

**DCP552 Mark II
Digital Control Programmer
User's Manual**

WARRANTY

The Honeywell device described herein has been manufactured and tested for corrent operation and is warranted for a period of one year.

TECHNICAL ASSISTANCE

If you encounter a problem with your unit, please review all the configuration data to verify that your selections are consistent with your application; (i.e. Inputs, Outputs, Alarms, Limits, etc.). If the problem persists after checking the above parameters, you can get technical assistance by calling the following:

In the U.S.A. 1-800-423-9883

In Europe Your local branch office

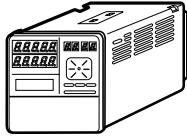
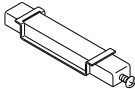


Unpacking

Check the following when removing the **DCP552** from its package.

1. Check the model No. to make sure that you have received the product that you ordered.
2. Check the **DCP552** for any apparent physical damage.
3. Check the contents of the package against the Package List to make sure that all accessories are included in the package.

After unpacking, handle the **DCP552** and its accessories taking care to prevent damage or loss of parts.

If an inconsistency is found or the package contents are not in order, immediately contact your dealer.

Name	Model No.	Q'ty	Remarks
Body 		1	See 1-5, "Model Number Configuration", on page 1-5.
Mounting bracket 	81446044-001	1 pair (2)	
User's Manual 	EN11-6187 (CP-UM-5025E)	1	This manual
Engineering unit indicator label		1	
Terminal cover 	81446176-001	1	Power supply terminal cover

Configuration of This User's Manual

This manual is organized as follows.

Chapter 1. PRODUCT OUTLINE

This chapter explains the use and features of the **DCP552** and provides the basic function block and product model numbers.

Chapter 2. NAMES AND FUNCTIONS OF PARTS

This chapter gives the names and functions of parts of the **DCP552**, and input type and range number.

Chapter 3. INSTALLATION AND MOUNTINGS

This chapter describes the procedure for mounting the **DCP552** onto an operation console.

We strongly urge persons responsible for device design on the **DCP552** read this chapter.

Chapter 4. WIRING

This chapter describes the wiring procedure and precautions required for installing the **DCP552**.

We strongly urge persons responsible for device design and wiring of the **DCP552** read this chapter.

Chapter 5. FUNCTIONS

This chapter explains detailed functions of the **DCP552**.

We strongly urge persons responsible for control design on the **DCP552** read this chapter.

Chapter 6. OPERATION

This chapter gives the selections of the basic display, program selection, operation, and other information.

We strongly urge persons responsible for device design and operation on the **DCP552** read this chapter.

Chapter 7. PARAMETER SETUP

This chapter describes the parameter setting method of the **DCP552** and the meaning of settings.

Chapter 8. PROGRAM SETUP

This chapter describes the program setting method of the **DCP552** and the meaning of settings.

Chapter 9. MEMORY CARD OPERATION

This chapter describes how to use memory cards.

Chapter 10. TROUBLESHOOTING

This chapter describes checkpoints and countermeasures when the **DCP552** is not operating normally.

Chapter 11. SPECIFICATIONS

This chapter gives the general specifications, performance specifications and the external dimensions of the **DCP552**.

Chapter 12. CALIBRATION

This chapter describes calibration procedures for the functions of the **DCP550**.

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Program Work Sheet


Parameter Work Sheet


SAFETY REQUIREMENTS

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Conventions Used in This Manual

The following conventions are used in this manual.

-  **Handling Precautions** : Handling Precautions indicate items that the user should pay attention to when handling the **DCP552**.

-  **NOTE** : Notes indicate useful information that the user might benefit by knowing.

- (1)(2)(3) : The numbers with the parenthesis indicate steps in a sequence or indicate corresponding parts in an explanation.

- >> : Controller state after an operation

- DISP key, ↑ key** : Indicate the **DCP552** keys. These symbols represent keys on the **DCP552**'s console.

- FUNC+PROG key** : Combinations of symbols like this indicate that **PROG key** must be pressed while holding **FUNC key** down.

- PA01, C21* : Indicate the 7 segment display of. **DCP552** display panel 1 and display panel 2.

- PV SHIFT* : Indicates messages displayed by the **DCP552** message display.

Chapter 1. PRODUCT OUTLINE

1 - 1 Features

The **DCP552** is a general purpose dual-loop control programmer for controlling temperature, pressure, flow rate, carbon potential (CP) and other parameters. The program provides a total of 49 patterns and up to 99 segments can be set for each pattern. Note, however, that the maximum number of segments is 2000 or less and that the maximum number of subfunctions for setting events is 4000 or less.

- **High accuracy in multi-range inputs**

Featuring a multi-range format, the user can select thermocouple, resistance temperature detector, DC voltage or DC current. Accuracy is $\pm 0.1\%$ FS ± 1 digit, the sampling cycles is 0.1 sec and some model numbers allow PV2 channel O₂ sensor inputs for carbon potential compensation.

- **Multi-control output types**

Selection at setup allows the user to choose from among current proportional output, voltage time proportional output and open collector time proportional output.

- **Multi-communications**

Selection at setup enables the user to switch between RS-485 and RS-232C on the rear panel terminal base.

At setup it is also possible to switch the communications port from the rear panel terminal base to the front panel loader jack. A special cable is required to use to loader jack on the front panel.

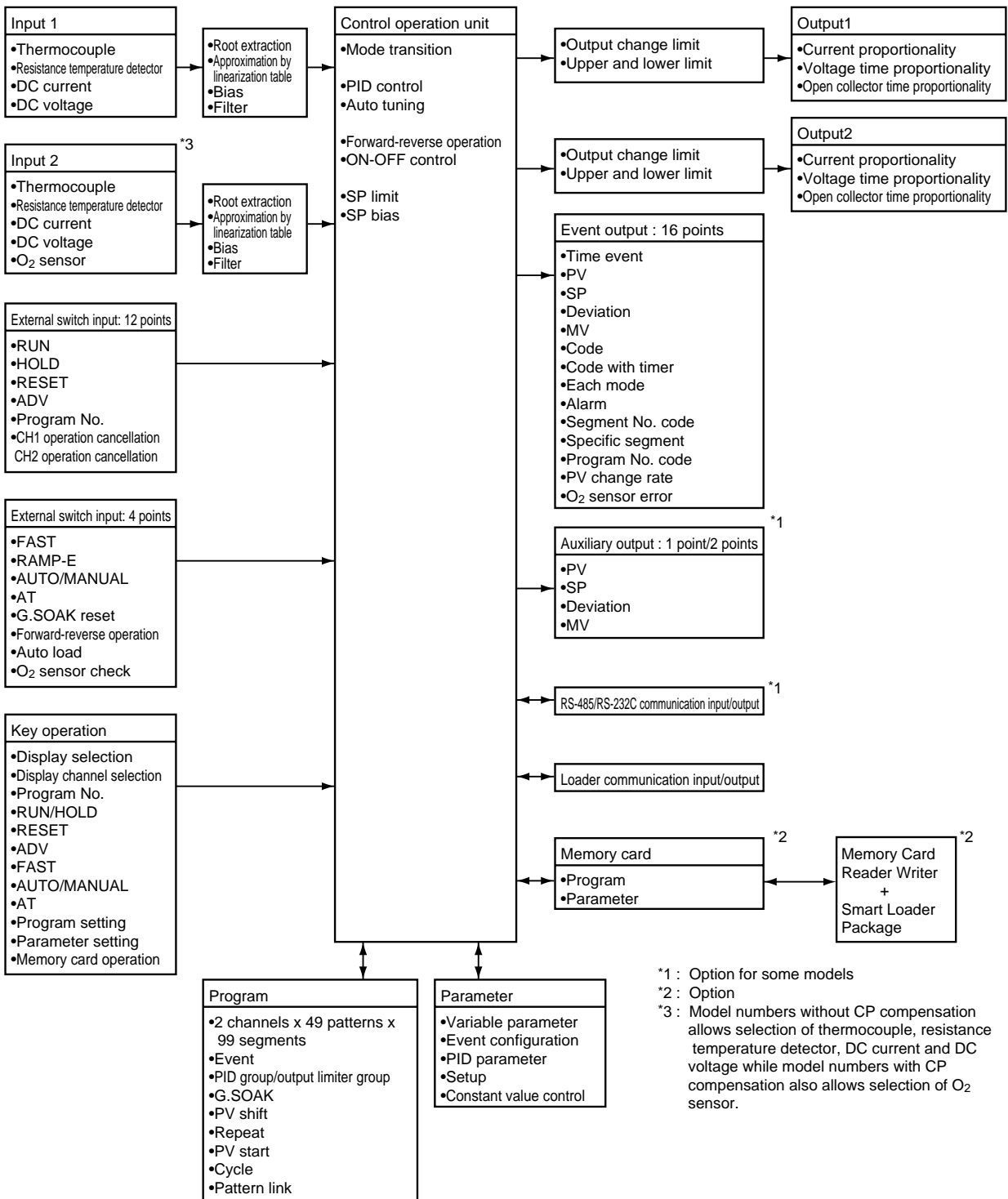
- **Improved PLC support**

The programmer is equipped with 16 external switch inputs and 16 event outputs for flexible support of PLC based automatic systems.

- **Simple operation**

The optional plug-in memory card makes it easy to achieve program and parameter settings for later reuse. Also, the optional smart loader package allows you to make program and parameter settings from a PC.

1 - 2 Basic Function Block Diagram



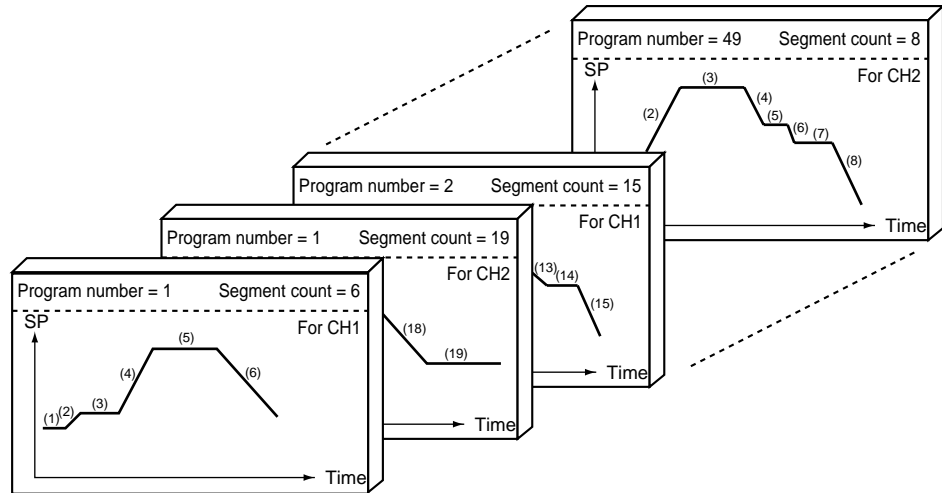
1 - 3 Data Configuration Overview

Data is comprised of parameters and the program.

Parameters are used to set the functions of the **DCP552** while the program is the software that operates the controller at run time.

- **A total of 49 patterns**

It will store up to 49 programs per channel (CH1 and CH2), with up to 99 segments per program.



- **Parameters**

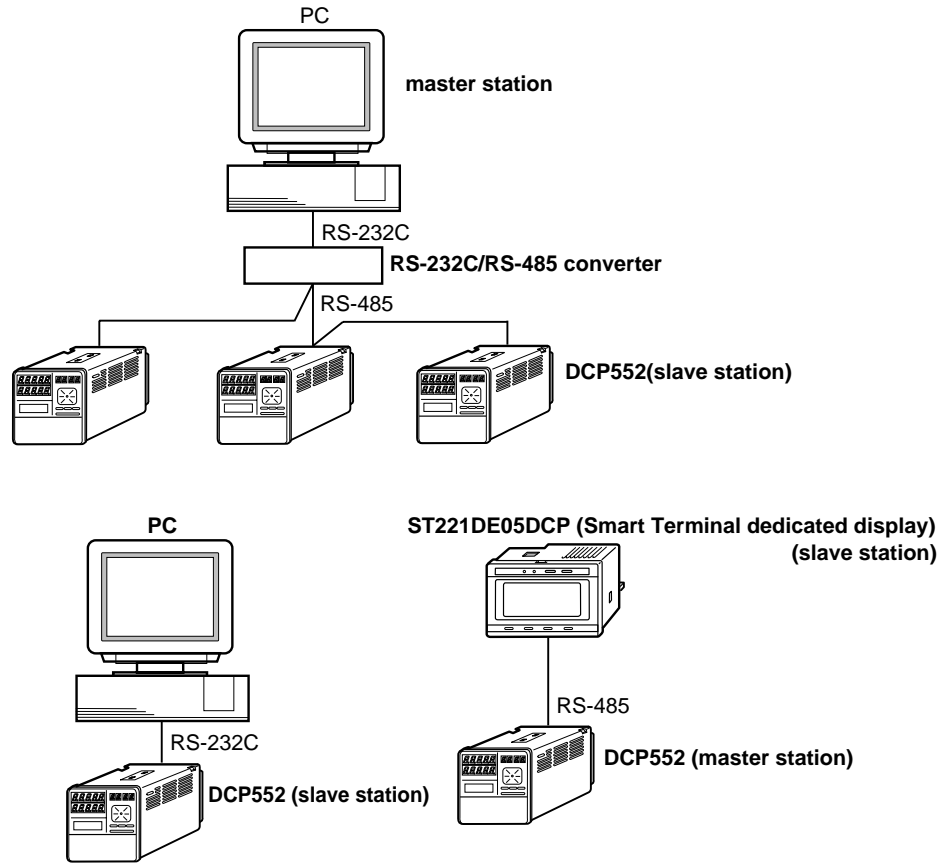
Five types of patterns are provided: variable parameters, event configuration data, PID parameters, setup data and constant value control data.

Variable parameter
Event configuration data
PID parameter (CH1)
PID parameter (CH2)
Setup data
Constant value control data (CH1)
Constant value control data (CH2)

1 - 4 System Configuration

■ CPL communications network-based configuration

Models equipped with the optional communications interface can be connected as a slaved controller to a communications network. In this case, the user can employ as the master station a personal Computer.



1 - 5 Model Number

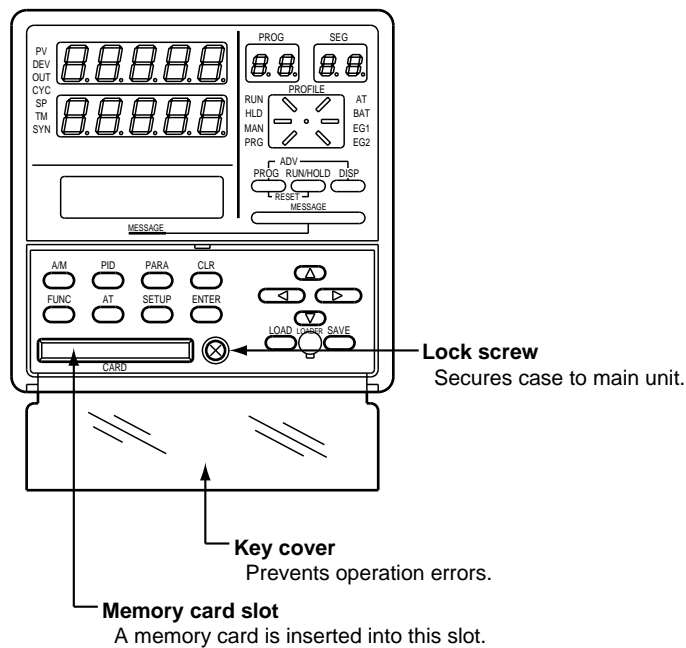
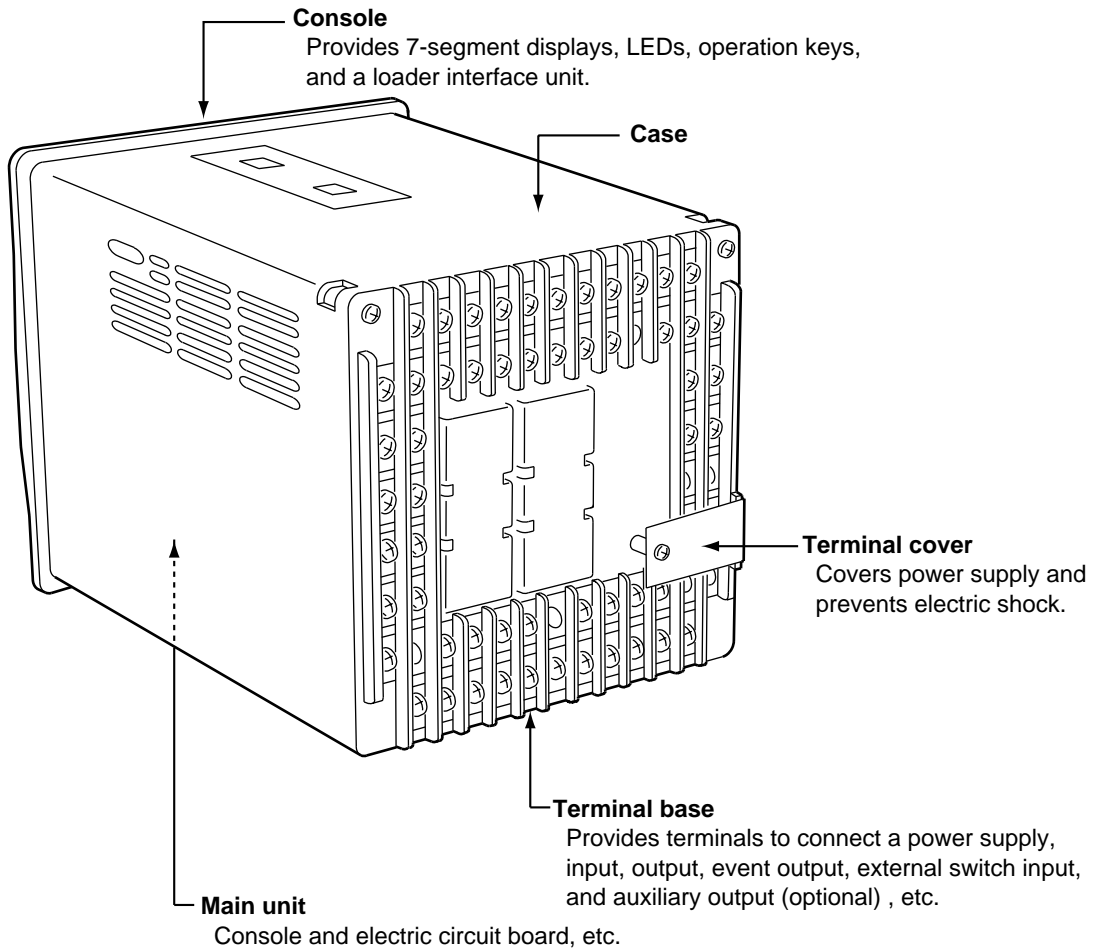
Model number : **DCP552E2******

Basic model number	PV input count	Carbon potential	Option	Additional processing	Contents
DCP552					Digital programmable controller (dual-loop control)
	E				Mark II
		2			2 channels
			0		Not provided
			1		Provided
				0	Not provided
				1	Auxiliary output channel 1
				2	Auxiliary output channel 2, communications
				00	Not provided

Chapter 2. NAMES AND FUNCTIONS OF PARTS

2 - 1 Structure

The DCP552 consists of a main unit, console, case, and terminal base.

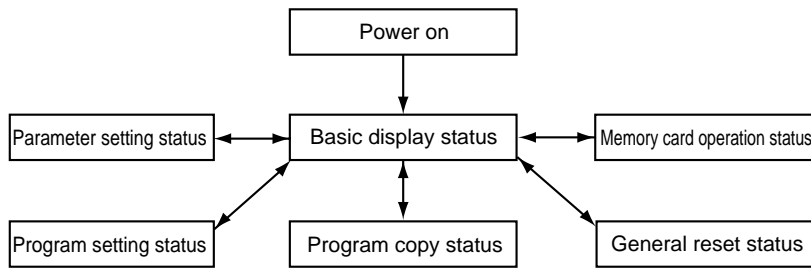


2 - 2 Console

The console consists of the operation keys, displays and LEDs (light emitting diodes).

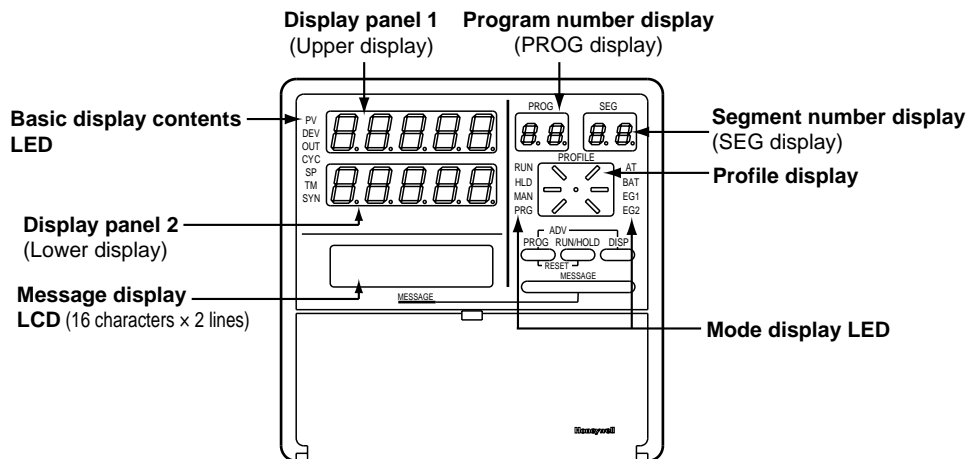
■ Basic display status

Basic display status shows the running condition of the **DCP552** on the console. The basic display status is invoked when the **DCP552** is powered up (power on). Key operations make it possible to change from the basic display status to parameter setting status, program setting status, program copy status, memory card operation status and general reset status.



Key operations can also be used to return to the basic display status.

■ Display



● Basic display LEDs

- PV : Lights during PV display, otherwise off.
- DEV : Lights during deviation display, otherwise off.
- OUT : Lights during output display, otherwise off.
- CYC : Lights during cycle display, otherwise off.
- SP : Lights during SP display, otherwise off.
- TM : Lights during time display, otherwise off.
- SYN : Lights in CH1 and CH2 sync mode, otherwise off.

- **Display panel 1**
 Indicates PV and other data in basic display status.
 Indicates item codes in parameter setting status.
 Indicates set values and item codes in program setting status.
- **Display panel 2**
 Indicates SP, time, output and other data in basic display status.
 Indicates set values in parameter setting status.
 Indicates set values in program setting status.
- **Message display**
 Indicates output graph, deviation graph, running progress graph, event status, program tag and other data in basic display status.
 Displays reference messages in parameter setting status.
 Displays tag settings and reference messages in program setting status.
 Indicates selected operation and operation results during memory card operation.
- **Program number display**
 Indicates a selected program number in basic display status.
 Indicates a set program number in program setting status.
 Off during constant value control.
 Indicates the alarm code “AL” when an alarm occurs in basic display status.
- **Segment number display**
 Indicates a selected segment number in basic display status.
 Indicates a set segment number in program setting status.
 Off during constant value control.
 Indicates an alarm code number when an alarm occurs in basic display status.
- **Mode display LED**
 RUN, HLD : Indicates the RUN, HOLD, FAST, END, and READY FAST modes (see the table below).

LED \ Mode	READY	RUN	HOLD	FAST	END	READY FAST
RUN	OFF	Lights	OFF	Flicker	OFF	Lights
HLD	OFF	OFF	Lights	OFF	Flickers	Lights

- MAN : Lights in MANUAL mode. Off in AUTO mode.
- PRG : Lights in program setting status, otherwise off.
- AT : Flickers during auto tuning execution, otherwise off.
- BAT : Flickers when battery voltage is too low, otherwise off.
- EG1 : Lights when CH1 is displayed, otherwise off.
- EG2 : Lights when CH2 is displayed, otherwise off.

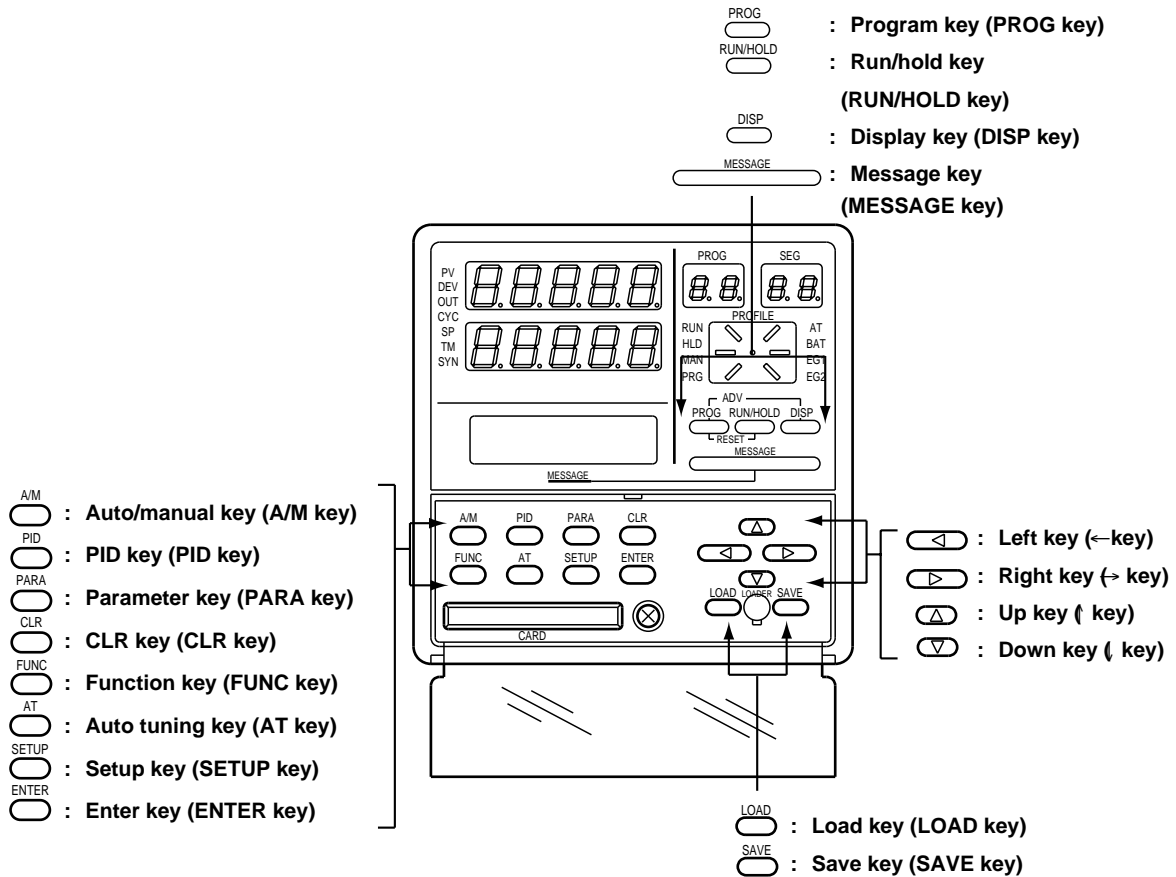
- **Profile display**
 Indicates the rising, soaking, and falling trends of a program pattern.
 Flickers during G.SOAK wait and lights continuously after power on.

■ Key pad

CAUTION



Do not use pointed objects such as mechanical pencils or pins to press the keys on the controller. This may result in malfunction.



() : Denotes key term used in this manual.

Classification	Function	Key operation
Basic display status	Changes the display contents.	DISP
	Changes display channels.	FUNC + DISP
	Changes the display contents on the message display.	MESSAGE
	Changes set program numbers in ascending order. (In READY mode)	PROG
	Performs RUN operation. (In READY, HOLD, FAST, or READY FAST mode)	RUN/HOLD
	Performs HOLD operation. (In RUN mode)	
	Performs RESET operation. (In RUN, HOLD, FAST, END, or READY FAST mode)	PROG + RUN/HOLD
	Performs ADV operation. (In RUN, HOLD, FAST, or READY FAST mode)	PROG + DISP
	Performs FAST operation. (In RUN, HOLD, or READY mode)	FUNC + →
	Performs MANUAL operation. (In AUTO mode)	A/M
	Performs AUTO operation. (In MANUAL mode)	
	Starts AUTO tuning. (When AUTO tuning is not in operation.)	AT
	Interrupts AUTO tuning. (When AUTO tuning is in operation.)	
	Changes numerics during MANUAL operation. (When the MV or SV display flickers.)	↑ ↓ ← →
Changes program numbers or segment numbers. (When the program number or segment number flickers.)		
Parameter setting	Starts the variable parameter setting. (In basic display status)	PARA
	Starts the event configuration setting. (In basic display status)	FUNC + PARA
	Starts the PID parameter setting. (In basic display status)	PID
	Starts the setup setting. (In basic display status)	SETUP
	Starts the fixed command control setting. (In basic display status)	FUNC + PID
	Shifts each item.	↑ ↓ ← →
	Enters set values.	
	Completes a change in a set value. (When a set value flickers.)	↑ ↓ ← →
	Changes each item's set point. (When a set value flickers.)	
	Stops each item's set point. (When a set value flickers.)	
	Ends parameter setting.	DISP
Program setting	Starts the program setting (programming). (In basic display status)	FUNC + PROG
	Shifts to program item or segment number.	↑ ↓ ← →
	Enters set values.	
	Completes a change in a set values. (When a set value flickers.)	↑ ↓ ← →
	Changes each item's set point. (When a set value flickers.)	

Classification	Function	Key operation
Program setting	Erases or resets a set value. (When a set value flickers.)	FUNC + CLR
	Cancels change in set value. (When a set value flickers.)	DISP
	Inserts or delete a segment when a pattern SP setting is started.	FUNC + ENTER
	Changes RAMP-X ↔ RAMP-T or RAMP-X ↔ RAMP-E when a pattern SP setting is completed.	
	Starts a program number change.	FUNC + PROG
	Ends program setting.	DISP
Program copy	Starts program copy. (In basic display status)	↑ + PROG
	Changes program number at copy destination.	↑ ↓
	Executes the copy. (When a set value flickers.)	ENTER
	Ends program copy.	DISP
Memory card operation	Starts a data write operation to the memory card. (In basic display status)	SAVE
	Writes data to the memory card.	
	Starts a data read operation from the memory card. (In basic display status)	LOAD
	Reads data from the memory card.	
	Changes selected memory card operation.	↑ ↓
	Enters memory card operation.	ENTER
	Interrupts memory card operation.	DISP
General reset	Returns a check status of the general reset. (In basic display status)	FUNC + CLR + MESSAGE
	Executes a general reset.	ENTER
	Interrupts a general reset.	DISP

■ Key chord functions

PROG + RUN/HOLD : Reset key
 Press the **RUN/HOLD key** while holding down the **PROG key** in basic status display to perform a RESET.
 The READY mode is invoked when a reset is performed in the RUN, HOLD, FAST, END, or READY FAST modes. This RESET operation does not work in the READY mode.

PROG + DISP : Advance key
 Press the **DISP key** while holding down the **PROG key** in the program run mode in basic status display to perform an ADV (advance) operation. The next segment is displayed when this action is performed in the RUN, HOLD, FAST, or READY FAST modes. This ADV operation does not work in the READY mode.

FUNC + → : Fast key
 Press the **→ key** while holding down the **FUNC key** in the program run mode in basic status display to perform a FAST operation.
 The system changes from the RUN or HOLD mode to the FAST mode. If the system is in the READY mode, it goes to the READY FAST mode.

-
- FUNC + DISP** : Display channel select key
Press the **DISP key** while holding down the **FUNC key** in basic display status to select display channels.
In the program setting status, press the **DISP key** while holding down the **FUNC key** to select the channel of the program to be set.
- FUNC + PARA** : Event configuration setting key
Press the **PARA key** while holding down the **FUNC key** in basic status display to switch to the event configuration setting status.
- FUNC + PID** : constant value control setting key
Press the **PID key** while holding down the **FUNC key** in basic status display to switch to the constant value control setting status.
- FUNC + PROG** : Program setting (programming) key
Press the **PROG key** while holding down the **FUNC key** in the program run mode in basic status display to go to the program setting (programming) status. When the **PROG key** is pressed while holding down the **FUNC key** in the program setting status, allows you to change the number of the program to be set.
- FUNC + CLR** : Program delete key
Press the **CLR key** while holding down the **FUNC key** during registration in the program setting status to delete a setting or return to a default value.
- FUNC + ENTER** : Segment insert/remove/RAMP/selection key
Press the **ENTER key** while holding down the **FUNC key** to go to the segment insert/delete panel during SP and time setting in the program setting status.
Pressing the **ENTER key** while the **FUNC key** is held down during SP registration in the program setting status allows you to switch between RAMP-X and RAMP-T as well as RAMP-X and RAMP-E.
- ↑ + PROG** : Program copy key
Press the **PROG key** while holding down the **↑ key** in program run READY mode in basic display status to go to the program copy panel.
- FUNC + CLR + MESSAGE** : General reset key
Press the **CLR and MESSAGE keys** simultaneously while holding down the **FUNC key** in the READY AUTO mode in the basic display status to go to the general reset verification panel.

■ Loader jack

This jack allows the connection of a loader.
Do not insert plugs other than loader plugs.
The loader jack is not isolated from internal digital circuits.
When not in use, always replace the cap.

2 - 3 Input Type and Range Number

■ Input

● Thermocouple

Input type			Input range (FS)		Accuracy (under standard conditions)	
Symbol	Code	Range No.	°C	°F		
K (CA)	K46	16	-200.0 to +200.0	-300.0 to +400.0	±0.1%FS	
K (CA)	K09	0	0.0 to 1200.0	0 to 2400	±0.1%FS	
K (CA)	K08	1	0.0 to 800.0	0 to 1600	±0.1%FS	
K (CA)	K04	2	0.0 to 400.0	0 to 750	±0.1%FS	
E (CRC)	E08	3	0.0 to 800.0	0 to 1800	±0.1%FS	
J (IC)	J08	4	0.0 to 800.0	0 to 1600	±0.1%FS	
T (CC)	T44	5	-200.0 to +300.0	-300 to +700	±0.1%FS	±0.3%FS at -200 to -45 °C
B (PR30-6)	B18	6	0.0 to 1800.0	0 to 3300	±0.1%FS	±4.0%FS at 0 to 260 °C, ±0.15%FS at 260 to 800 °C
R (RR13)	R16	7	0.0 to 1600.0	0 to 3100	±0.1%FS	
S (PR10)	S16	8	0.0 to 1600.0	0 to 3100	±0.1%FS	
W (WRe5-26)	W23	9	0.0 to 2300.0	0 to 4200	±0.1%FS	
W (WRe5-26)	W14	10	0.0 to 1400.0	0 to 2552	±0.1%FS	
PR40-20	D19	11	0.0 to 1900.0	0 to 3400	±0.2%FS	±0.9%FS at 0 to 300 °C, ±0.5%FS at 300 to 800 °C
N	U13	12	0.0 to 1300.0	32 to 2372	±0.1%FS	
PL II	Y13	13	0.0 to 1300.0	32 to 2372	±0.1%FS	
Ni-Ni • Mo	Z13	14	0.0 to 1300.0	32 to 2372	±0.1%FS	
Gold, iron, chromel	Z06	15	0.0 to 300.0K (K : Kelvin)		±0.4%FS	

● Resistance temperature detector (RTD)

Input type			Input range (FS)		Accuracy (under standard conditions)	
Symbol	Code	Range No.	°C	°F		
JIS'89Pt100 (IEC Pt100Ω)	F50	64	-200.0 to +500.0	-300.0 to +900.0	±0.1%FS	
	F46	65	-200.0 to +200.0	-300.0 to +400.0	±0.1%FS	
	F32	66	-100.0 to +150.0	-150.0 to +300.0	±0.1%FS	
	F36	67	-50.0 to +200.0	-50.0 to +400.0	±0.1%FS	
	F33	68	-40.0 to +60.0	-40.0 to +140.0	±0.15%FS	
	F01	69	0.0 to 100.0	0.0 to 200.0	±0.15%FS	
	F03	70	0.0 to 300.0	0.0 to 500.0	±0.1%FS	
	F05	71	0.0 to 500.0	0.0 to 900.0	±0.1%FS	
JIS'89JPt100	P50	96	-200.0 to +500.0	-300.0 to +900.0	±0.1%FS	
	P46	97	-200.0 to +200.0	-300.0 to +400.0	±0.1%FS	
	P32	98	-100.0 to +150.0	-150.0 to +300.0	±0.1%FS	
	P36	99	-50.0 to +200.0	-50.0 to +400.0	±0.1%FS	
	P33	100	-40.0 to +60.0	-40.0 to +140.0	±0.15%FS	
	P01	101	0.0 to 100.0	0.0 to 200.0	±0.15%FS	
	P03	102	0.0 to 300.0	0.0 to 500.0	±0.1%FS	
P05	103	0.0 to 500.0	0.0 to 900.0	±0.1%FS		

● DC current, DC voltage

Input type			Input range (FS)		Accuracy (under standard conditions)	
Symbol	Code	Range No.				
mA (Linear)	C01	48	4 to 20mA	Programmable range -19999 to +20000 (Decimal point position is variable.)	±0.1%FS	
	Z51	52	2.4 to 20mA		±0.1%FS	
mV (Linear)	M01	49	0 to 10mV		±0.1%FS	
	L02	50	-10 to +10mV		±0.1%FS	
		51	0 to 100mV		±0.1%FS	
mA (Linear)	C01	128	4 to 20mA		±0.1%FS	
	Z51	134	2.4 to 20mA		±0.1%FS	
V (Linear)		129	0 to 1V		±0.1%FS	
		130	-1 to +1V		±0.1%FS	
	V01	131	1 to 5V		±0.1%FS	
		132	0 to 5V	±0.1%FS		
		133	0 to 10V	±0.1%FS		
O ₂ sensor *		135	0 to 1250mV Carbon potential (CP value) indication range: 0.000 to 4.000% C (Note, however, that PID control is calculated over the 0.000 to 2.000% input range) Oxygen pressure indication range: 0.000 to 1.500 x 10 ⁻²⁰ atm	-0.1%FS	When converted to mV values	

*•The O₂ sensor is manufactured by one of the following companies: Nihon Gaishi (NGK), Marathon Monitors, Cambridge, Corning, AACC (Advanced Atmosphere Control Corporation), Barber Colman or Furnace Control.

•PV2 in models with carbon potential compensation is tied to the O₂ sensor.

! Handling Precautions

- The unit for code Z06 is “ K” (kelvin).
- Code F50 and P50 do not generate the PV lower limit alarm.
- The number of decimal digits for DC current and DC voltage is programmable from 0 to 4.
- The O₂ sensor generates the PV upper limit alarm at values of 1375mV or above, but does not generate the PV lower limit alarm.

Chapter 3. INSTALLATION AND MOUNTING

3 - 1 Before Installation

WARNING



Be sure to turn off the power supply when you are installing or removing the controller.
Failure to heed this warning may lead to electric shock.



Do not disassemble the controller as this could lead to electric shock or malfunction.

CAUTION



Be sure to follow the operating requirements (regarding temperature, humidity, voltage, vibration, shock, mounting direction, atmosphere, etc.) as stated in the specifications of the controller.
Failure to heed this caution may lead to fire or malfunction.



Do not block ventilation openings.
Failure to heed this caution may lead to fire or malfunction.



Make sure that wire scraps, chips, or water do not enter inside the case of the controller.
Failure to heed this caution may lead to fire or malfunction.

■ Mounting position

Do not install the **DCP552** in locations:

- exposed to high or low temperature or humidity.
- exposed to direct sunlight or to the elements such as outside.
- exposed to water, oil or chemicals.
- exposed to corrosive or inflammable gas.
- exposed to dust or smoke.
- exposed to vibrations or shocks.
- exposed to strong electric or magnetic fields.
- exposed to electric noise such as ignition devices or welding machines.

■ Sources of electrical interference and countermeasures

•The following list notes common sources of electrical interference.

- (1) Relays and contacts
- (2) Solenoid coils and valves
- (3) Power lines (especially those carrying more than 90V AC)
- (4) Inductive loads
- (5) Inverters
- (6) Motor rectifiers
- (7) Phase angle control SCR
- (8) Wireless communications equipment
- (9) Welding machines
- (10) High voltage ignition devices

•If the source of noise cannot be removed, take the following measures.

•Use a CR filter to suppress fast-rising noise.

Recommended CR filter : No. **81446365-001**

•Use a varistor to suppress high-amplitude interference.

Recommended varistors : No. **81446366-001** (for 110 to 120V)

81446367-001 (for 200 to 240V)

Handling Precautions

Varistors must be handled carefully as they become defective if they are short-circuited.

■ Dust proof cover

Use the soft dust proof cover when the **DCP552** is used in locations where there is a lot of dust.

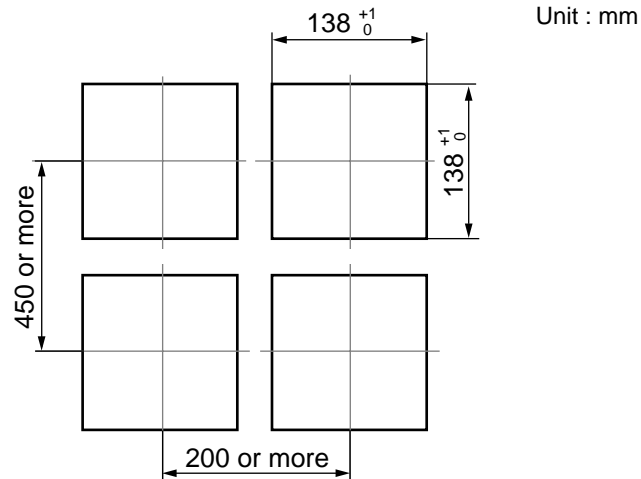
See Section “Soft dust-proof cover set (optional)” on page 11-8 for details.

3 - 2 Installation

This section describes installation procedures.

■ Panel cutout dimension

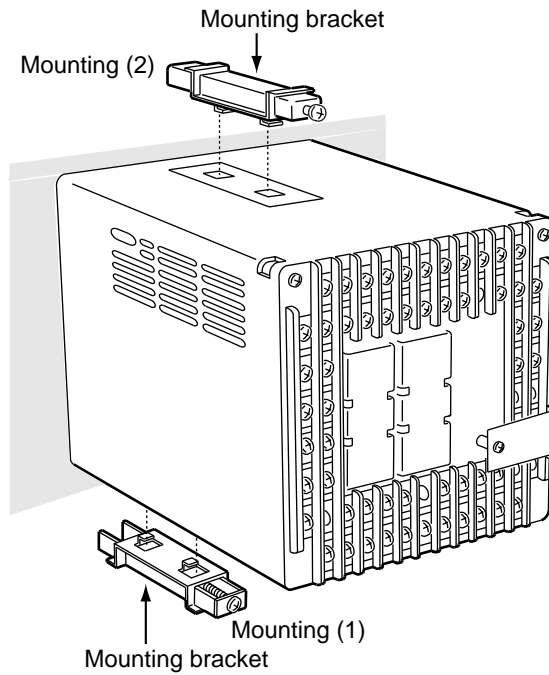
Use 2mm thick steel panels in setting up the **DCP552**.



! Handling Precautions

Install the **DCP552** in a location where the lower panel is not exposed to temperatures that exceed the operating temperature range (0 to 50°C). Make sure that the temperatures above and below the controller meet specified requirements.

■ Installation procedures

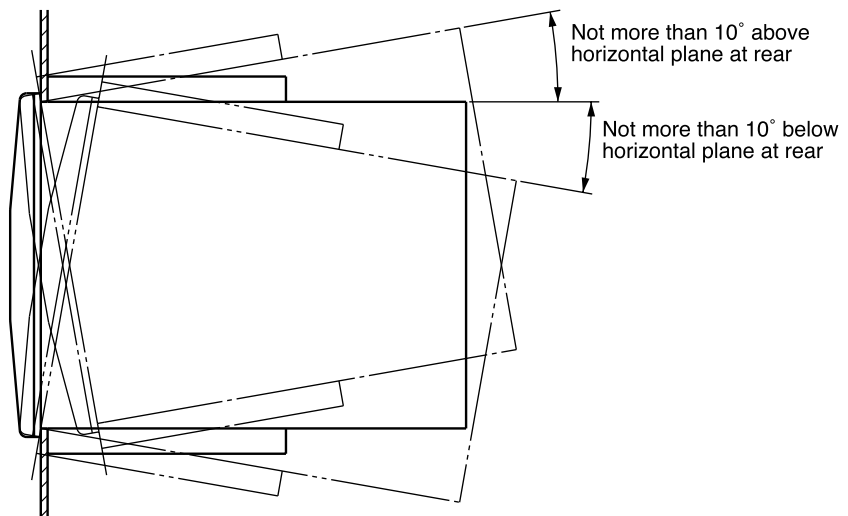


- Use the provided mounting bracket to firmly secure the upper and lower panels.
- Assemble the instrument before mounting (1).

! Handling Precautions

When the provided mounting brackets are firmly secured and there is no looseness, turn the screws only one full turn. Over-tightening the screws of the brackets can deform or damage the case.

- The rear of the instrument must not be more than 10° above or below the horizontal plane.



Chapter 4. WIRING

4 - 1 Precautions on Wiring

WARNING



Connect the FG terminal to ground with a ground resistance of maximum 100Ω before connecting other equipment and external control circuits. Failure to do so may cause electric shock or fire.



Be sure to turn off the power supply when you connect the controller. Failure to do so may lead to electric shock or fire.



Do not touch a live part such as a power terminal. This may result in electric shock.

CAUTION



Connect the controller as specified using designated cables and connection procedures. Failure to heed this caution may lead to electric shock, fire or malfunction.



Make sure that wire scraps, chips or water do not enter inside the case of the controller. Failure to heed this caution may lead to fire or malfunction.



Current applied to current input terminals (55), (56) and (58), (59) must meet the specified range. Failure to heed this caution may lead to fire or equipment breakdown.



All terminal screws shall be tightened to specified torque. Improperly tightened screws may lead to electric shock or fire.



Do not use unused terminals on the instrument as relay terminals for other equipment. Failure to heed this caution may lead to electric shock, fire or equipment breakdown.



Attaching the terminal covers after completing the controller connections is highly recommended. Failure to heed this caution may lead to fire or malfunction. (Terminal covers are supplied with the controller.)



Use induced lighting surge preventive device Non if there is a risk of power surges caused by lighting. Failure to do so may cause fire or malfunction.

Handling Precautions

- Before connecting the lines, verify the model number and terminal numbers on the label affixed to the side panel of the **DCP552**. After completing, always double check to ensure all wiring has been performed correctly before turning on the power.
- The I/O signal lines and the communications lines shall maintain at least 50cm between them and the power supply line and power supply cables. Do not route these cables through the same conduit or duct.
- Make sure that no crimp-style solderless wire connectors are touching an adjacent terminal or connector.
- When connecting a thermocouple input of the **DCP552** to another instrument, make sure the instrument's input impedance totals at least 1M Ω . If less than 1M Ω , the **DCP552** may not be able to detect sensor disconnection.
- Cautions when using data input devices in combination
Input of the **DCP552** input or output (connected in parallel for input) to an A/D converter, analog scanner, etc., may cause dispersion of the read data. To prevent such occurrence, take one of the following corrective measures.
 - (1) Use a low-speed integral A/D converter.
 - (2) Insert an isolator with no switching power supply between the **DCP552** and the A/D converter.
 - (3) Perform averaging with a personal computer when the data is read.
 - (4) If the device permits, insert an input filter.

4 - 2 Recommended Cables

To perform thermocouple input, connect a thermocouple element to the terminals. When the wiring distance is long or when connecting the thermocouple without the element to the terminals, connect via shielded compensating lead wires.

NOTE

- For I/O other than thermocouple, use polyethylene insulated vinyl sheathed cable for JCS-364 shielded instruments or equivalent. (general name: twisted shielded cable for instrument use)

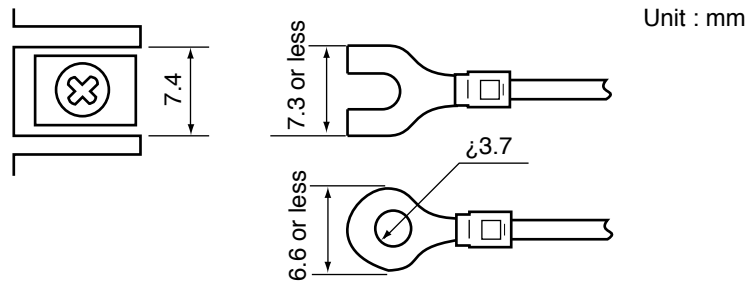
The following cables are recommended.

Fujikura Cable Co.	2-wire	IPEV-S-0.9mm ² × 1P
	3-wire	ITEV-S-0.9mm ² × 1T
Hitachi Cable Co.	2-wire	KPEV-S-0.9mm ² × 1P
	3-wire	KTEV-S-0.9mm ² × 1T

- A shielded multicore microphone cord (MVVS) may be used, if electromagnetic induction is comparatively low.

4 - 3 Making Terminal Connections

To connect a line to the terminals, use crimp-style solderless wire connectors that fit an M3.5 screw.

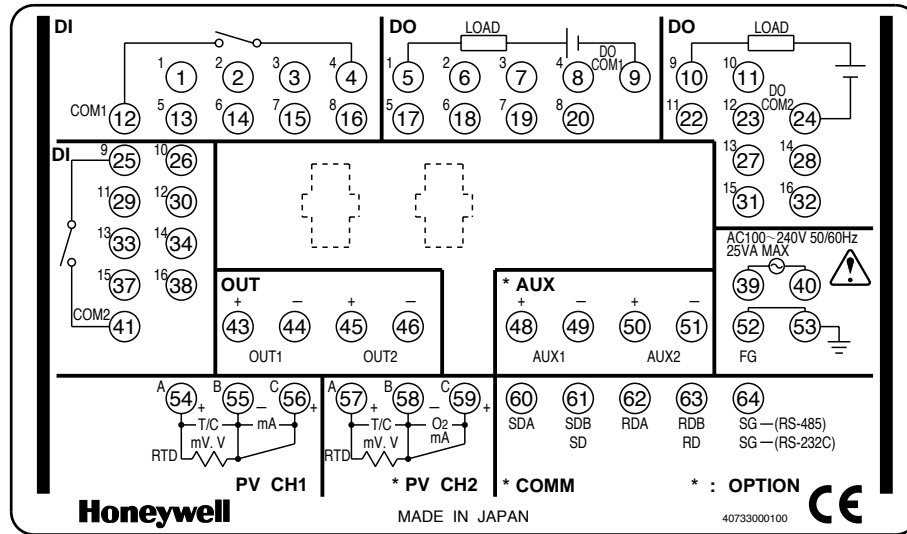


! Handling Precautions

- If the **DCP552** is mounted in a location subject to noticeable vibration or impact, be sure to use round crimp-style solderless wire connectors to prevent lines from becoming disconnected from the terminals.
- Be careful not to allow any of the crimp-style solderless wire connectors to touch adjacent terminals or connectors.
- The terminal screws shall be tightened to 0.78 to 0.98 N·m torque.

4 - 4 Terminal Array

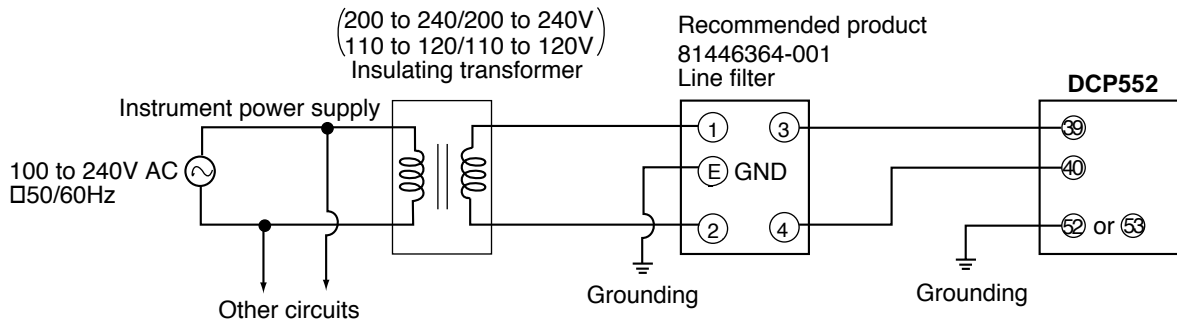
Wires are connected to the terminal base according to the layout shown below.



4 - 5 Power Supply and Grounding

■ Power supply

To supply power to the **DCP552**, use an instrument-dedicated single-phase power supply subject to minimal electrical interference.



! Handling Precautions

- If electrical interference proves excessive, we recommend adding an insulating transformer and/or using a line filter.
model No.: **81446364-001**
- After carrying out interference reducing measures, do not bundle the primary and secondary power supply coils together or insert them in the same conduit or duct.

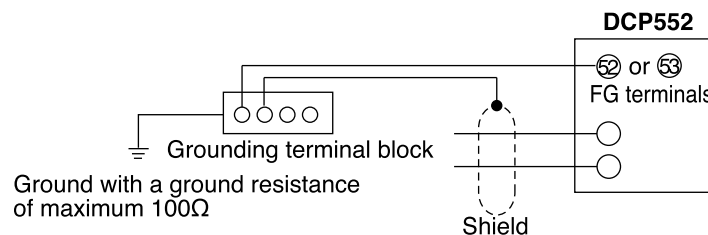
■ Grounding

If grounding the shield wire or other lines proves difficult, ground them separately to a grounding terminal block.

Type : A ground resistance of maximum 100Ω

Conductor : Annealed copper wire, min. 2mm² (AWG14)

Max. Length : 20m



! Handling Precautions

To ground the **DCP552**, connect the FG terminal (terminal (52) or (53)) to a single ground point without jumpering.

4 - 6 PV Input (Analog Input) Connection

⚠ CAUTION



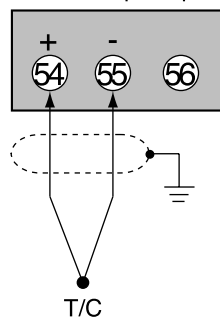
Current applied to current input terminals (55), (56) and (58), (59) must meet the specified range.

Failure to heed this caution may lead to fire or equipment breakdown.

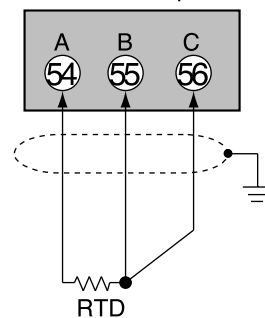
■ PV input CH1 connection

PV input CH1 is a multi-input type input for sensors. Connect as shown below, according to the type of sensor being used.

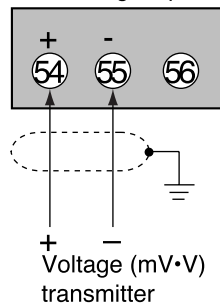
•Thermocouple input



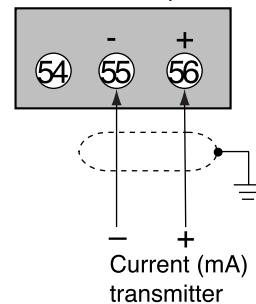
•Resistance temperature detector input



•DC voltage input



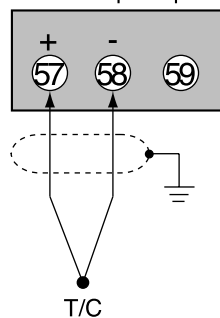
•DC current input



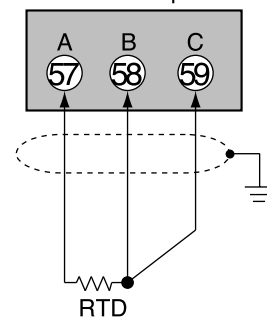
■ PV input CH2 connection

PV input CH2 is a multi-input type input for sensors. Connect as shown below, according to the type of sensor being used.

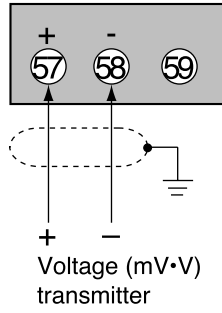
•Thermocouple input



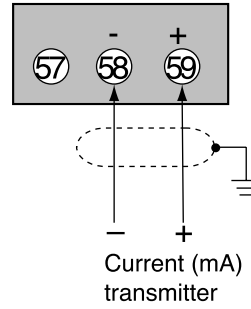
•Resistance temperature detector input



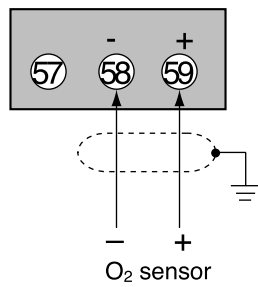
•DC voltage input



•DC current input



•O₂ sensor input



! Handling Precautions

- Be careful to connect the input polarities correctly.
- Use shielded cable to connect the input.

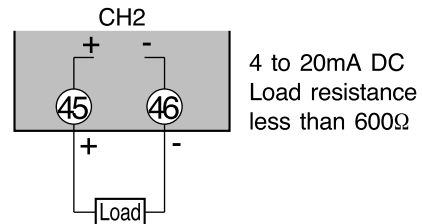
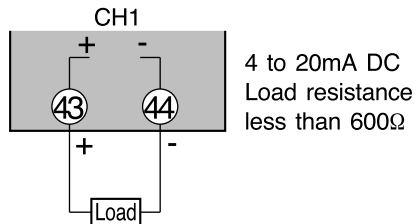
4 - 7 Control Output Connection

⚠ WARNING

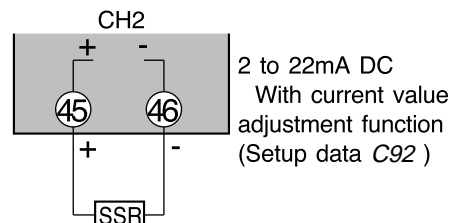
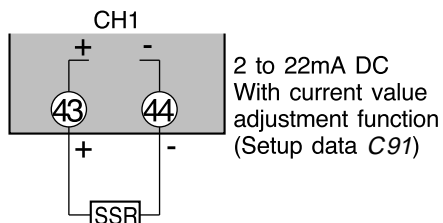


Be sure to turn off the power supply when you are installing or removing the controller.
Failure to do so may cause electric shock or fire.

● Current output (5G, 5S)



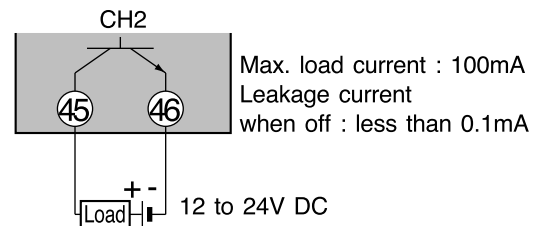
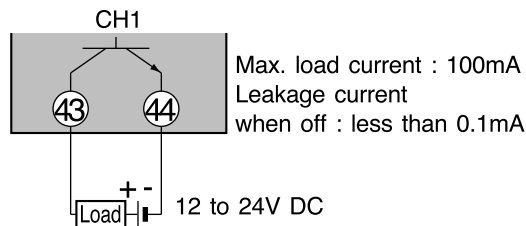
● Voltage output (6D)



ⓘ Handling Precautions

The voltage output is a constant current circuit inside. The SSR used is set to an optimum voltage to meet the requirements of the load. Enter the value in the setup data. A normal SSR voltage has been set at the factory before shipment.

● Open collector output (8D)



ⓘ Handling Precautions

- Do not short-circuit the positive (+) terminal of the external power supply to terminal (43) on the **DCP552**. Doing so causes the open collector outputs to malfunction. (There is no short-circuit preventing circuit inside.)
- When connecting a semiconductor load such as a programmable controller (sequencer), select a module in which the current directions match.
Use one made inoperative by the leakage current produced when the digital outputs are shut off.

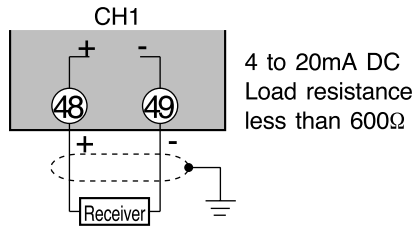
4 - 8 Auxiliary Output Connection

WARNING

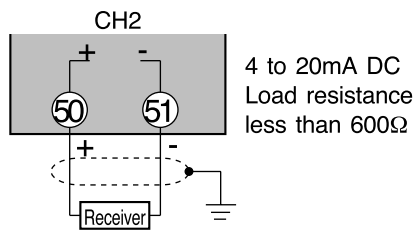


Be sure to turn off the power supply when you connect the controller.
Failure to do so may lead to electric shock or fire.

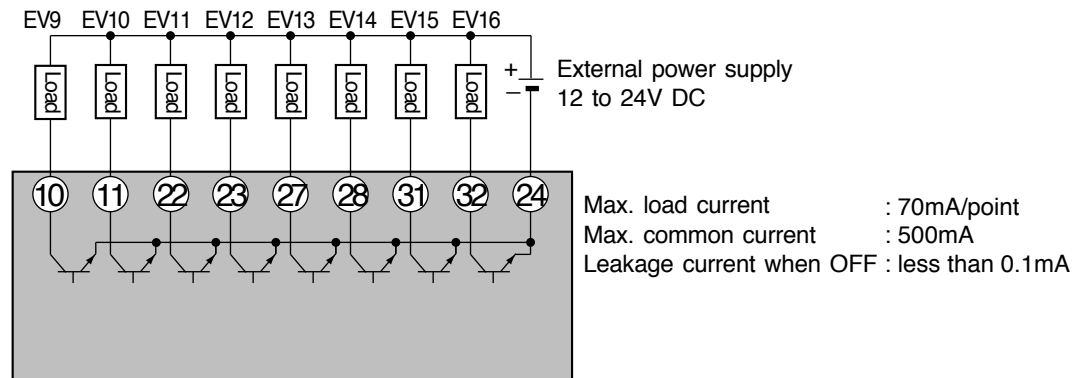
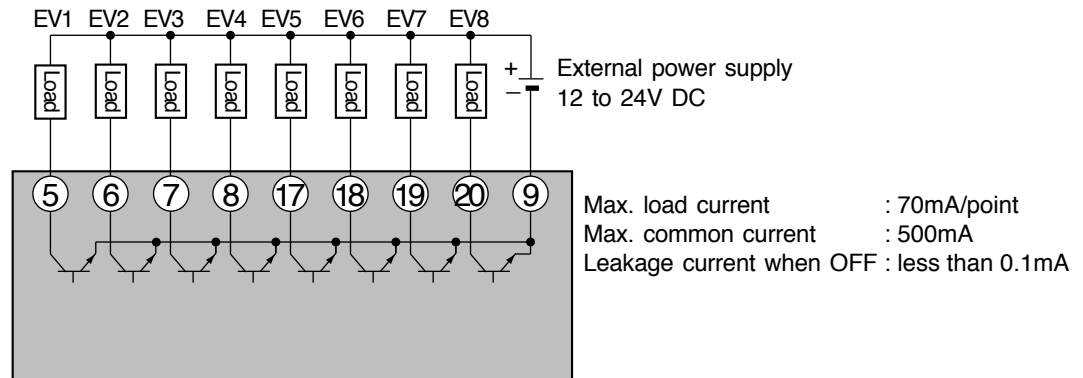
■ Auxiliary output CH1 connection



■ Auxiliary output CH2 connection



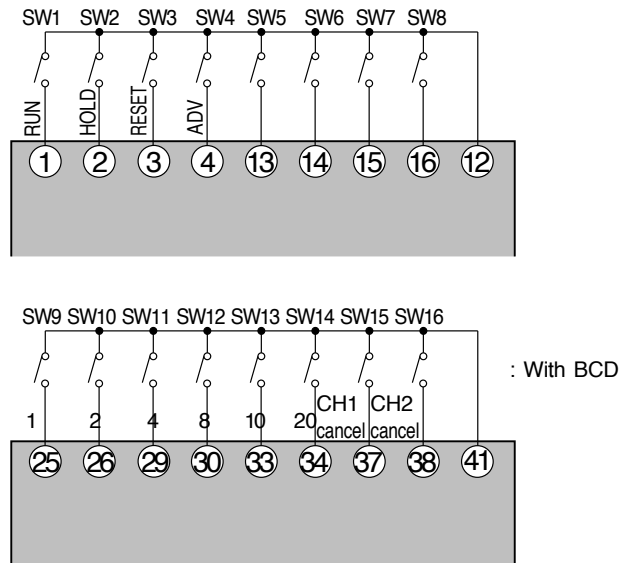
4 - 9 Event Output (Open Collector Output) Connection



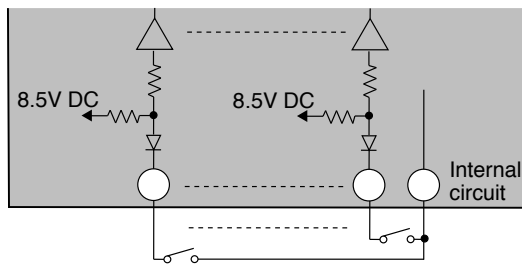
! Handling Precautions

- Do not short-circuit the positive (+) terminal of the external power supply to terminals (5) to (8), (17) to (20), (10), (11), (22), (23), (27), (28), (31), and (32) on the **DCP552**. Doing so causes the open collector outputs to malfunction. (There is no short-circuit preventing circuit inside.)
- When connecting a semiconductor load such as a programmable controller (sequencer), select a module in which the current directions match.
Use one made inoperative by the leakage current produced when the digital outputs are shut off.

4 - 10 External Switch Input Connection



● Internal circuit diagram of the DCP552 connecting external switch input

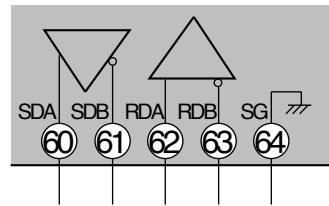


! Handling Precautions

- The inputs of the **DCP552** unit are provided with a built-in power supply (open voltage type, 8.5V DC). Always use no-voltage contacts externally.
- For the no-voltage contacts, use gold contacts or other relays that switch on small currents. Other types of relay contacts may not switch. Use contacts that have ample margin over the minimum switching capacity with respect to the current and open voltage ratings of contacts provided on the **DCP552**.
- If using semiconductors (open collectors, etc.) as no-voltage contacts, use one that maintains a potential of no more than 2V across the contacts when actuated, and a leakage current of no more than 0.1mA when shut off.
- The digital inputs (remote switch inputs) of all SDC40 and SDC10 series units can be connected in parallel. If connecting them in parallel to another instrument, carefully check the requirements of the other instrument before proceeding.
- Do not connect SDC20/21, SDC30/31 series in parallel. Doing so may cause the external switch input to malfunction.
- Common terminals (12) and (41) of the external switch input are connected internally.

4 - 11 Communication Connection

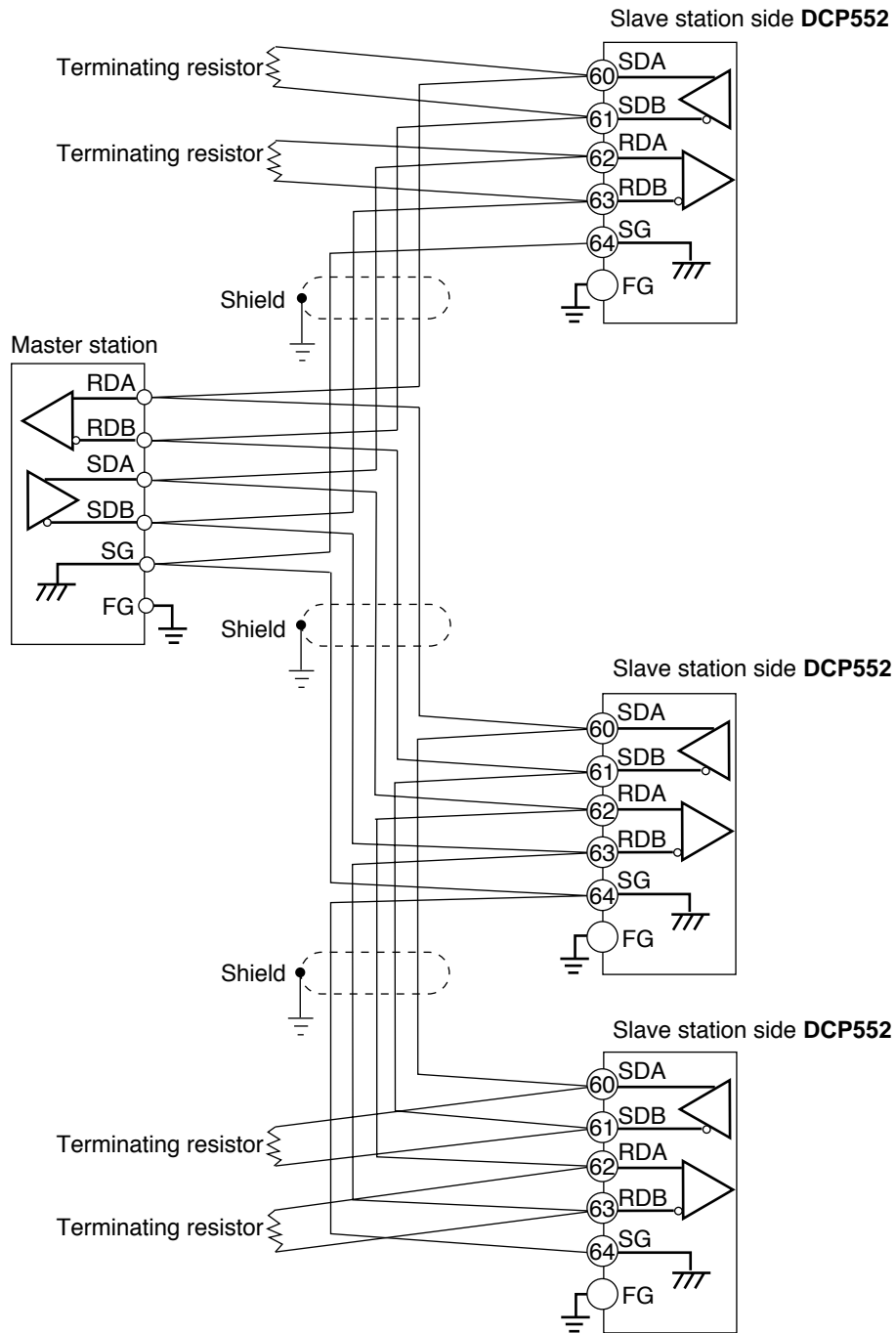
■ RS-485 connection



! Handling Precautions

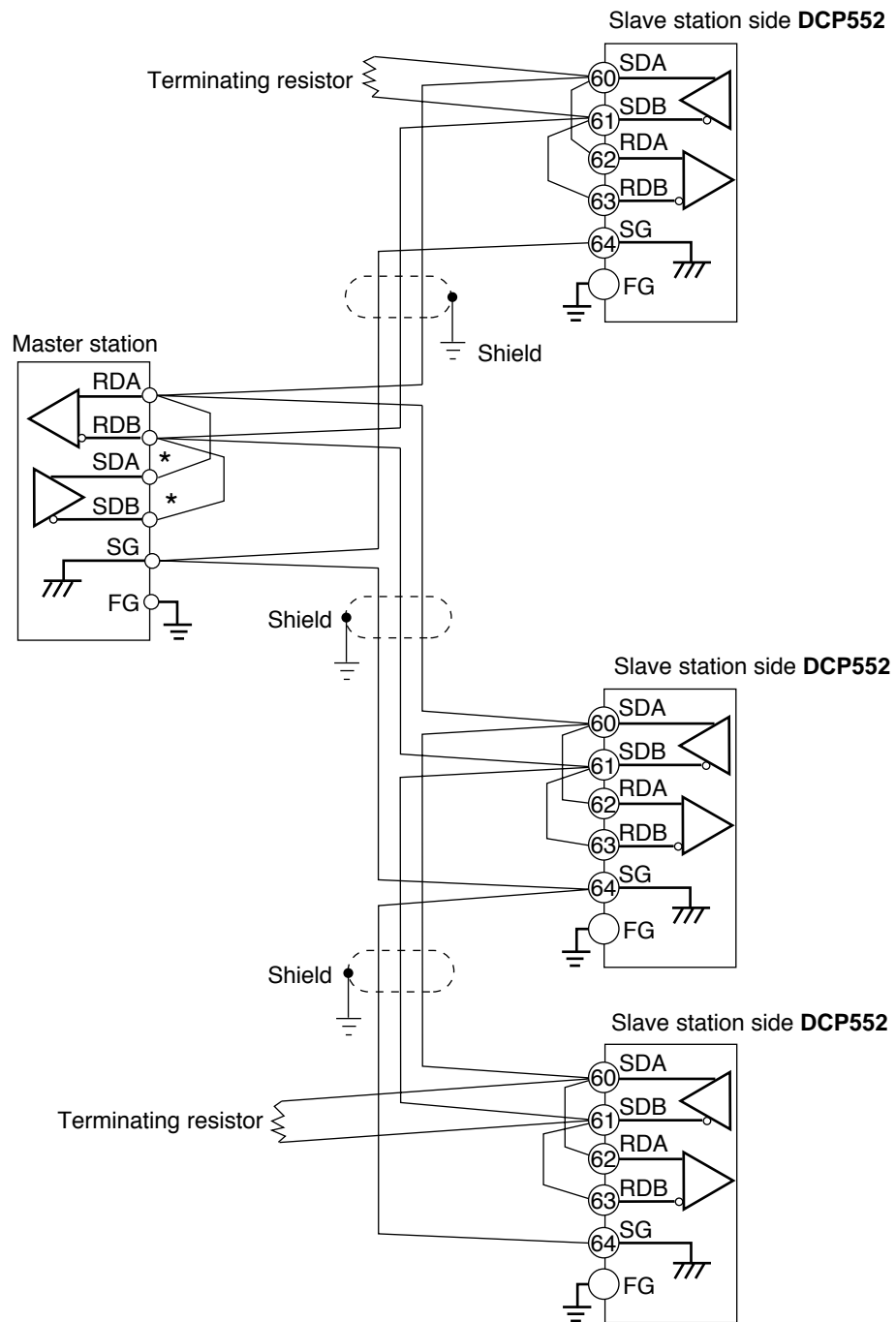
- The slave station can be connected in a multi-drop configuration.
- Always set a unique address to each slave station.
- Attach terminating resistances (a total of four when connecting a 5-wire system) to the ends of the communications lines. Use 1/2W or greater terminating resistances of $150\Omega \pm 5\%$.
- If connecting three lines, short-circuit terminals (60), (62) and (61), (63).
- Do not short-circuit the RDA to RDB and SDA to SDB terminals. Doing so may cause the **DCP552** to malfunction.

● 5-wire system RS-485 connection diagram



Attach 1/2W or greater terminating resistances of $150\Omega \pm 5\%$ at each end of the communications lines. Ground the shield FGs at one end in one location, not at both ends.

● 3-wire system RS-485 connection diagram

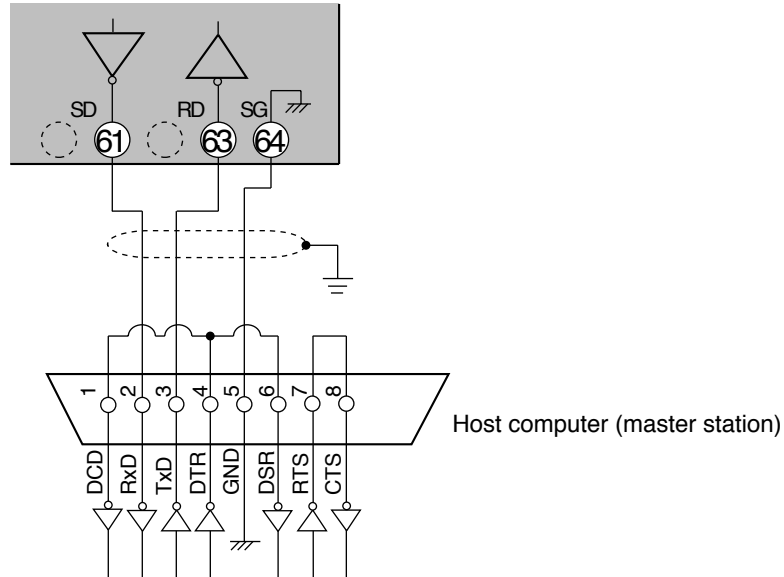


Attach 1/2W or greater terminating resistances of $150\Omega \pm 5\%$ at each end of the communications lines. Ground the shield FGs at one end in one location, not at both ends.

When only three RS-485 terminals are provided, the areas designated with an asterisk (*) are connected internally.

■ RS-232C connection

Example of connection using



! Handling Precautions

- Connect the slave station to the master station in a single-drop (point-to-point) configuration.
- There are three (SD, RD and FG) communications terminals on the RS-232C interface on the master station which may not output data if not short-circuited as shown above.

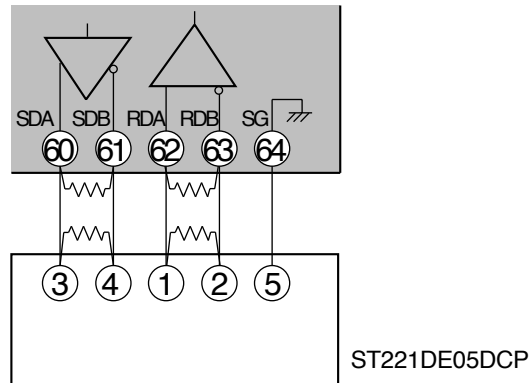
NOTE

RS-232C connector signals (9 pins)

Example : IBM and compatibles

Pin No.	Name	Signal direction	
		Host	Instrument
1	DCD	←	
2	RxD	←	
3	TxD		→
4	DTR		→
5	GND		
6	DSR	←	
7	RTS		→
8	CTS	←	

■ Connection to ST221



! Handling Precautions

- Attach 1/2W or greater terminating resistances of $150\Omega \pm 5\%$ at each end of the communications lines.
- The **DCP552** operates as a master station when connected to an ST221 during communications.

4 - 12 Isolation Between Input and Output

Isolation between inputs and outputs are shown below. In this figure, the solid lines enclose mutually-isolated sections. Those sections bounded by dashed lines are not isolated.

PV input CH1	Digital circuit	Control output CH1
PV input CH2		Auxiliary output CH1
Loader communication		Control output CH2
External switch input		Auxiliary output CH2
Communication		Event output
Memory card input		

Handling Precautions

The loader jack is not isolated from internal digital circuits.
When not in use, always replace the cap.

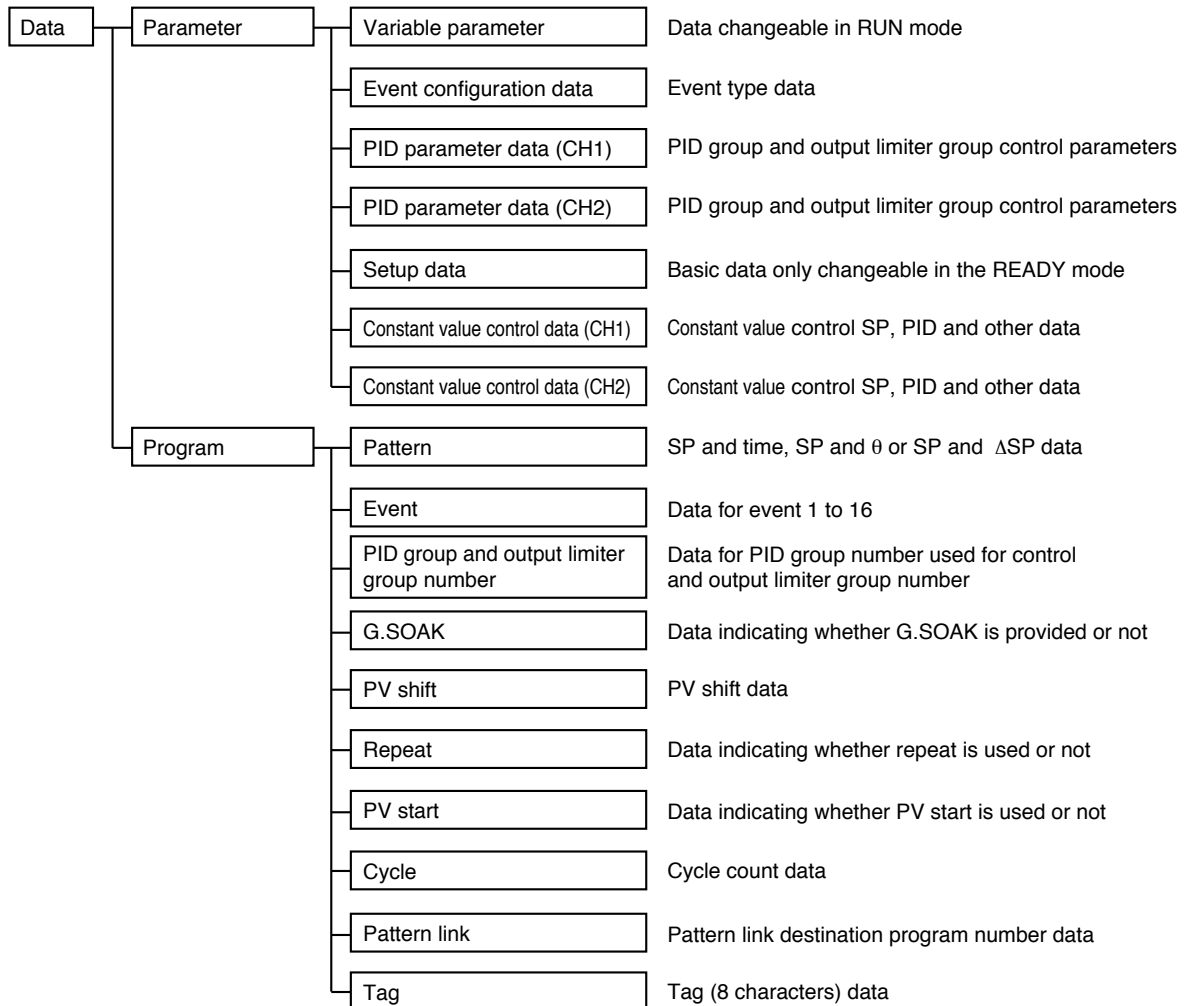
Chapter 5. FUNCTIONS

5 - 1 Data

■ Data types

The data types are listed below.

For further information on data types, see “Chapter 7. PARAMETER SETUP” and “Chapter 8. PROGRAM SETUP”.



5 - 2 Program Pattern

■ Pattern

Separate programs are set in CH1 and CH2 for each program number. Three systems for selecting programs are provided: RAMP-X, RAMP-T and RAMP-E. The first segment of each program is always RAMP-X, but the other segments can be any system and all three types can be used in one program.

● RAMP-X system

This system, sets a segment of a pattern using SP and time, is called RAMP-X. SP setting : within the upper and lower SP limiter range

Time setting : 0 hours 00 minutes to 500 hours 00 minutes

0 minutes 00 seconds to 500 minutes 00 seconds or

0.0 seconds to 3000.0 seconds

(Time units are selected using the C62 setup data setting.)

SP is a point on the elapsed time axis in the current segment, which is a straight line connecting the start point, the SP set value in the previous segment, and the end point, the SP set value in the current segment. Segments are classified as follows.

- Rising RAMP (or rising slope)

Previous segment SP setting < current segment SP setting

- Falling RAMP (or descending slope)

Previous segment SP setting > current segment SP setting

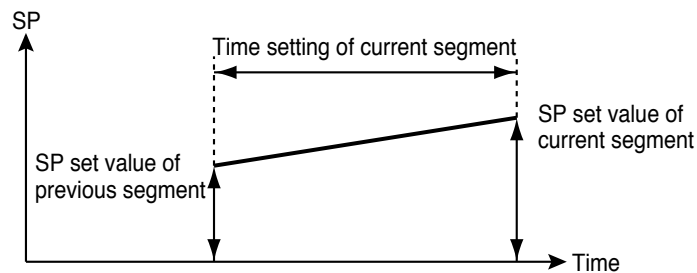
- SOAK (soaking)

Previous segment SP setting = current segment SP setting

The start and end points of the first segment are also the SOAK segment of the SP set value for the first segment.

SP calculation (other than first segment)

$$\text{SP} = (\text{current segment SP set value} - \text{previous segment SP set value}) \\ \times (\text{current segment elapsed time} \div \text{current segment time setting}) \\ + \text{previous segment SP setting.}$$



● RAMP-T system (θ setting)

In the RAMP-T system, a segment is set using SP and ramp θ (theta).

SP setting : within the upper and lower SP limiter range

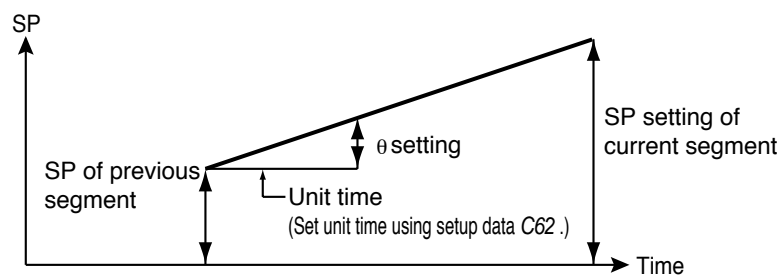
θ setting : 1 to 10000 (SPU/hour, SPU/min, SPU/sec)

(Time units are selected using the C62 setup data setting.)

SP is a point on the elapsed time axis in the current segment which is an extended straight line, the ramp set value of the current segment when the SP set value in the previous segment is the start point.

The end point is the point where this line reaches the SP setpoint of the current segment. Note that the RAMP-T system cannot be used in the first segment.

SP calculation: $SP = \theta \text{ set value} \times \text{segment elapsed time} + \text{previous segment SP}$.



● RAMP-E system (Δ SP setting)

In the RAMP-E system, segments are set using SP and Δ SP (digital SP) for each external switch input pulse.

SP setting : within the upper and lower SP limiter range

Δ SP setting: 1 to 10000 SPU

The start point is the SP set value in the previous segment.

SP is a value resulting from adding a multiple of the external switch input count to the SP set value when the SP in the previous segment is the start point.

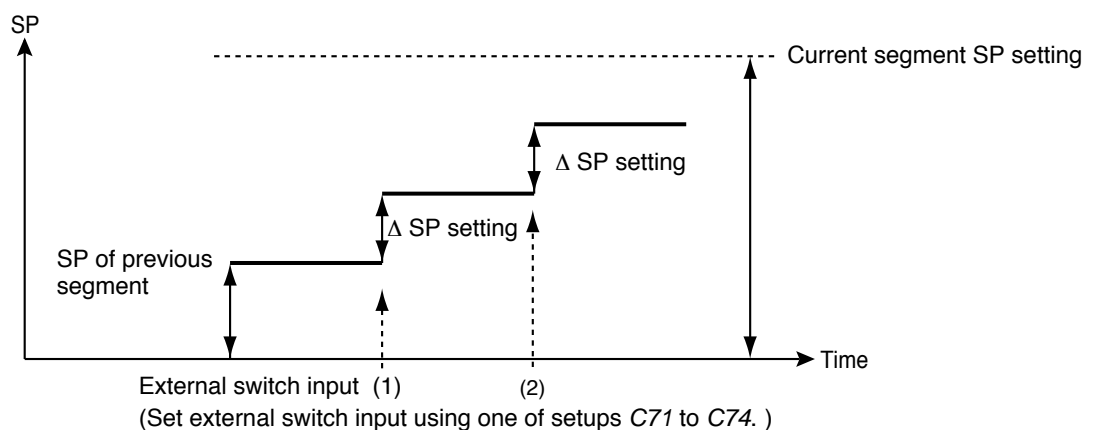
The segment ends when this SP reaches the SP setting in the current segment and the current segment SP is more than the previous segment SP or when current segment SP is less than the previous segment SP.

SP calculation: when current segment SP is more than the previous segment SP,

$SP = \Delta \text{ SP set value} \times \text{external switch input count} + \text{the previous segment SP}$.

When current segment SP is less than the previous segment SP,

$SP = -(\Delta \text{ SP set value} \times \text{external switch input count}) + \text{the previous segment SP}$.



 NOTE

- Select the program pattern setting system using setup data setting *C61*.
 - 0: combined use of RAMP-X and RAMP-T
 - 1: combined use of RAMP-X and RAMP-E
- Select time setting units using setup data setting *C62*.
 - 0: hours and minutes
 - 1: minutes and seconds
 - 2: 0.1 seconds
- Select θ setting units using setup data setting *C62*.
 - 0: SPU/hour
 - 1: SPU/min
 - 2: SPU/sec
- Select SP setting and SP setting decimal position using setup data setting *C65*.
 - 0: XXXXX
 - 1: XXXX.X
 - 2: XXX.XX
 - 3: XX.XXX
 - 4: X.XXXX
- External switch for pulse input requires 1: RAMP-E using a setup data setting between *C71* to *C74*.
- The pulse input interval time can be checked by setting event type 93 in the event. Event type 93 is RAMP-E time monitored during a period of 0.0 to 3000.0 seconds.
Even when a setting is exceeded and there is no pulse input, the event remains on.

■ Events

First, setup data setting **C64** is used to assign CH1 and CH2 events, then the event configuration data setting is used to set event types for event outputs 1 to 16. Events are of the following four types: time event, PV event, code event and mode event. Settings are divided into two types of events: segment events and instrument event.

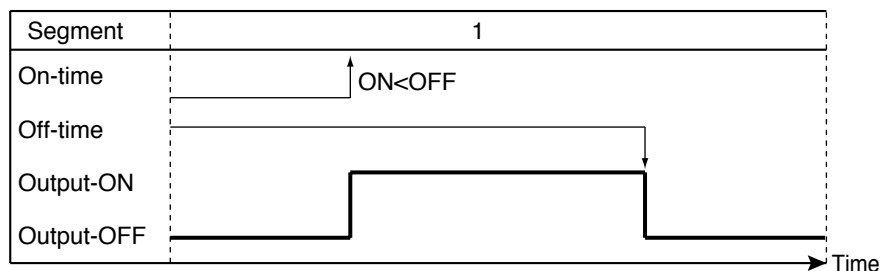
- Segment events are used to set the event operating point in a program setting and makes it possible to set different set values in different segments. But in the constant value control mode segment events are off.
- Instrument events are used to set events that do not require an event operating point or set the event operating point in the event configuration setting. It performs operations that are shared by all program operations and constant value control.

● Time events

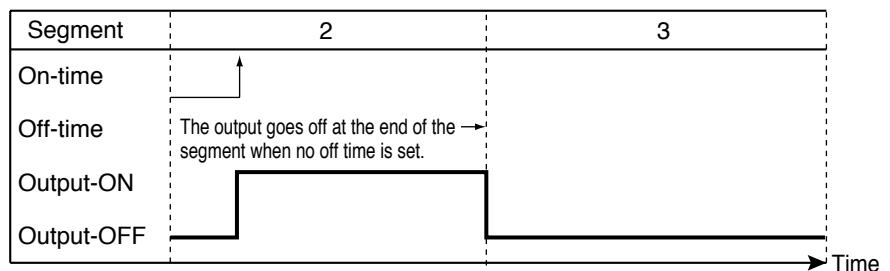
The On Time or both the On and Off Time can be set by event number and segment. Output on/off duration are as shown below.

NOTE

- The On Time is indicated by the length of the line from the start of the segment until the upturned arrow.
 - The Off Time is indicated by the length of the line from the start of the segment until the downturned arrow.
- When the On Time is less than the off time, the output is on from the on time until the off time.
(See segments 1, 6 and 7 in the figure.)

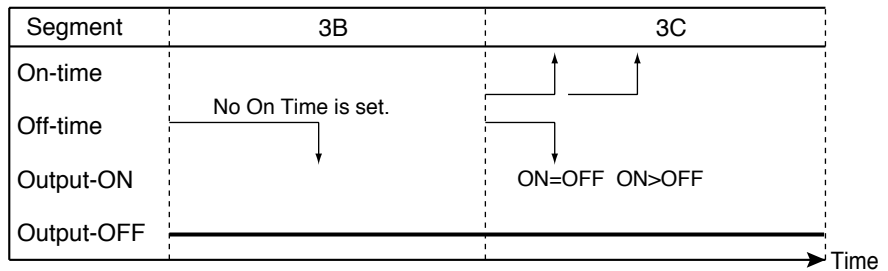


- When only an on setting is made, the output stays on until the end of the segment.
(See segments 2 and 5 in the figure.)



- The output is off when no On or Off Time has been set.
- An off time cannot be set without setting an on time.
(See segment 3B in the figure.)

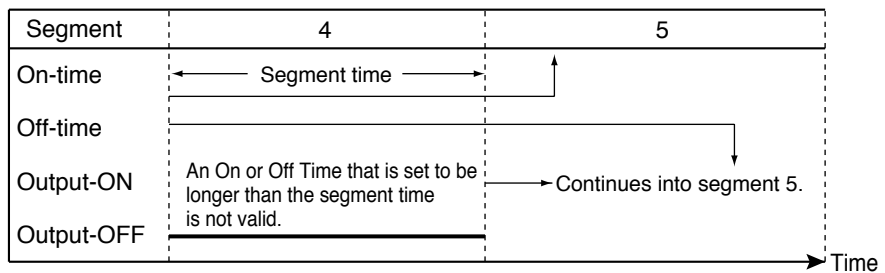
- An On Time \geq Off Time setting cannot be made. (See segment 3C in the figure.)



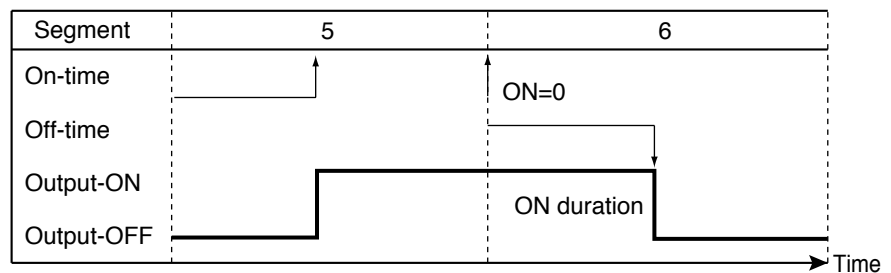
- An On Time or Off Time is valid only within a segment and cannot straddle segments. In the next segment, the On time and Off time set for that segment are valid. (See segments 4 and 5 in the figure.)

Thus an On Time and Off Time setting made at the end of a RAMP-X segment are ignored. (Compare segment 9 with the G.SOAK wait in segment 10 in the figure.)

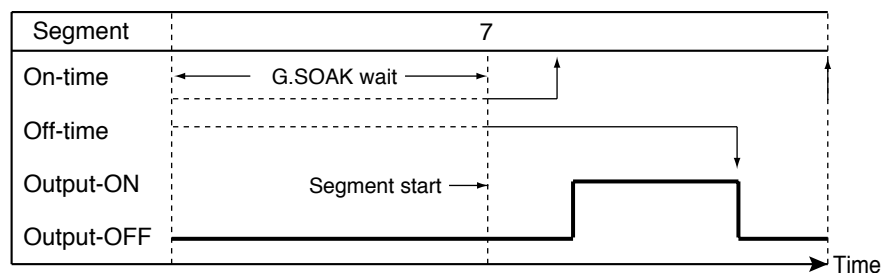
Note, however, that an On Time or Off Time setting at the end of a RAMP-T segment is either valid or invalid depending on the computational error.



- When the On Time is set to 0 (no Off Time being set or set to more than 0), the output goes on when the On Time becomes 0. If the output was on at the end of the previous segment, it stays on and does not go off momentarily between the two segments. (See segments 5 and 6 in the figure.)

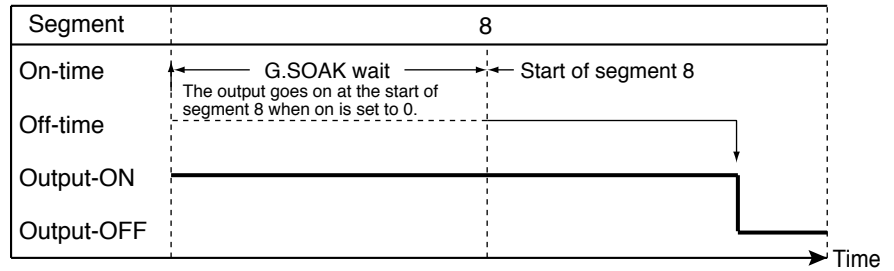


- The G.SOAK Time is not included in the On and Off Time. (See segment 7.) Nor is the Wait Time included for a G.SOAK that occupies an entire segment.



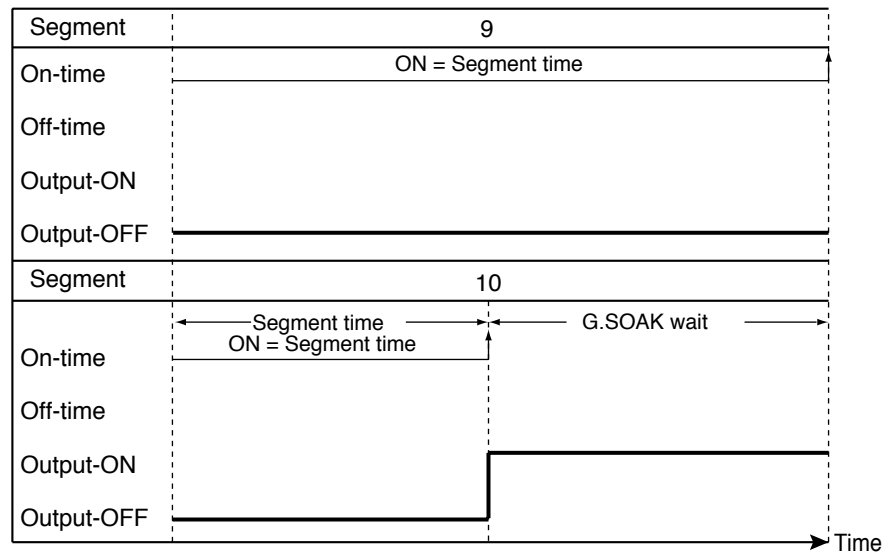
- When there is a G.SOAK wait at the start of a segment and the ON Time is set to 0, the output goes on at the start of the G.SOAK wait and the On Time starts as the G.SOAK wait ends.

The output time = G.SOAK time + (Off Time – On Time) (See segment 8 in the figure.)



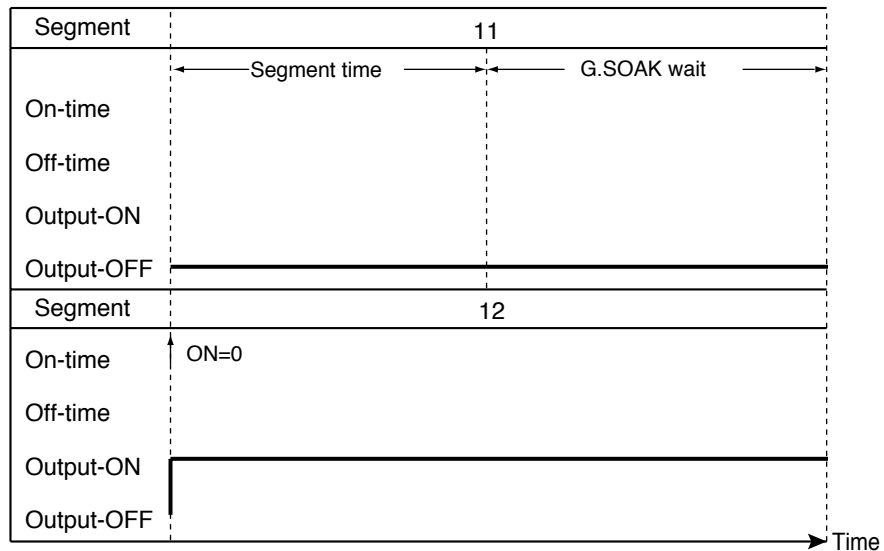
- An On Time and Off Time occurring at the end of a RAMP-X segment are valid when there is a G.SOAK wait at the end of a segment or as the end state of the final segment. (See segment 10 in the figure.)

Note, however, that an On Time or Off Time setting at the end of a RAMP-T segment is either valid or invalid depending on the computational error.



- When there is a G.SOAK at the end of the previous segment, the On Time in the next segment is ignored if it is set to 0. (See segments 11 and 12 in the figure.) Thus the ON = 0 of segment 12 is not output at the end of the set time for segment 11, but when the G.SOAK wait ends.
- This function can be combined with an event ON delay set using PARA. Delay works when an event goes from off to on. A delay is not triggered when an On Time continues across two segments as shown in segments 5 and 6 in the figure.

● PV event



- **Basic specifications**
The difference between PV, deviation, absolute value deviation, SP and MV for each event type is shown on the following pages. The thick lines show ON and OFF conditions. The upper line indicates ON and the lower line indicates OFF conditions.
EV indicates the event set value and H indicates the hysteresis value. Outputs in READY mode are OFF. But normal PV1 upper and lower limit operation and normal PV2 upper and lower limit operation events run also in the READY mode.
- **Event standby**
Standby events operate as described below.
 - If the event is in the gray area shown in the figure during a change from READY to RUN mode or when the power is restored after an outage, the event operates without a standby. The upturned arrows in the figures indicate ON while the downturned arrows indicate OFF.
 - If the event is outside the gray area shown in the figure during a change from READY to RUN mode or when the power is restored after an outage, it remains off until it enters the gray area .

After entering the gray area , the upturned arrows in the figures indicate ON while the downturned arrows indicate OFF.
A standby event is off in the READY mode.

- Event on delay

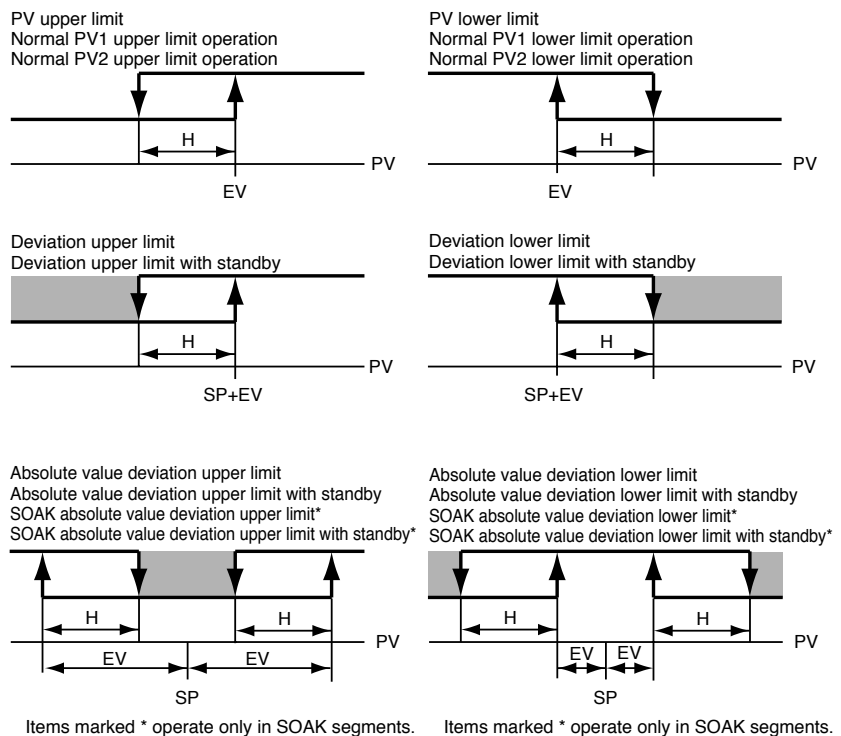
The number of the event to be delayed and the delay time can be set regardless of event type. The delay turns on the output for the duration of the delay when the event meets the conditions for going from OFF to ON. When this function is combined with the event standby function, the event on delay operates when the standby state is cleared.

- Segment event progress

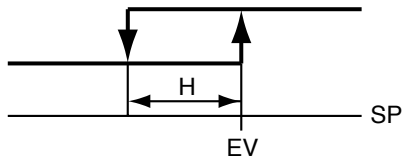
- The output stays OFF until the program reaches a segment with an event.
- The event goes ON or OFF according to the set value of the event.
- Previous settings are valid until segments with other event settings are reached.
- Previous settings are valid when the program has reached segment number 1 using the cycle function or pattern link function. The output is turned off if there is no event in segment number 1.

- Other functions

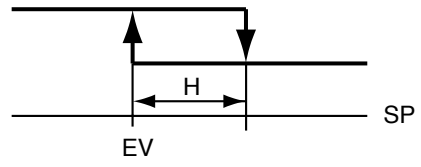
Normal PV1 upper and lower limit operation event and normal PV2 upper and lower limit operation events operate in the READY mode.



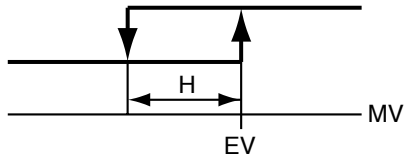
SP upper limit



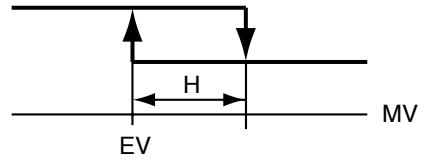
SP lower limit



MV upper limit



MV lower limit

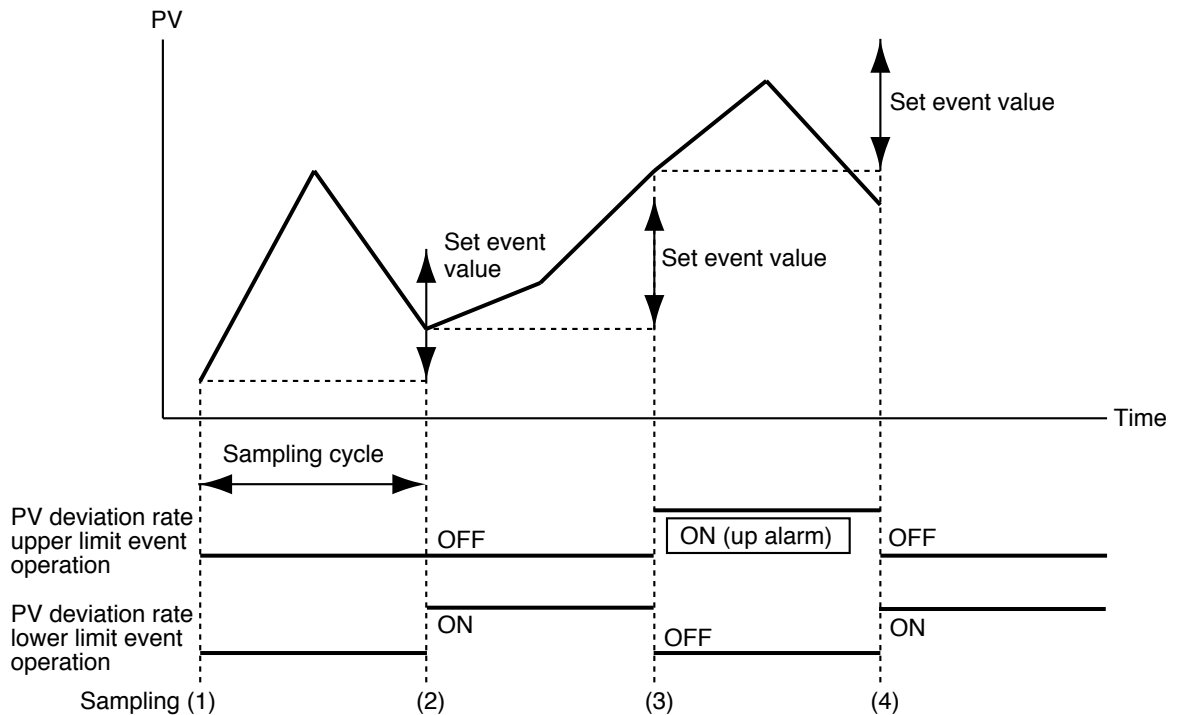


● PV deviation rate event

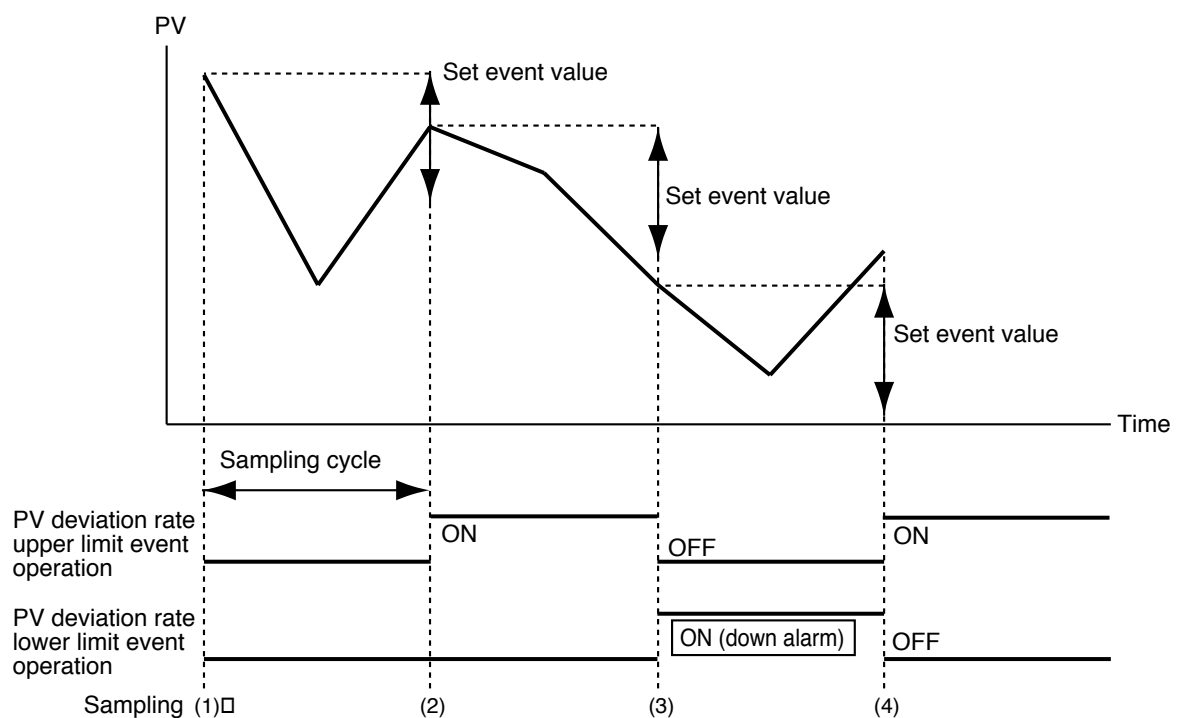
PV deviation is measured in each sampling cycle set using the event configuration data setting while on/off states are determined by comparing event setting deviation rate ΔPV s.

PV deviation between sampling cycles is ignored. Event on/off switching is performed according to the sampling cycle. This function can be combined with event on delay.

Set event value is more than 0 (using upper limit event)



Set event value is less than 0 (using lower limit event)



● **Code event**

Several events are used as one group and the number of output points are output as one parallel code number. Assigning code numbers to event outputs has the same effect as increasing the number of physical output points.

•Code event

Set event type to code event and set the number of output points (1 to 8) in auxiliary setting 1. An output code value (0 to 255) can be set for each segment. A binary coded low-order bit for the set number of output points is output. The previous setting is valid until the program reaches a segment with a new setting.

Note, however, that unless a setting is made in the first segment, the program will assume that a set value of 0 is set in the first segment.

Example: Setting a code event involving 3 output points in event 3

The table below shows the output state when a value of 3 is set in segment 2, a value of 6 is set in segment 4 and a value of 0 is set in segment 5.

Segment	1	2	3	4	5
Set value	Not set	3	Not set	6	0
Code value 1 in event 3	OFF	ON	ON	OFF	OFF
Code value 2 in event 4	OFF	ON	ON	ON	OFF
Code value 4 in event 5	OFF	OFF	OFF	ON	OFF
Output code	0 (OFF,OFF,OFF) (0, 0, 0)	3 (OFF,ON,ON) (0, 1, 1)	3 (OFF,ON,ON) (0, 1, 1)	6 (ON,ON,OFF) (1, 1, 0)	0 (OFF,OFF,OFF) (0, 0, 0)

•Timed code event

This function is a combination of a code event and a time event. The set code value is output at the set time. The number of settings that can be made in the first segment is the same as the number of output points. For example, for a 3-point output up to three settings can be made in the first segment.

Like a time eventit, a setting within the segment period is valid and those that exceed it are ignored. When the program reaches the start time of the first segment or a new segment, the set code value is 0 (all points off) until the set time of the time event.

Example: Setting a timed code with 3 output points in event 3

The table below shows the output state when a value of 5 is set in segment 2 and set to start at the beginning of the segment, a value of 3 is set to occur 0:10 after the start of segment 2 and a value of 4 is set to occur 0:30 after the start of segment 4.

Segment	1	2	3	4	5		
Set value	Not set	5	3	Not set	6	0	
Set time	Not set	0.00	0.10	Not set	0.30	0.00	
Time		0.10		0.30			
Code value 1 in event 3	OFF	ON	ON	OFF	OFF	OFF	
Code value 2 in event 4	OFF	OFF	ON	OFF	OFF	ON	OFF
Code value 4 in event 5	OFF	ON	OFF	OFF	OFF	ON	OFF
Output code	0 (OFF,OFF,OFF) 0, 0, 0	*1 5	*2 3	*3 3 (OFF,OFF,OFF) 0, 0, 0	*4 0 6	0 (OFF,OFF,OFF) 0, 0, 0	

*1:(ON,OFF,ON) *2:(OFF,ON,ON) *3:(OFF,OFF,OFF) *4:(ON,ON,OFF)
 1, 0, 1) 0, 1, 1) 0, 0, 0) 1, 1, 0)

- **Mode event**

This event goes on or off depending on controller mode, alarm generation and other states.

It cannot be combined with the event standby function but with the on delay function. It does not set event set values (operating points) or hysteresis.

- **Basic operations**

The following types are provided.

RUN + HOLD + END + FAST

HOLD

READY + READY FAST

END

G.SOAK wait

MANUAL

During auto-turning execution

FAST + READY FAST

Console setting operation

RUN

ADV (advance)

Full alarm (logical OR)

PV range alarm

Instrument alarm

O₂ sensor failure

Battery voltage drop

The event goes on when the specified instrument state is reached and is off at other times.

- **Alarm**

Alarms are of two types: PV range alarm group (alarm code number 01 to 04) and instrument alarm group (alarm code number 91 to 99 and battery voltage drop). When the event type is all alarm, the event goes on if one alarm occurs. When the event type is a PV range alarm, the event goes on if one alarm in the PV range alarm group goes on.

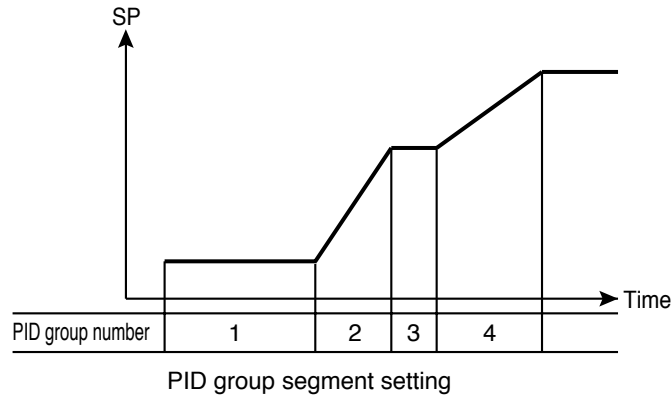
When the event type is an instrument alarm, the event goes on if one alarm in the instrument alarm group goes on.

- **ADV**

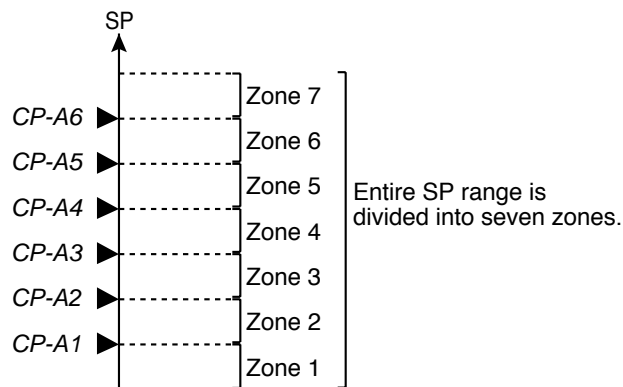
When ADV (advance) is executed, the event goes on for 1 second. This function is valid during on delay.

■ PID group selection

- Separate PID group selections can be set in CH1 and CH2 programs.
- PID groups can be selected in two ways: by setting a PID segment or through automatic PID group switching.
A PID group segment and automatic PID group switching can also be combined. When a PID group number is set to 0, the setting in the previous segment is continued.



- In a PID group segment setting a PID group number is set in each segment and PID parameters are used for calculating the control output. The nine PID groups *PID1* to *PID9* can be used.
- In automatic PID group switching, the entire SP scale is divided into seven zones assigning *CP-A1* to *CP-A6* to each. The PID constants that are used according to SP values are automatically selected to calculate control output. The PID group number for each segment specifies A. Seven PID groups from *PID-A1* to *PID-A7* can be used.



■ Selection of output limiter group

- Separate output limiter groups can be set in CH1 and CH2 programs.
- Output limiter group number can be set for each segment to control the lower limit (OL) and upper limit (OH) of the control output. *OL* and *OH* groups 1 to 9 can be used.
- The output limiter can only be specified by segment; automatic selection cannot be made.
- When the output limiter is set to 0, the setting in the previous segment is continued.

■ G.SOAK (Guarantee soak)

Separate G.SOAK settings can be made in CH1 and CH2 programs.

G.SOAK on/off state, type and G.SOAK width is set by the segment. G.SOAK are of three types: segment start point, segment end point and the entire segment.

G.SOAK time is set using the variable parameter *PA46* setting. Any offset between SP and PV triggers a G.SOAK wait which narrows the distance between SP and PV to guarantee the segment execution time. G.SOAK operates not only on SOAK but also on RAMP segments.

Note, however, that in FAST mode a G.SOAK setting does not trigger a G.SOAK wait.

When a G.SOAK wait occurs in one channel in sync mode (variable parameter *PA04* is set to 1), the program in the other channel is halted.

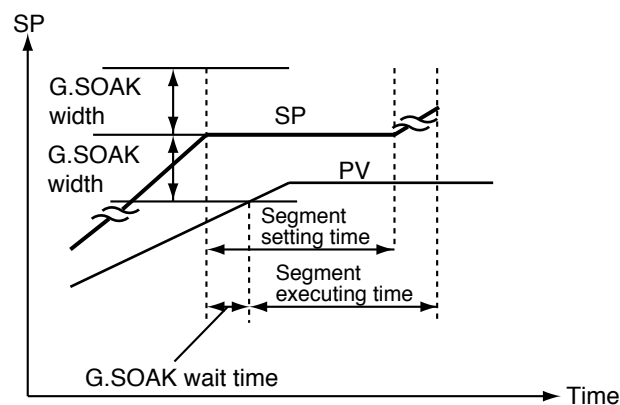
G.SOAK can be cleared with an external switch input. The following types of clearing conditions can be selected using setup data setting *C71* to *C74*.

- (1) G.SOAK is cleared when an external switch contact is set to on or when PV meets the G.SOAK clearing conditions.
- (2) G.SOAK is cleared when an external switch contact is set to on and PV meets the G.SOAK clearing conditions.

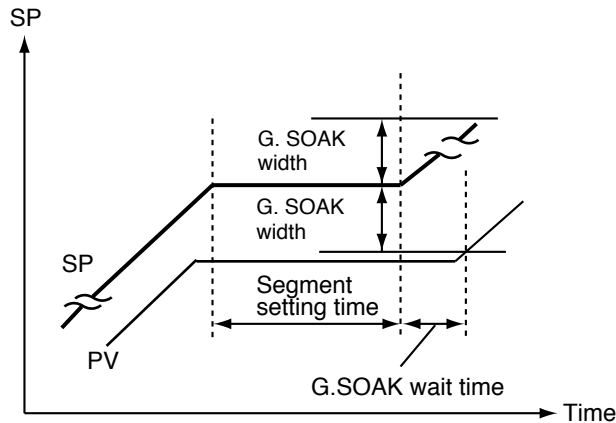
• G.SOAK at start of segment

PV and SP are compared at the beginning of the segment. The segment starts when the absolute value of the difference continues beyond the G.SOAK time and becomes narrower than G.SOAK width.

A G.SOAK wait state continues until these conditions are met which is announced by the flashing of the linear LED on the left of the profile display. The operating condition is the same as HOLD at the beginning of a segment (time = 0).



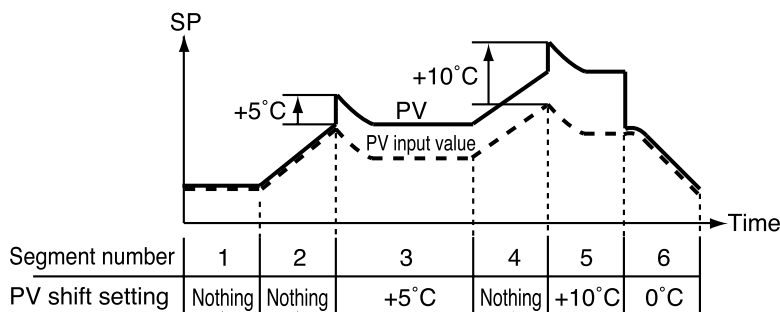
- G.SOAK at end of segment**
 PV and SP are compared at the end of the segment. The operation in that segment ends when the absolute value continues beyond the G.SOAK time and becomes narrower than G.SOAK width.
 A G.SOAK wait state continues until these conditions are met which is announced by the flashing of the linear LED at the center of the profile display.
 The operating condition is the same as HOLD at the end of a segment (time = set segment time).



- G.SOAK for entire segment**
 PV and SP are compared at across the entire segment. The operation in that segment continues when the absolute value continues beyond the G.SOAK time and becomes narrower than G.SOAK width.
 A G.SOAK wait state continues until these conditions are met which is announced by the flashing of the linear LED at the left and the center of the profile display.
 The operating condition is the same as HOLD at the continued time.

■ PV shift

Separate PV shift settings can be made in CH1 and CH2 programs.
 A PV correction value can be set for each segment. PV is PV input value plus PV bias and PV shift. Note, however, that in the READY mode and the constant value control mode, PV bias but not PV shift is added to the PV input value.
 The setting in the previous segment continues when PV shift is set to “-----” (nothing).

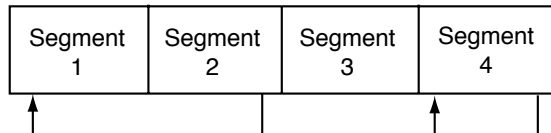


↑ +5°C setting is continued.
 A “No PV shift setting” that continues from the first segment has the same effect as a PV shift 0°C setting.

Repeat

Separate repeat settings can be made in CH1 and CH2 programs.

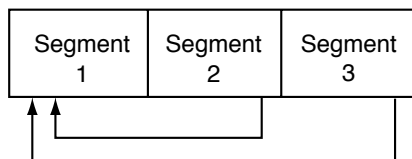
Repeat on/off and return destination are set by the segment with the segment number and repeat count. Operation completes at the end of a segment. If there is a repeat setting, the program returns to the start of the set destination segment and operation is resumed from there. This operation is repeated the number of times specified by the repeat count.



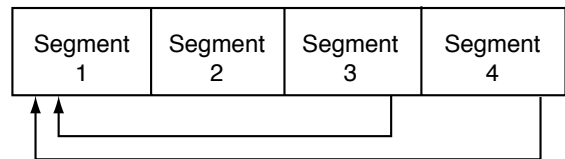
No repeat is performed when the destination segment number is larger than the current segment number. When the program returns to the first segment, PV is not started even if a PV start setting has been made.

! Handling Precautions

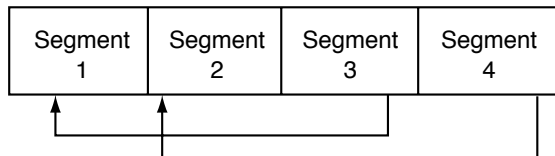
•When repeat operations involve multiple segments and the destination segment settings overlap, nest or intersect, the repeat operation will become an abnormal eternal loop. Do not make such settings.



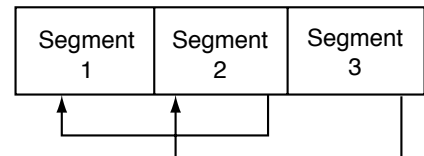
Example of a double



Example of a nest



Intersect example (1)



Intersect example (2)

•When the current segment does not contain a set value or the value is 0, executed values for program items (for example, set PV event values or set PID group selection values) that are sequels to settings in a previous segment are the same during the first run and the repeat run.

■ PV start

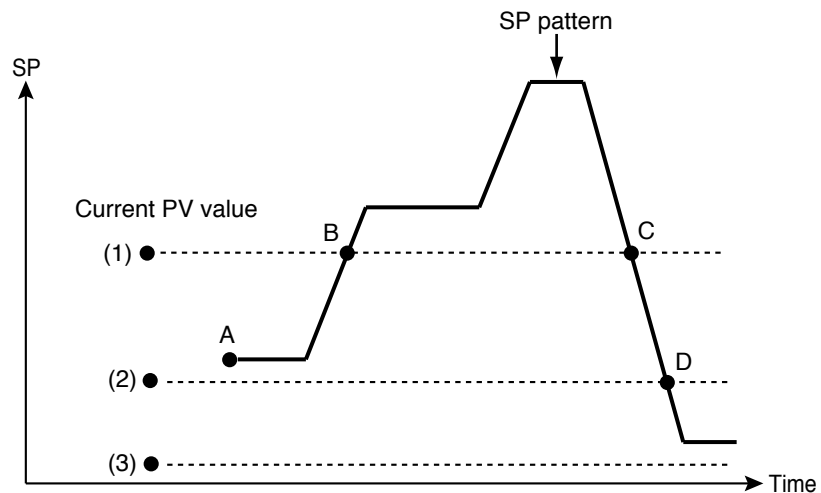
Separate PV start settings can be made in CH1 and CH2 programs.

When a PV start is set in the program setting, a PV start is performed in a normal RUN operation.

The program looks for the first point where PV and the program pattern SP are equal (both PV and SP include bias) and starts operation from there. PV starts are of three kinds: rising PV start that looks for a point where PV and SP are equal on a rising RAMP, falling PV start that looks for a point where PV and SP are equal on a falling RAMP and bi-directional PV start that looks for such a point both on rising and falling RAMPS.

Note, however, that if there is no point where PV and SP are equal, operation starts from the beginning of segment 1.

When a PV start has been implemented, the event operating point and the time event time are automatically corrected. This is described in the figure shown below. When PV is at (1) in the figure, a rising PV start or a bi-directional PV start starts from B and a falling PV start starts from C. When PV is at (2) in the figure, a falling PV start or a bi-directional PV start starts from D and a rising PV start starts from A. When PV is at (3) in the figure, any PV start starts from A.



 NOTE

PV start is valid for segments in the selected program but not for segments beyond a pattern link destination.

When a PV start is performed in one or both channels of a program whose both channels have the same segment time settings, the segment number and operating progress time of the two channels do not match.

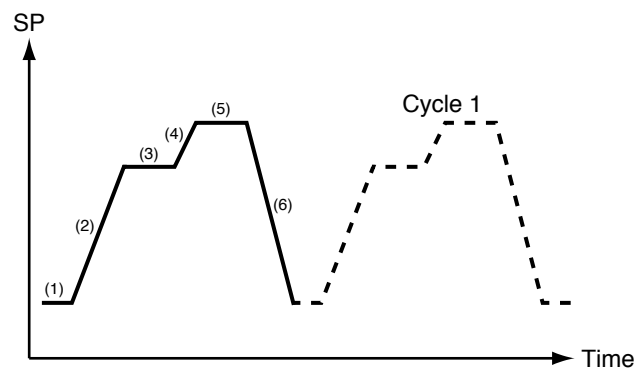
■ Cycle

Separate cycles can be set in CH1 and CH2 programs.

The cycle function allows you to repeat operation from segment 1 to the last segment in a program pattern the number of times set in the cycle count. A total of 10,000 times can be set.

When a cycle number of n is set, the total operation count is $n + 1$. During cycle operation, the operation at the last point in the final segment is not performed and executed values of program items (sequels to settings in the previous segment ; for example, PV event value, pid group number) that continue from a previous segment are cleared before program restart.

When the SP start point and end point are not equal, SP changes in a step-like manner during cycle operation.



■ Pattern link

Separate pattern links can be made in CH1 and CH2 programs.

The pattern link function links patterns; the program number of the link at the destination is set in the pattern link item. An initial value of 0 indicates that linking is not performed.

When the number of the program is set in the pattern link item, it forms an eternal loop.

When SP at the end of the original link and SP at the destination are not equal, SP changes in a step-like manner.

When cycle operation has been set, the pattern link operates after the cycle operation has been completed.

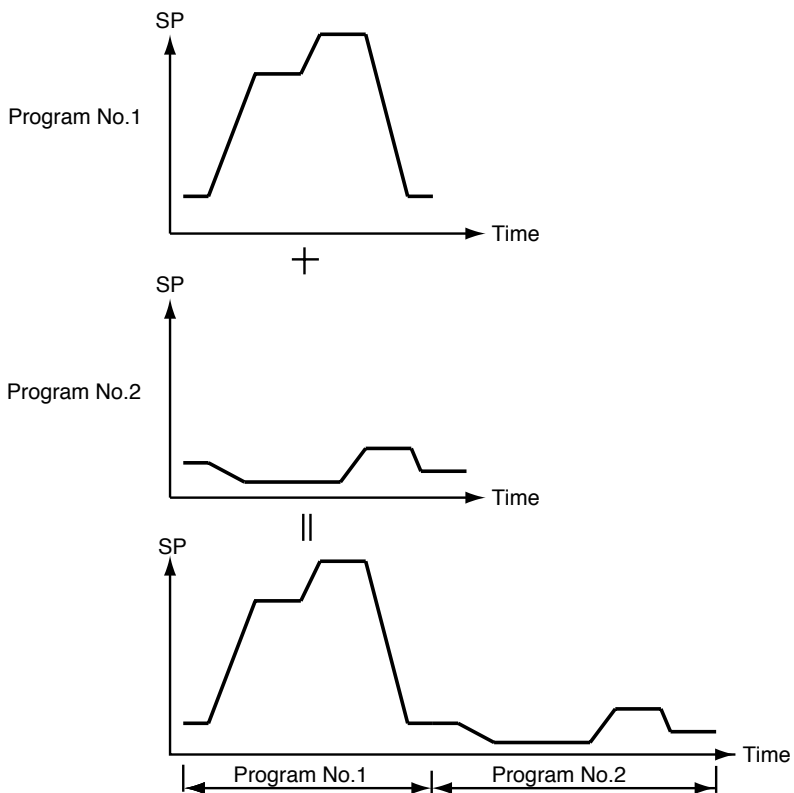
Since operation starts from the first segment at the destination during pattern linking, executed values of program items (sequels to settings in the previous segment) that continue from a previous segment are cleared before program restart.

When a PV start has been programmed in a pattern at the destination link, the PV start function operates after the link has been made.

PID computations are not initialized but continued after a link has been established.

When the READY mode is invoked at the end of an operation or in a RESET operation, operation returns to program number 1 that is switched from READY to RUN mode (RUN to READY). If a RESET is performed when a program at the pattern link destination is reached during an ADV operation in the READY mode, operation returns to segment 1 of the link destination program number. Note, however, that program numbers selected using the external switch takes priority.

Linking program No. 1 and program No. 2



■ Tag

Programs that have the same number in CH1 and CH2 also share the same tag. Tags are 8-character alphanumerics, katakana or symbols that can be entered in a program.

When segment 1 pattern item is set in a program setting, a total of eight characters consisting of PROG plus two characters in the program number and “_” two space characters.

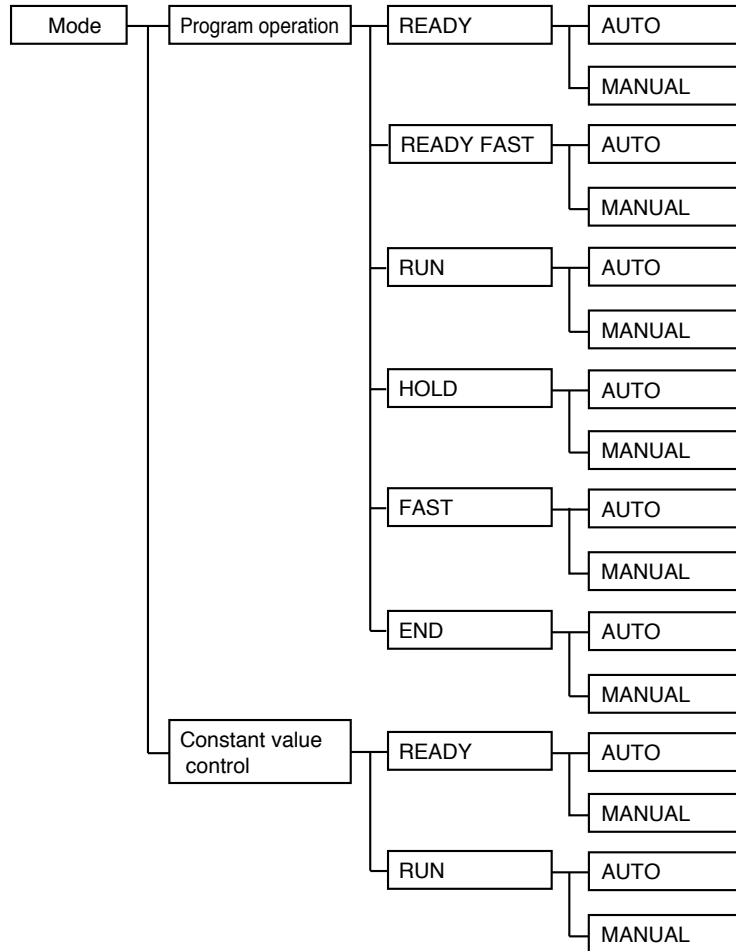
Example: Program No. 1 : “*PROG01_*”

Program No. 19 : “*PROG19_*”

5 - 3 Mode

■ Mode types

Modes are listed below.



● Program operation

The program is run according to SP, time, events and other settings made in program patterns 1-49.

● Constant value control

The control is run according to SP and events made with the constant value control data.

● READY

READY indicates that the program is ready to run.

MV becomes fixed and events whose operation depends on values set in the segments are turned off. Note, however, that **DCP552** state dependent events still run.

Program numbers between 1 to 49 and set segment numbers can be selected during program operation.

All setup data, some event configuration data and some constant value control data parameters can be changed in the READY mode.

Memory cards can also be used in the READY mode

- **RUN**

The RUN mode indicates that the program is run sequentially. MV output and events operate during PID control, ON-OFF control and other types of control. In the program RUN mode, program operation progresses according as time elapses. Note, however, that G.SOAK (guarantee soak) wait, like the HOLD mode, halts program operation.

- **HOLD**

The HOLD mode temporarily halts program operation. Note, however, that, like the RUN mode, MV output and events operate during PID operation, ON-OFF control and other types of control. During constant value control the HOLD mode cannot be invoked.

- **FAST**

The FAST mode is essentially a speeded-up version of the RUN mode. The time factor is selected using variable parameter *PA39*. MV output and events operate during PID control, ON-OFF control and other types of control. G.SOAK (guarantee soak) settings are ignored. During constant value control the FAST mode cannot be invoked.

- **END**

The END mode indicates the state of a program that has run its course. When a program stops at the end, MV output and events operate during PID control, ON-OFF control and other types of control. During constant value control the END mode cannot be invoked.

- **READY FAST**

The READY FAST mode is a combination of the READY and FAST modes. MV output, SP output and events operate in the same way as in the READY mode. Program numbers and segment numbers cannot be selected. Parameters that can only be changed in the READY mode and memory card operation cannot be performed in this mode. During constant value control the READY FAST mode cannot be invoked.

- **AUTO**

The AUTO mode performs automatic operation. MV outputs can be used depending on **DCP552** control.

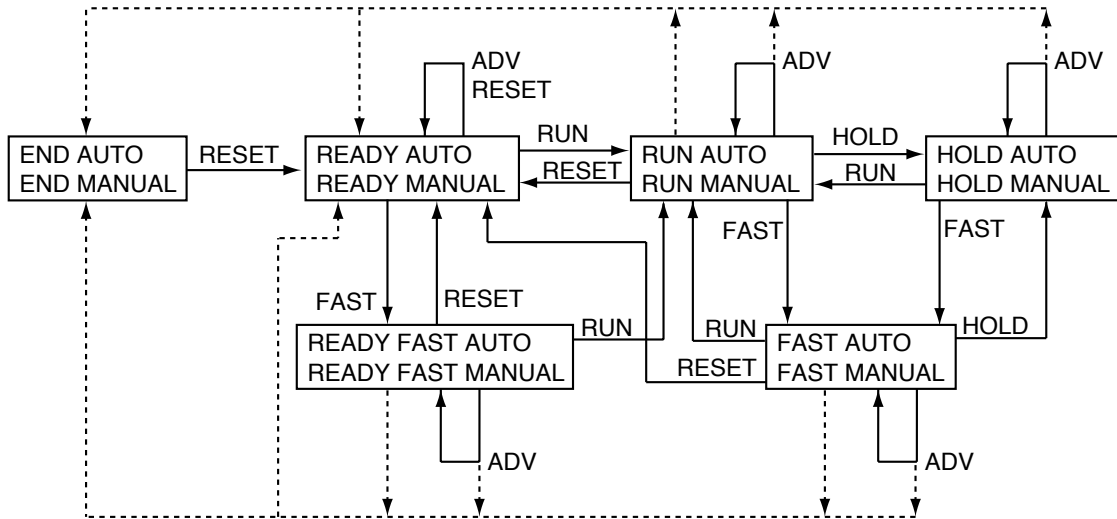
- **MANUAL**

The MANUAL mode performs manual operation. The “↑”, “↓”, “←” and “→” console keys can be used to change communications and MV output.

■ Mode transitions

● Program operation

Mode transitions are indicated by the solid line arrows and end operation is indicated by the dashed lines in the figure below.

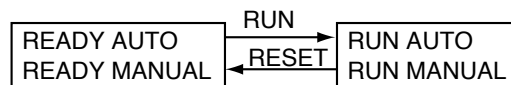


NOTE

- AUTO ↔ MANUAL mode changes can be made in the boxes of each mode.
- READY and END at the end of operation can be selected using setup data C31.
- CH1 and CH2 mode transitions can be performed both synchronously or asynchronously.

● Constant value control

Mode transitions are indicated by the solid line arrows.



NOTE

- AUTO ↔ MANUAL mode changes can be made in the boxes of each mode.
- CH1 and CH2 mode transitions can be performed both synchronously or asynchronously.

● Switching between program operation and constant value control

Constant value control data “ConSt” control mode item in the READY mode is used to switch between these two modes.

- 0: Program operation
- 1: Constant value control

■ Mode transition operations

Mode transitions are performed using the following operations.

Although “Operation end” is not an operation, it is described here as a factor in mode transitions.

● RUN

Switches from the READY, HOLD, FAST and READY FAST modes to the RUN mode. To go from the READY mode or READY FAST to the RUN mode using keys, external switches or transmission, the **DCP552** must be in basic display status.

● HOLD

Switches from the RUN and FAST modes to the HOLD mode. During constant value control the HOLD mode cannot be invoked.

● RESET

Switches from the RUN, HOLD, FAST, END and READY FAST modes to the READY mode.

In program operation, the reset involves returning the program to the first segment.

● ADV

Brings the program forward by one segment in the READY, RUN, HOLD, FAST and READY FAST modes. ADV (advance) operation is not available in the constant value control mode.

● FAST

The FAST mode is invoked from the RUN, HOLD, READY and READY FAST modes. During constant value control the FAST mode cannot be invoked.

● AUTO

Switches from the MANUAL mode to AUTO mode.

● MANUAL

Switches from the AUTO mode to MANUAL mode.

The basic display status shows PV and the output value (%) during this transition.

Switching from AUTO to MANUAL using external switches or transmission invokes the basic display status even when the parameter setting status or programmer setting status are in use.

● Operation end

Operation ends when all progress of program settings including cycle and pattern links reach the end in the RUN, FAST and READY FAST program operation modes or during an ADV operation. By making a setup selection, it is possible to set READY or END as the state of the controller when the program reaches its end.

Note, however, that when an operation ends in the READY FAST mode, it always ends in the READY mode. In constant value control mode, operation end is not available.

■ Mode transition restrictions

Modes can be changed using console keys, external switch inputs or through communications. The table below shows the operations that are valid for each mode.

Operation		RUN (To RUN mode)			HOLD (To RUN mode)			RESET (To READY mode)			ADV (To next segment)			FAST (To FAST or READY FAST mode)		
		Key	Switch	Commu- nication	Key	Switch	Commu- nication	Key	Switch	Commu- nication	Key	Switch	Commu- nication*	Key	Switch	Commu- nication
Program operation	READY	*	*	*	-	-	-	-	Δ□	□	-	*	-	*	*	*
	RUN	-	-	□	*	○	*	*	○	*	*	○	*	*	○	*
	HOLD	*	○	*	-	-	□	*	○	*	*	○	*	*	○	*
	FAST	*	○	*	-	○	*	*	○	*	*	○	*	-	-	□
	END	-	-	-	-	-	-	*	○	*	-	-	-	-	-	-
	READY FAST	*	*	*	-	-	-	*	○	*	*	○	*	-	-	□
Constant value control	READY	*	*	*	-	-	-	-	-	□	-	-	-	-	-	-
	RUN	-	-	□	-	-	-	*	○	*	-	-	-	-	-	-

Operation		MANUAL (To MANUAL mode)			AUTO (To AUTO mode)		
		Key	Switch	Communication	Key	Switch	Communication
Program operation	AUTO	*	○	*	-	-	□
	MANUAL	-	-	□	*	○	*
Constant value control	AUTO	*	○	*	-	-	□
	MANUAL	-	-	□	*	○	*

- : Valid operation
- * : Operation from basic display status valid
- Δ : Returns to the first segment remaining in the READY mode.
- : Operation is invalid, but the communication end code is normal if performed in the basic display status.
- : Invalid operation

* ADV operation performed via communications may not go to the next segment but to the segment set in the communications message.

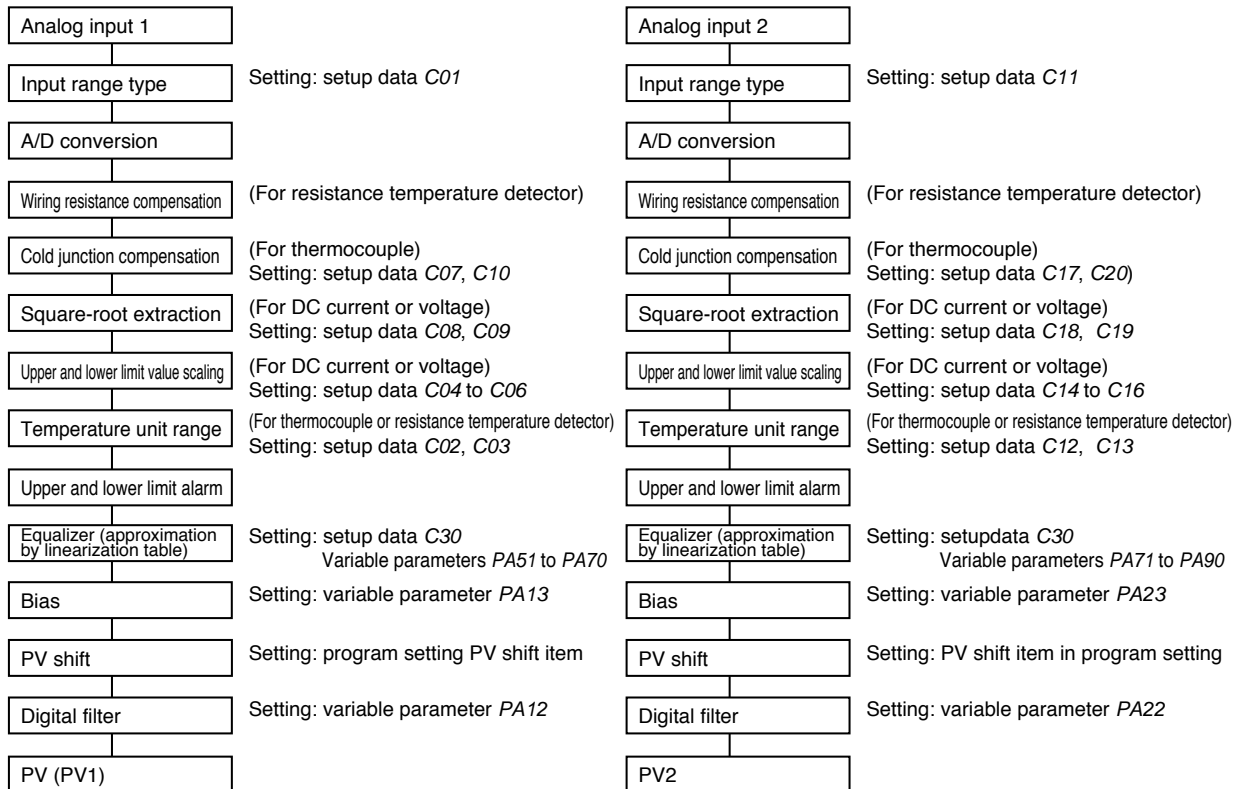
! Handling Precautions

- Mode transitions can be simultaneously performed for both CH1 and CH2 under the following conditions.
 - When key operations are performed in synchronous mode (PA04=1).
 - Switch operations performed when both the CH1 operation cancel switch (SW15) and the CH2 operation cancel switch (SW16) are set to OFF.
 - When a write command is used to communicate with 2001 status 1 (CH1 and CH2).
- Mode transitions can be simultaneously performed for either CH1 or CH2 under the following conditions.
 - When key operations are performed in asynchronous mode (PA04=0).
 - Switch operations performed when either the CH1 operation cancel switch (SW15) or the CH2 operation cancel switch (SW16) is set to ON.
 - When a write command is used to communicate with 261 status 1 (CH1) or 281W status 1 (CH2).

5 - 4 Input Process Functions

This section uses diagrams to describe input processes.

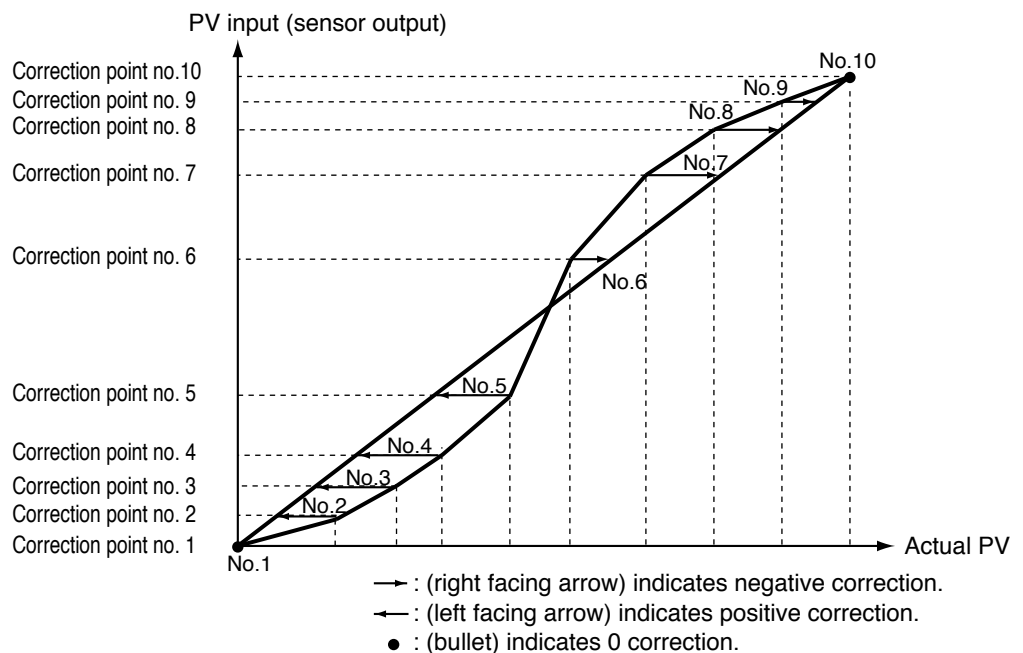
■ Model without carbon potential (CP) compensation



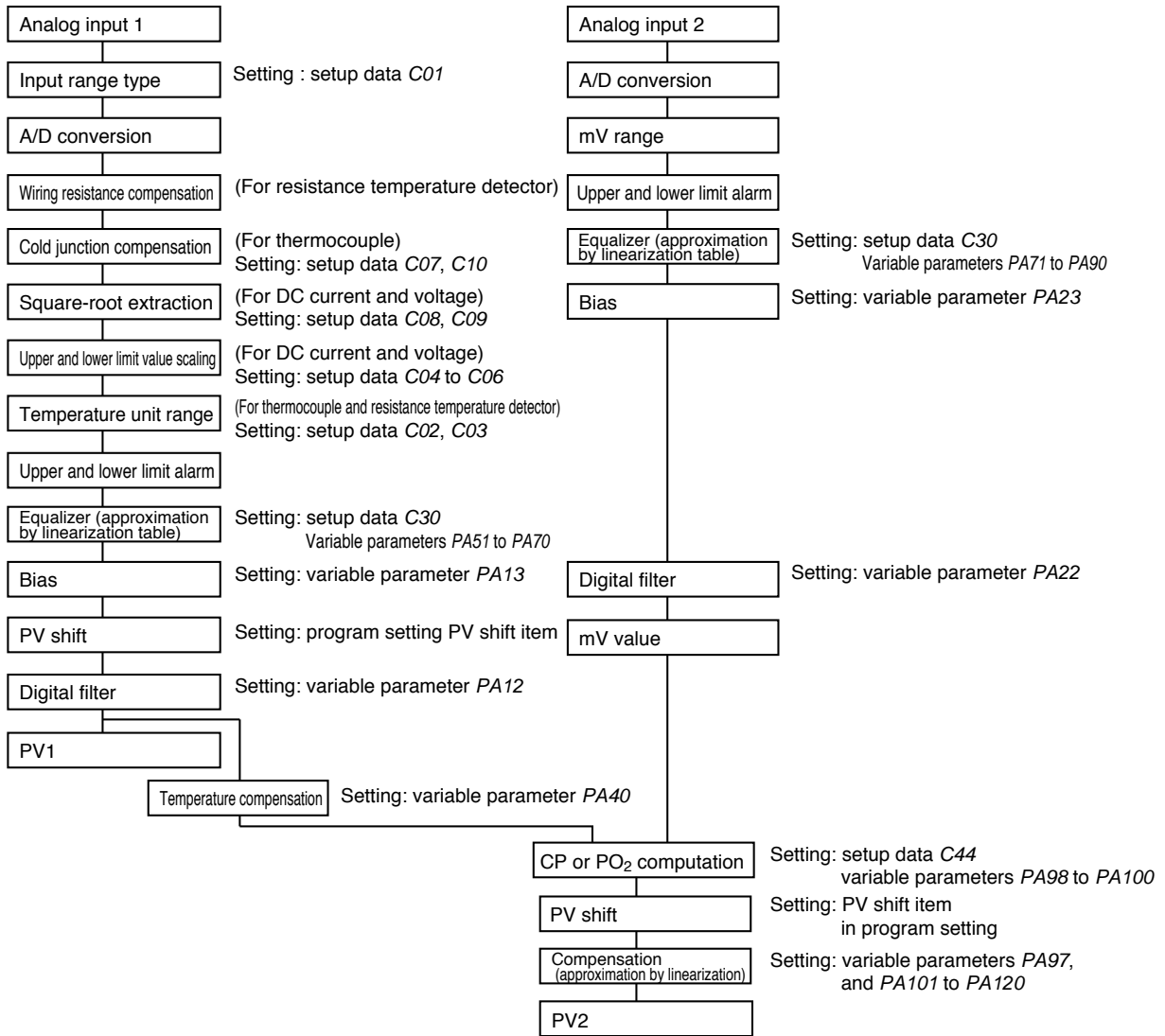
NOTE

The use of equalizer (approximation by linearization table) is shown in the figure below.

When a sensor with curved characteristics is used to measure PV, a linearization table is used.



■ Model with carbon potential (CP) compensation



■ O₂ sensor check (model with CP compensation)

● Objective

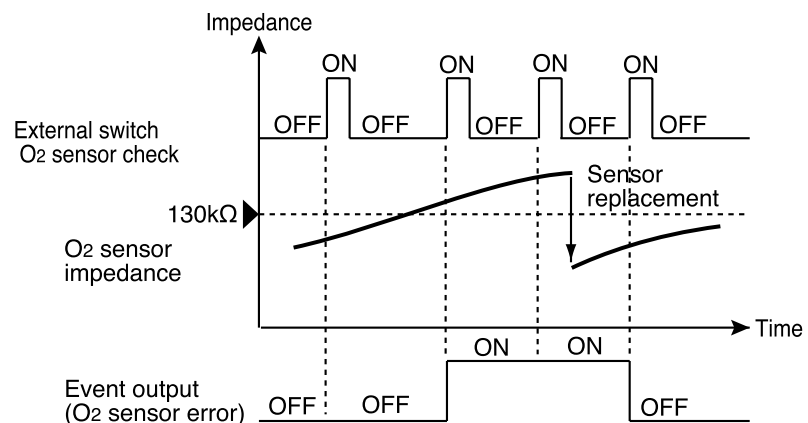
As the O₂ sensor starts to deteriorate, its output impedance increases. This function checks sensor output impedance and turns on the O₂ sensor error event when the impedance exceeds 130k Ω .

● Setting

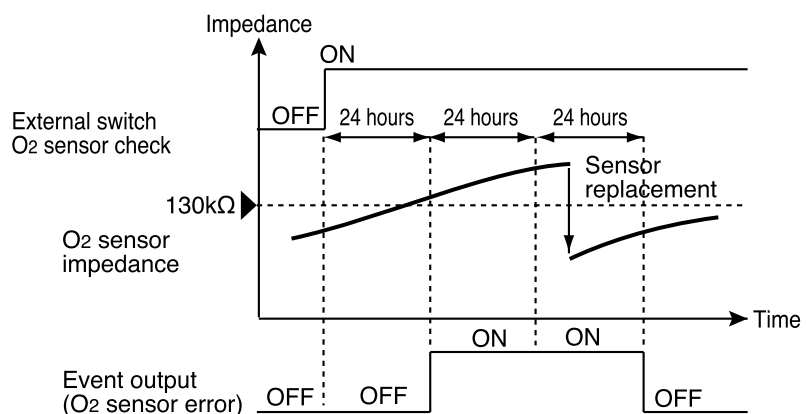
- One of the values set for setup data *C71* to *C74* is set to 11 to assign the O₂ sensor check to an external switch.
- One of the values set for event configuration data setting *E01-t* to *E16-t* is set to 142 to assign an O₂ sensor error event.

● Operation

- Two methods are used to perform an O₂ sensor check. In one method the external switch which has been assigned the O₂ sensor check function goes from OFF to ON. This is called a constant check.
- The other method the external switch is turned on each 24-hour period. This is called an automatic check.
- The impedance is checked when PV1 is 800 °C or more and the O₂ input is 1000mV or higher.
- The O₂ sensor error event goes on when sensor impedance exceeds 130k Ω ; otherwise it remains off.
- The constant check method is shown below.



- The automatic check method is shown below.

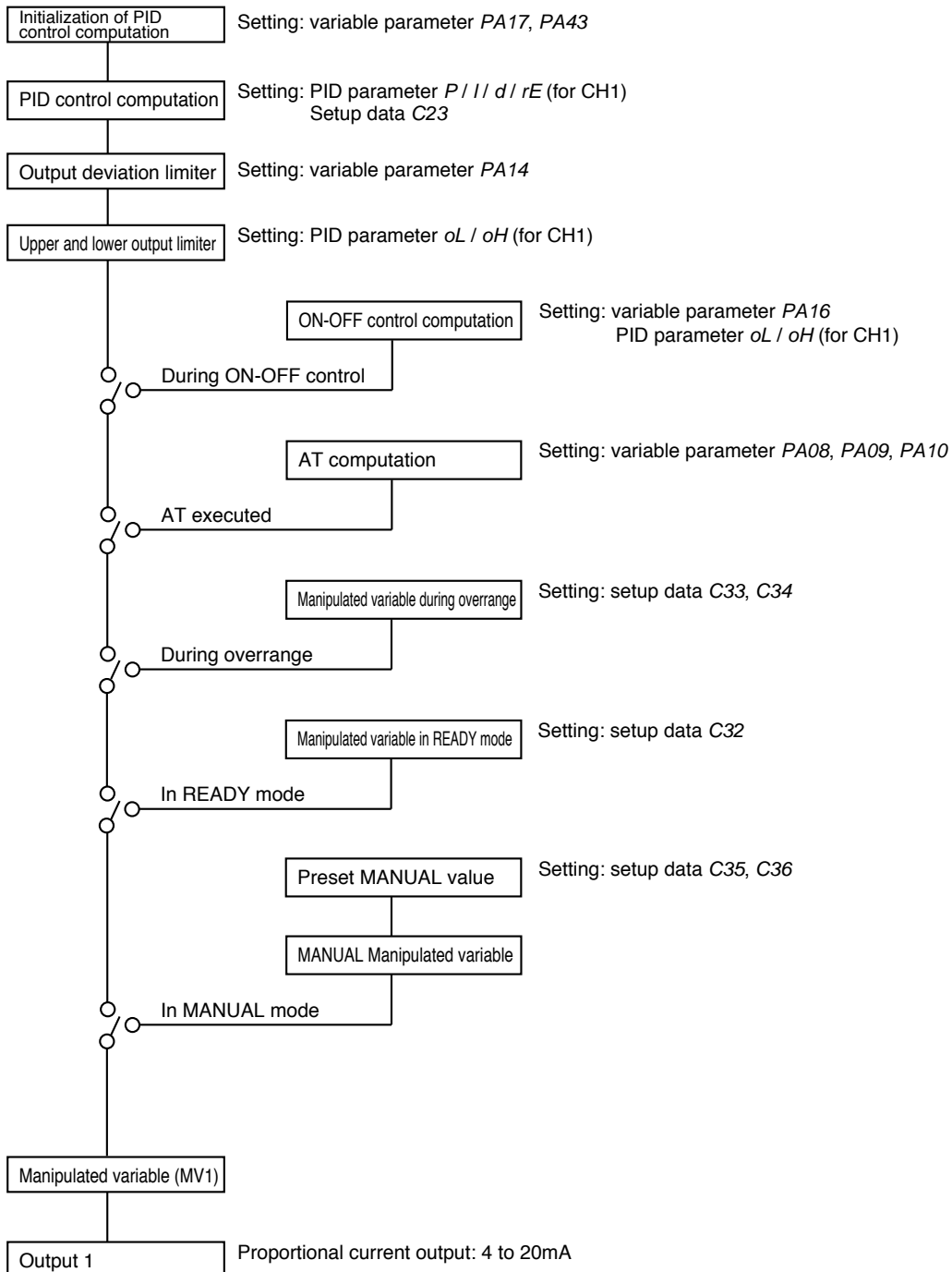


5 - 5 Output Processing Functions

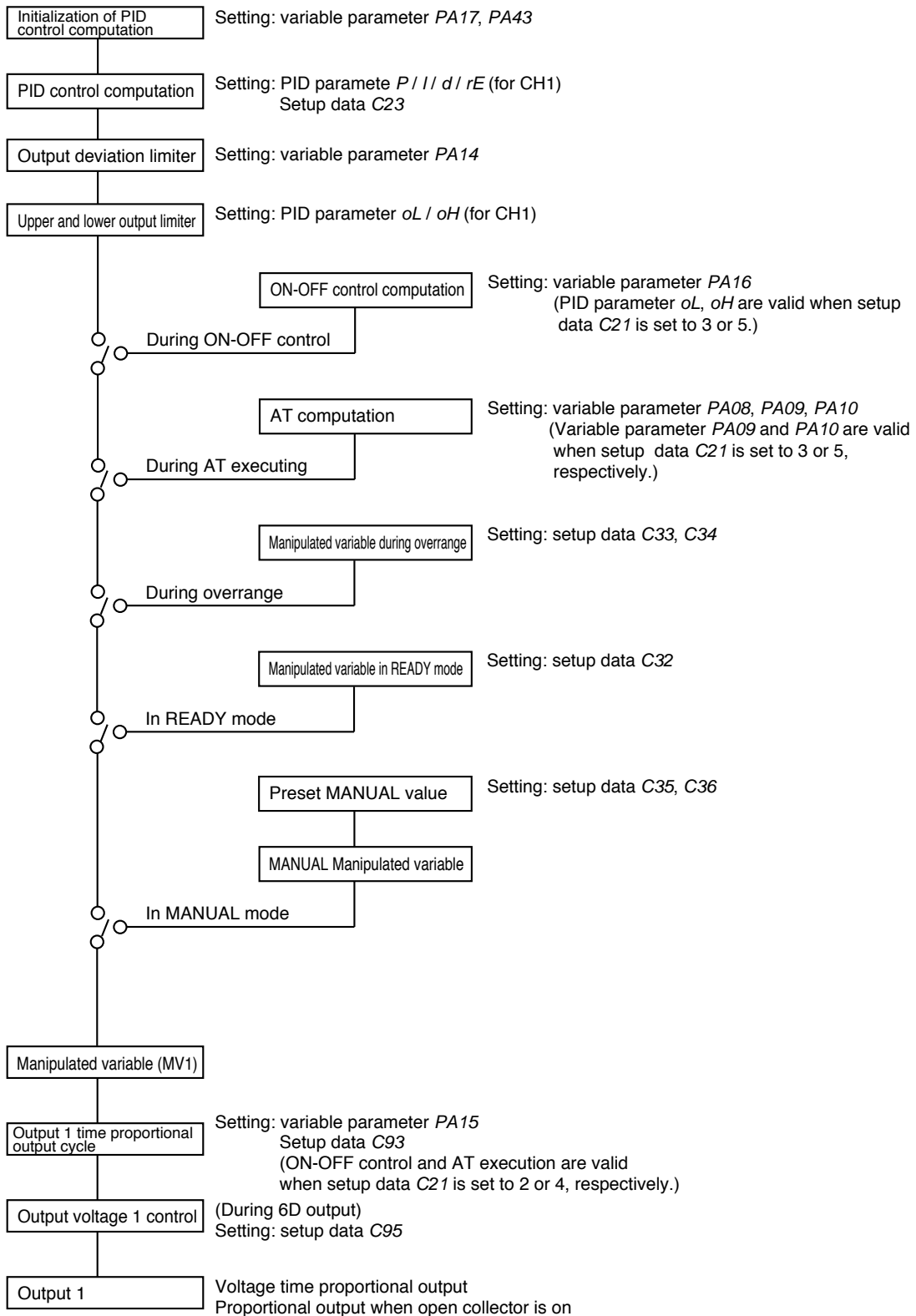
■ Control output CH1

Control output CH1 is processed as shown below.

● Current output (with setup data C21 set to 1)



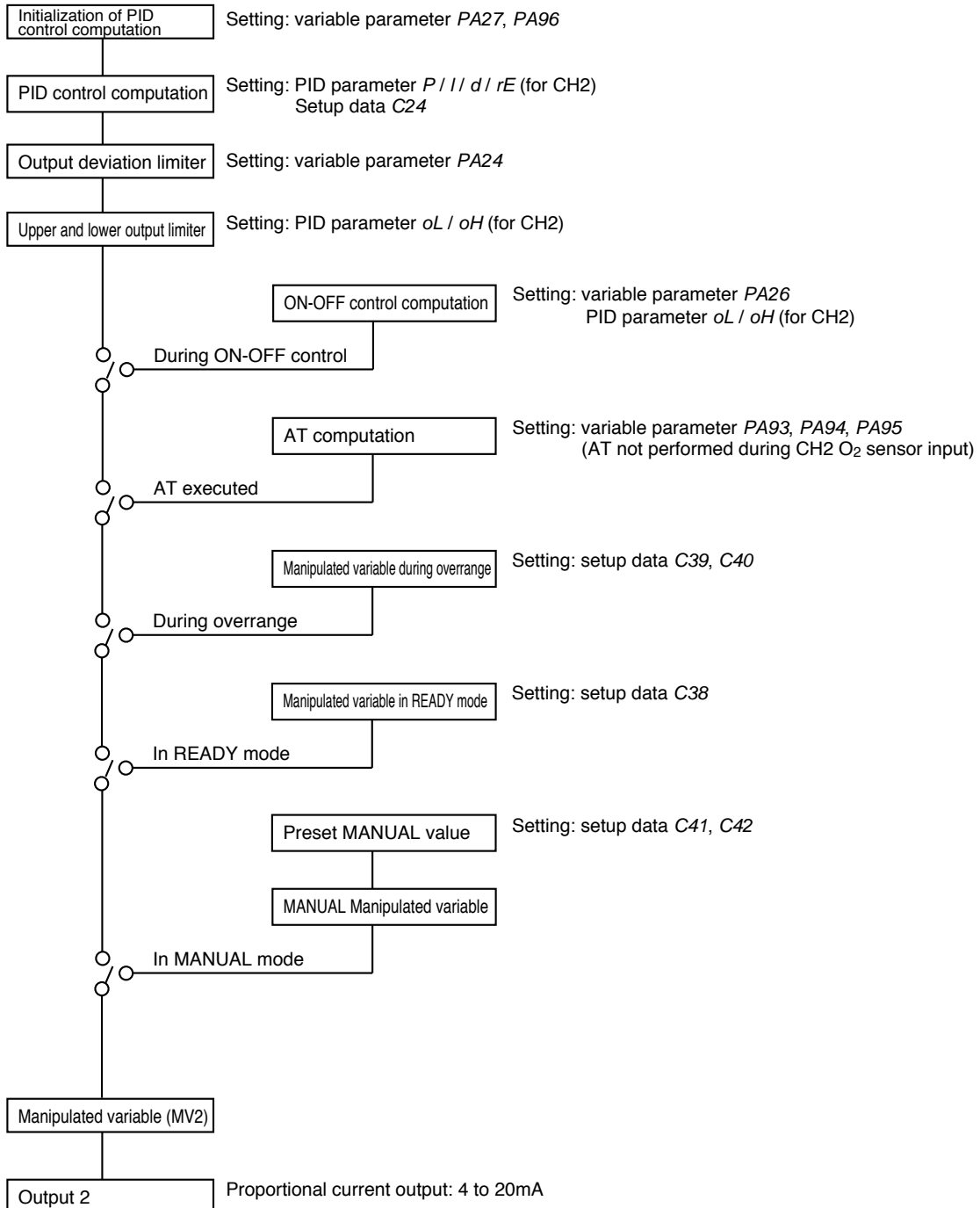
● Voltage, Open collector output (with setup data C21 set between 2 to 5)



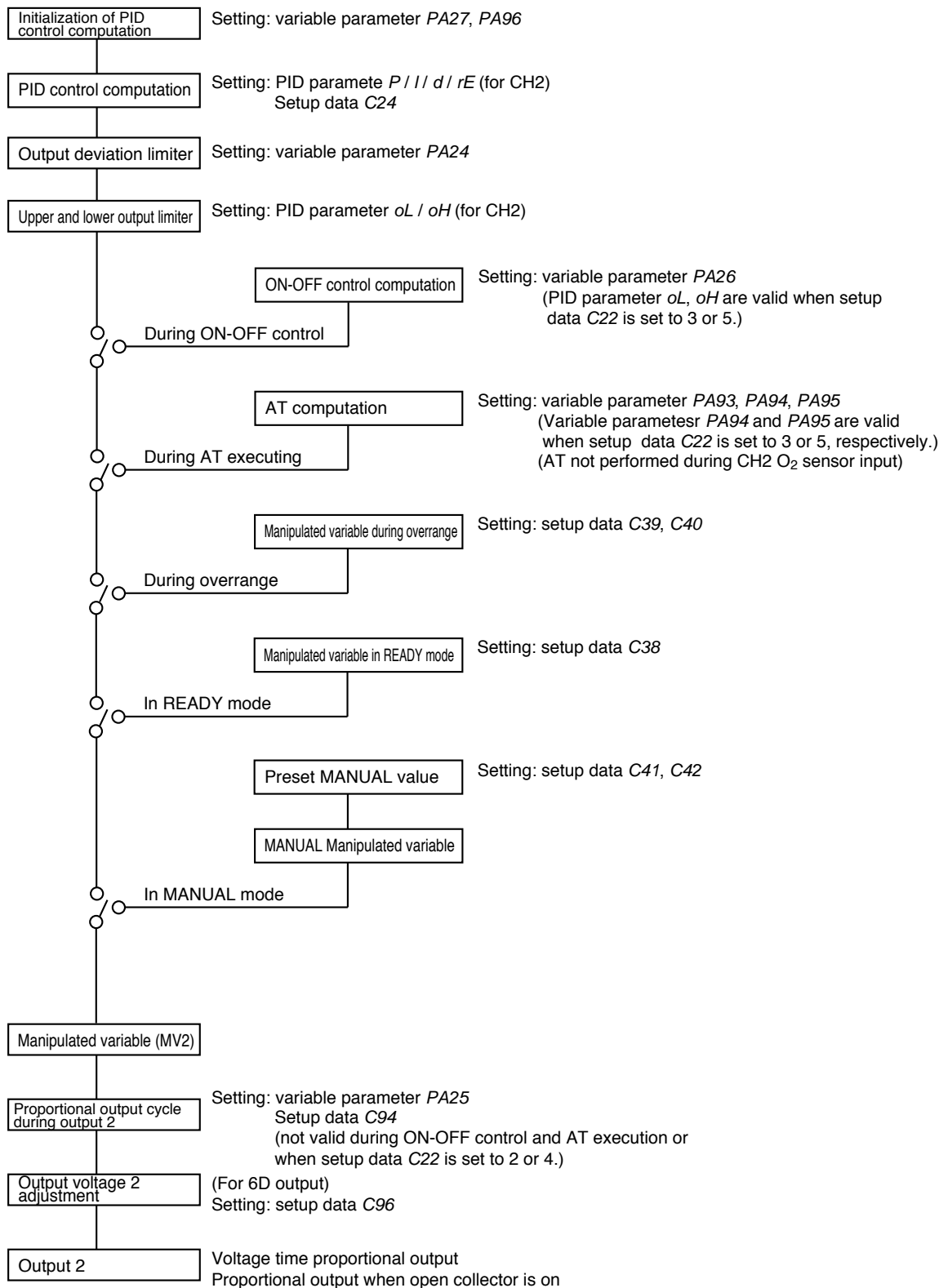
■ Control output CH2

Control output CH2 is processed as shown below.

● 5G output (with setup data C22 set to 1)



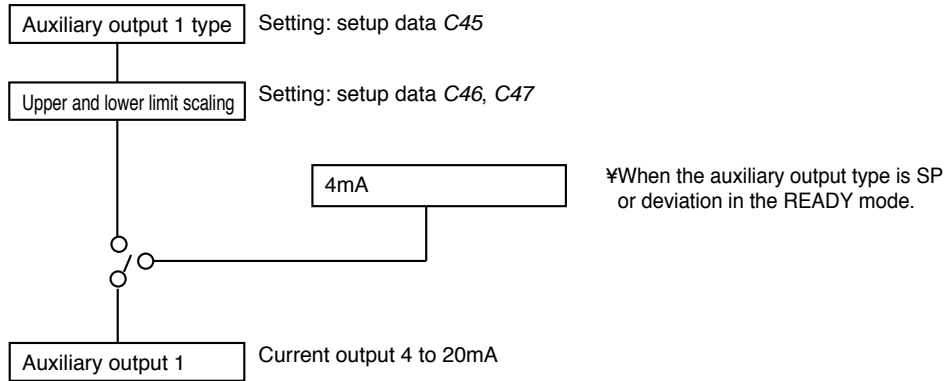
● Voltage, Open collector output (with setup data C22 set between 2 to 5)



■ Auxiliary output

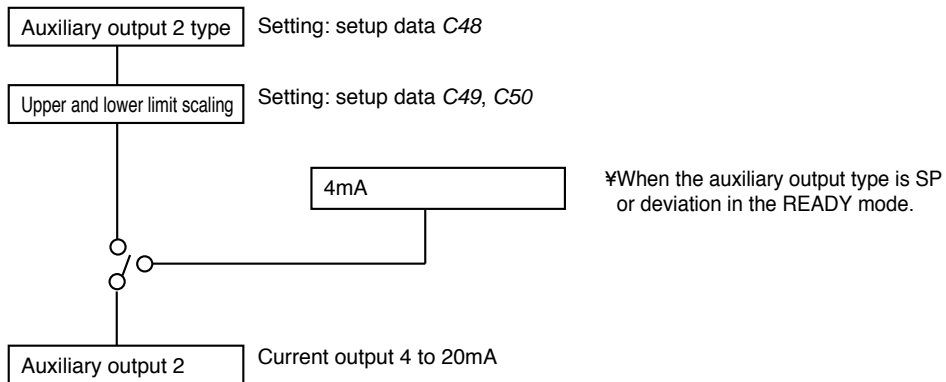
● Auxiliary output 1

Auxiliary output 1 is processed as shown below by a model with one or two auxiliary output channels.



● Auxiliary output 2

Auxiliary output 2 is processed as shown below on a model with two auxiliary output channels.



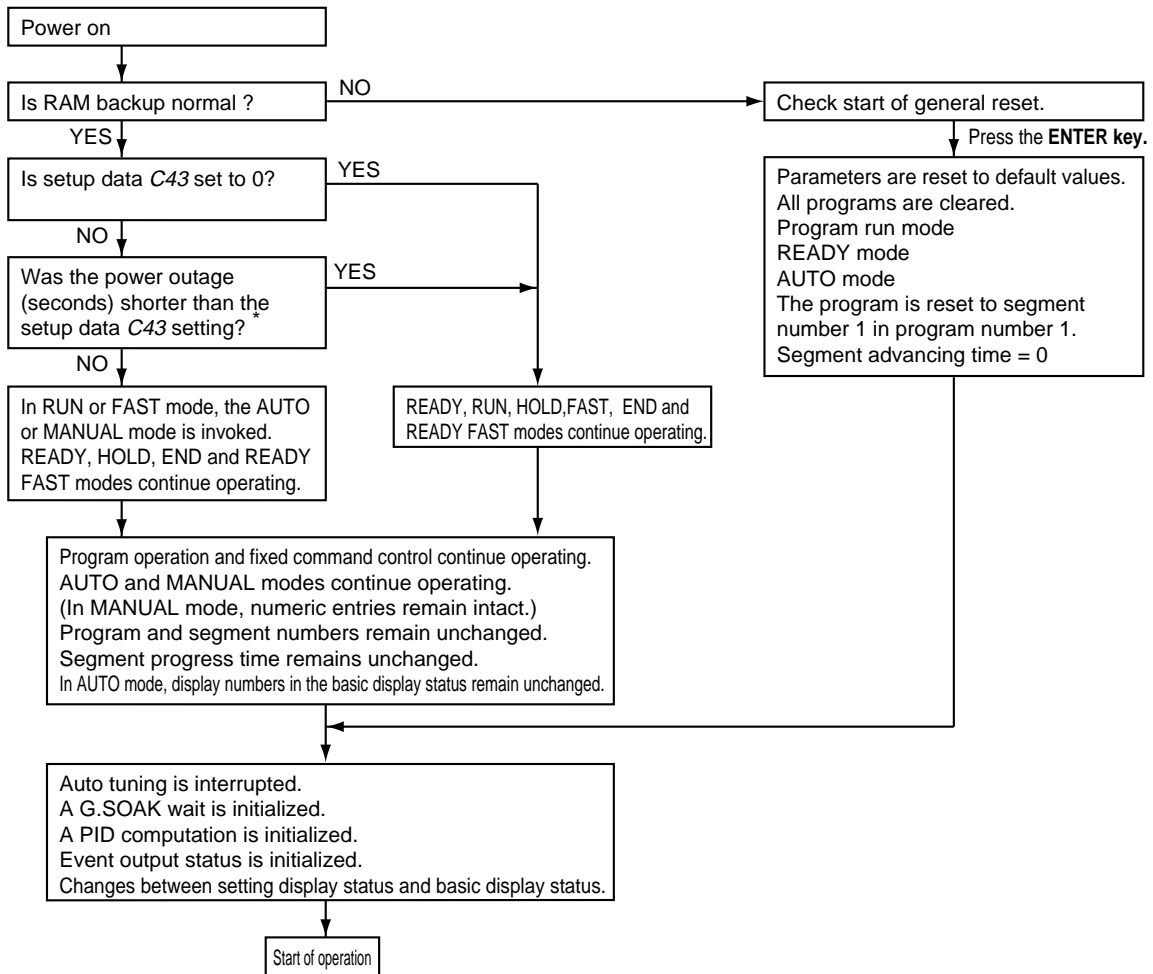
Chapter 6. OPERATION

6 - 1 Power Supply On

When 100 to 240V AC is applied across terminals (39) and (40) on the **DCP552**, the display goes on in about 10 seconds and controls and other operations start. When the controller is starting up, the LEDs on the profile display go on at irregular intervals one after the other starting from top right in clock-wise order until the controller becomes ready for operation.

The startup flow procedure is shown below.

● Startup flow procedure



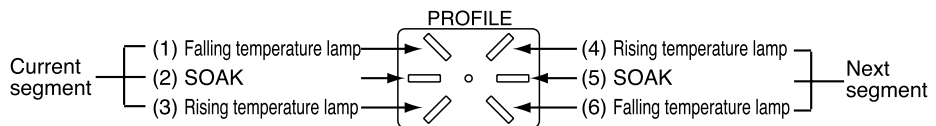
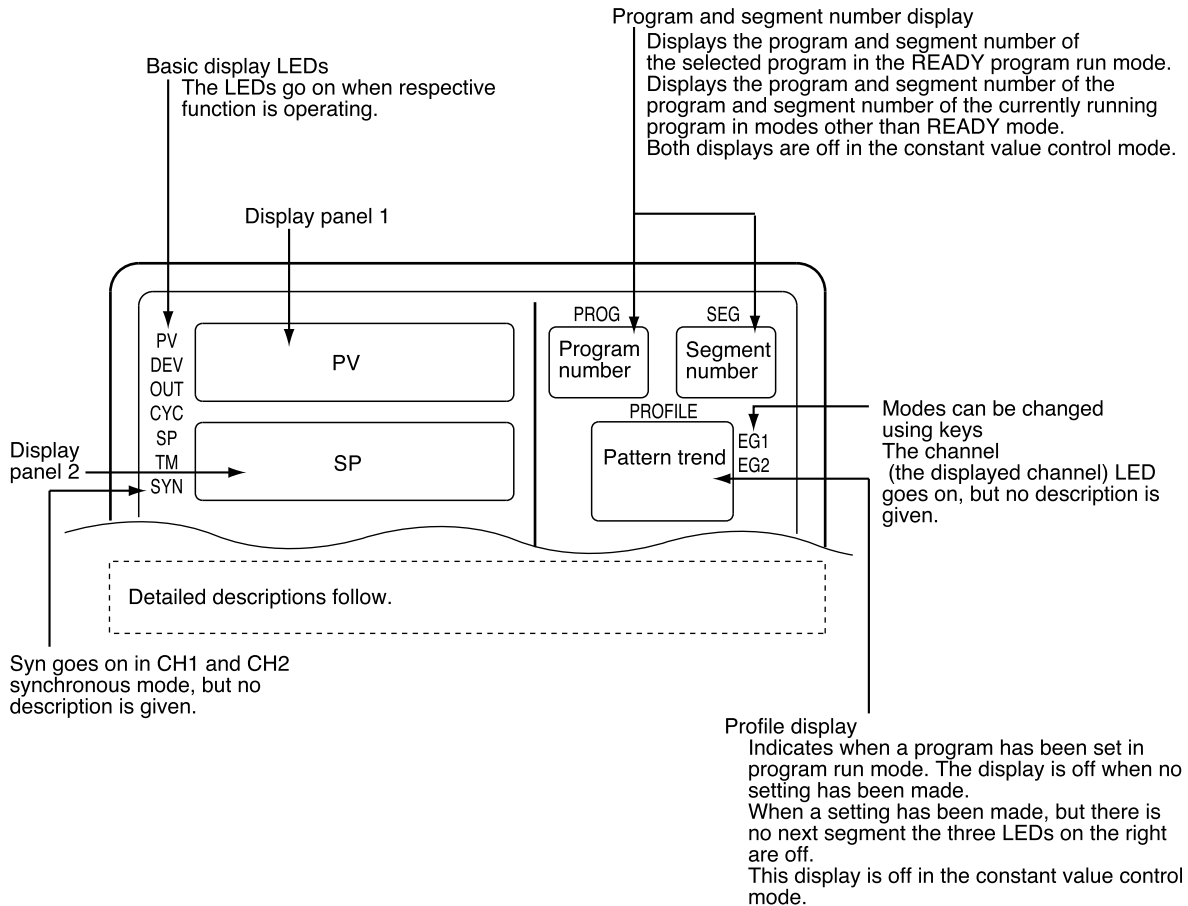
*: The measurement of a power outage may vary by about 10 seconds.

6 - 2 Basic Display Selection

The console basic display status is comprised of the program number display, segment number display, display panel 1, display panel 2, basic display LEDs and the message panel.

Use the **DISP key** or **MESSAGE key** to cycle through the different displays. The mode display LEDs perform the same functions both in the basic display status and during parameter settings and do not change by pressing the **DISP** or **MESSAGE key**.

The displays and their functions are shown in the figure below.

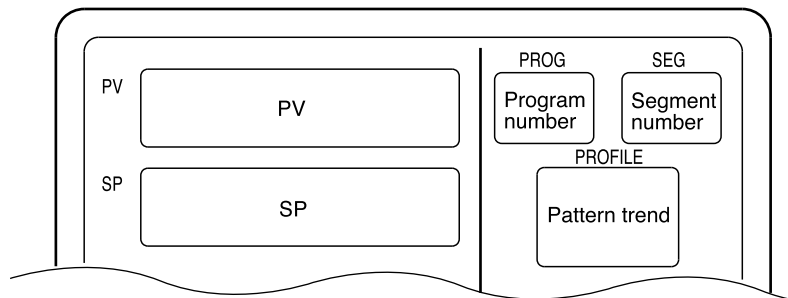


■ Program run mode displays

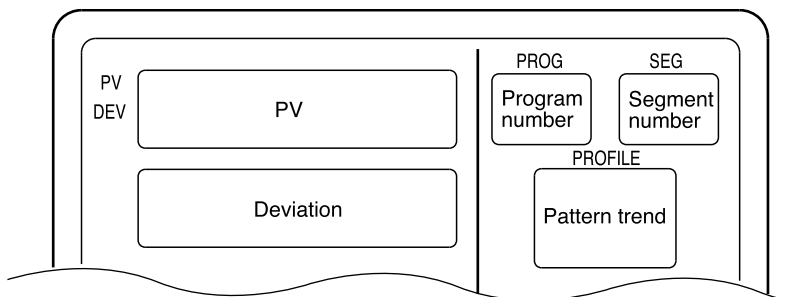
● DISP key function (When variable parameter *PA03* is set to 0)

The DISP key is used to cycle through the displays in the following order: Display A1, display A2, display A3, display A4, display A5, display A6, display A1.

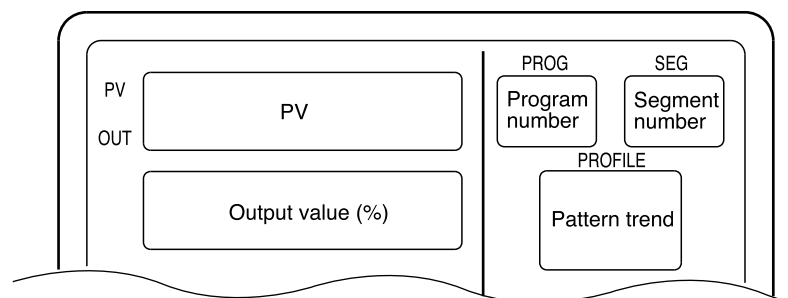
● Display A1



● Display A2

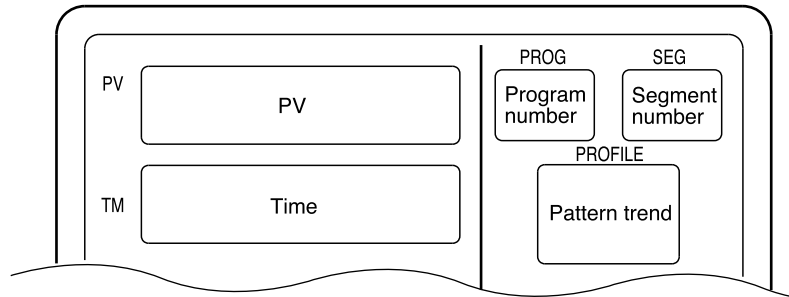


● Display A3



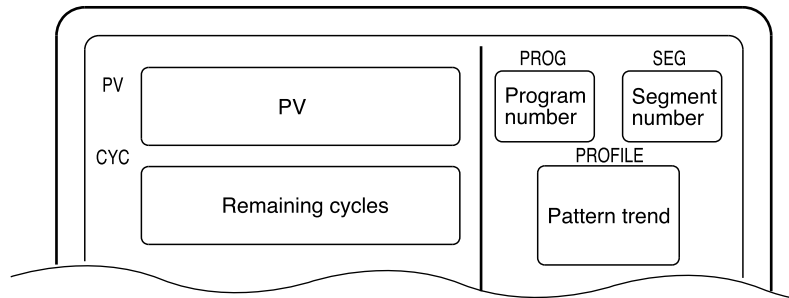
When used in MANUAL mode, the number of digits available for output values flashes.

● Display A4



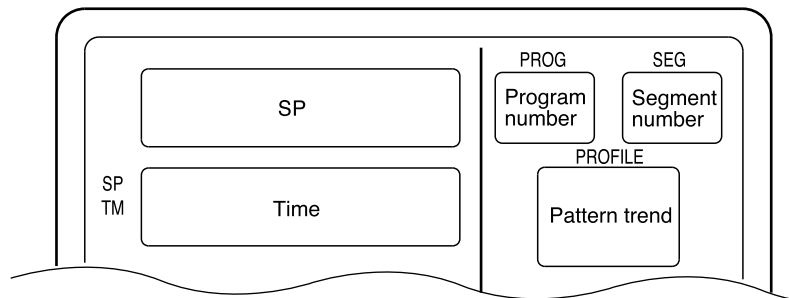
Select Hours and Minutes, Minutes and Seconds or 0.1 Seconds in the time unit setup data. In the setup data, also select Remaining Segment Time or Total Running Time.

● Display A5



When the remaining number of cycles is 0, cycle operation stops.

● Display A6

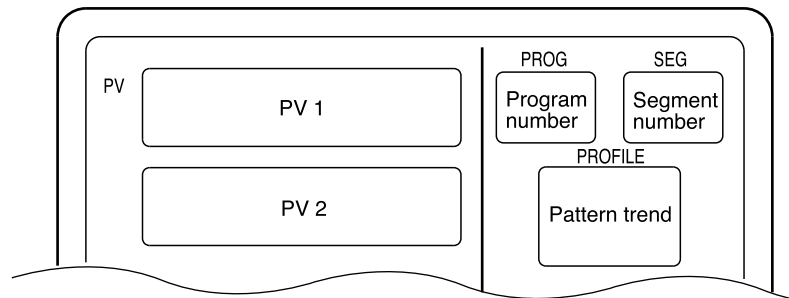


Select Hours and Minutes, Minutes and Seconds or 0.1 Seconds in the time unit setup data. In the setup data, also select Remaining Segment Time or Total Running Time.

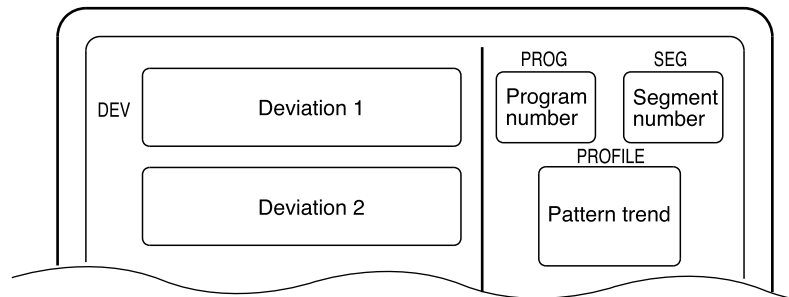
- **DISP key function (when variable parameter *PA03* is set to 1)**

Cycles through display B1 → display B2 → display B3 → display B4 → display B5 → display B6 → display B1 → . . .

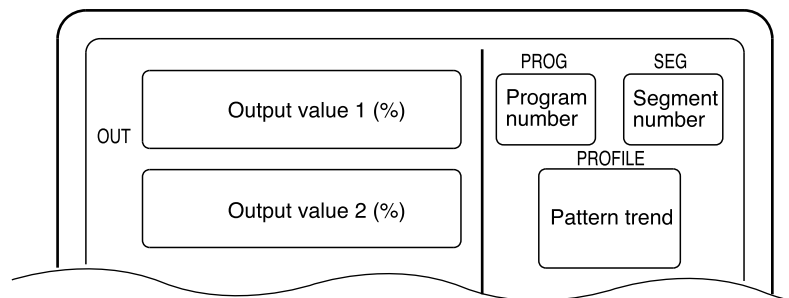
- **Display B1**



- **Display B2**

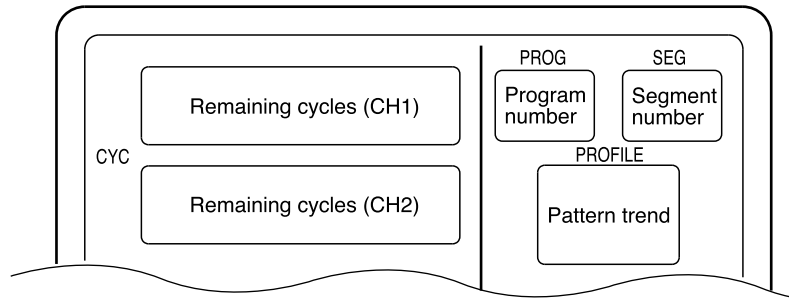


- **Display B3**



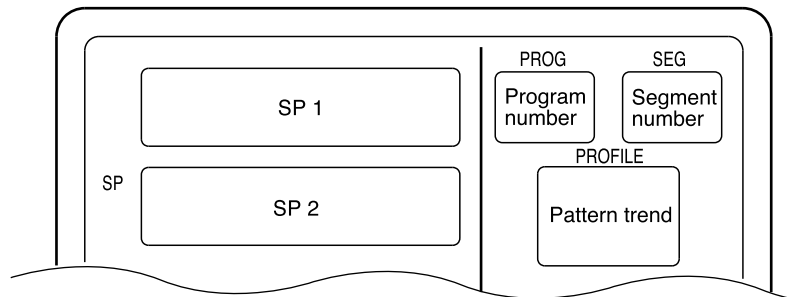
When used in MANUAL mode, the number of digits available for output values flashes.

● Display B4

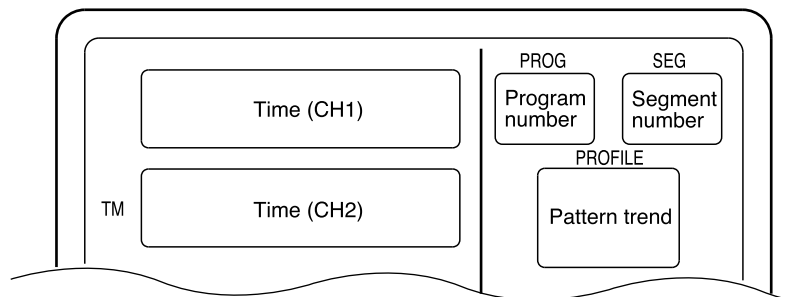


When the remaining number of cycles is 0, cycle operation stops.

● Display B5



● Display B6



Select Hours and Minutes, Minutes and Seconds or 0.1 Seconds in the time unit setup data. In the setup data, also select Remaining Segment Time or Total Running Time.

● **Message key function (when variable parameter PA03 is set to 0)**

Cycles through the message panel displays.

- When CH1 is displayed: Display C1, display C2, display C3, display C4, display C5, display C6, display C1.
- When CH2 is displayed: Display C1, display C2, display C3, display C4, display C5, display C6, display C1.

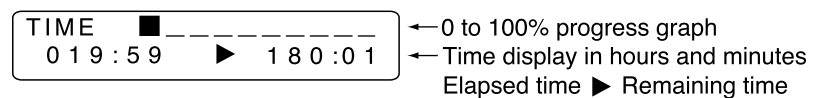
● **Display C1**



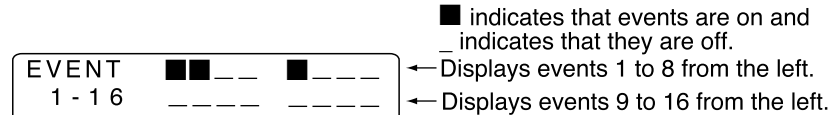
● **Display C2**



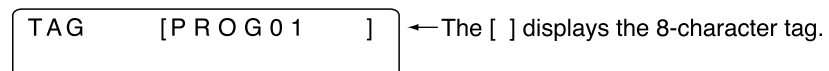
● **Display C3**



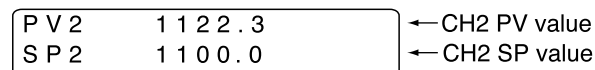
● **Display C4**



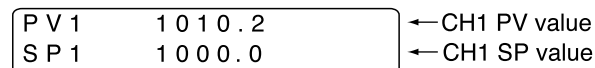
● **Display C5**



● **Display C6**



● **Display C7**



! **Handling Precautions**

- Models with CP computation compensation the CH2 PV values have the following meaning depending on variable parameter PA44 settings.
 - When PA44 is set to 0: CP value (unit: %) or PO₂ values (unit: 10⁻²⁰ atm)
 - When PA44 is set to 1: millivolt voltage value (unit: mV)
 - When PA44 is set to 2: O₂ sensor impedance value (unit: kΩ)

● **Message key function (when variable parameter *PA03* is set to 1)**

Cycles through the message panel displays.

- Display D1, display D2, display D3, display D4, display D5, display D6, display D1.

● **Display D1**

OUT 1	20 . 4 % OUT	←5 to 105% CH1 output value
OUT 2	70 . 5 % OUT	←5 to 105% CH2 output value

● **Display D2**

DEV 1	8 . 6 % F S	←-999.9 to 999.9% CH1 deviation value
DEV 2	3 . 1 % F S	←-999.9 to 999.9% CH2 deviation value

● **Display D3**

T1	0 1 9 : 5 9 ▶	1 8 0 : 0 1	←Time value of CH1 time unit
T2	0 1 9 : 5 9 ▶	1 8 0 : 0 1	←Time value of CH2 time unit

● **Display D4**

EVENT	■ ■ _ _ _ ■ _ _ _	■ indicates that events are on and _ indicates that they are off.
1 - 1 6	_ _ _ _ _	←Displays events 1 to 8 from the left. ←Displays events 9 to 16 from the left.

● **Display D5**

TAG1	[P R O G 0 1]	CH1 tag ←The [] displays the 8-character program tag.
TAG2	[P R O G 0 1]	←CH2 tag

● **Display D6**

PV1	1 0 1 0 . 2	←CH1 PV value
PV2	1 1 2 2 . 3	←CH2 PV value

! **Handling Precautions**

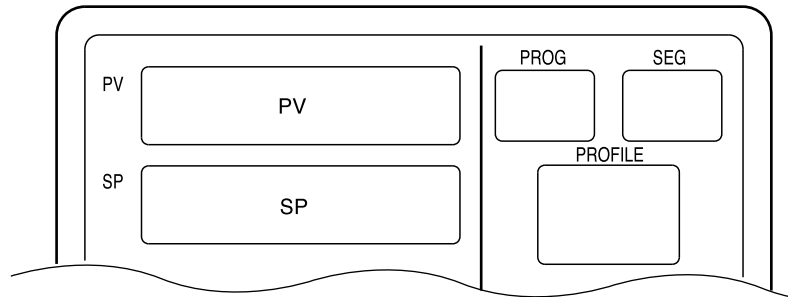
- Models with CP computation compensation the CH2 PV values have the following meaning depending on variable parameter *PA44* settings.
 - When *PA44* is set to 0: CP value (unit: %) or PO₂ values (unit 10⁻²⁰ atm)
 - When *PA44* is set to 1: millivolt voltage value (unit: mV)
 - When *PA44* is set to 2: O₂ sensor impedance value (unit: kΩ)

■ Constant value control mode

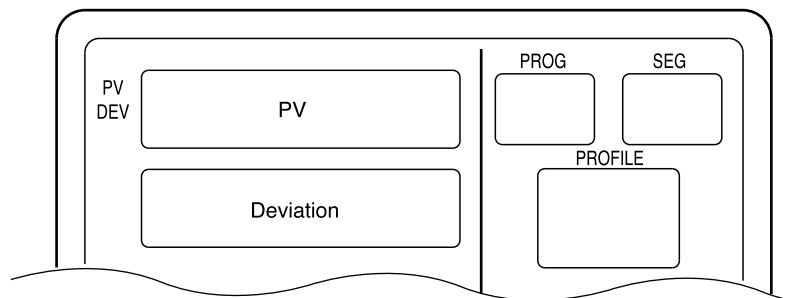
● DISP key function (when variable parameter *PA03* is set to 0)

The DISP key is used to cycle through the displays in the following order: Display E1, display E2, display E3, display E1.

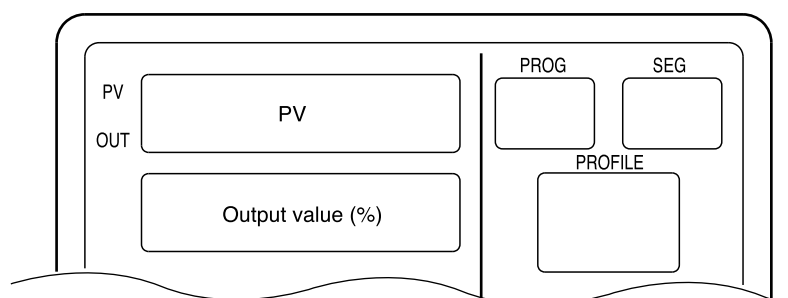
● Display E1



● Display E2



● Display E3



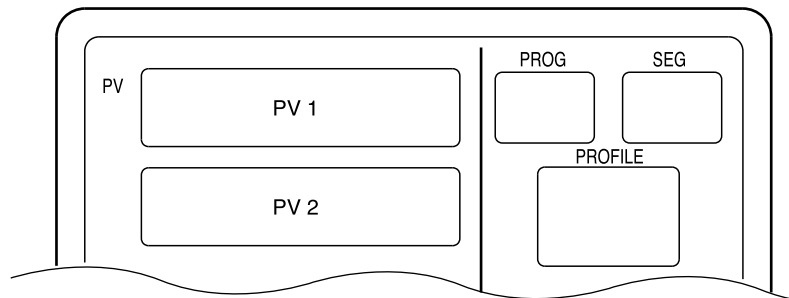
In MANUAL mode, the number of digits available for output values flash.

● **DISP key function (when variable parameter PA03 is set to 1)**

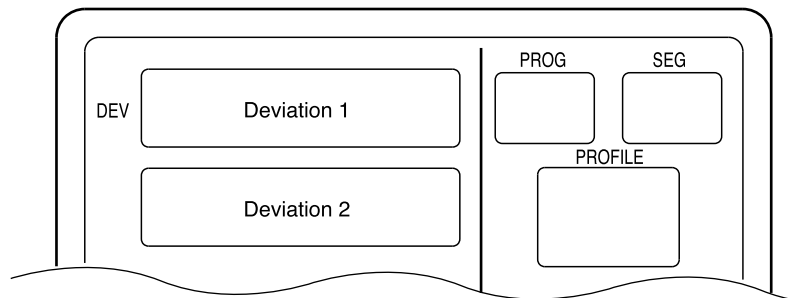
The **DISP key** is used to cycle through the displays in the following order: Display F1, display F2, display F3, display F4, display F1.

When CH1 and CH2 are both in the fixed command control mode, the display show the information shown in the figures below. When only one channel is in the fixed command control mode, the displays provide the same information is shown in the program run mode. Note, however, that channel time and remaining cycle count are displayed as [----].

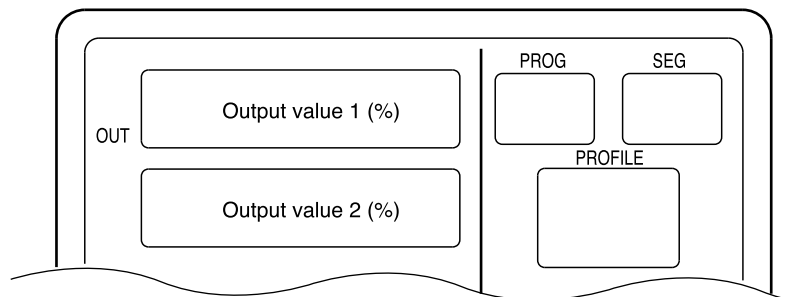
● **Display F1**



● **Display F2**

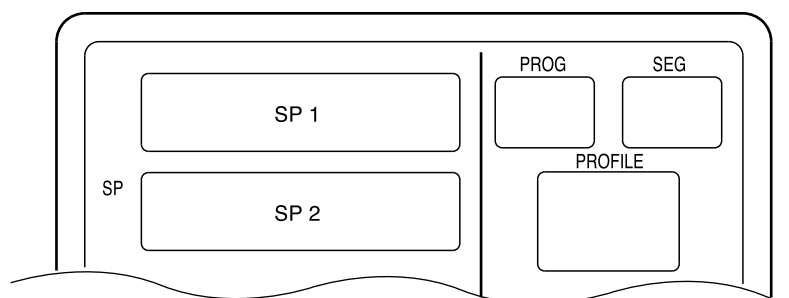


● **Display F3**



When used in MANUAL mode, the number of digits available for output values flashes.

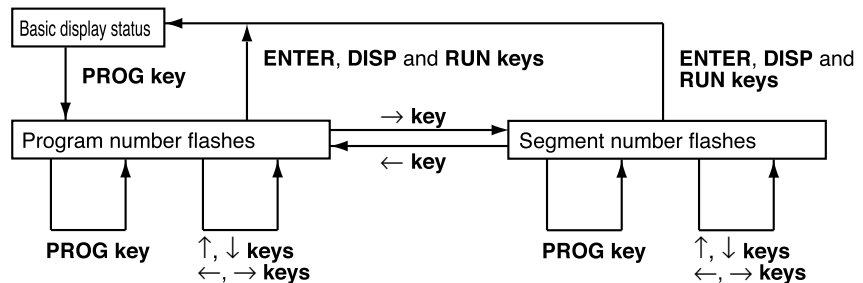
● **Display F4**



6 - 3 Selecting Programs

A total of 49 programs can be selected with the operation keys.

■ Selecting program numbers



- Press the **PROG key** in the READY program run mode and basic display status. The program number starts to flash.
- Press the **PROG key** when the program or segment number starts flashing to cycle through set program numbers when several programs have been set. The segment number is set to 1.
- Use the **↑** or **↓ key** when the program number is flashing to select a program number regardless of whether a program has been set or not. The segment number is set to 1.
- Use the **↑** or **↓ key** when the segment number is flashing to select a segment number. When no program has been set, only 1 can be selected. When a program has been set, any of the set segments can be selected.
- The message panel displays the program tag when a program or segment number flashes. The 8-character tag display is off when no program has been set.
- Press the **RUN key** to start RUN mode operation from the displayed segment number when the program or segment number is flashing.

! Handling Precautions

- Programs cannot be selected during external switch input.
- Selections cannot be made in fixed command control mode, RUN, HOLD, END and READY FAST modes.
- When variable parameter *PA04* is set to 0, separate program numbers can be selected for CH1 and CH2 using the keys. When variable parameter *PA04* is set to 1, only the same program number can be set for CH1 and CH2 using the keys.
- When variable parameter *PA04* is set to 1, the RUN mode can be invoked with the **RUN key** only when a program with the selected number is set both in CH1 and CH2.

6 - 4 External Switch Operation

■ External switch input

A total of 16 external switch inputs are available. Each input is called SW1, SW2, etc. up to SW16. (SW: external switch input)

● Types of external switch inputs

SW1 to 4 and SW9 to 16 are tied.

SW5 to 8 functions are selected using setup data settings *C71* to *C74*.

SW9 to 14 are for program selections. Selections are made by entering BCD code or binary codes in the setup data *C75*. When two weights are given for an item, the right weight is for binary figures and the left is for BCD.

External switch number	Function	Detection way
SW1	RUN	Leading edge
SW2	HOLD	Leading edge
SW3	RESET	Leading edge
SW4	ADV	Leading edge
SW5	Selects one of the following functions using setup settings.	
SW6	RAMP-E	Leading edge
SW7	FAST	Leading edge
SW8	Clears G.SOAK using the OR condition.	Status
	Clears G.SOAK using the AND condition.	Status
	MANUAL/AUTO	Leading/trailing edge
	AT start/stop	Leading/trailing edge
	AUTO Loading	Leading edge
	O ₂ sensor check	Leading edge
SW9	Selects program number, weight 1	Status
SW10	Selects program number, weight 2	Status
SW11	Selects program number, weight 4	Status
SW12	Selects program number, weight 8	Status
SW13	Selects program number, weight 10 or 16	Status
SW14	Selects program number, weight 20 or 32	Status
SW15	CH1 operation canceled	Status
SW16	CH2 operation canceled	Status

NOTE

- When G.SOAK is cleared using an OR condition and an external switch is on, or PV enters the G.SOAK width, a G.SOAK wait is cleared.
- When G.SOAK is cleared using an AND condition and an external switch is on and PV enters the G.SOAK width, a G.SOAK wait is cleared.

- The on and off states of SW15 and SW16 determine whether external SW1 to SW14 operations are enabled or disabled. Note, however, that the autoloading function and the O₂ sensor check function cannot be disabled by SW15 and SW16.

SW15	SW16	External switch operation
OFF	OFF	Enabled in both CH1 and CH2
ON	OFF	Enabled in CH2, but disabled in CH1
OFF	ON	Enabled in CH1, but disabled in CH2
ON	ON	Disabled in both CH1 and CH2

■ Selecting programs

- Programs can be selected using the external switches in the READY program run mode.
- Programs are selected using the external switches and the BCD system or the binary system, and are set in setup data C75. In the BCD system, four switches SW9 to 12 are used to set the one digit and the two switches SW13 to 14 are used to set the ten digit. In the binary system, six switches SW9 to 14 are used to set. Settings made with these systems are shown in the tables below.

● BCD system

BCD system (the one digit)		Status									
External switch number	Weight										
SW9	1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
SW10	2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF
SW11	4	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF
SW12	8	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
Number selection		0	1	2	3	4	5	6	7	8	9

BCD system (the ten digit)		Status			
External switch number	Weight				
SW13	10	OFF	ON	OFF	ON
SW14	20	OFF	OFF	ON	ON
Number selection		0	10	20	30

● Binary system

Binary system		Status												
External switch number	Weight													
SW9	1	OFF	ON	OFF	ON	OFF	ON		ON	OFF	ON	OFF	ON	
SW10	2	OFF	OFF	ON	ON	OFF	OFF		OFF	ON	ON	OFF	OFF	
SW11	4	OFF	OFF	OFF	OFF	ON	ON		ON	ON	ON	OFF	OFF	
SW12	8	OFF	OFF	OFF	OFF	OFF	OFF		ON	ON	ON	OFF	OFF	
SW13	16	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF	ON	ON	
SW14	32	OFF	OFF	OFF	OFF	OFF	OFF		OFF	OFF	OFF	OFF	OFF	
Number selection		0	1	2	3	4	5	...	13	14	15	16	17	

Binary system		Status							
External switch number	Weight								
SW9	1		ON	OFF	ON		ON	OFF	ON
SW10	2		ON	OFF	OFF		ON	OFF	OFF
SW11	4		ON	OFF	OFF		ON	OFF	OFF
SW12	8		ON	OFF	OFF		ON	OFF	OFF
SW13	16		ON	OFF	OFF		OFF	ON	ON
SW14	32		OFF	ON	ON		ON	ON	ON
Number selection		...	31	32	33	...	47	48	49

! Handling Precautions

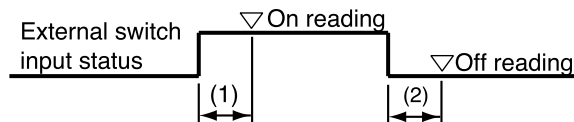
- When a program number of 0 is set using the external switch inputs, programs can be selected using the console keys and by transmission.
- Program numbers 1 to 39 can be selected in the BCD system.

■ Read timing

● SW1 to 8 and 15 to 16 timing

SW1 to 8 and 15 to 16 are read according to the timing in the figure shown below.

- (1) When the input changes from OFF to ON, reading starts within less than 0.2 seconds.
- (2) When the input changes from ON to OFF, reading starts within less than 0.2 seconds.

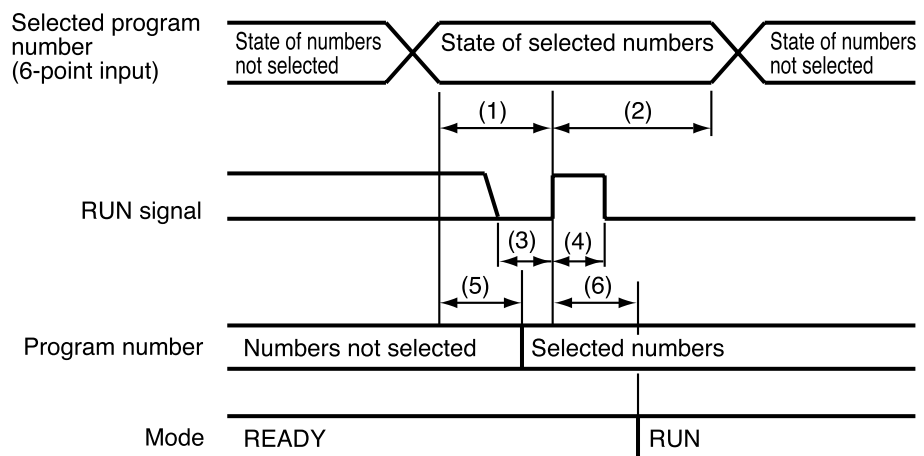


● SW9 to 14 and RUN, FAST (READY FAST) timing

Selecting SW9 to 14 program numbers takes less than 0.4 seconds after a change in input status.

Thus the following timings (1) to r must be observed during RUN operations. FAST (READY FAST) operations should follow the same timings.

- (1) Time from number selection to leading edge of the RUN signal : 0.4 seconds or more
- (2) Time from the leading edge of the RUN signal to number selection hold : 0.2 seconds or more
- (3) Time from RUN signal OFF to leading edge of RUN signal : 0.2 seconds or more
- (4) Time from leading edge of RUN signal to RUN signal ON hold : 0.2 seconds or more
- (5) Time from entry of selected number to program number change : 0.4 seconds or less
- (6) Time from leading edge of RUN signal to start of RUN signal : 0.4 seconds or less



! Handling Precautions

To ensure correct operation, the above read timings should be regarded as minimum time settings in external switch operations.

6 - 5 Manual Operation and Auto-Tuning

■ Manual operation

When outputs are indicated in the basic display status, only one digit in the output value flashes. Increasing or decreasing the output value using \uparrow and \downarrow **keys** causes the actual output to change accordingly. Unlike setting registration, there is no need to press the **ENTER key**.

Use the \leftarrow and \rightarrow **keys** to move the flashing digit.

Setup data **C35** is used to select smooth and preset output changes when going from AUTO to MANUAL modes.

Changes from MANUAL to AUTO are smooth.

(Note, however, that when the integral time setting for a PID group PID parameter of 0 may cause abrupt changes.)

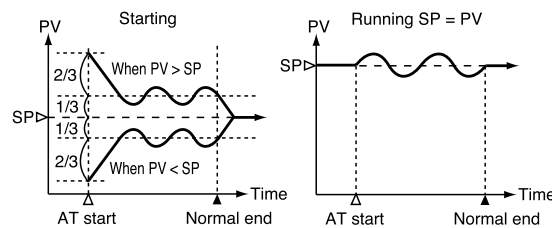
■ Auto-tuning (AT)

Set values can automatically be written when using auto-tuning (AT) in the RUN, HOLD, FAST and END modes during AUTO mode operation and PID groups (1 to 9, A1 to A7 or fixed command control) are being used.

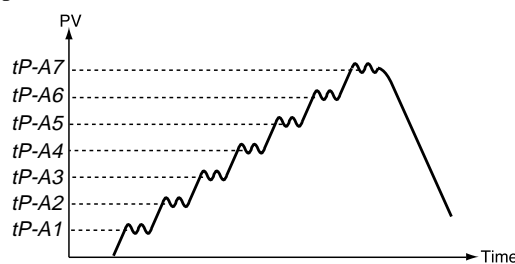
In READY AUTO mode, the tuning points of PID parameters $tP-A1$ to $tP-A7$ settings can be used as SP to perform auto-tuning of PID groups A1 to A7 values. Variable parameter **PA08** (CH1) and **PA93** (CH2) allow the following selections:

- 0 : AT is not performed.
 - 1 : A general AT operation of a PID group used in a mode other than READY mode
 - 2 : AT of PID values that do not easily overshoot can be written to a PID group used in a mode other than READY mode.
 - 3 : A standard AT operation is repeatedly performed on PID groups A1 to A7 in READY mode.
 - 4 : Repeated AT of PID values that do not easily overshoot can be written to PID groups A1 to A7 used in READY mode.
- During auto-tuning, program run time stops. Thus the RUN and FAST modes are changed to the HOLD mode.
 - Auto-tuning always calculates the excess time and limit sensitivity of thread for two limit cycles and calculates PID values using characteristics equations, then automatically writes the results.
 - The setup data **C21** setting (CH1) and **C22** setting (CH2) change the upper and lower output limit used during auto-tuning.
A setting of 1, 3 or 5 causes the lower output limit to be determined by variable parameter **PA09** and the upper output limit to be determined by **PA10**.
A setting of 2 or 4, lower output limit is off and the upper output limit is on.

- The point at which output reverses (lower limit \Leftrightarrow upper limit) during auto-tuning is determined from the SP and PV values at AT startup as follows.



- Auto-tuning performed using a variable parameter *PA08* setting of 3 or 4 and a *PA93* setting of 3 or 4 cause auto-tuning to be performed on SP, PID parameters *tP-A1* to *tP-A7*, in order.



- Auto-tuning can be started by the **AT key**, external switch input and by transmission. The **AT LED** flashes during auto-tuning.
- Auto-tuning terminates without writing PID constants and the **AT LED** goes off when any of the following conditions occur.
 - Operation is terminated by pressing of the **AT key**.
 - Operation is terminated by an external switch input.
 - Operation is terminated by transmission.
 - Mode change occurs. (When the **MANUAL** mode is invoked; the **READY** mode is invoked by setting *PA08* and *PA93* to 1 or 2, the **RUN** mode is invoked by setting *PA08* and *PA93* to 3 or 4.)
 - When PV goes outside the range.

! Handling Precautions

- Auto-tuning cannot be performed in CH2 on a model with CP compensation.
- Auto-tuning does not operate normally when the equipment to be controlled is not connected.
- The time required for auto-tuning depends on the equipment controlled.
- When auto-tuning is executed, control is terminated, lower and higher limit outputs are repeated several times and PV fluctuates. When equipment failure may be caused by PID fluctuations, set the PID value manually.
If just PID value can not be got in case of control object, sets PID value with manual.
- Variable parameter *PA08* and *PA93* settings make values set at the start of auto-tuning valid. A change in the *PA08* and *PA93* settings made during auto-tuning execution is ignored. The new value is valid in the next auto-tuning operation.

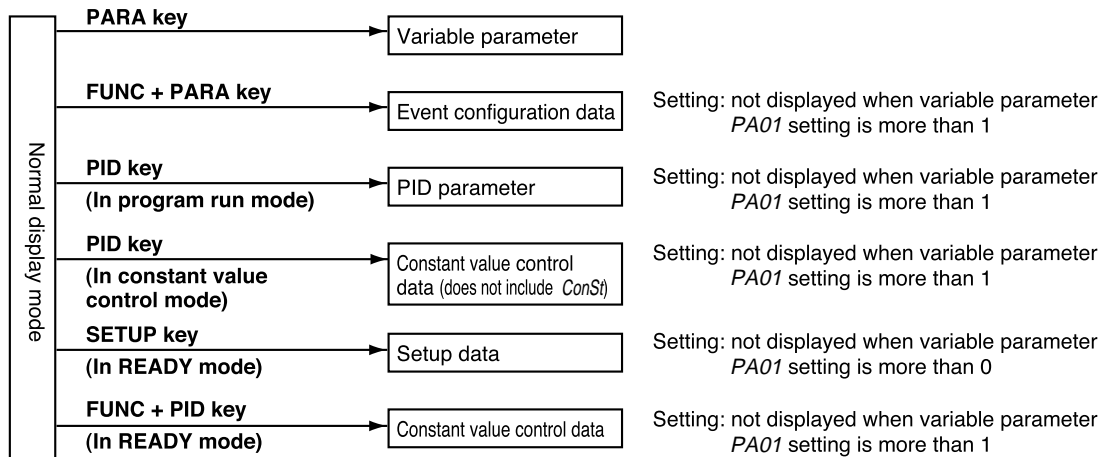
Chapter 7. PARAMETER SETUP

7 - 1 Parameter Setup

Parameter settings can be changed when the **DCP552** is in the normal display mode.
When not in the normal display mode, press the **DISP key** to invoke it.

■ Selecting parameter settings groups

In the normal display mode, the keys listed in the table below can be used to select settings groups and individual items in these groups.



Individual items in each settings group are listed below.

Variable parameter : PA01
 Event configuration data : E01-t
 PID parameters : P-1 in READY mode
 Use P setting in the used PID group in modes other than READY mode.
 Setup data : C01
 Constant value control data : ConSt when using **FUNC + PID key**
 SP when using the **PID key** in constant value control mode

■ Progression of individual items in parameter settings

The item codes for individual (specific) items are shown on display panel 1, their set values are shown on display panel 2 and their mnemonic codes are shown on the message panel.

Individual items are displayed in the vertical-horizontal matrix shown on page 7-3, with matrix sizes varying according to settings group. The **↑ key**, **↓ key**, **← key** and **→ key** are used to cycle through individual items.

The **PARA key** (valid for variable parameters and event configuration data), **PID key** (valid for PID parameters and constant value control data) or the **SETUP key** (valid for setup data) allow you to search for displayable items in ascending order of item number.

■ Modifying individual items and exiting the setting mode

Pressing the **ENTER key** while an individual item is displayed causes the set value to flash and enables the registration state. At this point, the **↑ key** and **↓ key** allow you to increase or decrease the values, while the **← key** and **→ key** move the digit positions on the display at which the values flash.

Pressing the **ENTER key** after the flashing number has been changed to the desired value stops the flashing, the number reverts to the on state and the new setting is stored in internal memory.

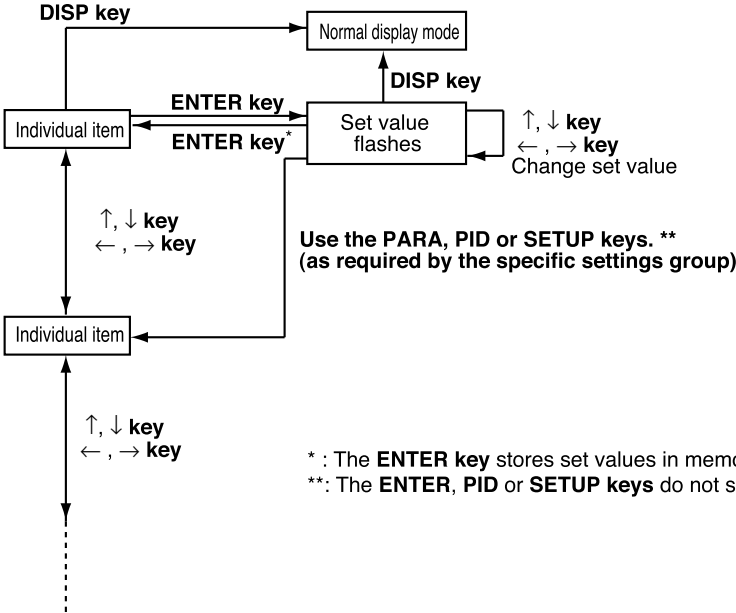
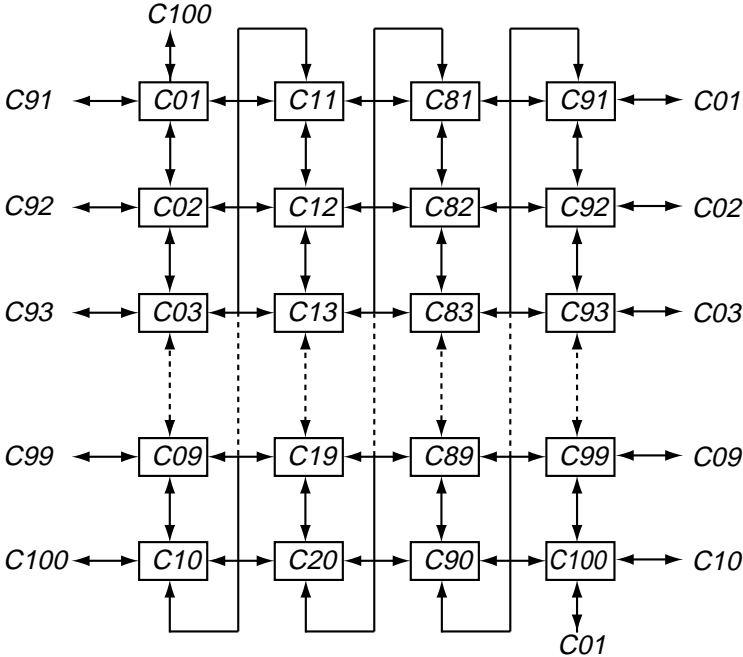
Modification of settings is terminated by pressing either the **PARA key** (valid for variable parameters and event configuration data), **PID key** (valid for PID parameters and constant value control data), **SETUP key** (valid for setup data) or **DISP key**. Pressing the **PARA key**, **PID key** or **SETUP key** moves the cursor to the next item stops the flashing and the number reverts to its normal on state. Pressing the **DISP key** enables the normal display mode.

Should display panel 2 show “-----” during display of an individual item or pressing the **ENTER key** not enable the registration state, it means that settings cannot be made or modified for that item.

! Handling Precautions

- When *PA01* is set to more than 1 in a variable parameter setting, *PA03* and items beyond are not displayed. *PA03* and items beyond cannot be changed when *PA02* is set to more than 1.
- Event configuration data settings cannot be changed when *PA02* is set to a value more than 1. Also, when *PA02* is set to 0 or 1, the event type setting and some auxiliary settings (output points of code events) cannot be changed.
- PID parameter settings cannot be changed when *PA02* is set to 4 or 5.
- Setup data settings cannot be changed when *PA02* is set to a value more than 1 and cannot be displayed in modes other than the READY mode.
- The fixed control data setting cannot be changed when *PA02* is set to 4 or 5. And, since the **FUNC** and **PID keys** are invalid in modes other than the READY mode, a *ConSt* setting cannot be displayed or changed.

• Example of individual item matrix (setup data)



7 - 2 Parameter Setting List

 **NOTE**

“PVU (PV1)”, “PVU (PV2)”, “SPU (CH1)” and “SPU (CH2)” used in the “Factory Default Settings” and “User Settings” columns in the lists on the following pages have the following meaning.

PVU (PV1): When the PV1 range type (setup data setting **C01**) is a thermocouple or resistance temperature detector, the PV1 decimal point position (setup data setting **C03**) causes the decimal point position to change.

When the PV range type is linear, the PV1 linear decimal point position (setup data setting **C04**) causes the decimal point position to change.

For example, in a decimal point position of 1,
–19999 PVU (PV1) becomes –19999.9 and +20000 PVU (PV1) becomes +2000.0.

PVU (PV2): Like PVU (PV1), a PV2 range type (setup data setting **C11**), a PV2 decimal point position (setup data setting **C13**) and a PV2 linear decimal point position (setup data setting **C14**) causes the decimal point position to change.

SPU(CH1) : The SPU decimal point position (setup data setting **C65**) causes the decimal point position to change.

For example a decimal point position of 2,
–19999 SPU becomes –199.99 and +20000 SPU becomes +200.00.

SPU(CH2) : The SPU decimal point position (setup data setting **C68**) causes the decimal point position to change.

Variable parameter setting

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	PA 01	Keylock	0		0: Keylock disabled 1: Display of setup data settings disabled 2: Display of all settings disabled 3: Display of all settings disabled. Operation keys disabled [Description:] PA01 can be displayed and changed regardless of PA01 and PA02 settings.
2	PA 02	Memory protect	0		0: Disabled 1: Program settings are protected 2: Setup, variable parameters and event configurations are protected. 3: Setup, variable parameters and event configurations are protected. 4: Setup, variable parameters and event configurations are protected. 5: Program settings and all parameter settings are protected. [Description:] PA02 can be displayed and changed regardless of PA01 and PA02 settings.
3	PA 03	Display channel setting	0		0: 2 items are displayed for the selected CH 1: Simultaneous 2CH display of the same item
4	PA 04	Synchronous 2 channel operation	0		0: asynchronous 1: synchronous
5	PA 05	Program auto load	0		1: ON 2: OFF
6	PA 06	Unused	—		[Description:]
7	PA 07	Unused	—		“-----”is displayed and setting cannot be performed.
8	PA 08	Auto-tuning (CH1)	0		0: AT not performed 1: Standard AT performed on currently used PID group in mode other than READY mode. 2: AT writing overshoot-proof PID values to currently used PID groups in mode other than READY mode performed. 3: Standard AT performed on PID groups A1 to A7 in READY mode. 4: AT writing overshoot-proof PID values to PID groups A1 to A7 in READY mode continuously performed.
9	PA 09	Auto-tuning MV lower limit (CH1)	0.0		—5.0 to upper limit % [Description:] Valid when setup data C21 setting is set to 1, 3, 5.
10	PA 10	Auto-tuning MV upper limit (CH1)	100.0		Lower limit to +105% [Description:] Valid when setup data C21 setting is set to 1, 3, 5.
11	PA 11	SP bias (CH1)	0 SPU		—10000 to +10000 SPU (CH1)
12	PA 12	PV digital filter (CH1)	0.0		0.0 to 120.0sec
13	PA 13	PV bias (CH1)	0 PVU		—1000 to +1000 PVU (PV1)
14	PA 14	Manipulated variable deviation limit (CH1)	110.0		0.1 to 110.0% OUT/0.1sec
15	PA 15	Time proportional output cycle (CH1)	10		1 to 240sec
16	PA 16	On-off control differential (CH1)	50 SPU		0 to +1000 SPU (CH1)
17	PA 17	PID computation initialize manipulated variable (CH1)	0.0		—5.0 to +105.0%
18	PA 18	Unused	-----		[Description:]
19	PA 19	Unused	-----		“-----”is displayed and setting cannot be performed.
20	PA 20	Unused	-----		
21	PA 21	SP bias (CH2)	0 SPU		—10000 to +10000 SPU (CH2)
22	PA 22	PV digital filter (CH2)	0.0		0.0 to 120.0sec
23	PA 23	PV bias (CH2)	0 PVU		—1000 to +1000 PVU (PV2)

Chapter 7. PARAMETER SETUP

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
24	PA 24	Manipulated variable deviation limit (CH2)	110.0		0.1 to 110.0% OUT/0.1 sec
25	PA 25	Time proportional output cycle (CH2)	10		1 to 240 sec
26	PA 26	ON-OFF control Differential (CH2)	50		0 to 1000 SPU (CH2)
27	PA 27	PID computation initialize manipulated variable (CH2)	0.0		-5.0 to 105.0%
28	PA 28	Unused	-----		[Description:] "-----" is displayed and setting cannot be performed.
29	PA 29	Unused	-----		
30	PA 30	Unused	-----		
31	PA 31	Event on delay Group 1 event number	0		0 to 16 [Description:] A setting of 0 generates no delay.
32	PA 32	Event on delay Group 1 delay time	0.0		0.0 to 3000.0sec [Description:] When PA31 is set to 0, "-----" is displayed and setting cannot be performed.
33	PA 33	Event on delay Group 2 event number	0		0 to 16 [Description:] A setting of 0 generates no delay.
34	PA 34	Event on delay Group 2 delay time	0.0		0.0 to 3000.0sec [Description:] When PA33 is set to 0, "-----" is displayed and setting cannot be performed.
35	PA 35	Event on delay Group 3 event number	0		0 to 16 [Description:] A setting of 0 generates no delay.
36	PA 36	Event on delay Group 3 delay time	0.0		0.0 to 3000.0sec [Description:] When PA35 is set to 0, "-----" is displayed and setting cannot be performed.
37	PA 37	Event on delay Group 4 event number	0		0 to 16 [Description:] A setting of 0 generates no delay.
38	PA 38	Event on delay Group 4 delay time	0.0		0.0 to 3000.0sec [Description:] When PA37 is set to 0, "-----" is displayed and setting cannot be performed.
39	PA 39	FAST X	0		0 : 2X 1 : 10X 2 : 60X 3 : 120X [Description:] When setup data C62 is set to 1 (program time unit: minutes, seconds), settings 3 and 4 produce a speed of 10 X. When C62 is set to 2 (program time unit: 0.1sec), the FAST mode is not available.
40	PA 40	CP computation temperature compensation	0		-1000 to +1000 PVU (CH1) [Description:] "-----" is displayed for models without CP compensation and setting can not be performed.
41	PA 41	Unused	0		[Description:] "-----" is displayed and setting cannot be performed.
42	PA 42	Unused	0		
43	PA 43	PID computation initialize (CH1)	0		0: No initialization during advance processing and PID group change. 1: Initializes during advance processing but not during PID group change. 2: No initialization during advance processing but initializes during PID group change 3: Initializes both during advance processing and PID group change
44	PA 44	PV2 message display mode	0		0: CP or PO ₂ value display 1: mV value display 2: O ₂ sensor impedance value display
45	PA 45	G.SOAK time (CH1)	2.0		0.1 to 60.0sec
46	PA 46	G.SOAK time (CH2)	2.0		0.1 to 60.0sec

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
47	PA 47	Unused	----		[Description:] “-----” is displayed and setting can not be performed.
48	PA 48	Unused	----		
49	PA 49	Unused	----		
50	PA 50	Unused	----		
51	PA 51	PV1 equalizer compensation point No. 1	Range lower limit value		Compensation point No. 1 : PV1 range lower limit value (tied) Compensation points No. 2 to 9 : -19999 to +20000 PVU (PV1) Compensation point No. 10 : PV1 range upper limit value (tied) Compensation amount No. 1 to 10: -1000 to +1000 PVU (PV1) [Description:] When setup data C30 is set to 0, 2, “-----” is displayed and setting cannot be performed. Compensation point No. 1 and No. 10 are automatically changed during a PV1 range change.
52	PA 52	PV1 equalizer compensation amount No. 1	0 PVU		
53	PA 53	PV1 equalizer compensation point No. 2	500 PVU		
54	PA 54	PV1 equalizer compensation amount No. 2	0 PVU		
55	PA 55	PV1 equalizer compensation point No. 3	1000 PVU		
56	PA 56	PV1 equalizer compensation amount No. 3	0 PVU		
57	PA 57	PV1 equalizer compensation point No. 4	1500 PVU		
58	PA 58	PV1 equalizer compensation amount No. 4	0 PVU		
59	PA 59	PV1 equalizer compensation point No. 5	2000 PVU		
60	PA 60	PV1 equalizer compensation amount No. 5	0 PVU		
61	PA 61	PV1 equalizer compensation point No. 6	2500 PVU		
62	PA 62	PV1 equalizer compensation amount No. 6	0 PVU		
63	PA 63	PV1 equalizer compensation point No. 7	3000 PVU		
64	PA 64	PV1 equalizer compensation amount No. 7	0 PVU		
65	PA 65	PV1 equalizer compensation point No. 8	3500 PVU		
66	PA 66	PV1 equalizer compensation amount No. 8	0 PVU		
67	PA 67	PV1 equalizer compensation point No. 9	4000 PVU		
68	PA 68	PV1 equalizer compensation amount No. 9	0 PVU		
69	PA 69	PV1 equalizer compensation point No. 10	Range upper limit value		
70	PA 70	PV1 equalizer compensation amount No. 10	0 PVU		
71	PA 71	PV2 equalizer compensation point No. 1	Range lower limit value		Compensation point No. 1 : PV2 range lower limit value (tied) Compensation points No. 2 to 9 : -19999 to +20000 PVU (PV2) Compensation point No. 10 : PV2 range upper limit value (tied) Compensation amount No. 1 to 10 : -1000 to +1000 PVU (PV2) [Description:] When setup data C30 is set to 0, 1, “-----” is displayed and setting cannot be performed. Compensation point No. 1 and No. 10 are automatically changed during a PV2 range change.
72	PA 72	PV2 equalizer compensation amount No. 1	0 PVU		
73	PA 73	PV2 equalizer compensation point No. 2	500 PVU		
74	PA 74	PV2 equalizer compensation amount No. 2	0 PVU		
75	PA 75	PV2 equalizer compensation point No. 3	1000 PVU		
76	PA 76	PV2 equalizer compensation amount No. 3	0 PVU		
77	PA 77	PV2 equalizer compensation point No. 4	1500 PVU		
78	PA 78	PV2 equalizer compensation amount No. 4	0 PVU		
79	PA 79	PV2 equalizer compensation point No. 5	2000 PVU		
80	PA 80	PV2 equalizer compensation amount No. 5	0 PVU		
81	PA 81	PV2 equalizer compensation point No. 6	2500 PVU		
82	PA 82	PV2 equalizer compensation amount No. 6	0 PVU		
83	PA 83	PV2 equalizer compensation point No. 7	3000 PVU		
84	PA 84	PV2 equalizer compensation amount No. 7	0 PVU		
85	PA 85	PV2 equalizer compensation point No. 8	3500 PVU		
86	PA 86	PV2 equalizer compensation amount No. 8	0 PVU		
87	PA 87	PV2 equalizer compensation point No. 9	4000 PVU		
88	PA 88	PV2 equalizer compensation amount No. 9	0 PVU		
89	PA 89	PV2 equalizer compensation point No. 10	4500 PVU		
90	PA 90	PV2 equalizer compensation amount No. 10	0 PVU		
91	PA 91	Unused	-----		[Description:] “-----” is displayed and setting cannot be performed.
92	PA 92	Unused	-----		

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No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
93	PA 93	Auto-tuning (CH2)	0		0: AT not performed 1: standard AT performed on currently used PID group in mode other than READY mode. 2: AT writing overshoot-proof PID values to currently used PID groups in mode other than READY mode performed. 3: Standard AT performed on PID groups A1 to A7 in READY mode. 4: AT writing overshoot-proof PID values to PID groups A1 to A7 in READY mode continuously performed. [Description:] "....." is displayed for models with CP compensation and setting cannot be performed.
94	PA 94	Auto-tuning MV lower limit (CH2)	0.0		-5.0 to upper limit % [Description:] "....." is displayed for models with CP compensation and setting cannot be performed. Valid when setup data C22 setting is set to 1, 3 or 5.
95	PA 95	Auto-tuning MV upper limit (CH2)	100.0		Lower limit to +105% [Description:] "....." is displayed for models with CP compensation and setting cannot be performed. Valid when setup data C22 setting is set to 1, 3 or 5.
96	PA 96	PID computation initialize (CH2)	0		0: No initialization during advance processing and PID group change 1: Initializes during advance processing but not during PID group change 2: No initialization during advance processing but initializes during PID group change 3: Initializes both during advance processing and PID group change
97	PA 97	CP computation compensation	0		0: No compensation 1: compensates [Description:] "....." is displayed for models without CP compensation and setting cannot be performed.
98	PA 98	CP value (PV) display lower limit value	0.000		0 to upper limit SPU (CH2) [Description:] "....." is displayed for models without CP compensation and setting cannot be performed.
99	PA 99	CP value (PV) display upper limit value	4.000		lower limit to 4000 SPU (CH2) [Description:] "....." is displayed for models without CP compensation and setting cannot be performed.
100	PA 100	Gas constant	23.5		10.0 to 50.0 % [Description:] "....." is displayed for models without CP compensation and setting cannot be performed.
101	PA 101	CP computation compensation No. 1 compensation point	0.000		No. 1 compensation point : 0 SPU (CH2) (tied) No. 2 to 9 compensation point : 0 to +2000 SPU (CH2) NO. 10 compensation point : 2000 SPU (CH2) (tied) NO. 1 to 10 compensation amount : -1000 to +1000 SPU (CH2) [Description:] "....." is displayed for models without CP compensation and setting cannot be performed. "....." is displayed when PA97 is set to 0 and setting cannot be performed.
102	PA 102	CP computation compensation No. 1 compensation amount	0.000		
103	PA 103	CP computation compensation No. 2 compensation point	0.200		
104	PA 104	CP computation compensation No. 2 compensation amount	0.000		
105	PA 105	CP computation compensation No. 3 compensation point	0.400		
106	PA 106	CP computation compensation No. 3 compensation amount	0.000		
107	PA 107	CP computation compensation No. 4 compensation point	0.600		
108	PA 108	CP computation compensation No. 4 compensation amount	0.000		
109	PA 109	CP computation compensation No. 5 compensation point	0.800		
110	PA 110	CP computation compensation No. 5 compensation amount	0.000		
111	PA 111	CP computation compensation No. 6 compensation point	1.000		
112	PA 112	CP computation compensation No. 6 compensation amount	0.000		
113	PA 113	CP computation compensation No. 7 compensation point	1.200		
114	PA 114	CP computation compensation No. 7 compensation amount	0.000		
115	PA 115	CP computation compensation No. 8 compensation point	1.400		
116	PA 116	CP computation compensation No. 8 compensation amount	0.000		
117	PA 117	CP computation compensation No. 9 compensation point	1.600		
118	PA 118	CP computation compensation No. 9 compensation amount	0.000		
119	PA 119	CP computation compensation No. 10 compensation point	2.000		
120	PA 120	CP computation compensation No. 10 compensation amount	0.000		

■ Detailed information on variable parameters

● PA01 (keylock)

0: keylock disabled

1: display of setup data setting disabled

2: display of all settings disabled

3: display of all settings disabled. Operation keys disabled

- The following keys are disabled when *PA01* is set to 1.

Normal display mode:

SETUP key (setup data setting)

FUNC + CLR + MESSAGE keys (general reset)

- The following keys are disabled when *PA01* is set to 2.

Normal display mode:

SETUP key (setup data setting)

FUNC + CLR + MESSAGE keys (general reset)

FUNC + PARA keys (event configuration data setting)

PID key (PID parameter setting/constant value control data setting)

FUNC + PID keys (constant value control data setting)

FUNC + PROG keys (program setting)

↑ + PROG keys (program copy)

LOAD key (memory card load)

SAVE key (memory card save)

- The following keys are disabled when *PA01* is set to 3 or to 2.

Normal display mode:

FUNC + DISP key (display channel switching)

PROG key (program selection)

RUN/HOLD key (RUN operation/HOLD operation)

PROG + RUN/HOLD keys (RESET operation)

PROG + DISP keys (ADV operation)

FUNC + → keys (FAST operation)

A/M key (AUTO operation/MANUAL operation)

AT key (AT start, AT cancel)

Note, however, that in the normal display mode in MANUAL mode MV can be changed.

● PA02 (memory protect)

0 : disabled

1 : program settings are protected

2 : setup, variable parameters and event configuration settings are protected

3 : setup, variable parameters, event configuration settings and program settings are protected

4 : setup, variable parameters, event configuration settings and PID parameter settings are protected

5 : program settings and all parameter settings are protected

- When *PA02* is set to $\neq 0$ (protect on), a general reset cannot be performed.

- When program settings are protected, it is not possible to copy programs or load programs from a memory card.
- When PID parameters are protected, constant value control data is also protected.
- When settings are protected by setup data, variable parameters, event configurations and PID parameters, they cannot be loaded from a memory card.

● **PA05 (program autoload)**

- 0 : OFF
- 1 : ON

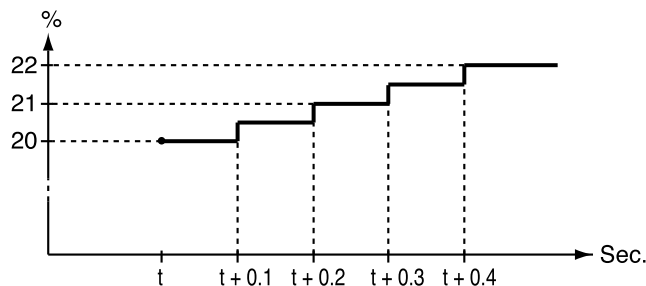
- When *PA05* is set to 1 and a memory card is inserted and press **LOAD key**, display panel 1 shows “*AUtO*”, display panel 2 shows “*LOAd*” and program file No. 1 is read to program No. 1 in the **DCP552**. This operation is called “program autoload”.
- A load operation other than a program autoload that is started using the **LOAD key** can only be performed when *PA05* is set to 0.
- A program autoload using the external switches can be performed when *PA05* is set to 0 or 1.

● **PA14 (manipulated variable deviation rate limit)**

● **PA24 (manipulated variable deviation rate limit)**

When output deviation (%) after a PID computation is larger than the set limit value, the controller limits the output deviation both of the increase or decrease to the set value.

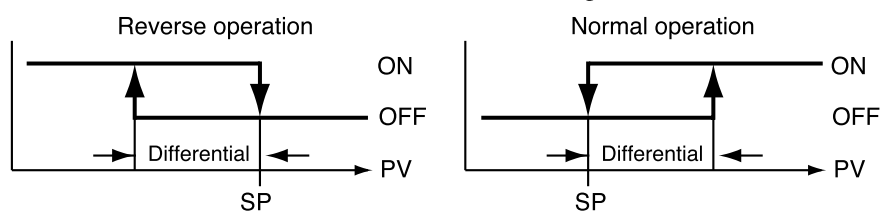
The following example shows the actual deviation change when the deviation limit is set to 0.5% and the manipulated variable changes from 20% to 22%. When the set value is 0.5% per 0.1 sec, the output becomes 22% after 0.4 sec.



● **PA16 (ON-OFF control differential)**

● **PA26 (ON-OFF control differential)**

When the PID group number is set to ON-OFF or *P* is set to 0.0, ON-OFF control is on and a value for the differential between the two operations is set.



- **PA17 (PID computation initialize manipulated variable)**
- **PA27 (PID computation initialize manipulated variable)**

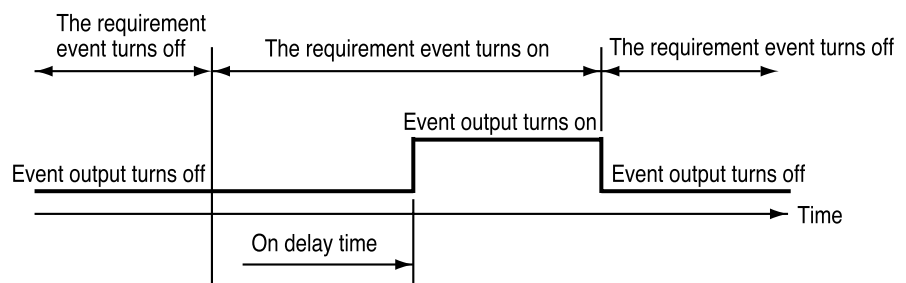
Under the conditions listed below, a PID computation starts using the value set in *PA17*.

- When there is a mode change from READY AUTO to RUN AUTO.
- When the controller is powered up in RUN (or HOLD, FAST, END) AUTO mode.
- When auto-tuning ends.

Since the PV, SP and PID parameters affect a PID computation, the first manipulated variable of a PID computation may not be the same as the value set in *PA17* and *PA27*.

- **PA31 to PA38 (event on delay groups 1 to 4, event/delay time)**

- On delay can be performed on up to 4 events.
- *PA31*, *PA33*, *PA35* and *PA37* determine which events are to be processed.
- In a code event involving several event outputs, event on delay has to be set separately for each output.
- All processes including event output standby on/off are processed before on delay processing. When the event output ON condition remains on for longer than the on delay time, the event output stays on.
- This is shown in the diagram below.



- **PA43 (PID computation initialize)**
- **PA96 (PID computation initialize)**

When SP changes abruptly due to ADV, the derivative action of a PID computation, may cause an excessive change in the manipulated variable of the computation.

For this reason, the initialization of a PID computation is performed to suppress an excessive change.

But the initialization of a PID computation means that PID computation continuity is lost which may affect operating conditions. *PA43* and *PA96* settings allow the user to turn on or off initialization and determine its conditions.

■ Event configuration data settings

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	<i>E01-t</i>	Event 1 event type	0		The event type setting of each event determines whether auxiliary setting 1 or auxiliary setting 2 is on or off, their meaning, unit and range. For details, see “■ Settings by event type” on the following pages.
2	<i>E01-1</i>	Event 1 auxiliary setting 1	----		
3	<i>E01-2</i>	Event 1 auxiliary setting 2	----		
4	<i>E02-t</i>	Event 2 event type	0		
5	<i>E02-1</i>	Event 2 auxiliary setting 1	----		
6	<i>E02-2</i>	Event 2 auxiliary setting 2	----		
7	<i>E03-t</i>	Event 3 event type	0		
8	<i>E03-1</i>	Event 3 auxiliary setting 1	----		
9	<i>E03-2</i>	Event 3 auxiliary setting 2	----		
10	<i>E04-t</i>	Event 4 event type	0		
11	<i>E04-1</i>	Event 4 auxiliary setting 1	----		
12	<i>E04-2</i>	Event 4 auxiliary setting 2	----		
13	<i>E05-t</i>	Event 5 event type	0		
14	<i>E05-1</i>	Event 5 auxiliary setting 1	----		
15	<i>E05-2</i>	Event 5 auxiliary setting 2	----		
16	<i>E06-t</i>	Event 6 event type	0		
17	<i>E06-2</i>	Event 6 auxiliary setting 1	----		
18	<i>E06-3</i>	Event 6 auxiliary setting 2	----		
19	<i>E07-t</i>	Event 7 event type	0		
20	<i>E07-1</i>	Event 7 auxiliary setting 1	----		
21	<i>E07-2</i>	Event 7 auxiliary setting 2	----		
22	<i>E08-t</i>	Event 8 event type	0		
23	<i>E08-1</i>	Event 8 auxiliary setting 1	----		
24	<i>E08-2</i>	Event 8 auxiliary setting 2	----		
25	<i>E09-t</i>	Event 9 event type	0		
26	<i>E09-1</i>	Event 9 auxiliary setting 1	----		
27	<i>E09-2</i>	Event 9 auxiliary setting 2	----		
28	<i>E10-t</i>	Event 10 event type	0		
29	<i>E10-1</i>	Event 10 auxiliary setting 1	----		
30	<i>E10-2</i>	Event 10 auxiliary setting 2	----		
31	<i>E11-t</i>	Event 11 event type	0		
32	<i>E11-1</i>	Event 11 auxiliary setting 1	----		
33	<i>E11-2</i>	Event 11 auxiliary setting 2	----		
34	<i>E12-t</i>	Event 12 event type	0		
35	<i>E12-1</i>	Event 12 auxiliary setting 1	----		
36	<i>E12-2</i>	Event 12 auxiliary setting 2	----		
37	<i>E13-t</i>	Event 13 event type	0		
38	<i>E13-1</i>	Event 13 auxiliary setting 1	----		
39	<i>E13-2</i>	Event 13 auxiliary setting 2	----		
40	<i>E14-t</i>	Event 14 event type	0		
41	<i>E14-1</i>	Event 14 auxiliary setting 1	----		
42	<i>E14-2</i>	Event 14 auxiliary setting 2	----		
43	<i>E15-t</i>	Event 15 event type	0		
44	<i>E15-1</i>	Event 15 auxiliary setting 1	----		
45	<i>E15-2</i>	Event 15 auxiliary setting 2	----		
46	<i>E16-t</i>	Event 16 event type	0		
47	<i>E16-1</i>	Event 16 auxiliary setting 1	----		
48	<i>E16-2</i>	Event 16 auxiliary setting 2	----		

■ Settings by event type

For information on event operations, see “■ Events” (pages 5-5 to 5-14).

Event type	0	1	2	3
Meaning Message	Event off OFF	Time event TIME	PV upper limit PV-H	PV lower limit PV-L
Range of auxiliary setting 1 Message	Unused	Unused	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	– –	Segment type Time type	Segment type PV type	Segment type PV type

Event type	4	5	6	7
Meaning Message	Upper deviation limit DEV-H	Lower deviation limit DEV-L	Deviation rate upper limit wait DEV-H-W	Deviation lower limit with standby DEV-L-W
Range of auxiliary setting 1 Message	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Segment type PV type	Segment type PV type	Segment type PV type	Segment type PV type

Event type	8	9	10	11
Meaning Message	Absolute value deviation upper limit A-DEV-H	Absolute value deviation lower limit A-DEV-L	Absolute value deviation rate upper limit with standby A-DEV-H-W	Absolute value deviation lower limit with standby A-DEV-L-W
Range of auxiliary setting 1 Message	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Segment type PV type	Segment type PV type	Segment type PV type	Segment type PV type

Event type	12	13	14	15
Meaning Message	PV deviation rate upper limit D-PV-H	PV deviation rate lower limit D-PV-L	SP upper limit SP-H	SP lower limit SP-L
Range of auxiliary setting 1 Message	Sampling cycle 0.1 to 600.0sec sampling rate	Sampling cycle 0.1 to 600.0sec sampling rate	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Segment type PV type	Segment type PV type	Segment type PV type	Segment type PV type

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Event type	16	17	18	19
Meaning Message	MV upper limit MV-H	MV lower limit MV-L	Code event CODE	SOAK absolute value deviation upper limit S-A-DEV-H
Range of auxiliary setting 1 Message	Hysteresis 0.0 to 100.0% hysteresis	Hysteresis 0.0 to 100.0% hysteresis	Number of output points 1 to 8 ^{*1} channels	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Segment type PV type	Segment type PV type	Segment type Code type	Segment type PV type

*1: Code event auxiliary setting 1 (number of output points) can be changed only in the READY mode.

Event type	20	21	22	23
Meaning Message	SOAK absolute value deviation lower limit S-A-DEV-L	SOAK absolute value deviation upper limit with stanby S-A-DEV-H-W	SOAK absolute value deviation lower limit with stanby S-A-DEV-L-W	Timer code event T-CODE
Range of auxiliary setting 1 Message	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Number of output points 1 to 8 ^{*2} channels
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Segment type PV type	Segment type PV type	Segment type PV type	Segment type Time type, code type

*2: Auxiliary setting 1 (number of output points) can be changed only in the READY mode.

Event type	24 to 63	64	65	66
Meaning Message	Event off OFF	Normal PV1 upper limit operation PV1-H	Normal PV1 lower limit operation PV1-L	Normal PV2 upper limit operation PV2-H
Range of auxiliary setting 1 Message	Unused	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Unused	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point
Setting category Operation category	- -	Instrument type PV type	Instrument type PV type	Instrument type PV type

Event type	67	68	69	70
Meaning Message	Normal PV2 upper limit operation PV2-L	PV upper limit PV-H	PV lower limit PV-L	Deviation upper limit DEV-H
Range of auxiliary setting 1 Message	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point
Setting category Operation category	Instrument type PV type	Instrument type PV type	Instrument type PV type	Instrument type PV type

Event type	71	72	73	74
Meaning Message	Deviation lower limit DEV-L	Deviation upper limit wait DEV-H-W	Deviation lower limit wait DEV-L-W	Absolute value deviation upper limit A-DEV-H
Range of auxiliary setting 1 Message	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point	Operating point 0 to 20000 SPU set point
Setting category Operation category	Instrument type PV type	Instrument type PV type	Instrument type PV type	Instrument type PV type

Event type	75	76	77	78
Meaning Message	Absolute value deviation lower limit A-DEV-L	Absolute value deviation upper limit with stanby A-DEV-H-W	Absolute value deviation lower limit with stanby A-DEV-L-W	PV deviation rate upper limit D-PV-H
Range of auxiliary setting 1 Message	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Sampling cycle 0.1 to 600.0 sec sampling rate
Range of auxiliary setting 2 Message	Operating point 0 to 20000 SPU set point	Operating point 0 to 20000 SPU set point	Operating point 0 to 20000 SPU set point	Operating point -19999 to +20000 SPU set point
Setting category Operation category	Instrument type PV type	Instrument type PV type	Instrument type PV type	Instrument type PV type

Event type	79	80	81	82
Meaning Message	PV deviation rate lower limit D-PV-L	SP upper limit SP-H	SP lower limit SP-L	MV upper limit MV-H
Range of auxiliary setting 1 Message	Sampling cycle 0.1 to 600.0sec sampling rate	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0.0 to 100.0% hysteresis
Range of auxiliary setting 2 Message	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point	Operating point -19999 to +20000 SPU set point	Operating point -5.0 to +105.0% set point
Setting category Operation category	Instrument type PV type	Instrument type PV type	Instrument type PV type	Instrument type PV type

Event type	83	84	85	86
Meaning Message	MV lower limit MV-L	SOAK absolute value deviation upper limit S-A-DEV-H	SOAK absolute value deviation lower limit S-A-DEV-L	SOAK absolute value deviation upper limit with stanby S-A-DEV-H-W
Range of auxiliary setting 1 Message	Hysteresis 0.0 to 100.0% hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis	Hysteresis 0 to 1000 SPU hysteresis
Range of auxiliary setting 2 Message	Operating point -5.0 to +105.0% set point	Operating point 0 to 20000 SPU set point	Operating point 0 to 20000 SPU set point	Operating point 0 to 20000 SPU set point
Setting category Operation category	Instrument type PV type	Instrument type PV type	Instrument type PV type	Instrument type PV type

Event type	87	88	89	90
Meaning Message	SOAK absolute value deviation lower limit with stanby S-A-DEV-L-W	Program number binary code PROG-BIN	Segment number binary code SEG-BIN	Program number BCD code PROG-BCD
Range of auxiliary setting 1 Message	Hysteresis 0 to 1000 SPU hysteresis	Number of output points 1 to 7 channels	Number of output points 1 to 7 channels	Number of output points 1 to 8 channels
Range of auxiliary setting 2 Message	Operating point 0 to 20000 SPU set point	Unused	Unused	Unused
Setting category Operation category	Instrument type PV type	Instrument type Code type	Instrument type Code type	Instrument type Code type

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Event type	91	92	93	94
Meaning	Segment number BCD code	Special segment	RAMP-E time monitoring	Segment time
Message	SEG-BCD	SEG SEQUENCE	RAMP-E TIME OUT	SEG TIME
Range of auxiliary setting 1 Message	Number of output points 1 to 8 channels	Segment specification -2 to +2 * ¹ segment	Operating point 0.0 to 3000.0sec * ² time out	On Time 0:00 to 500:00 * ³ on-time
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Off Time 0:00 to 500:00 * ³ off-time
Setting category Operation category	Instrument type Code type	Instrument type Mode type	Instrument type Time type	Instrument type Time type

Event type	95	96 to 127	128	129
Meaning Message	Program time PROG TIME	Event off OFF	RUN, HOLD, END, FAST RUN, HOLD, END, FAST	HOLD HOLD
Range of auxiliary setting 1 Message	On Time 0:00 to 500:00 * ³ on-time	Unused	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels
Range of auxiliary setting 2 Message	Off Time 0:00 to 500:00 * ³ off-time	Unused	Unused	Unused
Setting category Operation category	Instrument type Time type	-	Instrument type Mode type	Instrument type Mode type

*1: The meaning of auxiliary setting 1 for special segment is shown below.

- 2: Two segments before the final segment 1: First segment
- 1: One segment before the final segment 2: Second segment
- 0: Final segment

*2: When auxiliary setting 1 of RAMP-E time monitoring is set to 0.0 sec, event output is off.

*3: Auxiliary setting 1 and auxiliary setting 2 of segment time and program time that determine display unit and range of segment are set by setup data C62 settings as follows.

When C62 is set to 0: 0 hours 00 min to 500 hours 00 min

When C62 is set to 1: 0 min 00 sec to 500 min 00 sec

When C62 is set to 2: 0.0 sec to 3000.0 sec

Event type	130	131	132	133
Meaning Message	READY, READY FAST, READY, READY FAST	END END	G.SOAK wait G.SOAK	MANUAL MANUAL
Range of auxiliary setting 1 Message	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Instrument type Mode type	Instrument type Mode type	Instrument type Mode type	Instrument type Mode type

Event type	134	135	136	137
Meaning Message	AT executing AT	FAST, READY FAST FAST, READY FAST	Console settings are being made CONSOLE	RUN RUN
Range of auxiliary setting 1 Message	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels	Unused	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Instrument type Mode type	Instrument type Mode type	Instrument type Mode type	Instrument type Mode type

Event type	138	139	140	141
Meaning Message	Advance ADV	All alarm (logical OR) ALL ALARMS	PV range alarm PV ALARMS	Instrument alarm DCP ALARMS
Range of auxiliary setting 1 Message	Conditions assessed for each channel 0: only assigned channel 1: OR condition for both channels 2: AND conditions for both channels	Unused	Unused	Unused
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Instrument type Mode type	Instrument type Mode type	Instrument type Mode type	Instrument type Mode type

Event type	142	143	144	145 to 253
Meaning Message	O ₂ sensor error SENSOR CHECK	Event off OFF	Battery voltage drop BATTERY LOW	Event off OFF
Range of auxiliary setting 1 Message	Unused	Unused	Unused	Unused
Range of auxiliary setting 2 Message	Unused	Unused	Unused	Unused
Setting category Operation category	Instrument type Mode type	– –	Instrument type Mode type	– –

■ PID parameter (CH1) setting

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	<i>P-1</i>	Proportional band (PID group 1)	100.0		<p><i>P</i> : 0.0 to 1000.0% ON-OFF control when set to 0.0</p> <p><i>I</i> : 0 to 3600sec No integral operation when set to 0</p> <p><i>d</i> : 0 to 1200sec No derivative operation when set to 0</p> <p><i>rE</i> : 0.0 to 100.0%</p> <p><i>oL</i> : -5.0 to manipulated variable upper limit %</p> <p><i>oH</i> : Manipulated variable lower limit to +105.0%</p> <p><i>CP</i> : -19999 to +20000 SPU</p> <p><i>tP</i> : -19999 to +20000 SPU</p> <p>[Description:]</p> <ul style="list-style-type: none"> When <i>P</i> is set to 0.0, ON-OFF control is on and <i>I</i>, <i>d</i> and <i>rE</i> settings display "-----" and setting cannot be performed. When the <i>I</i> setting is not equal to 0, "-----" is displayed for <i>rE</i> and setting cannot be performed. Although a low <i>P</i> setting improves control, overshoot and hunting is more likely to occur. Although a low <i>I</i> setting improves tracking, cycling caused by integral operation occurs more often. Although a low <i>d</i> setting makes it easier to suppress overshoot, hunting is more likely to occur due to reactions to minute PV action. <p>In normal temperature control, derivative time should be between 1/3 to 1/4 of the integral time.</p> <p>Since derivative operation is a cause of hunting in pressure and flow control, set <i>d</i> to 0.0 to turn off derivative action or set a low value.</p> <ul style="list-style-type: none"> The <i>rE</i> setting is used to eliminate offset caused by proportional action (no integral action) and sets a suitable deviation of 0. The <i>oL</i> and <i>oH</i> settings also operate as integral limiters. When <i>oL</i> or <i>oH</i> manipulated variable reaches the upper or lower limit, they turn off integral action and prevents reset windup that occurs when PV has not risen for a long time. The <i>CP</i> setting is the point where switching occurs between PID groups A1 to A7. <i>tP</i> is the tuning point where <i>P</i>, <i>I</i> and <i>D</i> settings in groups A1 to A7 are automatically tuned starting from A1. <p>[Note:]</p> <p>CH1 PID parameter settings are described on this page. CH1 PID parameters are set when the PID key is pressed when CH1 is selected (when the EG1 LED is on) during program operation in the normal display mode.</p>
2	<i>I-1</i>	Integral time (PID group 1)	0		
3	<i>d-1</i>	Derivative time (PID group 1)	0		
4	<i>rE-1</i>	Manual reset (PID group 1)	50.0		
5	<i>oL-1</i>	Manipulated variable lower limit (Output limiter group 1)	0.0		
6	<i>oH-1</i>	Manipulated variable upper limit (Output limiter group 1)	100.0		
7	<i>P-2</i>	Proportional band (PID group 2)	100.0		
8	<i>I-2</i>	Integral time (PID group 2)	0		
9	<i>d-2</i>	Derivative time (PID group 2)	0		
10	<i>rE-2</i>	Manual reset (PID group 2)	50.0		
11	<i>oL-2</i>	Manipulated variable lower limit (Output limiter group 2)	0.0		
12	<i>oH-2</i>	Manipulated variable upper limit (Output limiter group 2)	100.0		
13	<i>P-3</i>	Proportional band (PID group 3)	100.0		
14	<i>I-3</i>	Integral time (PID group 3)	0		
15	<i>d-3</i>	Derivative time (PID group 3)	0		
16	<i>rE-3</i>	Manual reset (PID group 3)	50.0		
17	<i>oL-3</i>	Manipulated variable lower limit (Output limiter group 3)	0.0		
18	<i>oH-3</i>	Manipulated variable upper limit (Output limiter group 3)	100.0		
19	<i>P-4</i>	Proportional band (PID group 4)	100.0		
20	<i>I-4</i>	Integral time (PID group 4)	0		
21	<i>d-4</i>	Derivative time (PID group 4)	0		
22	<i>rE-4</i>	Manual reset (PID group 4)	50.0		
23	<i>oL-4</i>	Manipulated variable lower limit (Output limiter group 4)	0.0		
24	<i>oH-4</i>	Manipulated variable upper limit (Output limiter group 4)	100.0		
25	<i>P-5</i>	Proportional band (PID group 5)	100.0		
26	<i>I-5</i>	Integral time (PID group 5)	0		
27	<i>d-5</i>	Derivative time (PID group 5)	0		
28	<i>rE-5</i>	Manual reset (PID group 5)	50.0		
29	<i>oL-5</i>	Manipulated variable lower limit (Output limiter group 5)	0.0		
30	<i>oH-5</i>	Manipulated variable upper limit (Output limiter group 5)	100.0		
31	<i>P-6</i>	Proportional band (PID group 6)	100.0		
32	<i>I-6</i>	Integral time (PID group 6)	0		
33	<i>d-6</i>	Derivative time (PID group 6)	0		

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
34	<i>rE-6</i>	Manual reset (PID group 6)	50.0		[Note:] CH1 PID parameter settings are described on this page. CH1 PID parameters are set when the PID key is pressed when CH1 is selected (when the EG1 LED is on) during program operation in the normal display mode.
35	<i>oL-6</i>	Manipulated variable lower limit (Output limiter group 6)	0.0		
36	<i>oH-6</i>	Manipulated variable upper limit (Output limiter group 6)	100.0		
37	<i>P-7</i>	Proportional band (PID group 7)	100.0		
38	<i>I-7</i>	Integral time (PID group 7)	0		
39	<i>d-7</i>	Derivative time (PID group 7)	0		
40	<i>rE-7</i>	Manual reset (PID group 7)	50.0		
41	<i>oL-7</i>	Manipulated variable lower limit (Output limiter group 7)	0.0		
42	<i>oH-7</i>	Manipulated variable upper limit (Output limiter group 7)	100.0		
43	<i>P-8</i>	Proportional band (PID group 8)	100.0		
44	<i>I-8</i>	Integral time (PID group 8)	0		
45	<i>d-8</i>	Derivative time (PID group 8)	0		
46	<i>rE-8</i>	Manual reset (PID group 8)	50.0		
47	<i>oL-8</i>	Manipulated variable lower limit (Output limiter group 8)	0.0		
48	<i>oH-8</i>	Manipulated variable upper limit (Output limiter group 8)	100.0		
49	<i>P-9</i>	Proportional band (PID group 9)	100.0		
50	<i>I-9</i>	Integral time (PID group 9)	0		
51	<i>d-9</i>	Derivative time (PID group 9)	0		
52	<i>rE-9</i>	Manual reset (PID group 9)	50.0		
53	<i>oL-9</i>	Manipulated variable lower limit (Output limiter group 9)	0.0		
54	<i>oH-9</i>	Manipulated variable upper limit (Output limiter group 9)	100.0		
55	<i>P-A1</i>	Proportional band (PID group A1)	100.0		
56	<i>I-A1</i>	Integral time (PID group A1)	0		
57	<i>d-A1</i>	Derivative time (PID group A1)	0		
58	<i>rE-A1</i>	Manual reset (PID group A1)	50.0		
59	<i>CP-A1</i>	Changeover point (PID group A1)	1000 SPU		
60	<i>tP-A1</i>	Tuning point (PID group A1)	500 SPU		
61	<i>P-A2</i>	Proportional band (PID group A2)	100.0		
62	<i>I-A2</i>	Integral time (PID group A2)	0		
63	<i>d-A2</i>	Derivative time (PID group A2)	0		
64	<i>rE-A2</i>	Manual reset (PID group A2)	50.0		
65	<i>CP-A2</i>	Changeover point (PID group A2)	2000 SPU		
66	<i>tP-A2</i>	Tuning point (PID group A2)	1500 SPU		
67	<i>P-A3</i>	Proportional band (PID group A3)	100.0		
68	<i>I-A3</i>	Integral time (PID group A3)	0		
69	<i>d-A3</i>	Derivative time (PID group A3)	0		
70	<i>rE-A3</i>	Manual reset (PID group A3)	50.0		
71	<i>CP-A3</i>	Changeover point (PID group A3)	3000 SPU		
72	<i>tP-A3</i>	Tuning point (PID group A3)	2500 SPU		
73	<i>P-A4</i>	Proportional band (PID group A4)	100.0		
74	<i>I-A4</i>	Integral time (PID group A4)	0		
75	<i>d-A4</i>	Derivative time (PID group A4)	0		
76	<i>rE-A4</i>	Manual reset (PID group A4)	50.0		
77	<i>CP-A4</i>	Changeover point (PID group A4)	4000 SPU		
78	<i>tP-A4</i>	Tuning point (PID group A4)	3500 SPU		
79	<i>P-A5</i>	Proportional band (PID group A5)	100.0		
80	<i>I-A5</i>	Integral time (PID group A5)	0		

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No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
81	<i>d-A5</i>	Derivative time (PID group A5)	0		[Note:] CH1 PID parameter settings are described on this page. CH1 PID parameters are set when the PID key is pressed when CH1 is selected (when the EG1 LED is on) during program operation in the normal display mode.
82	<i>rE-A5</i>	Manual reset (PID group A5)	50.0		
83	<i>CP-A5</i>	Changeover point (PID group A5)	5000 SPU		
84	<i>tP-A5</i>	Tuning point (PID group A5)	4500 SPU		
85	<i>P-A6</i>	Proportional band (PID group A6)	100.0		
86	<i>I-A6</i>	Integral time (PID group A6)	0		
87	<i>d-A6</i>	Derivative time (PID group A6)	0		
88	<i>rE-A6</i>	Manual reset (PID group A6)	50.0		
89	<i>CP-A6</i>	Changeover point (PID group A6)	6000 SPU		
90	<i>tP-A6</i>	Tuning point (PID group A6)	5500 SPU		
91	<i>P-A7</i>	Proportional band (PID group A7)	100.0		
92	<i>I-A7</i>	Integral time (PID group A7)	0		
93	<i>d-A7</i>	Derivative time (PID group A7)	0		
94	<i>rE-A7</i>	Manual reset (PID group A7)	50.0		
95	<i>CP-A7</i>	Changeover point (PID group A7)	20000 SPU (fixed)		
96	<i>tP-A7</i>	Tuning point (PID group A7)	6500 SPU		

■ PID parameter (CH2) setting

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	<i>P-1</i>	Proportional band (PID group 1)	100.0		<p><i>P</i> : 0.0 to 1000.0% ON-OFF control when set to 0.0</p> <p><i>I</i> : 0 to 3600sec No integral operation when set to 0</p> <p><i>d</i> : 0 to 1200sec No derivative operation when set to 0</p> <p><i>rE</i> : 0.0 to 100.0%</p> <p><i>oL</i> : -5.0 to manipulated variable upper limit %</p> <p><i>oH</i> : Manipulated variable lower limit to +105.0%</p> <p><i>CP</i> : -19999 to +20000 SPU</p> <p><i>tP</i> : -19999 to +20000 SPU</p> <p>[Description:]</p> <ul style="list-style-type: none"> When <i>P</i> is set to 0.0, ON-OFF control is on and <i>I</i>, <i>d</i> and <i>rE</i> settings display "-----" and setting cannot be performed. When the <i>I</i> setting is not equal to 0, "-----" is displayed for <i>rE</i> and setting cannot be performed. Although a low <i>P</i> setting improves control, overshoot and hunting is more likely to occur. Although a low <i>I</i> setting improves tracking, cycling caused by integral operation occurs more often. Although a low <i>d</i> setting makes it easier to suppress overshoot, hunting is more likely to occur due to reactions to minute PV action. <p>In normal temperature control, derivative time should be between 1/3 to 1/4 of the integral time.</p> <p>Since derivative operation is a cause of hunting in pressure and flow control, set <i>d</i> to 0.0 to turn off derivative action or set a low value.</p> <ul style="list-style-type: none"> The <i>rE</i> setting is used to eliminate offset caused by proportional action (no integral action) and sets a suitable deviation of 0. The <i>oL</i> and <i>oH</i> settings also operate as integral limiters. When <i>oL</i> or <i>oH</i> manipulated variable reaches the upper or lower limit, they turn off integral action and prevents reset windup that occurs when PV has not risen for a long time. The <i>CP</i> setting is the point where switching occurs between PID groups A1 to A7. <i>tP</i> is the tuning point where <i>P</i>, <i>I</i> and <i>D</i> settings in groups A1 to A7 are automatically tuned starting from A1. <p>[Note:]</p> <p>CH2 PID parameter settings are described on this page. CH2 PID parameters are set when the PID key is pressed when CH2 is selected (when the EG2 LED is on) during program operation in the normal display mode.</p>
2	<i>I-1</i>	Integral time (PID group 1)	0		
3	<i>d-1</i>	Derivative time (PID group 1)	0		
4	<i>rE-1</i>	Manual reset (PID group 1)	50.0		
5	<i>oL-1</i>	Manipulated variable lower limit (Output limiter group 1)	0.0		
6	<i>oH-1</i>	Manipulated variable upper limit (Output limiter group 1)	100.0		
7	<i>P-2</i>	Proportional band (PID group 2)	100.0		
8	<i>I-2</i>	Integral time (PID group 2)	0		
9	<i>d-2</i>	Derivative time (PID group 2)	0		
10	<i>rE-2</i>	Manual reset (PID group 2)	50.0		
11	<i>oL-2</i>	Manipulated variable lower limit (Output limiter group 2)	0.0		
12	<i>oH-2</i>	Manipulated variable upper limit (Output limiter group 2)	100.0		
13	<i>P-3</i>	Proportional band (PID group 3)	100.0		
14	<i>I-3</i>	Integral time (PID group 3)	0		
15	<i>d-3</i>	Derivative time (PID group 3)	0		
16	<i>rE-3</i>	Manual reset (PID group 3)	50.0		
17	<i>oL-3</i>	Manipulated variable lower limit (Output limiter group 3)	0.0		
18	<i>oH-3</i>	Manipulated variable upper limit (Output limiter group 3)	100.0		
19	<i>P-4</i>	Proportional band (PID group 4)	100.0		
20	<i>I-4</i>	Integral time (PID group 4)	0		
21	<i>d-4</i>	Derivative time (PID group 4)	0		
22	<i>rE-4</i>	Manual reset (PID group 4)	50.0		
23	<i>oL-4</i>	Manipulated variable lower limit (Output limiter group 4)	0.0		
24	<i>oH-4</i>	Manipulated variable upper limit (Output limiter group 4)	100.0		
25	<i>P-5</i>	Proportional band (PID group 5)	100.0		
26	<i>I-5</i>	Integral time (PID group 5)	0		
27	<i>d-5</i>	Derivative time (PID group 5)	0		
28	<i>rE-5</i>	Manual reset (PID group 5)	50.0		
29	<i>oL-5</i>	Manipulated variable lower limit (Output limiter group 5)	0.0		
30	<i>oH-5</i>	Manipulated variable upper limit (Output limiter group 5)	100.0		
31	<i>P-6</i>	Proportional band (PID group 6)	100.0		
32	<i>I-6</i>	Integral time (PID group 6)	0		
33	<i>d-6</i>	Derivative time (PID group 6)	0		

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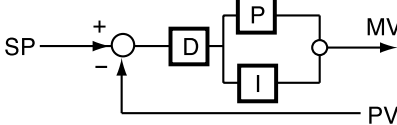
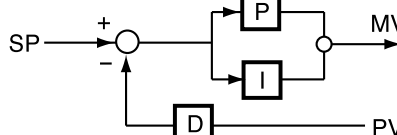
No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
34	<i>rE-6</i>	Manual reset (PID group 6)	50.0		[Note:] CH2 PID parameter settings are described on this page. CH2 PID parameters are set when the PID key is pressed when CH2 is selected (when the EG2 LED is on) during program operation in the normal display mode.
35	<i>oL-6</i>	Manipulated variable lower limit (Output limiter group 6)	0.0		
36	<i>oH-6</i>	Manipulated variable upper limit (Output limiter group 6)	100.0		
37	<i>P-7</i>	Proportional band (PID group 7)	100.0		
38	<i>I-7</i>	Integral time (PID group 7)	0		
39	<i>d-7</i>	Derivative time (PID group 7)	0		
40	<i>rE-7</i>	Manual reset (PID group 7)	50.0		
41	<i>oL-7</i>	Manipulated variable lower limit (Output limiter group 7)	0.0		
42	<i>oH-7</i>	Manipulated variable upper limit (Output limiter group 7)	100.0		
43	<i>P-8</i>	Proportional band (PID group 8)	100.0		
44	<i>I-8</i>	Integral time (PID group 8)	0		
45	<i>d-8</i>	Derivative time (PID group 8)	0		
46	<i>rE-8</i>	Manual reset (PID group 8)	50.0		
47	<i>oL-8</i>	Manipulated variable lower limit (Output limiter group 8)	0.0		
48	<i>oH-8</i>	Manipulated variable upper limit (Output limiter group 8)	100.0		
49	<i>P-9</i>	Proportional band (PID group 9)	100.0		
50	<i>I-9</i>	Integral time (PID group 9)	0		
51	<i>d-9</i>	Derivative time (PID group 9)	0		
52	<i>rE-9</i>	Manual reset (PID group 9)	50.0		
53	<i>oL-9</i>	Manipulated variable lower limit (Output limiter group 9)	0.0		
54	<i>oH-9</i>	Manipulated variable upper limit (Output limiter group 9)	100.0		
55	<i>P-A1</i>	Proportional band (PID group A1)	100.0		
56	<i>I-A1</i>	Integral time (PID group A1)	0		
57	<i>d-A1</i>	Derivative time (PID group A1)	0		
58	<i>rE-A1</i>	Manual reset (PID group A1)	50.0		
59	<i>CP-A1</i>	Changeover point (PID group A1)	1000 SPU		
60	<i>tP-A1</i>	Tuning point (PID group A1)	500 SPU		
61	<i>P-A2</i>	Proportional band (PID group A2)	100.0		
62	<i>I-A2</i>	Integral time (PID group A2)	0		
63	<i>d-A2</i>	Derivative time (PID group A2)	0		
64	<i>rE-A2</i>	Manual reset (PID group A2)	50.0		
65	<i>CP-A2</i>	Changeover point (PID group A2)	2000 SPU		
66	<i>tP-A2</i>	Tuning point (PID group A2)	1500 SPU		
67	<i>P-A3</i>	Proportional band (PID group A3)	100.0		
68	<i>I-A3</i>	Integral time (PID group A3)	0		
69	<i>d-A3</i>	Derivative time (PID group A3)	0		
70	<i>rE-A3</i>	Manual reset (PID group A3)	50.0		
71	<i>CP-A3</i>	Changeover point (PID group A3)	3000 SPU		
72	<i>tP-A3</i>	Tuning point (PID group A3)	2500 SPU		
73	<i>P-A4</i>	Proportional band (PID group A4)	100.0		
74	<i>I-A4</i>	Integral time (PID group A4)	0		
75	<i>d-A4</i>	Derivative time (PID group A4)	0		
76	<i>rE-A4</i>	Manual reset (PID group A4)	50.0		
77	<i>CP-A4</i>	Changeover point (PID group A4)	4000 SPU		
78	<i>tP-A4</i>	Tuning point (PID group A4)	3500 SPU		
79	<i>P-A5</i>	Proportional band (PID group A5)	100.0		
80	<i>I-A5</i>	Integral time (PID group A5)	0		

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
81	<i>d-A5</i>	Derivative time (PID group A5)	0		[Note:] CH2 PID parameter settings are described on this page. CH2 PID parameters are set when the PID key is pressed when CH2 is selected (when the EG2 LED is on) during program operation in the normal display mode.
82	<i>rE-A5</i>	Manual reset (PID group A5)	50.0		
83	<i>CP-A5</i>	Changeover point (PID group A5)	5000 SPU		
84	<i>tP-A5</i>	Tuning point (PID group A5)	4500 SPU		
85	<i>P-A6</i>	Proportional band (PID group A6)	100.0		
86	<i>I-A6</i>	Integral time (PID group A6)	0		
87	<i>d-A6</i>	Derivative time (PID group A6)	0		
88	<i>rE-A6</i>	Manual reset (PID group A6)	50.0		
89	<i>CP-A6</i>	Changeover point (PID group A6)	6000 SPU		
90	<i>tP-A6</i>	Tuning point (PID group A6)	5500 SPU		
91	<i>P-A7</i>	Proportional band (PID group A7)	100.0		
92	<i>I-A7</i>	Integral time (PID group A7)	0		
93	<i>d-A7</i>	Derivative time (PID group A7)	0		
94	<i>rE-A7</i>	Manual reset (PID group A7)	50.0		
95	<i>CP-A7</i>	Changeover point (PID group A7)	20000 SPU (fixed)		
96	<i>tP-A7</i>	Tuning point (PID group A7)	6500 SPU		

■ Setup data setting

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	C 01	PV1 range number	0		0 to 16 : t/c 48 to 52 : linear (DC current, DC voltage) 64 to 71 : RTD 96 to 103 : RTD 128 to 134: linear (DC current, DC voltage) [Description:] For details see range numbers listed in "Section 2-3 Input Type and Range Number" (page 2-8)
2	C 02	PV1 temperature unit	0		0: °C Celsius 1: °F Fahrenheit [Description:] When setting C01 is set to linear, "-----" is displayed and setting cannot be performed.
3	C 03	PV1 decimal point position	1		0 to 2 A setting of 0 means no decimal point and a setting of 1 and 2 indicates the number of decimal digits. [Description:] When setting C01 is set to linear, "-----" is displayed and setting cannot be performed. The setting range varies with the C01 and C02 setting. • A setting between 0 and 2 can be made when C01 is set to: 5, 15, 65 to 69, 97 to 101 and C02 is set to 0. C01 settings: 66, 68, 69, 98, 100, 101 and C02 is set to 1. • A setting of 0 and 1 can be made when C01 is set to: 0 to 4, 6 to 14, 16, 64, 70, 71, 96, 102, 103 and C02 is set to 0. C01 settings: 0 to 5, 7, 8, 10, 12 to 14, 16, 64, 65, 67, 70, 71, 96, 97, 99, 102, 103 and C02 is set to 1. • Only a setting of 0 is possible when C01 is set to: 6, 9, 11 and C02 is set to 1 When the C01 setting is set to t/c or RTD, this setting is reflected in PVU (PV1) units.
4	C 04	PV1 linear decimal point position	1		0 to 4 A setting of 0 means no decimal point and a setting between 1 and 4 indicates the number of decimal digits. [Description:] C01 settings for t/c and RTD display "-----" and setting cannot be performed. When the C01 setting is set to linear, this setting is reflected in PVU (PV1) units.
5	C 05	PV1 linear range lower limit	0 PVU		-19999 to +20000 PVU (PV1) [Description:] When the C01 settings is set to t/c and RTD display "-----" and setting cannot be performed.
6	C 06	PV1 linear range upper limit	10000PVU		Reversing the lower limit and upper limit makes it possible to reverse analog inputs and specified values.
7	C 07	PV1 cold junction compensation	0		0: Provided (compensated internally) 1: Not provided (compensated externally) [Description:] When the C01 setting is set to t/c and RTD display "-----" and setting cannot be performed.
8	C 08	PV1 square root extraction	0		0: Not provided 1: Provided [Description:] When the C01 setting is set to t/c and RTD display "-----" and setting cannot be performed.
9	C 09	PV1 square root extraction dropout	0.2		0.2 to 10.0% (ratio depends on input range) [Description:] When the C01 setting is set to t/c and RTD display "-----" and setting cannot be performed.
10	C 10	PV1 cold junction bias	0.0		-1.0 to +1.0°C [Description:] When the C01 setting is set to t/c and RTD display "-----" and setting cannot be performed. Use 0.0 for normal settings.

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
11	C 11	PV2 range number	0		0 to 16 : t/c 48 to 52 : linear (DC current, DC voltage) 64 to 71 : RTD 96 to 103 : RTD 128 to 134: linear (DC current, DC voltage) 135 : O ₂ Sensor [Description:] Setting 135 cannot be made on a model without CP compensation. A model with CP compensation is tied to setting 135. For details see range numbers listed in Section 2-3, "Input Types and Range Numbers" (page 2-8).
12	C 12	PV2 temperature unit	0		0: °C Celsius 1: °F Fahrenheit [Description:] When the C01 setting is set to linear or O ₂ sensor, [----] is displayed and setting cannot be performed.
13	C 13	PV2 decimal point position	1		0 to 2 A setting of 0 means no decimal point and a setting of 1 and 2 indicates the number of decimal digits. [Description:] When the C11 setting is set to linear or O ₂ sensor, [----] is displayed and setting cannot be performed. The setting range varies with the C11 and C12 setting. • A setting between 0 and 2 can be made when C11 is set to: and C12 is set to 0. C11 settings: 66, 68, 69, 98, 100, 101 and C12 is set to 1. • A setting of 0 and 1 can be made when C11 is set to: 0 to 4, 6, to 14, 16, 64, 70, 71, 96, 102, 103 and C12 is set to 0, when C11 is set to: 0 to 5, 7, 8, 10, 12 to 14, 16, 64, 65, 67, 70, 71, 96, 97, 99, 102, 103 and C12 is set to 1. • Only a setting of 0 is possible when C11 is set to: 6, 9, 11 and C12 is set to 1. • When the C11 setting is for t/c or RTD, this setting is reflected in PVU (PV2) units.
14	C 14	PV2 linear decimal point position	1		0 to 4 A setting of 0 means no decimal point and a setting between 1 and 4 indicates the number of decimal digits. [Description:] When the C11 setting is set to t/c, RTD, or O ₂ sensor, [---] is displayed and setting cannot be performed. When setting C11 is linear, this setting is reflected in PVU (PV2) units.
15	C 15	PV2 linear range lower limit	0 PVU		-19999 to +20000 PVU (PV2) [Description:] When the C11 setting is set to t/c, RTD, or O ₂ sensor, [---] is displayed and setting cannot be performed.
16	C 16	PV2 linear range upper limit	10000PVU		Reversing the lower limit and upper limit makes it possible to reverse analog inputs and specified values.
17	C 17	PV2 cold junction compensation	0		0: Yes (compensated internally) 1: No (compensated externally) [Description:] When the C11 setting is set to RTD, linear or O ₂ sensor, [----] is displayed and setting cannot be performed.
18	C 18	PV2 square root extraction	0		0: No 1: Yes [Description:] When the C11 setting is set to t/c, RTD or O ₂ sensor, [----] is displayed and setting cannot be performed.
19	C 19	PV2 square root extraction dropout	0.2		0.2 to 10.0 % (ratio depends on input range) [Description:] When the C11 setting is set to t/c, RTD or O ₂ sensor, [----] is displayed and setting cannot be performed.
20	C 20	PV2 cold junction bias	0.0		-1.0 to +1.0°C [Description:] When the C11 setting is set to RTD, linear or O ₂ sensor, [----] is displayed and setting cannot be performed. Use 0.0 for normal settings.

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
21	C 21	Control output system (CH1)	1		1 : 5G output (current proportional control output) 2 : 6D output (voltage time proportional control output) system A 3 : 6D output (voltage time proportional control output) system B 4 : 8D output (open collector time proportional control output) system A 5 : 8D output (open collector time proportional control output) system B [Description:] The difference between system A and system B is in the output system of ON-OFF control and auto-tuning. System A: Output ON-OFF is performed regardless of time proportional output cycles and output limits. System B: The output limit upper limit value is output instead of on and the output limit lower value is output instead of off according to time proportional output cycles.
22	C 22	Control output system (CH2)	1		
23	C 23	Control operation (CH1)	0		0: PID-A reverse operation 1: PID-A normal operation 2: PID-B reverse operation 3: PID-B normal operation [Description:] PID-A: deviation derivative PID (system where SP changes are affected by derivative action) 
24	C 24	Control operation (CH2)	----		PID-B: derivative-based PID (system where SP changes are not affected by derivative action) 
25	C 25	Unused	----		[Description:] “-----” is displayed and setting cannot be performed.
26	C 26	Unused	----		
27	C 27	Unused	----		
28	C 28	Unused	----		
29	C 29	Unused	----		
30	C 30	PV equalizer	0		0: No 1: PV1 only 2: PV2 only 3: PV1 and PV2
31	C 31	End of operation (CH1)	0		0: READY mode 1: END mode
32	C 32	Manipulated variable in READY mode (CH1)	0.0		-5.0 to +105.0 %
33	C 33	Manipulated variable setting in PV overrange (CH1)	0		0: No 1: Yes
34	C 34	Manipulated variable in PV overrange (CH1)	0.0		-5.0 to +105.0 %
35	C 35	Manual change mode (CH1)	0		0: bias 1: preset
36	C 36	Preset MANUAL value (CH1)	0.0		-5.0 to +105.0 %
37	C 37	End of operation (CH2)	0		0: READY mode 1: END mode
38	C 38	Manipulated variable in READY mode (CH2)	0.0		-5.0 to +105%

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
39	C 39	Manipulated variable setting in PV overrange (CH2)	0		0: No 1: Yes
40	C 40	Manipulated variable in PV overrange (CH2)	0.0		-5 to +105%
41	C 41	Manual change mode (CH2)	0		0: smooth 1: preset
42	C 42	Preset manual value (CH2)	0.0		-5 to +105%
43	C 43	Length of outage permitting continuous operation	0		0 to 3600sec When set to 0, operation continues regardless of outage time. [Description:] The HOLD mode is invoked when the outage is longer than set time. The measurement of a power outage may vary by about 10 seconds.
44	C 44	CP computation type (varies with sensor manufacturer)	1		0: oxygen pressure (PO ₂) computation 1: CP computation for NKG sensor 2: CP computation for Marathon monitors and Cambridge sensors 3: CP computation for Corning sensors 4: CP computation for AACC sensors 5: CP computation for Barber-Coleman sensors 6: CP computation for Furnace Control sensors [Description:] “-----” is displayed for a model without CP compensation and setting cannot be performed.
45	C 45	Auxiliary output type 1	0		0: SP1 1: PV1 2: Deviation1 (DEV1) 3: Manipulated variable 1 (MV1) 4: SP2 5: PV2 6: Deviation 2 (DEV2) 7: Manipulated variable 2 (MV2) 8: O ₂ sensor mV input value [Description:] “-----” is displayed and setting cannot be performed on model without auxiliary output.
46	C 46	Auxiliary output 1 lower limit (4mA)	0 SPU		-19999 to +20000 SPU (C45 not equal to 3, 7) -1999.9 to +2000.0 SPU (C45 set to 3, 7) [Description:]
47	C 47	Auxiliary output 1 upper limit (20mA)	10000SPU		“-----” is displayed and setting cannot be performed on model without auxiliary output.
48	C 48	Auxiliary output type 2	0		0: SP1 1: PV1 2: Deviation1 (DEV1) 3: Manipulated variable 1 (MV1) 4: SP2 5: PV2 6: Deviation 2 (DEV2) 7: Manipulated variable 2 (MV2) 8: O ₂ sensor mV input value [Description:] “-----” is displayed and setting cannot be performed on model without auxiliary output or with one auxiliary output.
49	C 49	Auxiliary output 2 lower limit (4mA)	0 SPU		-19999 to +20000 SPU (C48 not equal to 3, 7) -1999.9 to +2000.0% (C48 set to 3, 7) [Description:]
50	C 50	Auxiliary output 2 upper limit (20mA)	10000SPU		“-----” is displayed and setting cannot be performed on model without auxiliary output or with one auxiliary output.
51	C 51	Unused	----		[Description:] “-----” is displayed and setting cannot be performed.
52	C 52	Unused	----		
53	C 53	Unused	----		
54	C 54	Unused	----		
55	C 55	Unused	----		
56	C 56	Unused	----		

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No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
57	C 57	Programming item event	0		0: Displayed 1: Not displayed
58	C 58	Programming item PID group, output limiter group	0		0: Displayed 1: Not displayed
59	C 59	Programming item G.SOAK, PV shift, repeat	0		0: Displayed 1: Not displayed
60	C 60	Programming item PV start, cycle, pattern link	0		0: Displayed 1: Not displayed
61	C 61	Programming system	0		0: RAMP-X and RAMP-T (θ) combined 1: RAMP-X and RAMP-E (ΔSP) combined
62	C 62	Programming time unit	0		0: hours, min (SPU/hour for RAMP-T) 1: min, sec (SPU/min for RAMP-T) 2: 0.1 sec (SPU/sec for RAMP-T)
63	C 63	Time display (display panel 1 and 2)	0		0: remaining segment time 1: total operation time (after READY → RUN start)
64	C 64	Event no. division (first CH2 number)	0		0 to 16 0 indicates no CH2 event [Description:] When a change in set values cause multiple output points for a code event to overlap the CH1 and CH2 division, the event configuration setting output points is changed so that only CH1 is used.
65	C 65	SP decimal point position (CH1)	1		0 to 4 A setting of 0 means no decimal point and a setting between 1 and 4 indicates the number of decimal digits. [Description:] This setting is reflected in PVU (SPU (CH1)) units.
66	C 66	SP limit lower limit (CH1)	PV1 range lower limit		-19999 to +20000 SPU (CH1) [Description:] When C01 to C06 are set, C66 and C67 are automatically set as the upper limit and lower limit of the range.
67	C 67	SP limit upper limit (CH1)	PV1 range upper limit		
68	C 68	SP decimal point position (CH2)	1 or 3		0 to 4 on a model without CP compensation. 0 to 3 on a model with CP compensation. A setting of 0 means no decimal point and a setting between 1 and 4 indicates the number of decimal digits. [Description:] This setting is reflected in PVU (SPU (CH2)) units. The factory default setting for models without CP compensation is 1. The factory default setting for models without CP compensation is 3.
69	C 69	SP limit lower limit (CH2)	PV2 range lower limit		-19999 to +20000 SPU (CH2) on a model without CP compensation. 0 to 2000 SPU(CH2) on a model with CP compensation. [Description:] When C11 to C16 are set, C69 and C70 are automatically set as the upper limit and lower limit of the PV1 range. The factory default setting for models with CP compensation is C69=0.000, C70=2.000.
70	C 70	SP limit upper limit (CH2)	PV2 range upper limit		
71	C 71	External switch input RSW5	0		0 : NOP (does not function) 1 : RAMP-E 2 : FAST 3 : G.SOAK is cleared using OR 4 : G.SOAK is cleared using AND 5 : MANUAL/AUTO 6 : AT start/terminate 7 : NOP (does not function) 8 : Auto load 9 : NOP (does not function) 10: NOP (does not function) 11: O ₂ sensor check
72	C 72	External switch input RSW6	0		
73	C 73	External switch input RSW7	0		
74	C 74	External switch input RSW8	0		
75	C 75	External switch input RSW9 to 14 (program selection)	0		0: BCD4 bits + BCD2 bits 1: binary 7 bits

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
76	C 76	Communication address	0		0 to 127 [Description:] "----" is displayed for model without communications and when C97 is set to a value that is not equal to 0 and setting cannot be performed. When C76 is set to 0, the communication function is not activated.
77	C 77	Transmission rate	0		0: 9600bps 1: 4800bps 2: 2400bps 3: 1200bps [Description:] "----" is displayed for model without communications and when C97 is set to a value that is not equal to 0 and setting cannot be performed.
78	C 78	Transmission code	0		0: 8 bits, even parity, 1 stop bit 1: 8 bits, no parity, 2 stop bits [Description:] "----" is displayed for model without communications and when C97 is set to a value that is not equal to 0 and setting cannot be performed.
79	C 79	Communication	0		0: CPL 1: ST221 (no PV trend) 2: ST221 (PV trend) [Description:] "----" is displayed for model without communications and when C97 is set to a value that is not equal to 0 and setting cannot be performed.
80	C 80	Communication method	0		0 : RS-485 1 : RS-232C [Description:] "----" is displayed for model without communications and when C97 is set to a value that is not equal to 0 and setting cannot be performed.
81	C 81	ROM ID	—		[Description:] Can only be referenced for mechanical service use.
82	C 82	ROM ITEM	—		
83	C 83	ROM revision	—		
84	C 84	Data version	—		
85	C 85	CPU board ID	—		
86	C 86	I/O board ID	—		
87	C 87	Unused	----		[Description:] "----" is displayed and setting cannot be performed.
88	C 88	Unused	----		
89	C 89	Unused	----		
90	C 90	PID type	1		0: Improved 1: Compatible with MarkI
91	C 91	PV1 burnout	0		0: Yes 1: No
92	C 92	PV2 burn out	0		0: Yes 1: No
93	C 93	Time proportional output	0		0: Does not go on a second time off in time proportional cycle. 1: Goes on a second time in time proportional cycle.
94	C 94	Time proportional output	0		0: Does not go on a second time off in time proportional cycle 1: Goes on a second time in time proportional cycle
95	C 95	Voltage output control (CH1)	15		2 to 22mA
96	C 96	Voltage output control (CH2)	15		2 to 22mA
97	C 97	Communications port	0		0 to 15 The backplate terminal is used when set to 0. The loader jack is used for settings 1 to 15. [Description:] When set to 0, communications cannot be performed on model without communications. When set to 0, communications conditions are selected using C76 to C80. The communication address is used for settings 1 to 15. 4800bps, 8 bits, even parity, 1 stop bit
98	C 98	Special function	0		0 to 255 [Description:] A setting of 0 is normally used.

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No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
99	<i>C 99</i>	PV1 zener barrier adjustment	----		-20.00 to +20.00 [Description:] "----" is displayed when PV1 is not an RTD input and <i>C98</i> is not equal 241.
100	<i>C100</i>	PV2 zener barrier adjustment	----		-20.00 to +20.00 [Description:] "----" is displayed when PV2 is not an RTD input and <i>C98</i> is not equal 241.

■ Detailed descriptions of setup data settings

- **C07 (PV1 cold junction compensation)**

- **C17 (PV2 cold junction compensation)**

- This is a selection for cold junction compensation for thermocouples.
- When set to 1, perform 0°C compensation using a cold junction compensation device outside the **DCP552**.

- **C08 (PV1 square root extraction)**

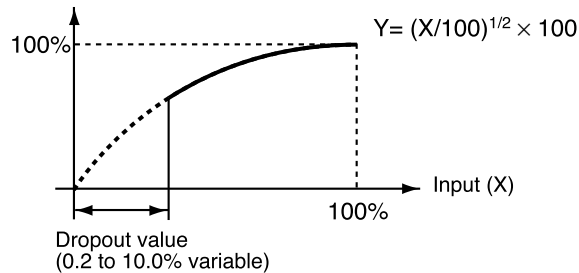
- **C09 (PV1 square root extraction dropout)**

- **C18 (PV2 square root extraction)**

- **C19 (PV2 square root extraction dropout)**

- Flow pressure detected by the orifice of a normal differential pressure type flowmeter is proportional to the power 2 of the flow rate signal. Consequently, square root extraction is used when a uniform signal is needed. When the input in the square root extraction is **C09** or less than the dropout set in **C19**, an output of 0% can be obtained in the square root process.
- Square root extraction is not performed when **C08** and **C18** are set to 0.

Output of root extraction (Y)



- **C46 (auxiliary output 1 lower limit)**

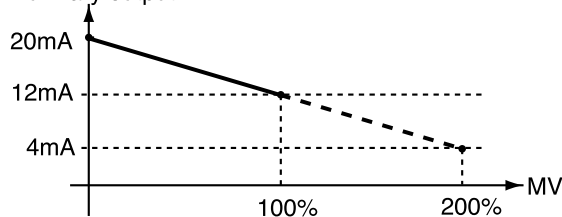
- **C47 (auxiliary output 1 upper limit)**

- **C49 (auxiliary output 2 lower limit)**

- **C50 (auxiliary output 2 upper limit)**

- This is the scaling setting of the auxiliary output. The high and low values for the upper and lower limits can be reversed.
- The example below shows that the output from auxiliary output 1 is 12mA when MV is 100% and 20mA when MV is 0%. As shown, a 200% MV value is required to generate an output of 4mA. Thus **C46** is set to 200.0 and **C47** is set to 0.0.

Auxiliary output 1



● **C63 (time display)**

0: remaining segment time

1: total operation time

- These are selections for display panel 1 and 2 in the normal display mode in the program run mode.
- In the READY mode a setting of 0 displays the set time values for the selected segments.
- In the RUN, HOLD, FAST and END modes a setting of 0 displays the remaining time in rounded hours.
For example, when the time unit hours/min is selected a remaining time of 1 hour 30 minutes and 59 seconds is displayed as “1.30”.
- In the READY mode a setting of 1 displays the time as “0.00”.
- In the RUN, HOLD, FAST and END modes a setting of 1 means that the time is displayed in rounded hours after a change from the READY mode to the RUN mode. In G.SOAK wait, repeat, cycle and pattern link, time is displayed as integrated values.
When the time unit is hours/min or min/sec, the display returns to “0.00” after “499.59”. When the time unit is 0.1 sec, the display returns to “0.0” after “2999.9”.
When the time unit is hour/min, a total operating time of 501 hours 30 minutes and 59 seconds is displayed as “1.30”.
- In FAST mode a setting of 0 or 1 displays the time according to FAST X.

● **C66 (SP limit lower limit)**

● **C67 (SP limit upper limit)**

● **C69 (SP limit lower limit)**

● **C70 (SP limit upper limit)**

- These settings operate as limiters when SP is set or changed in the program setting pattern items.
- In the program run mode these settings operate as limiters when SP and SP bias (variable parameter) set in a program are added to produce the resulting SP.
- These settings operate as limiters when SP is set or changed in constant value control data settings.
- In the constant value control mode these settings operate as limiters when SP and SP bias (variable parameter) set in constant value control data settings are added to produce the resulting SP.

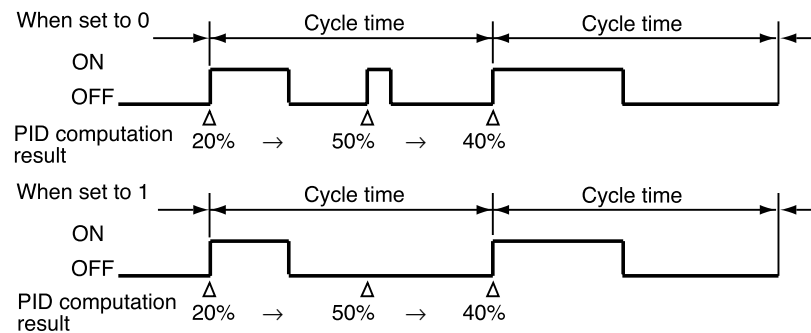
- **C93 (time proportional output system)**
- **C94 (time proportional output system)**

0: Goes on again within time proportional cycle

1: Does not go on again within time proportional cycle

- This setting determines whether the output is to go on again after the result of a PID computation has changed in a time proportional cycle (cycle time) and the output has been turned off.

- The difference between the two settings is illustrated below.



- **C95 (voltage output control)**
- **C96 (voltage output control)**

In a voltage time proportional output driven by SSR, the **DCP552** must enter the SSR rated input voltage (optimum striking voltage of arc).

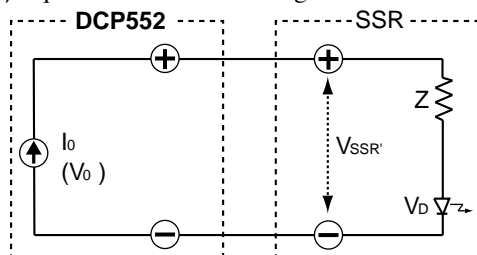
The **DCP552** employs a newly developed variable output system that can output optimum striking voltage of arc to accommodate multiple SSR drives. A suitable current value is set on the **DCP552** to obtain optimum striking voltage of arc for the internal impedance of the SSR. An equivalent circuit with related equations is shown below.

- Description of symbols

(1) Settings

- I_0 : set **DCP552** output current (range: 2 to 22mA)
- V_0 : end-to-end load voltage (13.2V)
- $V_{SSR'}$: actual voltage input to SSR
- V_{SSR} : rated input voltage range for SSR ($V_{SSR/MIN}$ to $V_{SSR/MAX}$)
- $V_{SSR/MIN}$: minimum SSR rated input voltage
- $V_{SSR/MAX}$: maximum SSR rated input voltage
- Z : internal SSR impedance
- V_D : internal SSR voltage drop (normally about 1 to 2V)

(2) Equivalent circuit showing connection of one SSR



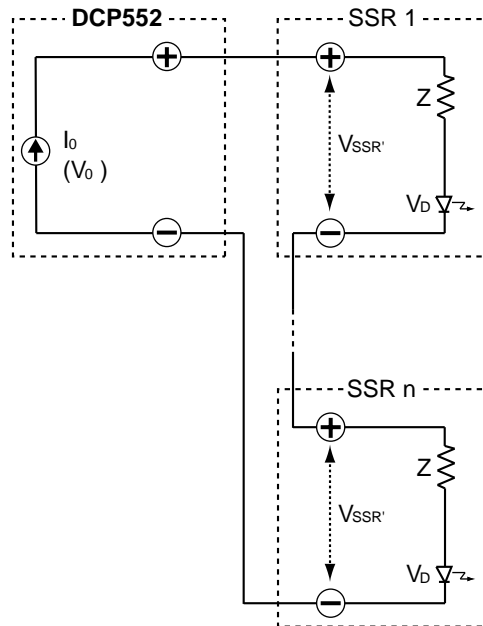
Equations (1) and (2) below must be satisfied.

$$V_{SSR/MIN} \leq I_0 \times Z + V_D \leq V_0 \quad \text{Equation (1)}$$

$$V_{SSR'} \leq V_{SSR/MAX} \quad \text{Equation (2)}$$

$$(V_{SSR'} = I_0 \times Z + V_D)$$

(3) Equivalent circuit showing connection of n SSRs



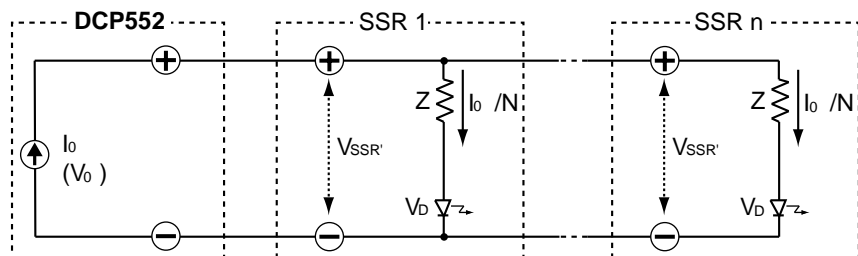
Equations (3) and (4) below must be satisfied.

$$V_{SSR'/MIN} \leq I_0 \times Z + V_D \leq V_0 / N \quad \text{Equation (3)}$$

$$V_{SSR'} \leq V_{SSR'/MAX} \quad \text{Equation (4)}$$

$$(V_{SSR'} = I_0 \times Z + V_D)$$

(4) Equivalent circuit showing parallel connection of n SSRs



Equations (5) and (6) below must be satisfied.

$$V_{SSR'/MIN} \leq I_0 / N \times Z + V_D \leq V_0 \quad \text{Equation (5)}$$

$$V_{SSR'} \leq V_{SSR'/MAX} \quad \text{Equation (6)}$$

$$(V_{SSR'} = I_0 / N \times Z + V_D)$$

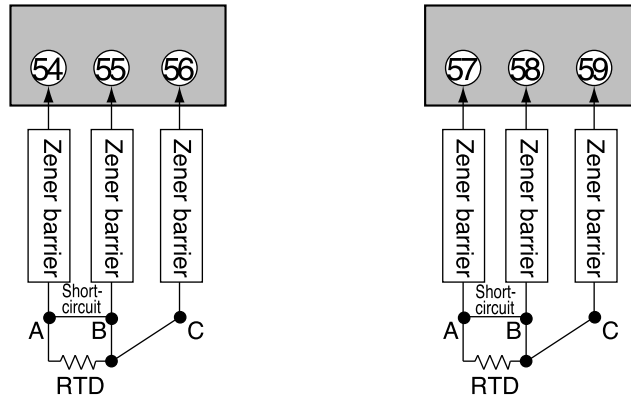
- **C99 (PV1 zener barrier adjustment)**
- **C100 (PV2 zener barrier adjustment)**

The adjustment described below must be performed when a zener barrier is used.

(1) Turn off the **DCP552**. When installation and wiring is completed, short-circuit A and B on the resistance temperature detector.

• PV1 zener barrier adjustment

• PV2 zener barrier adjustment



(2) Turn on the **DCP552** and set setup data **C98** to 241.

(3) Display setup data **C99** and **C100**.

(4) Press the **ENTER** key to display the difference in resistance (A-B) between zener barriers connected to wire A and wire B.

(5) Press the **ENTER** key to store the difference in resistance values (A-B) in the **DCP552**.

(6) Press the **DISP** key to return to the normal display mode.

(7) Turn off the **DCP552** and disconnect the wire between A and B.

! Handling Precautions

- Adjust the resistance in the zener barriers connected to wire A and B to 20Ω or less. Adjustment is not possible if the resistance is higher than 20Ω .
- This adjustment is not required for inputs other than resistance temperature detectors or when zener barriers are not to be used.
- When a zener barrier has been adjusted, compensation is performed for this zener barrier. When resistance temperature detector inputs not employing zener barriers are to be used, perform the above adjustment without the zener barriers.

■ Constant value control data (CH1) setting

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	<i>ConSt</i>	Control mode	0		0: Program run mode 1: Fixed command control mode
2	<i>SP</i>	Setpoint	0		Within the range of setup C66 to C67 (SP limit)
3	<i>P</i>	Proportional band	100.0		0.0 to 1000.0% A setting of 0.0 turns on ON-OFF control
4	<i>I</i>	Integral time	0		0 to 3600sec No integral operation when set to 0. [Description:] When <i>P</i> is set to 0.0, "-----" is displayed and setting cannot be performed.
5	<i>d</i>	Derivative time	0		0 to 1200 sec No integral operation when set to 0. [Description:] When <i>P</i> is set to 0.0, "-----" is displayed and setting cannot be performed.
6	<i>rE</i>	Manual reset	50.0		0.0 to 100.0% [Description:] When <i>P</i> is set to 0.0, "-----" is displayed and setting cannot be performed. When <i>I</i> is not equal to 0, "-----" is displayed and setting cannot be performed.
7	<i>oL</i>	Manipulated variable lower limit	0.0		-5.0 to upper limit %
8	<i>oH</i>	Manipulated variable upper limit	100.0		Lower limit to +105%

■ Constant value control data (CH2) setting

No.	Item code	Item	Factory default settings	User settings	Settings and descriptions
1	<i>ConSt</i>	Control mode	0		0: Program run mode 1: Fixed command control mode
2	<i>SP</i>	Setpoint	0		Within the range of setup C69 to C70 (SP limit)
3	<i>P</i>	Proportional band	100.0		0.0 to 1000.0% A setting of 0.0 turns on ON-OFF control
4	<i>I</i>	Integral time	0		0 to 3600 sec No integral operation when set to 0. [Description:] When <i>P</i> is set to 0, [----] is displayed and setting cannot be performed.
5	<i>d</i>	Derivative time	0		0 to 12600 sec No integral operation when set to 0. [Description:] When <i>P</i> is set to 0.0, [----] is displayed and setting cannot be performed.
6	<i>rE</i>	Manual reset	50.0		0.0 to 100% [Description:] When <i>P</i> is set to 0.0, [----] is displayed and setting cannot be performed. When <i>I</i> is not equal to 0, [----] is displayed and setting cannot be performed.
7	<i>oL</i>	Manipulated variable lower limit	0.0		-5.0 to upper limit %
8	<i>oH</i>	Manipulated variable upper limit	100.0		Lower limit to +105%