	Ditto					
1C0	Loop 1 Table 8	Ditto					
200 │	Loop 2 Ditto	Ditto					
400 │	Loop 3 Ditto	Ditto					
600 │	Loop 4 Ditto	Ditto					

File No.	File name		Size (byte)
14	System table	SYSTEM_TABLE	498

File composition

Setting of parameters on the whole system of CC-M.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Basic cycle (BASIC_CYCLE)	2	10	50		Designated by multiples of 10ms integral number	20
02	PI1 full-stroke (PIFULL STROKE1)	2	0	10000		0 to 10000 corresponds to 0 to 10000sec or 0 to 10000.	300
04	PI2 full-stroke (PIFULL STROKE2)	2	0	10000		0 to 10000 corresponds to 0 to 10000sec or 0 to 10000.	200
06	PI3 full-stroke (PIFULL STROKE3)	2	0	10000		0 to 10000 corresponds to 0 to 10000sec or 0 to 10000.	200
08	PI4 full-stroke (PIFULL STROKE4)	2	0	10000		0 to 10000 corresponds to 0 to 10000sec or 0 to 10000.	300
0A						(Not used)	
0C						(Not used)	
0D	System FLT latch designation	1	0	1		0: No latch, 1: Latch	0
0E	(Blank)	2					
10	MV read-back judgement	2				Corresponds to Loop 1 to 4 from LSB; judgement at bit on.	all ON
12	(Blank) 3 words	2×3					
18	Loop 1/primary FLT latch designation	1				(Not used)	
19	ALM latch designation	1	0	1		0: No latch, 1: latch	0
1A	Alarm output designation	1	0	3		0: No output,1: PH/PL, 2: DPH/DPL, 3: DH/DL	1
1B	Setting lock	1	0	1		0: Setting, 1: No setting	0
1C	Start mode	1	0	2		0: A, 1: RorC, 2: M	0
1D	SCC enable designation	1	0	4		0: OFF, 4: ON	
1E	(Blank)	1				(Not used)	
1F	MV alarm 2NH	1				0 to 1, 0: Without 1NH, 1: INH	0
20	Power fault processing time	2	0	32767	*1	0 to 32767sec (loop alone effective)	180
22	(Blank)	2					
24	Loop 1/secondary	Ditto	Ditto	Ditto	Ditto	Ditto	
30	Loop 2/primary	Ditto	Ditto	Ditto	Ditto	Ditto	
3C	Loop 2/secondary	Ditto	Ditto	Ditto	Ditto	Ditto	
48	Loop 3/primary	Ditto	Ditto	Ditto	Ditto	Ditto	
54	Loop 3/secondary	Ditto	Ditto	Ditto	Ditto	Ditto	
60	Loop 4/primary	Ditto	Ditto	Ditto	Ditto	Ditto	
6C	Loop 4/secondary	Ditto	Ditto	Ditto	Ditto	Ditto	
78	Loop 5/primary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	
84	Loop 5/secondary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	
90	Loop 6/primary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	

*1) Only the loop 1 primary module data can be used for power fault processing time (other data: 0).

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
9C	Loop 6/secondary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	
A8	Loop 7/primary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	
B4	Loop 7/secondary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	
C0	Loop 8/primary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	
CC	Loop 8/secondary (spare)	Ditto	Ditto	Ditto	Ditto	Ditto	
D8	(Blank)	2				(Not used)	
DA	MODBUS station No.	2	1	255			1
DC	Baud rate	2	0	4		0: 2400, 1: 4800, 2: 9600, 3: 19200, 4: 38400	2
DE	Parity	2	0	2		0: odd, 1: even, 2: none	2
E0	Stop bit	2	1	2		1, 2	1
E2	(Blank)	2				(Not used)	
E4	(Blank)	2				(Not used)	
E6	(Blank)	2				(Not used)	
E8	(Blank)	2				(Not used)	
EA	(Blank)	2				(Not used)	
EC	FRONT communication	2	Ditto	Ditto	Ditto	Ditto	
100	(Blank)	2	Ditto	Ditto	Ditto	(Not used)	
114	AI check designation (PV1, 2, AI1 to 6)	2×8	0	1		0: No check, 1: AI check	0
124	Direct input AI check designation (PVD1, PVD2)	2×8	0	1		Ditto (only the first 2 words are used)	0
134	Direct input (PVD1) Input type	2	0	1		0: Pt, 1: TC, (2: V)	0
	Range code	2	0	15		(as mentioned below)	0
	RCJ ON/OFF	2	0	1		0: RCJ off, 1: RCJ on	0
13C	Direct input (PVD2)	2	Ditto	Ditto	Ditto	Ditto	
144	AI range setting (PV1) Range code	2	0	2		0: 1 to 5V, 1: 0 to 5V, 2: 0 to 10V	0
	Base scale	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0
	Full-scale	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	10000
14C	AI range setting (PV2)	2	Ditto	Ditto	Ditto	Ditto	
154	AI range setting (AI1)	2	Ditto	Ditto	Ditto	Ditto	
15C	AI range setting (AI2)	2	Ditto	Ditto	Ditto	Ditto	
164	AI range setting (AI3)	2	Ditto	Ditto	Ditto	Ditto	
16C	AI range setting (AI4)	2	Ditto	Ditto	Ditto	Ditto	
174	AI range setting (AI5)	2	Ditto	Ditto	Ditto	Ditto	
17C	AI range setting (AI6)	2	Ditto	Ditto	Ditto	Ditto	
184	AO range setting (A01) Range code	2	0	2		0: 1 to 5V, 1: 0 to 5V, 2: 0 to 10V	0
	Base scale	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	0
	Full-scale	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00%.	10000
18C	AO range setting (A02)	2	Ditto	Ditto	Ditto	Ditto	
194	AO range setting (A03)	2	Ditto	Ditto	Ditto	Ditto	
19C	AO range setting (A04)	2	Ditto	Ditto	Ditto	Ditto	

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
1A4	AO range setting (A05)	2	Ditto	Ditto	Ditto	Ditto	
1AC	Control function (loop 1, primary) Function code	2	0	2		0: PID, 1: RATIO, 2: PROGRAM	0
	Setting method	2	0	2	*2	0: R-A-M, 1: A-M, 2: C-A-M	With PILC
	Auto tuning	2	0	1	*2	(Not used)	
1B4	Control function (loop 2, primary)	2	Ditto	Ditto	Ditto	Ditto	
1BC	Control function (loop 3, primary)	2	Ditto	Ditto	Ditto	Ditto	
1C4	Control function (loop 4, primary)	2	Ditto	Ditto	Ditto	Ditto	
1CC	Control function (spare)	2	Ditto	Ditto	Ditto	Ditto	
1D4	Control function (spare)	2	Ditto	Ditto	Ditto	Ditto	
1DC	Control function (spare)	2	Ditto	Ditto	Ditto	Ditto	
1E4	Control function (spare)	2	Ditto	Ditto	Ditto	Ditto	
1EC	LCD contrast	2	—	—			
1EE	Pass word (menu 2/3) Input value	2	0	FFFFH		Hexadecimal number	0000
1F0	Set value	2	0	FFFFH		Hexadecimal number	0000
1F2	Pass word (menu 3/3)	2	Ditto	Ditto	Ditto	Ditto	
1F6	Pass word (spare)	2	Ditto	Ditto	Ditto	Ditto	
1FA	MI polarity designation (loop 1)	1	0	1		0: normal, 1: reverse	0
1FB	MI polarity designation (loop 2)	1	0	1		0: normal, 1: reverse	0
1FC	MI polarity designation (loop 3)	1	0	1		0: normal, 1: reverse	0
1FD	MI polarity designation (loop 4)	1	0	1		0: normal, 1: reverse	0

*2) On the setting method and auto tuning, an 8-block data area is provided, but only the first area is used.

Direct input range code

Input signal		Input type code	Input type code	Measurement range (°C)
Resistance bulb, JIS (IEC)	Pt100	00	00	0.0 to 150.0°C
			01	0.0 to 300.0°C
			02	0.0 to 500.0°C
			03	0.0 to 600.0°C
			04	-50.0 to 100.0°C
			05	-100.0 to 200.0°C
			06	-200.0 to 600.0°C
			07	-200.0 to 850.0°C
Resistance bulb, old JIS	JPt100		08	0.0 to 150.0°C
			09	0.0 to 300.0°C
			10	0.0 to 500.0°C
			11	0.0 to 600.0°C
			12	-50.0 to 100.0°C
			13	-100.0 to 200.0°C
			14	-200.0 to 600.0°C
Thermocouple	J	01	00	0.0 to 400.0°C
	J		01	0.0 to 800.0°C
	K		02	0.0 to 400.0°C
	K		03	0.0 to 800.0°C
	K		04	0.0 to 1200.0°C
	R		05	0.0 to 1600.0°C
	B		06	0.0 to 1800.0°C
	T		07	-200.0 to 200.0°C
	T		08	-150.0 to 400.0°C
	E		09	0.0 to 800.0°C
	E		10	-200.0 to 800.0°C
	S		11	0.0 to 1600.0°C
	N		12	0.0 to 1300.0°C
	U		13	-200.0 to 400.0°C
	WRe 5-26		14	0.0 to 2300.0°C
	PL-II		15	0.0 to 1300.0°C

File No.	File name		Size (byte)
15	Wafer wiring table	WAF_CONN_TBL	8 × 48 × LOOP

File composition

Table for wiring wafer of each loop. Up to 48 x 4 loops can be registered.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Wafer 1 Wafer code	2	0000	FFFF	—	Wafer code	0000
02	Input terminal 1	2				Input terminal 1	0000
04	Input terminal 2	2				Input terminal 2	0000
06	Input terminal 3	2				Input terminal 3	0000
08	Wafer 2	Ditto	Ditto	Ditto			
|	|	|	|	|			
178	Wafer 48	Ditto	Ditto	Ditto			
180 |	Loop 2 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
300 |	Loop 3 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
480 |	Loop 4 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	

File No.	File name		Size (byte)
16	AO terminal board	AO_FILE	10

File composition

Analog output data is stocked.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Analog output 1	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	
02	Analog output 2	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	
04	Analog output 3	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	
06	Analog output 4	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	
08	Analog output 5	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	

File No.	File name		Size (byte)
17	Current output terminal board	CURRENT_FILE	8

File composition

4 to 20mA output data is stocked.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Current output 1	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	
02	Current output 2	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	
04	Current output 3	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	
06	Current output 4	2	—	—	%	0 to 10000 corresponds to 0.00 to 100.00%.	

File No.	File name		Size (byte)
18	DO terminal board	DO_TERMINAL	2

File composition

Digital output (DO) data is stocked.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Digital output	2					

DO

0200 bits ---- D010
0100 bits ---- D09
0080 bits ---- D08
0040 bits ---- D07
0020 bits ---- D06
0010 bits ---- D05
0008 bits ---- D04
0004 bits ---- D03
0002 bits ---- D02
0001 bits ---- D01

File No.	File name		Size (byte)
19	Gain schedule table	GAIN_TBL	64 × 2 × LOOP

File composition

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 GS(1) Applicable index	2	-327.67	327.67	%	0 to 10000 corresponds to 0.00 to 100.00.	0.00
		2	-327.67	327.67	%		100.00
10	Proportional band	2	1.0	3276.7	%	0 to 10000 corresponds to 0.0 to 1000.0%.	3000.0
		2	1.0	3276.7	%		3000.0
20	Integration time	2	0.1	3276.7	SEC	0 to 10000 corresponds to 0.0 to 1000.0sec.	3000.0
		2	0.1	3276.7	SEC		3000.0
30	Differentiation time	2	0.0	900.0	SEC	0 to 10000 corresponds to 0 to 1000.0sec.	0.0
		2	0.0	900.0	SEC		0.0
40	Loop 1 GS(2)	Ditto	Ditto	Ditto	Ditto	Ditto	
80	Loop 2 GS(1)	Ditto	Ditto	Ditto	Ditto	Ditto	
C0	Loop 2 GS(2)	Ditto	Ditto	Ditto	Ditto	Ditto	
100	Loop 3 GS(1)	Ditto	Ditto	Ditto	Ditto	Ditto	
140	Loop 3 GS(2)	Ditto	Ditto	Ditto	Ditto	Ditto	
180	Loop 4 GS(1)	Ditto	Ditto	Ditto	Ditto	Ditto	
1C0	Loop 4 GS(2)	Ditto	Ditto	Ditto	Ditto	Ditto	

File No.	File name		Size (byte)
20	Output wiring table	OUT_CNECT	486

File composition

00

Table for wiring output from wafer opening to external terminals, including transmission output and internal setting output, in addition to external wiring, for setting input terminal code.

Address (HEX)	Name	Size (byte)	High limit set value	Low limit set value	Unit	Function	Factory delivery value
00	T-link Output 00 wiring	2	0000	FFFF	None	Data connected is outputted to T-link area (master) or OPTO22.	0000
|	|	|	|	|	|		
C6	Output 99 wiring	2	0000	FFFF	None		0000
C8	SCC output wiring S01	2	0000	FFFF	None	Data outputted to host system at T-link slave is connected. Not used when OPTO22 is used.	
|	|	|	|	|	|		
E6	output wiring S16	2	0000	FFFF	None		
148	AO1 output wiring	2	0000	FFFF	None	Output wiring data to AO1 to AO5	↓
|	|	|	|	|	|		↓
150	AO5 output wiring	2	0000	FFFF	None		↓
152	DO1 output wiring	2	0000	FFFF	None	Output wiring data up to DO1 to DO16	↓
|	|	|	|	|	|		↓
170	DO16 output wiring	2	0000	FFFF	None		↓
172	LOOP 1 PH1 inhibit	↓	↓	↓	↓		↓
174	PL1 inhibit	↓	↓	↓	↓		↓
176	PH1 inhibit	↓	↓	↓	↓		↓
178	PL1 inhibit	↓	↓	↓	↓		↓
17A	DH1 inhibit	↓	↓	↓	↓		↓
17C	DL1 inhibit	↓	↓	↓	↓		↓
17E	R-ACK command	↓	↓	↓	↓		↓
180	PH2 inhibit	↓	↓	↓	↓		↓
182	PL2 inhibit	↓	↓	↓	↓		↓
184	PH2 inhibit	↓	↓	↓	↓		↓
186	PL2 inhibit	↓	↓	↓	↓		↓
188	DH2 inhibit	↓	↓	↓	↓		↓
18A	DL2 inhibit	↓	↓	↓	↓		↓
18C	PV tracking command	↓	↓	↓	↓		↓
18E	R-ACK command	↓	↓	↓	↓		↓
190	SMAN command	2	↓	↓	↓		↓
192 |	Loop 2 Ditto	Ditto	↓	↓	↓		↓
1B2 |	Loop 3 Ditto	Ditto	↓	↓	↓		↓
1D2 |	Loop 4 Ditto	Ditto	↓	↓	↓		↓
1F2	SMAN mode request wiring	2	0000	FFFF	None	For wiring external manual command	
1F4	SMAN mode request wiring	2	0000	FFFF	None		
1F6	SMAN mode request wiring	2	0000	FFFF	None		
1F8	SMAN mode request wiring	2	0000	FFFF	None		

File No.	File name		Size (byte)
21	Logging table	TREND_SET	68 × 8

File composition

Data logging file is divided into setting area and working area. The 4-pen logging can be set in 8 pages.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Page 1 Command setting (COMMAND)	1	0	2	—	0: RESET, 1: START, 2: STOP	RESET
01	Interval time (INTERVAL)	1	0	20	day/ hr/ min/ sec	0: 1 sec, 1: 2 sec, 2: 5 sec, 3: 10 sec, 4: 15 sec, 5: 30 sec, 6: 1 min, 7: 2 min, 8: 5 min, 9: 10 min, 10: 15 min, 11: 30 min, 12: 1 hr, 13: 2 hr, 14: 3 hr, 15: 6 hr, 16: 12 hr, 17: 1 day, 18: 2 days, 19: 7 days, 20: 14 days	30 sec
02	Trend type	1	0	1	—	0: FILL, 1: ROUND	FULL
03	Trend method	1	0	1	—	0: POINT, 1: MIN-MAX	POINT
04	Pen 1 display data address No.	2	0000	FFFF	—		0000
06	Pen 2 display data address No.	2	0000	FFFF	—		0000
08	Pen 3 display data address No.	2	0000	FFFF	—		0000
0A	Pen 4 display data address No.	2	0000	FFFF	—		0000
0C	(Blank)					(Not used)	
44 |	Page 2 Ditto	Ditto	Ditto	Ditto			
88 |	Page 3 Ditto	Ditto	Ditto	Ditto			
CC |	Page 4 Ditto	Ditto	Ditto	Ditto			
110 |	Page 5 Ditto	Ditto	Ditto	Ditto			
154 |	Page 6 Ditto	Ditto	Ditto	Ditto			
198 |	Page 7 Ditto	Ditto	Ditto	Ditto			
1DC |	Page 8 Ditto	Ditto	Ditto	Ditto			

File No.	File name		Size (byte)
22	PILC code setting	PILC_CODE	25

File composition

Product type code (PILC) can be set.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	PILC 1st digit (P)	1					
01	PILC 2nd digit (D)	1					
02	PILC 3rd digit (A)	1					
03	PILC 4th digit (2)	1	0	1		1: Programmable	
04	PILC 5th digit (4) Loop number	1				0: 1 loop, 1: 2 loops, 2: 4 loops	
05	PILC 6th digit (1) External terminal	1				0: Screw, 1: Compression	
06	PILC 7th digit (A) Input signal	1				0: DCV, 1: TC, 2: Pt, 3: JPt	
07	PILC 8th digit (–)	1					
08	PILC 9th digit (A) Power source	1				0: AC	
09	PILC 10th digit (c) Setting method	1					
0A	PILC 11th digit (A) HMV	1				0: None, 1: 1 loop, 2: 2 loops, 3: 4 loops	
0B	PILC 12th digit (T) Communication	1				0: T, 1: R, 2: M, 3: Y	
0C	PILC 13th digit (Y) Instruction manual	1				0: Y, 1: W, 2: V	
0D	PILC 14th digit (1) Program	1				0: Wafer, 1: Soft Logic	
0E	PILC 15th digit (0) Wafer wiring	1				0: Without, 1: With	
0F	PILC 16th digit ( )	1				(Blank)	
10	PILC 17th digit ( )	1					
11	PILC 18th digit ( )	1					
12	PILC 19th digit ( )	1					
13	PILC 20th digit ( )	1					
14	PILC 21th digit ( )	1					
15	Device No., 1st digit	1					
16	Device No., 2nd digit	1					
17	Device No., 3rd digit	1					
18	Device No., 4th digit	1					
19	Device No., 5th digit	1					
1A	Device No., 6th digit	1					
1C	Device No., 7th digit	1					
1D		1					
1E		1					
1F		1					
20		1					
21		1					
22		1					

File No.	File name		Size (byte)
23	Module definition	MODULE_INFO	22 × LOOP × 2

File composition

Definition of each control loop

A total of 8 loop panels are defined.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop 1 Primary TAG name	1×9				TAG name (8th digit) is set by ASCII code (9th digit: 0).	TAG *-06*
09	Registered loop No.	1				(Not used)	
0A	Registered module No.	1				(Not used)	
0B	WAF display/PID display	1	0	1			
0C	Display type	1	0	3		(Not used)	
0D	Dimension Base scale	2	-9999	32767			0
0F	Full-scale	2	-9999	32767			10000
11	Decimal point position	1	0	4			2
12	Unit code	1	0	255		Code in unit code table is designated.	%
13	Hold designation ALM	1	0	1		0: No hold, 1: Hold	0
14	FLT	1	0	1		0: No hold, 1: Hold	0
15	OPEN/CLOSE	1				0: open/close, 1: close/open	0
16 |	Loop 1 Secondary block	Ditto	Ditto	Ditto	Ditto	Ditto	
2C |	Loop 2 Primary block	Ditto	Ditto	Ditto	Ditto	Ditto	
42 |	Loop 2 Secondary block	Ditto	Ditto	Ditto	Ditto	Ditto	
58 |	Loop 3 Primary block	Ditto	Ditto	Ditto	Ditto	Ditto	
6E |	Loop 3 Secondary block	Ditto	Ditto	Ditto	Ditto	Ditto	
84 |	Loop 4 Primary block	Ditto	Ditto	Ditto	Ditto	Ditto	
9A |	Loop 4 Secondary block	Ditto	Ditto	Ditto	Ditto	Ditto	

File No.	File name		Size (byte)
24	1 loop panel definition	PARAM1LOOP	16

File composition

Loop displayed on 2 loop panel is designated. A total of 8 panels.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Panel 1	1	0	15		0 to 7 corresponds to Loop 1 primary to Loop 4 secondary block. 8 to 15 corresponds to WAF1 to 8.	0
01	Panel 2	↓	↓	↓			1
02	Panel 3	↓	↓	↓			2
03	Panel 4	↓	↓	↓			3
04	Panel 5	↓	↓	↓			4
05	Panel 6	↓	↓	↓			5
06	Panel 7	↓	↓	↓			6
07	Panel 8	↓	↓	↓			7
08	(Spare)	↓	↓	↓			
09	(Spare)	↓	↓	↓			
0A	(Spare)	↓	↓	↓			
0B	(Spare)	↓	↓	↓			
0C	(Spare)	↓	↓	↓			
0D	(Spare)	↓	↓	↓			
0E	(Spare)	↓	↓	↓			
0F	(Spare)	↓	↓	↓			

File No.	File name		Size (byte)
25	2 loop panel definition	PARAM2LOOP	16

File composition

Loop displayed on 2 loop panel is designated. A total of 8 panels.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Panel 1 Left side	1	0	15		0 to 7 corresponds to Loop 1 primary to Loop 4 secondary block. 8 to 15 corresponds to WAF1 to 8.	0
01	Right side	1	0	15			1
02	Panel 2 Ditto	Ditto	Ditto	Ditto			
04	Panel 3 ↓	↓	↓	↓			
06	Panel 4 ↓	↓	↓	↓			
08	Panel 5 ↓	↓	↓	↓			
0A	Panel 6 ↓	↓	↓	↓			
0C	Panel 7 ↓	↓	↓	↓			
0E	Panel 8 Ditto	Ditto	Ditto	Ditto			

File No.	File name		Size (byte)
26	4 loop panel definition	PARAM4LOOP	16

File composition

Loop displayed on 4 loop panel is defined. A total of 4 panels.

Address (HEX)	Name		Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Panel 1	Upper left	1	0	15		0 to 7 corresponds to Loop 1 primary to Loop 4 secondary block. 8 to 15 corresponds to WAF1 to 8.	
01		Upper right	1					
02		Lower left	1					
03		Lower right	1					
04 |	Panel 2	Ditto	Ditto	Ditto	Ditto			
08 |	Panel 3	Ditto	Ditto	Ditto	Ditto			
0C |	Panel 4	Ditto	Ditto	Ditto	Ditto			

File No.	File name		Size (byte)
27	8 loop panels definition	PARAM8LOOP	16

File composition

Loop displayed on 8 loop panel is defined. A total of 2 panels.

Address (HEX)	Name		Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Panel 1	1st panel	1	0	15		0 to 7 corresponds to Loop 1 primary to Loop 4 secondary block. 8 to 15 corresponds to WAF1 to 8.	
01		2nd panel	1					
02		3rd panel	1					
03		4th panel	1					
04		5th panel	1					
05		6th panel	1					
06		7th panel	1					
07		8th panel	1					
08 |	Panel 2	Ditto	Ditto	Ditto	Ditto			

File No.	File name		Size (byte)
28	Unit preparation table	EDIT_UNIT	8 × 10

File composition

Setting of unit code for display. Up to 10 of 8th digit unit codes can be registered.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Code 1	8					
08	Code 2						
10	Code 3						
18	Code 4						
20	Code 5						
28	Code 6						
30	Code 7						
38	Code 8						
40	Code 9						
48	Code 10						

File No.	File name		Size (byte)
29	T-link master composition definition	KOSEI_TEIGI	100

File composition

Slave registration is performed at T-link (master). Not used when OPTO22 is used.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	ST0	1				Noted below	
|	|					|	
63	ST99					Noted below	

Designated from LSB by the following bits.

0004 bit--- With slave registration in its station No.
0002 bit--- With output hold at communication error
0001 bit--- With reduction designation

File No.	File name		Size (byte)
30	OPTO communication setting	OPTO_FILE	6 × 40

File composition

Connection at OPTO22 communication is defined. Not used when T-link is used.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Module No. 1 setting of use/no use	1	0	1		0:No use, 1:Use	
│	Off-set	1	0	99			
│	Station address	1	0	252			
│	Slot No.	1	0	15			
↓	Module type	1	0	4			
05	(Blank)					(Not used)	
06 │	Module No. 2 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
0C │	Module No. 3 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	
│	│	│	│	│	│	│	
│	│	↓	↓	↓	↓	↓	
EA │	Module No. 40 Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	

File No.	File name		Size (byte)
31	System command	SYSTEM_COMMAND	9

File composition

System command area.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	T-FIX command	1	0	1		FIX starts at 1.	
01	Reset command	1	0	1		(Not used)	
02	Wafer all RUN/STOP	1	0	1		0: STOP, 1: RUN	
03	Loop 1 wafer RUN/STOP	1	0	1		0: STOP, 1: RUN	
04	Loop 2 wafer RUN/STOP	1	0	1		0: STOP, 1: RUN	
05	Loop 3 wafer RUN/STOP	1	0	1		0: STOP, 1: RUN	
06	Loop 4 wafer RUN/STOP	1	0	1		0: STOP, 1: RUN	
07	Fault latch clear	1	0	1		Clear at 0 → 1 → 0	
08	Alarm latch clear	1	0	1		Clear at 0 → 1 → 0	

File No.	File name		Size (byte)
32	Wafer loop display table	WAF_MODUINFO	24×8

File composition

Setting to display wafer output on loop panel.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Wafer loop 1 TAG	9				ASCII 8th digit (9th digit: NULL)	
	(Blank)						
0C	Dimension Base scale	2	-9999	32767			0
1E	Full-scale	2	-9999	32767			10000
10	Decimal point position	1	0	4			2
	(Blank)						
14	Unit	1					%
18	Wafer loop 2 Ditto	Ditto	Ditto	Ditto			
30	Wafer loop 3 Ditto	↓	↓	↓			
48	Wafer loop 4 Ditto	↓	↓	↓			
60	Wafer loop 5 Ditto	↓	↓	↓			
78	Wafer loop 6 Ditto	↓	↓	↓			
90	Wafer loop 7 Ditto	↓	↓	↓			
A8	Wafer loop 8 Ditto	Ditto	Ditto	Ditto			

File No.	File name		Size (byte)
33	T-link setting	TLNK_WORD	2

File composition

Setting of T-link slave word number.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	T-link slave word number	2				0: 4-word input/output 1: 4-word input 2: 4-word output 3: 8-word input/output 4: 8-word input 5: 8-word output 6: 16-word input/output 7: 16-word input 8: 16-word output	

File No.	File name		Size (byte)
34	T-link setting	TLNK_FTLS	2

File composition

Setting of T-link slave word number.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	FTLS used	2				0: no 1: yes	

File No.	File name		Size (byte)
35	Trend display TAG setting	PEN_TAG	5×32

File composition

Setting of Tag name of each pen on trend display panel.

Address (HEX)	Name	Size (bite)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Trend Page 1/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
05	Pen 2 TAG name	1×5				Ditto	
0A	Pen 3 TAG name	1×5				Ditto	
0F	Pen 4 TAG name	1×5				Ditto	
14	Trend Page 2/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
19	Pen 2 TAG name	1×5				Ditto	
1E	Pen 3 TAG name	1×5				Ditto	
23	Pen 4 TAG name	1×5				Ditto	
28	Trend Page 3/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
2D	Pen 2 TAG name	1×5				Ditto	
32	Pen 3 TAG name	1×5				Ditto	
37	Pen 4 TAG name	1×5				Ditto	
3C	Trend Page 4/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
41	Pen 2 TAG name	1×5				Ditto	
46	Pen 3 TAG name	1×5				Ditto	
4B	Pen 4 TAG name	1×5				Ditto	
50	Trend Page 5/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
55	Pen 2 TAG name	1×5				Ditto	
5A	Pen 3 TAG name	1×5				Ditto	
5F	Pen 4 TAG name	1×5				Ditto	
64	Trend Page 6/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
69	Pen 2 TAG name	1×5				Ditto	
6E	Pen 3 TAG name	1×5				Ditto	
73	Pen 4 TAG name	1×5				Ditto	
78	Trend Page 7/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
7D	Pen 2 TAG name	1×5				Ditto	
82	Pen 3 TAG name	1×5				Ditto	
87	Pen 4 TAG name	1×5				Ditto	
8C	Trend Page 8/8 Pen 1 TAG name	1×5				Setting of TAG name (4 digits) by ASCII code; 9th digit: 00	
91	Pen 2 TAG name	1×5				Ditto	
96	Pen 3 TAG name	1×5				Ditto	
9B	Pen 4 TAG name	1×5				Ditto	

File No.	File name		Size (byte)
36	Trend display scale setting	PEN_SCAL	8×32

File composition

Setting of scaling of each pen on trend display panel.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Trend Page 1/8 Pen 1 base scale	2	-9999	32767			0
02	Pen 1 full-scale	2	-9999	32767			10000
04	Pen 1 decimal point position	1	0	4			2
05	Blank	1	—	—			
06	Blank	2	—	—			
08	Trend Page 1/8 Pen 2 base scale	2	-9999	32767			0
0A	Pen 2 full-scale	2	-9999	32767			10000
0C	Pen 2 decimal point position	1	0	4			2
0D	Blank	1	—	—			
0E	Blank	2	—	—			
10	Trend Page 1/8 Pen 3 base scale	2	-9999	32767			0
12	Pen 3 full-scale	2	-9999	32767			10000
14	Pen 3 decimal point position	1	0	4			2
15	Blank	1	—	—			
16	Blank	2	—	—			
18	Trend Page 1/8 Pen 4 base scale	2	-9999	32767			0
1A	Pen 4 full-scale	2	-9999	32767			10000
1C	Pen 4 decimal point position	1	0	4			2
1D	Blank	1	—	—			
1E	Blank	2	—	—			
20	Trend Page 2/8 Pen 1 base scale	2	-9999	32767			0
22	Pen 1 full-scale	2	-9999	32767			10000
24	Pen 1 decimal point position	1	0	4			2
25	Blank	1	—	—			
26	Blank	2	—	—			
28	Trend Page 2/8 Pen 2 base scale	2	-9999	32767			0
2A	Pen 2 full-scale	2	-9999	32767			10000
2C	Pen 2 decimal point position	1	0	4			2
2D	Blank	1	—	—			
2E	Blank	2	—	—			

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
30	Trend Page 2/8 Pen 3 base scale	2	-9999	32767			F0
32	Pen 3 full-scale	2	-9999	32767			10000
34	Pen 3 decimal point position	1	0	4			2
35	Blank	1	—	—			
36	Blank	2	—	—			
38	Trend Page 2/8 Pen 4 base scale	2	-9999	32767			0
3A	Pen 4 full-scale	2	-9999	32767			10000
3C	Pen 4 decimal point position	1	0	4			2
3D	Blank	1	—	—			
3E	Blank	2	—	—			
40	Trend Page 3/8 Pen 1 base scale	2	-9999	32767			0
42	Pen 1 full-scale	2	-9999	32767			10000
44	Pen 1 decimal point position	1	0	4			2
45	Blank	1	—	—			
46	Blank	2	—	—			
48	Trend Page 3/8 Pen 2 base scale	2	-9999	32767			0
4A	Pen 2 full-scale	2	-9999	32767			10000
4C	Pen 2 decimal point position	1	0	4			2
4D	Blank	1	—	—			
4E	Blank	2	—	—			
50	Trend Page 3/8 Pen 3 base scale	2	-9999	32767			0
52	Pen 3 full-scale	2	-9999	32767			10000
54	Pen 3 decimal point position	1	0	4			2
55	Blank	1	—	—			
56	Blank	2	—	—			
58	Trend Page 3/8 Pen 4 base scale	2	-9999	32767			0
5A	Pen 4 full-scale	2	-9999	32767			10000
5C	Pen 4 decimal point position	1	0	4			2
5D	Blank	1	—	—			
5E	Blank	2	—	—			
60	Trend Page 4/8 Pen 1 base scale	2	-9999	32767			0
62	Pen 1 full-scale	2	-9999	32767			10000
64	Pen 1 decimal point position	1	0	4			2
65	Blank	1	—	—			
66	Blank	2	—	—			

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
68	Trend Page 4/8 Pen 2 base scale	2	-9999	32767			0
6A	Pen 2 full-scale	2	-9999	32767			10000
6C	Pen 2 decimal point position	1	0	4			2
6D	Blank	1	—	—			
6E	Blank	2	—	—			
70	Trend Page 4/8 Pen 3 base scale	2	-9999	32767			0
72	Pen 3 full-scale	2	-9999	32767			10000
74	Pen 3 decimal point position	1	0	4			2
75	Blank	1	—	—			
76	Blank	2	—	—			
78	Trend Page 4/8 Pen 4 base scale	2	-9999	32767			0
7A	Pen 4 full-scale	2	-9999	32767			10000
7C	Pen 4 decimal point position	1	0	4			2
7D	Blank	1	—	—			
7E	Blank	2	—	—			
80	Trend Page 5/8 Pen 1 base scale	2	-9999	32767			0
82	Pen 1 full-scale	2	-9999	32767			10000
84	Pen 1 decimal point position	1	0	4			2
85	Blank	1	—	—			
86	Blank	2	—	—			
88	Trend Page 5/8 Pen 2 base scale	2	-9999	32767			0
8A	Pen 2 full-scale	2	-9999	32767			10000
8C	Pen 2 decimal point position	1	0	4			2
8D	Blank	1	—	—			
8E	Blank	2	—	—			
90	Trend Page 5/8 Pen 3 base scale	2	-9999	32767			0
92	Pen 3 full-scale	2	-9999	32767			10000
94	Pen 3 decimal point position	1	0	4			2
95	Blank	1	—	—			
96	Blank	2	—	—			
98	Trend Page 5/8 Pen 4 base scale	2	-9999	32767			0
9A	Pen 4 full-scale	2	-9999	32767			10000
9C	Pen 4 decimal point position	1	0	4			2
9D	Blank	1	—	—			
9E	Blank	2	—	—			

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
A0	Trend Page 6/8 Pen 1 base scale	2	-9999	32767			0
A2	Pen 1 full-scale	2	-9999	32767			10000
A4	Pen 1 decimal point position	1	0	4			2
A5	Blank	1	—	—			
A6	Blank	2	—	—			
A8	Trend Page 6/8 Pen 2 base scale	2	-9999	32767			0
AA	Pen 2 full-scale	2	-9999	32767			10000
AC	Pen 2 decimal point position	1	0	4			2
AD	Blank	1	—	—			
AE	Blank	2	—	—			
B0	Trend Page 6/8 Pen 3 base scale	2	-9999	32767			0
B2	Pen 3 full-scale	2	-9999	32767			10000
B4	Pen 3 decimal point position	1	0	4			2
B5	Blank	1	—	—			
B6	Blank	2	—	—			
B8	Trend Page 6/8 Pen 4 base scale	2	-9999	32767			0
BA	Pen 4 full-scale	2	-9999	32767			10000
BC	Pen 4 decimal point position	1	0	4			2
BD	Blank	1	—	—			
BE	Blank	2	—	—			
C0	Trend Page 7/8 Pen 1 base scale	2	-9999	32767			0
C2	Pen 1 full-scale	2	-9999	32767			10000
C4	Pen 1 decimal point position	1	0	4			2
C5	Blank	1	—	—			
C6	Blank	2	—	—			
C8	Trend Page 7/8 Pen 2 base scale	2	-9999	32767			0
CA	Pen 2 full-scale	2	-9999	32767			10000
CC	Pen 2 decimal point position	1	0	4			2
CD	Blank	1	—	—			
CE	Blank	2	—	—			
D0	Trend Page 7/8 Pen 3 base scale	2	-9999	32767			0
D2	Pen 3 full-scale	2	-9999	32767			10000
D4	Pen 3 decimal point position	1	0	4			2
D5	Blank	1	—	—			
D6	Blank	2	—	—	—		

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
D8	Trend Page 7/8 Pen 4 base scale	2	-9999	32767			0
DA	Pen 4 full-scale	2	-9999	32767			10000
DC	Pen 4 decimal point position	1	0	4			2
DD	Blank	1	—	—			
DE	Blank	2	—	—			
E0	Trend Page 8/8 Pen 1 base scale	2	-9999	32767			0
E2	Pen 1 full-scale	2	-9999	32767			10000
E4	Pen 1 decimal point position	1	0	4			2
E5	Blank	1	—	—			
E6	Blank	2	—	—			
E8	Trend Page 8/8 Pen 2 base scale	2	-9999	32767			0
EA	Pen 2 full-scale	2	-9999	32767			10000
EC	Pen 2 decimal point position	1	0	4			2
ED	Blank	1	—	—			
EE	Blank	2	—	—			
F0	Trend Page 8/8 Pen 3 base scale	2	-9999	32767			0
F2	Pen 3 full-scale	2	-9999	32767			10000
F4	Pen 3 decimal point position	1	0	4			2
F5	Blank	1	—	—			
F6	Blank	2	—	—			
F8	Trend Page 8/8 Pen 4 base scale	2	-9999	32767			0
FA	Pen 4 full-scale	2	-9999	32767			10000
FC	Pen 4 decimal point position	1	0	4			2
FD	Blank	1	—	—			
FE	Blank	2	—	—			

File No.	File name		Size (byte)
37	Trend display pen unit setting	PEN_UNIT	32

File composition

Setting of pen unit on trend display panel.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Trend Page 1/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
01	Pen 2 unit	1	Ditto	Ditto	Ditto	Ditto	%
02	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
03	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%
04	Trend Page 2/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
05	Pen 2 unit	1	Ditto	Ditto	Ditto	Ditto	%
06	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
07	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%
08	Trend Page 3/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
09	Pen 2 unit	1	Ditto	Ditto	Ditto	Ditto	%
0A	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
0B	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%
0C	Trend Page 4/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
0D	Pen 2 unit	1	Ditto	Ditto	Ditto	Ditto	%
0E	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
0F	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%
10	Trend Page 5/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
11	Pen 2 unit	1	Ditto	Ditto	Ditto	Ditto	%
12	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
13	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%
14	Trend Page 6/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
15	Pen 2 unit	1	Ditto	Ditto	Ditto	Ditto	%
16	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
17	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%
18	Trend Page 7/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
19	Pen 2 unit	1	Ditto	Ditto	Ditto	Ditto	%
1A	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
1B	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%
1C	Trend Page 8/8 Pen 1 unit	1	0	255	—	Designation of code in unit code table	%
1D	Pen 2 unit	1	0	255	—	Ditto	%
1E	Pen 3 unit	1	Ditto	Ditto	Ditto	Ditto	%
1F	Pen 4 unit	1	Ditto	Ditto	Ditto	Ditto	%

File No.	File name		Size (byte)
38	Setting of trend display jump destination	TREN_JP	8

File composition

Setting of shift destination from loop panel to trend display panel.

Address (HEX)	Name	Size (byte)	Low limit set value	High limit set value	Unit	Function	Factory delivery value
00	Loop panel 1/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	
01	Loop panel 2/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	
02	Loop panel 3/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	
03	Loop panel 4/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	
04	Loop panel 5/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	
05	Loop panel 6/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	
06	Loop panel 7/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	
07	Loop panel 8/8	1	0	7		0: Trend panel 1/8 to 7: Trend panel 8/8	

6. APPENDIX

(1) Unit code table

Table of settable units

The unit font number comes in 173. Besides these units, other units can be registered in “File No. 28. Unit preparation table in Chapter 5” by ASCII code to prepare 10 units for use.

Code	00	10	20	30	40	50	60	70	80	90	100	110
0	°C	t/day	t/h	t/min	t/sec	mmH$_2$O	mg/cm^2	mPa	mm	mℓ	mm^2	g/cm^3
1	°F	kg/day	kg/h	kg/min	kg/sec	mH$_2$O	g/cm^2	Pa	cm	l	cm^2	kg/cm^3
2		g/day	g/h	g/min	g/sec	mHg	kg/cm^2	kPa	m	kl	m^2	g/m^3
3		Nm^3/day	Nm^3/h	Nm^3/min	Nm^3/sec	cmHg		MPa				kg/m^3
4		m^3/day	m^3/h	m^3/min	m^3/sec	mHg	N/mm^2			mm^3		t/m^3
5		Nl/day	Nl/h	Nl/min	Nl/sec	mmAq	N/m^2			cm^3	g	g/l
6	%RH	l/day	l/h	l/min	l/sec					m^3	kg	kg/l
7	Vol%	cc/day	cc/h	cc/min	cc/sec	mbar	pai				t	g/ml
8						bar	Torr			cc		
9	*	*	*	*	*	*	*	*	*	*		

The asterisked (*) items are areas for units that have been prepared.

Code	120	130	140	150	160	170	180	190	200	210	220	230
0	ppm	%	mN	mm/sec	rps	μsec	mV	W	μF	kcal	cps	Pa.S
1	ppmNH$_3$	%H$_2$	N	mm/min	rpm	msec	V	kW	F	cal	cpm	mPa. S
2	ppmSO$_2$	%CO$_2$	Nm	mm/h	rph	sec	kV	VA	mH	kcal/m^3	μSv/h	
3	ppmH$_2$S	%He	gcm	m/sec		min	μA	kVA	H		mSv/h	
4	ppmCO	%Ar	kgcm	m/min	m/sec^2	h	mA	Var	C	lx	nGy/h	
5	ppmO$_2$	%O$_2$	kgm	m/h	rad/sec		A	kVar	m	cd	μGy/h	
6	ppmNOx	%NaCl		km/h				cm		lm	μm	
7	ppb	%CO	J				A/T	k cm	k	cd/m^2	g/m^2	
8	pH	CP	kJ				Hz	M cm	M			
9	mol	PO$_2$	HP				db	μS/cm	μ			

The asterisked (*) items are areas for units that have been prepared.

(2) Input terminal code table

Input terminal name	Symbol	Loop 1	Loop 2	Loop 3	Loop 4
Pulse number input 1	FI1	0010			
|	|	|			
4	FI4	0013			
Pulse width input 1	PI1	0014			
|	|	|			
4	PI4	0017			
Measurement value input 1	PV1	0030			
2	PV2	0031			
Analog input 1	AI1	0032			
|	|	|			
6	AI6	0037			
Direct input 1	PDV1	0038			
2	PDV2	0039			
Digital input 12	DI12	0093			
|	|	|			
1	DI1	009E			
SCC input 1	SCC1	0100	0200		
|	|	|	|		
16	SCC16	010F	020F		
T-link master input data 00	TIN00	0200			
|	|	|			
99	TIN99	0263			
T-link slave input 1	T01	0280			
|	|	|			
16	T16	028F			
PV-1ch input error	FLT3-1	032F			
PV-1ch input error	FLT3-2	032E			
Ai-1ch input error	FLT3-3	032D			
|	|	|			
Ai-6ch input error	FLT3-8	0328			
PDV-1ch input error (direct input)	FLT5-1	034F			
PDV-2ch input error (direct input)	FLT5-2	034E			
MV1 read back FLT	FLT6-1	035F			
MV2 read back FLT	FLT6-2	035E			
MV3 read back FLT	FLT6-3	035D			
MV4 read back FLT	FLT6-4	035C			
Master T-link heavy fault FLT	FLT7-1	036F			
Flash ROM erase error	WAR2-1	041F			
Flash ROM write error	WAR2-2	041E			
Basic cycle over	WAR2-3	041D			
Master flash ROM error	WAR2-4	041C			
Slave flash ROM error	WAR2-5	041B			
Wafer (Loop 1) stop	WAR3-1	042F			
|	|	|			
Wafer (Loop 4) stop	WAR3-4	042C			
Wafer wiring (Loop 1) error	WAR4-1	043F			
|	|	|			
Wafer wiring (Loop 4) error	WAR4-4	043C			
OPTO communication error	WAR5-1	044F			
Soft PLC calculation stop	WAR6-1	045F			
Constant 1	CON 1	0880	1880	2880	3880
|	|	|	|	|	|
48	CON48	08AF	18AF	28AF	38AF
Primary control mode					
EXM	EXM1	0912	1912	2912	3912
SCC	SCC1	0914	1914	2914	3914

Input terminal name	Symbol	Loop 1	Loop 2	Loop 3	Loop 4
R	R1	0915	1915	2915	3915
L	L1	0916	1916	2916	3916
NORM	NORM1	0918	1918	2918	3918
AT	AT1	0919	1919	2919	3919
RREQ (PRE)	RREQ1	091A	191A	291A	391A
AREQ (RUN)	AREQ1	091B	191B	291B	391B
NOT-A	NOTA1	091C	191C	291C	391C
SCC-EN	CEN1	091D	191D	291D	391D
LS	LS1	091E	191E	291E	391E
Secondary control mode					
HM	HM2	0930	1930	2930	3930
M	M2	0931	1931	2931	3931
EXM	EXM2	0932	1932	2932	3932
SMAN	SMAN2	0933	1933	2933	3933
SCC	SCC2	0934	1934	2934	3934
R	R2	0935	1935	2935	3935
L	L2	0936	1936	2936	3936
PVTRK	PVTR2	0937	1937	2937	3937
NORM	NORM2	0938	1938	2938	3938
AT	AT2	0939	1939	2939	3939
R-REQ	RREQ2	039A	193A	293A	393A
A-REQ	AREQ2	093B	193B	293B	393B
NOT-A	NOTA2	093C	193C	293C	393C
SCC-EN	CEN2	093D	193D	293D	393D
LS	LS2	093E	193E	293E	393E
Primary alarm					
SV-H	SH1	0940	1940	2940	3940
SV-L	SL1	0941	1941	2941	3941
PV-H	PH1	0942	1942	2942	3942
PV-L	PL1	0943	1943	2943	3943
PV -H	PH1	0944	1944	2944	3944
PV -L	PL1	0945	1945	2945	3945
DV-H	DH1	0946	1946	2946	3946
DV-L	DL1	0947	1947	2947	3947
MV-H	MH1	0948	1948	2948	3948
MV-L	ML1	0949	1949	2949	3949
MV -H	MH1	094C	194C	294C	394C
Secondary alarm					
SV-H	SH2	0950	1950	2950	3950
SV-L	SL2	0951	1951	2951	3951
PV-H	PH2	0952	1952	2952	3952
PV-L	PL2	0953	1953	2953	3953
PV -H	PH2	0954	1954	2954	3954
PV -L	PL2	0955	1955	2955	3955
DV-H	DH2	0956	1956	2956	3956
DV-L	DL2	0957	1957	2957	3957
MV-H	MH2	0958	1958	2958	3958
MV-L	ML2	0959	1959	2959	3959
MV -H	MH2	095C	195C	295C	395C
Wafer output terminal		0A00	1A00	2A00	3A00
		|	|	|	|
		0ABF	1ABF	2ABF	3ABF

(3) Control/calculation wafer table

Wafer code (lower 2 digits)	Wafer name	Loop 1	Loop 2	Loop 3	Loop 4
**		00** (wafer code, upper 2 digits)	01** (wafer code, upper 2 digits)	02** (wafer code, upper 2 digits)	03** (wafer code, upper 2 digits)
00	——	——	——	——	——
01	——	——	——	——	——
02	——	——	——	——	——
03	——	——	——	——	——
04	——	——	——	——	——
05	——	——	——	——	——
06	PULSE WIDTH INTEGRATION WAFER	0006	0106	0206	0306
07	TEMPERATURE/PRESSURE COMPENSATION WAFER	0007	0107	0207	0307
08	SELECTOR WAFER	0008	0108	0208	0308
09	ABSOLUTE VALUE/SIGN INVERSION WAFER	0009	0109	0209	0309
0A	LINEARIZE WAFER 1	000A	010A	020A	030A
0B	LINEARIZE WAFER 2	000B	010B	020B	030B
0C	——	——	——	——	——
0D	——	——	——	——	——
0E	——	——	——	——	——
0F	——	——	——	——	——
10	GAIN SCHEDULE WAFER 1	0010	0110	0210	0310
11	GAIN SCHEDULE WAFER 2	0011	0111	0211	0311
12	——	——	——	——	——
13	——	——	——	——	——
14	——	——	——	——	——
15	——	——	——	——	——
16	——	——	——	——	——
17	——	——	——	——	——
18	——	——	——	——	——
19	——	——	——	——	——
1A	——	——	——	——	——
1B	——	——	——	——	——
1C	——	——	——	——	——
1D	——	——	——	——	——
1E	——	——	——	——	——
1F	——	——	——	——	——
20	——	——	——	——	——
21	PRIMARY INPUT PROCESSING WAFER (PID)	0021	0121	0221	0321
22	PRIMARY PID OPERATION WAFER	0022	0122	0222	0322
23	PRIMARY INTEGRAL WAFER	0023	0123	0223	0323
24	PRIMARY INPUT PROCESSING WAFER (R)	0024	0124	0224	0324
25	PRIMARY RATIO OPERATION WAFER	0025	0125	0225	0325
26	CONTINUOUS TYPE PROGRAM SETTING WAFER (SECOND UNIT)	0026	0126	0226	0326
27	STEP TYPE PROGRAM SETTING WAFER (SECOND UNIT)	0027	0127	0227	0327
28	PRESET WAFER (SECOND UNIT)	0028	0128	0228	0328
29	——	——	——	——	——
2A	CONTINUOUS TYPE PROGRAM SETTING WAFER (MINUTE UNIT)	002A	012A	022A	032A
2B	STEP TYPE PROGRAM SETTING WAFER (MINUTE UNIT)	002B	012B	022B	032B
2C	PRESET WAFER (MINUTE UNIT)	002C	012C	022C	032C
2D	——	——	——	——	——
2E	——	——	——	——	——
2F	——	——	——	——	——
30	BIT ON/OFF WAFER 1	0030	0130	0230	0330
31	BIT ON/OFF WAFER 2	0031	0131	0231	0331
32	BIT ON/OFF WAFER 3	0032	0132	0232	0332
33	BIT ON/OFF WAFER 4	0033	0133	0233	0333
34	BIT ON/OFF WAFER 5	0034	0134	0234	0334
35	BIT ON/OFF WAFER 6	0035	0135	0235	0335
36	BIT ON/OFF WAFER 7	0036	0136	0236	0336
37	BIT ON/OFF WAFER 8	0037	0137	0237	0337
38	BIT RESOLUTION WAFER	0038	0138	0238	0338
39	——	——	——	——	——

Wafer code (lower 2 digits)	Wafer name	Loop 1	Loop 2	Loop 3	Loop 4
**		00** (wafer code, upper 2 digits)	01** (wafer code, upper 2 digits)	02** (wafer code, upper 2 digits)	03** (wafer code, upper 2 digits)
3A	——	——	——	——	——
3B	——	——	——	——	——
3C	PRIMARY PI SETTING WAFER	003C	013C	023C	033C
3D	PRIMARY D SETTING WAFER	003D	013D	023D	033D
3E	——	——	——	——	——
3F	——	——	——	——	——
40	——	——	——	——	——
41	SECONDARY INPUT PROCESSING WAFER	0041	0141	0241	0341
42	SECONDARY PID OPERATION WAFER	0042	0142	0242	0342
43	SECONDARY INTEGRAL WAFER	0043	0143	0243	0343
44	SECONDARY MV OUTPUT WAFER	0044	0144	0244	0344
45	——	——	——	——	——
46	——	——	——	——	——
47	——	——	——	——	——
48	SECONDARY FEED FORWARD WAFER	0048	0148	0248	0348
49	——	——	——	——	——
4A	——	——	——	——	——
4B	——	——	——	——	——
4C	——	——	——	——	——
4D	——	——	——	——	——
4E	——	——	——	——	——
4F	——	——	——	——	——
50	——	——	——	——	——
51	——	——	——	——	——
52	——	——	——	——	——
53	——	——	——	——	——
54	——	——	——	——	——
55	——	——	——	——	——
56	——	——	——	——	——
57	——	——	——	——	——
58	——	——	——	——	——
59	——	——	——	——	——
5A	——	——	——	——	——
5B	——	——	——	——	——
5C	SECONDARY PI SETTING WAFER	005C	015C	025C	035C
5D	SECONDARY D SETTING WAFER	005D	015D	025D	035D
5E	——	——	——	——	——
5F	——	——	——	——	——
60	——	——	——	——	——
61	SQUARE ROOT EXTRACTION WAFER	0061	0161	0261	0361
62	ADDITION WAFER	0062	0162	0262	0362
63	SUBTRACTION/MULTIPLICATION WAFER	0063	0163	0263	0363
64	MULTIPLICATION/ADDITION WAFER	0064	0164	0264	0364
65	ADDITION/DIVISION WAFER	0065	0165	0265	0365
66	LOGICAL OPERATION WAFER 1	0066	0166	0266	0366
67	CHANGEOVER WAFER	0067	0167	0267	0367
68	ENCODER WAFER	0068	0168	0268	0368
69	SAWTOOTH WAVE GENERATION WAFER	0069	0169	0269	0369
6A	BCD CONVERSION WAFER	006A	016A	026A	036A
6B	——	——	——	——	——
6C	——	——	——	——	——
6D	——	——	——	——	——
6E	——	——	——	——	——
6F	——	——	——	——	——
70	BCD/BIN CONVERSION WAFER	0070	0170	0270	0370
71	BCD/BIN CONVERSION 2 WAFER	0071	0171	0271	0371
72	BIN/BCD CONVERSION WAFER	0072	0172	0272	0372
73	BIN/BCD CONVERSION 2 WAFER	0073	0173	0273	0373
74	——	——	——	——	——
75	——	——	——	——	——
76	——	——	——	——	——
77	——	——	——	——	——

Wafer code (lower 2 digits)	Wafer name	Loop 1	Loop 2	Loop 3	Loop 4
**		00** (wafer code, upper 2 digits)	01** (wafer code, upper 2 digits)	02** (wafer code, upper 2 digits)	03** (wafer code, upper 2 digits)
78	——	——	——	——	——
79	——	——	——	——	——
7A	——	——	——	——	——
7B	——	——	——	——	——
7C	——	——	——	——	——
7D	——	——	——	——	——
7E	——	——	——	——	——
7F	——	——	——	——	——
80	——	——	——	——	——
81	DEAD TIME WAFERS 1	0081	0181	0281	0381
82	DEAD TIME WAFERS 2	0082	0182	0282	0382
83	DEAD TIME WAFERS 3	0083	0183	0283	0383
84	LEAD ELEMENT WAFER	0084	0184	0284	0384
85	LAG ELEMENT WAFER	0085	0185	0285	0385
86	ON-OFF WAFER	0086	0186	0286	0386
87	LIMITER WAFER	0087	0187	0287	0387
88	PULSE GENERATION WAFER	0088	0188	0288	0388
89	TIMER WAFER	0089	0189	0289	0389
8A	RAMP FUNCTION WAFER (MINUTE)	008A	018A	028A	038A
8B	ANALOG AVERAGE WAFER	008B	018B	028B	038B
8C	ANALOG INTEGRATION WAFER	008C	018C	028C	038C
8D	DEAD BAND WAFER	008D	018D	028D	038D
8E	——	——	——	——	——
8F	——	——	——	——	——
90	——	——	——	——	——
91	LINEARIZE WAFER 1	0091	0191	0291	0391
92	LINEARIZE WAFER 2	0092	0192	0292	0392
93	LINEARIZE WAFER 3	0093	0193	0293	0393
94	LINEARIZE WAFER 4	0094	0194	0294	0394
95	——	——	——	——	——
96	——	——	——	——	——
97	——	——	——	——	——
98	——	——	——	——	——
99	——	——	——	——	——
9A	——	——	——	——	——
9B	——	——	——	——	——
9C	——	——	——	——	——
9D	——	——	——	——	——
9E	——	——	——	——	——
9F	——	——	——	——	——
A0	——	——	——	——	——
A1	——	——	——	——	——
A2	——	——	——	——	——
A3	——	——	——	——	——
A4	——	——	——	——	——
A5	FLIP-FLOP WAFER	00A5	01A5	02A5	03A5
A6	DECORDER WAFER	00A6	01A6	02A6	03A6
A7	LINEARIZE WAFER 3	00A7	01A7	02A7	03A7
A8	——	——	——	——	——
A9	——	——	——	——	——
AA	RAMP FUNCTION WAFER (HOUR)	00AA	01AA	02AA	03AA
AB	——	——	——	——	——
AC	——	——	——	——	——
AD	——	——	——	——	——
AE	——	——	——	——	——
AF	——	——	——	——	——
B0	——	——	——	——	——
B1	——	——	——	——	——
B2	——	——	——	——	——
B3	——	——	——	——	——
B4	——	——	——	——	——
B5	——	——	——	——	——

Wafer code (lower 2 digits)	Wafer name	Loop 1	Loop 2	Loop 3	Loop 4
**		00** (wafer code, upper 2 digits)	01** (wafer code, upper 2 digits)	02** (wafer code, upper 2 digits)	03** (wafer code, upper 2 digits)
B6	——	——	——	——	——
B7	——	——	——	——	——
B8	——	——	——	——	——
B9	——	——	——	——	——
BA	——	——	——	——	——
BB	——	——	——	——	——
BC	——	——	——	——	——
BD	——	——	——	——	——
BE	——	——	——	——	——
BF	——	——	——	——	——
C0	——	——	——	——	——
C1	ADDITION/ARITHMETIC OPERATION WAFER	00C1	01C1	02C1	03C1
C2	SUBTRACTION/ARITHMETIC OPERATION WAFER	00C2	01C2	02C2	03C2
C3	MULTIPLICATION/ARITHMETIC OPERATION WAFER	00C3	01C3	02C3	03C3
C4	DIVISION/ARITHMETIC OPERATION WAFER	00C4	01C4	02C4	03C4
C5	PULSE NUMBER COUNTER WAFER	00C5	01C5	02C5	03C5
C6	ALARM WAFER	00C6	01C6	02C6	03C6
C7	PULSE NUMBER OUTPUT WAFER	00C7	01C7	02C7	03C7
C8	LEAD/LAG ELEMENT WAFER	00C8	01C8	02C8	03C8
C9	MOVING AVERAGE WAFER 1	00C9	01C9	02C9	03C9
CA	MOVING AVERAGE WAFER 2	00CA	01CA	02CA	03CA
CB	——	——	——	——	——
CC	POSITION TYPE PULSE WIDTH CONVERSION WAFER	00CC	01CC	02CC	03CC
CD	——	——	——	——	——
CE	——	——	——	——	——
CF	——	——	——	——	——
D0	SAMPLE HOLD WAFER	00D0	01D0	02D0	03D0
D1	——	——	——	——	——
D2	——	——	——	——	——
D3	——	——	——	——	——
D4	——	——	——	——	——
D5	——	——	——	——	——
D6	——	——	——	——	——
D7	——	——	——	——	——
D8	——	——	——	——	——
D9	——	——	——	——	——
DA	——	——	——	——	——
DB	——	——	——	——	——
DC	——	——	——	——	——
DD	——	——	——	——	——
DE	——	——	——	——	——
DF	——	——	——	——	——
E0	——	——	——	——	——
E1	DEAD TIME WAFERS 4	00E1	01E1	02E1	03E1
E2	DEAD TIME WAFERS 5	00E2	01E2	02E2	03E2
E3	DEAD TIME WAFERS 6	00E3	01E3	02E3	03E3
E4	LOGICAL OPERATION WAFER 2	00E4	01E4	02E4	03E4
E5	LOGICAL OPERATION WAFER 3	00E5	01E5	02E5	03E5
E6	LOGICAL OPERATION WAFER 4	00E6	01E6	02E6	03E6
E7	LOGICAL OPERATION WAFER 5	00E7	01E7	02E7	03E7
E8	LOGICAL OPERATION WAFER 6	00E8	01E8	02E8	03E8
E9	——	——	——	——	——
EA	——	——	——	——	——
EB	——	——	——	——	——
EC	——	——	——	——	——
ED	——	——	——	——	——
EE	——	——	——	——	——
EF	MEASURING METER DIAGRAM WAFER 1	00EF	01EF	02EF	03EF
F0	MEASURING METER DIAGRAM WAFER 2	00F0	01F0	02F0	03F0
F1	MEASURING METER DIAGRAM WAFER 3	00F1	01F1	02F1	03F1
F2	MEASURING METER DIAGRAM WAFER 4	00F2	01F2	02F2	03F2
F3	MEASURING METER DIAGRAM WAFER 5	00F3	01F3	02F3	03F3

Wafer code (lower 2 digits)	Wafer name	Loop 1	Loop 2	Loop 3	Loop 4
**		00** (wafer code, upper 2 digits)	01** (wafer code, upper 2 digits)	02** (wafer code, upper 2 digits)	03** (wafer code, upper 2 digits)
F4	MEASURING METER DIAGRAM WAFER 6	00F4	01F4	02F4	03F4
F5	MEASURING METER DIAGRAM WAFER 7	00F5	01F5	02F5	03F5
F6	MEASURING METER DIAGRAM WAFER 8	00F6	01F6	02F6	03F6
F7	——	——	——	——	——
F8	——	——	——	——	——
F9	——	——	——	——	——
FA	——	——	——	——	——
FB	——	——	——	——	——
FC	——	——	——	——	——
FD	——	——	——	——	——
FE	——	——	——	——	——
FF	——	——	——	——	——