Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
7	C 7	AI1 Linear input decimal point position	(Undefined)		0: X X X X X 1: X X X X.X 2: X X X.X X 3: X X.X X X 4: X.X X X X
8	C 8	AI1 Linear input low limit (0%)	(Undefined)		–19999 to 26000U
9	C 9	AI1 Linear input high limit (100%)	(Undefined)		–19999 to 26000U Supplement The numerics of C8 and C9 are free in magnitude relation.
10	C 10	AI1 Linear input square root operation and dropout	0.0		0.0: Square root operation is not provided. 0.1 to 10.0% FS: (Ratio to AI1 range) Square root operation is provided, and at the same time, a dropout value is set.
11	C 11	AI2 (analog input 2) Input type	0		0: 4 to 20mA 1: 1 to 5V Supplement AI2 functions as an RSP in the remote SP model, or as a PV2 in the internal cascade model.
12	C 12	AI2 Decimal point position	0		0: X X X X X 1: X X X X.X 2: X X X.X X 3: X X.X X X 4: X.X X X X Supplement This can be set only in the internal cascade model.
13	C 13	AI2 Input low limit	0		–19999 to 26000U

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
14	C 14	AI2 Input high limit	10000		−19999 to 26000U Supplement The numerics of C13 and C14 are free in magnitude relation.
15	C 15	AI2 Square root operation and dropout	0.0		0.0: Square root operation is not provided. 0.1 to 10.0% FS: Square root operation is provided, and at the same time, a dropout value is set.
16	C 16	LSP setting system	0		0: Only one LSP is used. Usually, an SP value is changed. 1: Only one LSP is used. An SP value is directly changed. 2: 8 LSPs are used. An SP value and PID group can be changed. 3: 8 LSPs are used. An SP value and PID group cannot be changed. Supplement If an RSW is not assigned for the LSP selection in the above-mentioned "2" and "3", 8 LSPs can be selected from the console. When an RSW is assigned, the console operation is ineffective, and the RSW has priority. In the internal cascade model, this setup item is effective only on the master side, using not 8 but 6 LSPs (0 to 5).
17	C 17	Low limit of SP limit	−19999		−19999U to High limit
18	C 18	High limit of SP limit	26000		Low limit to 26000U Supplement C17 and C18 are shared by LSP and RSP, and their limit ranges are the same. In the internal cascade model, they are effective only for the internal RSP. To assure safety, be sure to set necessary values as SP limits.
19	C 19	At AI overrange, Contents selection of control output (MV)	0		0: Not provided. 1: AI1 is over. 2: AI2 is over. 3: AI1 or AI2 is over.
20	C20	At AI overrange, setting of control output quantity	0		−10 to 110%

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
21	C21	Manual change mode	0		0: Bumpless (the current output is held) 1: Preset Supplement This item is applied to the case where AUTO/MAN is selected by the console or RSW.
22	C22	Preset MANUAL value	0		–10 to 110% Supplement This setup is applied to the case where "1" is selected as C21. When power is recovered from failure during manual operation from the console, the C22 value is selected irrespective of C21 setting.
23	C23	Fixed value output 1	0		–10 to 110% Supplement This setup can be controlled only by RSW. The priority is in the order of 1 > 2 > 3. "1" is highest in priority.
24	C24	Fixed value output 2	0		
25	C25	Fixed value output 3	0		
26	C26	Setting of control output quantity in READY mode	0		–10 to 110% Supplement This setup item functions as a control output on the cool side in the READY mode of the heat/cool model.
27	C27	Setting of cool side control output quantity in READY mode	0		–10 to 110% Supplement This setup item functions as a control output on the heat side in the READY mode of the heat/cool model.
28	C28	Event in READY mode	0		0: Acts even in READY mode. 1: Does not act in READY mode.

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
29	C29	Setting of internal RSP 0% (internal cascade model)	0		–19999 to 26000U
30	C30	Setting of internal RSP 100% (internal cascade model)	10000		–19999 to 26000U Supplement The numerics of C29 and C30 are free in magnitude relation.
31	C31	AI1 and AI2 exchange (Internal cascade model)	0		0: Not exchanged. (AI1 = PV for master, AI2 = PV for slave) 1: Exchanged. (AI1 = PV for slave, AI2 = PV for master) Supplement In the internal cascade model, it is selecetd whether each input of AI1 and AI2 is assigned as a PV for master control, or as a PV for slave control.
32	C32	Type of auxiliary output 1 (AUX1)	0		0: PV 1: SP 2: DEV 3: MV 4: RSP 5: Motor opening (MFB) Internal cascade model 0: PV1 6: PV2 1: SP1 7: SP2 2: DEV1 8: DEV2 3: MV1 9: MV2 4: ····· 10: I-RSP 5: MFB
33	C33	Auxiliary output 1 4mA setting	0		–19999 to 26000U –1999.9 to 2600.0% (MV, motor opening)
34	C34	Auxiliary output 1 20mA setting	10000		–19999 to 26000U –1999.9 to 2600.0% (MV, motor opening) Supplement The numerics of C34 and C35 are free in magnitude relation.

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
35	C35	Auxiliary output 1 Output in READY mode	0		0: Bumpless (the current output is held) 1: Preset
36	C36	Auxiliary output 1 Setting of preset output quantity in READY mode	0		–19999 to 26000U –1999.9 to 2600.0% (MV, motor opening)
37	C37	Type of auxiliary output 2 (AUX2)	0		0: PV 1: SP 2: DEV 3: MV 4: RSP 5: Motor opening (MFB) Internal cascade model 0: PV1 6: PV2 1: SP1 7: SP2 2: DEV1 8: DEV2 3: MV1 9: MV2 4: ····· 10: I-RSP 5: MFB
38	C38	Auxiliary output 2 4mA setting	0		–19999 to 26000U –1999.9 to 2600.0% (MV, motor opening)
39	C39	Auxiliary output 2 20mA setting	10000		–19999 to 26000U –1999.9 to 2600.0% (MV, motor opening) Supplement The numerics of C39 and C40 are free in magnitude relation.
40	C40	Auxiliary output 2, Output in READY mode	0		0: Bumpless (the current output is held) 1: Preset
41	C41	Auxiliary output 2, Setting of preset output quantity in READY mode	0		–19999 to 26000U –1999.9 to 2600.0% (MV, motor opening)

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column
42	C42	RSW1 assignment	0	
43	C43	RSW2 assignment	0	
44	C44	RSW3 assignment	0	
45	C45	RSW4 assignment	0	
46	C46	RSW5 assignment	0	
47	C47	RSW6 assignment	0	
48	C48	RSW7 assignment	0	
49	C49	RSW8 assignment	0	
50	C50	RSW9 assignment	0	
51	C51	RSW10 assignment	0	
52	C52	RSW11 assignment	0	
53	C53	RSW12 assignment	0	

Supplement

- " — " denotes that there is no effect on operation.
- If "1: RUN/READY" is assigned to an RSW, and that RSW is then open, the RUN mode is set forcibly. Therefore, the following setup operation cannot be done. To continue the setup operation, the RSW must be closed once to restore the READY mode.
- To assign "33" or "34" to an RSW, be sure to set "1" in C75.

Setting

	ON (contact closed time)	OFF (contact open time)
0:	NOP (non-action)	—
1:	READY	RUN
2:	MANUAL	AUTO
3:	REMOTE	LOCAL (LSP)
4:	Auto Tuning (AT) start	AT stop (during AT)
5:	Inversion of control action	As set to C2.
6:	—	—
7:	—	—
8:	—	—
9:	—	—
10:	LSP number selection 2^0 (+1)	0
11:	LSP number selection 2^1 (+2)	0
12:	LSP number selection 2^2 (+4)	0
13:	PID number selection 2^0 (+1)	0
14:	PID number selection 2^1 (+2)	0
15:	PID number selection 2^2 (+4)	0
16:	S–LSP 7	S–LSP 6
17:	Fixed value output 1	—
18:	Fixed value output 2	—
19:	Fixed value output 3	—
20:	LSP shift selection 2^0 (+1)	0
21:	LSP shift selection 2^1 (+2)	0
22:	LSP shift selection 2^2 (+4)	0
23:	LSP shift selection 2^3 (+8)	0
24:	LSP shift selection 2^4 (+16)	0
25:	LSP shift selection 2^5 (+32)	0
26:	LSP shift selection 2^6 (+64)	0
27:	LSP shift selection 2^7 (+128)	0
28:	LSP shift selection 2^8 (+256)	0
29:	LSP shift selection 2^9 (+512)	0
30:	RSP ratio number selection 2^0 (+1)	0
31:	RSP ratio number selection 2^1 (+2)	0
32:	RSP ratio number selection 2^2 (+4)	0
33:	Computer backup system 1 (through output)	Backup (LSP is PV)
34:	Computer backup system 2 (through output)	Backup (LSP is preset)

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
54	C54	LSP shift width by RSW	0		−10000 to 10000U Supplement The actual shift quantity is the product of this LSP shift width and the total of the LSP shift numbers assigned to RSWs.
55	C55	UF1 key basic register	0		0: Not registered. 1: AUTO/MAN 2: REM/LOC 3: AT 4: RUN/READY 5: Selected from among SP, EV, PARA, PID and SETUP items. Supplement Only one function can be registered in the UF1 to assign "1" to "4". When "5" is assigned, up to four items of C56 to C59 can be registered in the UF1 key.
56	C56	UF1 assigned content 1	0		When C55 = 5, the Guide No. of each set group to be registered plus the following radix are to be set to this setup item. Item : Radix SP : +4000 EV : +4500 PID : +5000 PARA : +5500 SETUP : +6000 Supplement For example, to register LSP0 in UF1, set 4002 (SP radix + Guide No. of LSP0 value = 4000 + 2 = 4002) to one of C56 to 59. If an inexistent number is set to this setup item, it is ineffective. For example, 0 is an inexistent number set at delivery from the factory. Therefore, it is ineffective, and it is not registered in the UF1 key.
57	C57	UF1 assigned content 2	0		
58	C58	UF1 assigned content 3	0		
59	C59	UF1 assigned content 4	0		

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
60	C60	UF2 key basic register	0		0: Not registered. 1: AUTO/MAN 2: REM/LOC 3: AT 4: RUN/READY 5: Selected from among SP, EV, PARA, PID and SETUP items. Supplement Only one function can be registered in the UF2 to assign "1" to "4". When "5" is assigned, up to eight items of C61 to C68 can be registered in the UF1 key. The same contents can be assigned doubly between the UF1 and UF2 keys.
61	C61	UF2 assigned content 1	0		When C60 = 5, the Guide No. of each set group to be registered plus the following numeric are to be set to this setup item. Set group : Addend SP : +4000 EV : +4500 PID : +5000 PARA : +5500 SETUP : +6000 Supplement If an inexistent number is set to this setup item, it is ineffective. For example, 0 is an inexistent number set at delivery from the factory. Therefore, it is ineffective, and it is not registered in the UF2 key.
62	C62	UF2 assigned content 2	0		
63	C63	UF2 assigned content 3	0		
64	C64	UF2 assigned content 4	0		
65	C65	UF2 assigned content 5	0		
66	C66	UF2 assigned content 6	0		
67	C67	UF2 assigned content 7	0		
68	C68	UF2 assigned content 8	0		
69	C69	Basic register of UF LED indication	0		0: Not registered (does not light). 1: Lights when registered in the UF1 or UF2 key. 2: Selected from EV (lights when event ON). 3: Selected from RSW (lights when RSW ON). Supplement When "2" or "3" is assigned in this setup, its contents are registered in C70.

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
70	C70	Assigned contents of UF LED indication	0		When C69=2, 1 to 8 (Event number) When C69=3, 1 to 12 (RSW number)
71	C71	Selection of indication contents of bar graph indicator	0		0: Control output quantity (final output) monitor 1: OK lamp (green belt) 2: Motor opening monitor (only with 2G output provided) 3: Event monitor (4 to 8) 4: RSW monitor (1 to 12)
72	C72	Input broken line approximation	0		0: Not used. 1: Used for AI1. 2: Used for AI2. Supplement A broken line is set in PARA 59 to 80.
73	C73	Unused	--		
74	C74	Unused	--		
75	C75	RSP, C/B selection	0		0: RSP 1: C/B (computer backup) Supplement When the computer backup system is selected in RSW assignment, be sure to set "1" in this setup.
76	C76	Selection of output system of time proportional output	0		0: Turned on again in the cycle. 1: Not turned on again in the cycle (normal output system). Supplement "0" has effect on improvement of the controllability when the cycle time is long. In the heat/cool model, the same contents are applied to the cool side as well.
77	C77	Compensation of thermocouple cold junction	0		0: Internal 1: External

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
78	C78	Action in AI1 disconnection	0		0: Upscale 1: Downscale Supplement Effective for the T/C, RTD, mV and V inputs.
79	C79	Adjustment of voltage output 1	15		2 to 22mA Supplement Usually, the value set at delivery from the factory is applicable.
80	C80	Adjustment of voltage output 2	15		2 to 22mA Supplement Usually, the value set at delivery from the factory is applicable.
81	C81	Extension setting 1	--		
82	C82	Extension setting 2	0		0: Not provided. 1: Provided. Supplement Used for maker service. Usually, kept at 0.
83	C83	Extension setting 3	0		0: Not provided. 1: Provided. Supplement Used for maker service. Usually, kept at 0.
84	C84	Communication address	0		0 to 127 Supplement Communication is disabled when set to 0.
85	C85	Transmission speed and code	0		0: 9600bps. Even parity, 1 stop bit 1: 9600bps. No parity, 2 stop bits 2: 4800bps. Even parity, 1 stop bit 3: 4800bps. No parity, 2 stop bits

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
86	C86	Unused.	– –		
87	C87	Unused.	– –		
88	C88	Unused.	– –		
89	C89	Unused.	– –		
90	C90	Special function 1	0		Used for maker service, and kept at 0.
91	C91	Special function 2	– –		Used for maker service. Usually, not indicated.
92	C92	Special function 3	– –		Used for maker service. Usually, not indicated.
93	C93	Special function 4	– –		Used for maker service. Usually, not indicated.
94	C94	Unused.	– –		
95	C95	Unused.	– –		
96	C96	Hardware type 1	Used for maker service. Indication only, and unchangeable.		
97	C97	Hardware type 2			
98	C98	ROM ID			
99	C99	ROM item			
00	C00	ROM revision			

7-3 Detailed Description of SETUP Items

(Figure in brackets [ ] denotes the set value at delivery from the factory.)

C1: Key lock [0]

Key lock can be applied to all the keys, except for the UF1, UF2 and DISP keys mounted outside the door. When functions are assigned to the UF1 and UF2 keys, their call and setting change can be done even if their function source keys are key-locked. This function is effective when the operator is permitted to make minimum level operation. The lock itself can be called for setting change at any key lock level.

0: Key lock is not provided.
1: The indication and change only of a SETUP item (except for the key lock itself; also same in the following) are disabled.
2: The indication and change of PARA, PID and SETUP items are disabled.
3: The indication and change of SP, EV, PARA, PID and SETUP are disabled.
4: DISP, UF1 and UF2 only can be changed, and all others are disabled.

< Key lock level table >

○ : Operation is enabled.
× : Operation is disabled.
*1 : Key lock only can be operated.

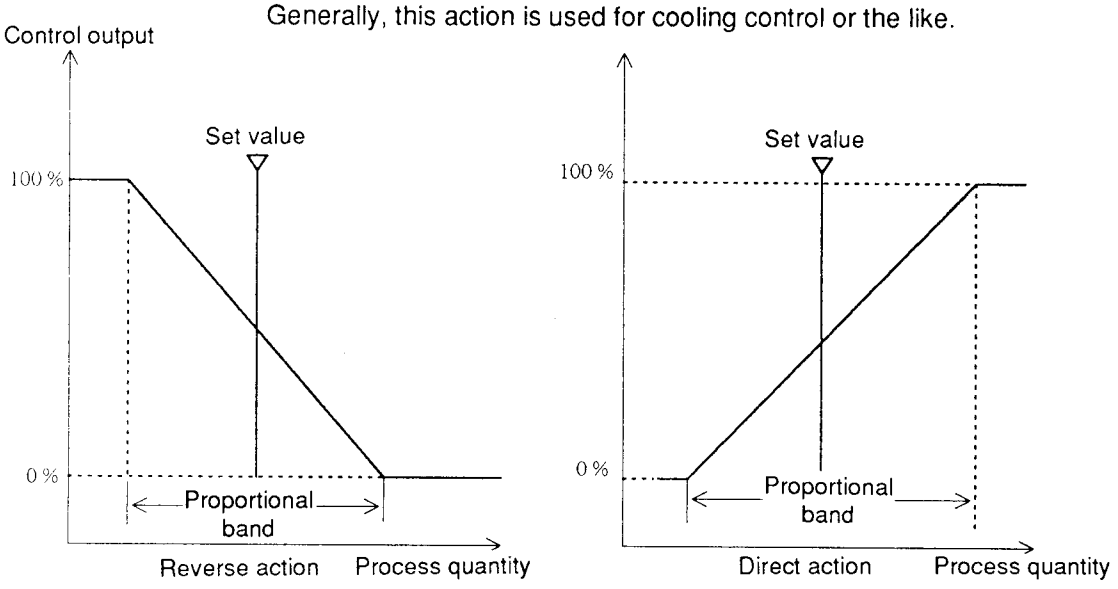
Key / Assignment	SP/EV key	A/M key	R/L key	AT key	PARA key			DISP, UF1, UF2 key
					PARA setting	PID setting	SETUP setting	
0	○	○	○	○	○	○	○	○
1	○	○	○	○	○	○	×*1	○
2	○	○	○	○	×	×	×*1	○
3	×	○	○	○	×	×	×*1	○
4	×	×	×	×	×	×	×*1	○

C2: Control action (master) [0]

The direction of control action is set. In the internal cascade model, the direction of the action on the master side is set. The action can be inverted by an RSW.

0: Reverse action When the process quantity increases, the control output quantity decreases. Generally, this action is used for heating control or the like.

1: Direction action When the process quantity increases, the control output quantity also increases. Generally, this action is used for cooling control or the like.



C3: Control action (slave) [0] Internal cascade model only

The direction of a control action on the slave side of the internal cascade model is set.

The contents are the same as in C3, except for the inversion of the action by an RSW.

0: Reverse action

1: Direction action

C4: Heat/cool output assignment [0] Heat/cool control model only

It is selected how the control output of the heat/cool control model is assigned.

For example, the set value at delivery from the factory is "0" in the AK model. When C2 is set to the reverse action, the heat side output is the current output, and the cool side control is the relay output. However, when this setup is changed into "1", the heat side control is the relay output, and the cool side control is the current output.

0: When C2 = 0 (reverse action), Heat = MV1, Cool = MV2
When C2 = 1 (direct action), Heat = MV2, Cool = MV1

1: When C2 = 0 (reverse action), Heat = MV2, Cool = MV1
When C2 = 1 (direct action), Heat = MV1, Cool = MV2

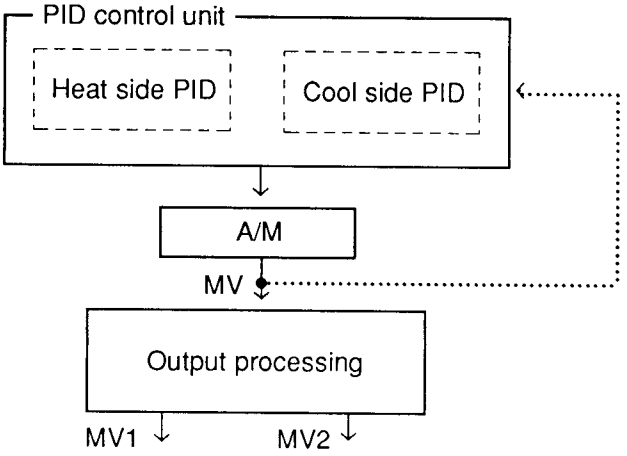
The PID operation method is such that two PID constants are assigned to the heat side and cool side, respectively; when the MV (control output) is 50% or more, the heat side PID constant is used for internal operation; when the MV is less than 50%, the cool side PID constant is used for internal operation. On/off control for P=0 cannot be done in the heat/cool model. The auto tuning cannot also be done. In the internal cascade model, the auto tuning can be done only on the master side, but it cannot be done in any other model.

PID constant group used

Heat side	Cool side	PID group No.
PID0	PID1	0
PID2	PID3	1
PID4	PID5	2
PID6	PID7	3

The heat/cool relation of the internal cascade model is as follows;

Master side	PID group No.
PID 0 to 5	0 to 5
Slave side	PID group
(heat side)	
PID6	– –
(cool side)	
PID7	– –



C5: AI1 (analog input 1) temperature unit [0]

When the input is T/C (thermocouple) or RTD (resistance thermometer bulb), its temperature unit is selected. The contents of the individual ranges are determined by C6 (AI1 input range type) and the PV range number table given on page 1-7 and 1-8.

0: °C (Centigrade)

1: °F (Fahrenheit)

C6: AI1 input range type [0]

AI1 is handled as a PV input in the standard model, remote SP model and internal cascade model. The instrument can cope with any input and range by setting the PV range number given on page 1-7 and 1-8. However, the terminal numbers of the input connection change, depending upon the thermocouple, resistance thermometer bulb, voltage input and current input, the wiring should be changed, referring to the terminal layout given on page 3-5.

If the actual input is smaller or larger than the set input range, it is indicated down to –10% FS or up to +110% FS. Any input out of this indication range is processed as an input overrange.

The SP limit is not interlocked with the contents of a set range, but is independent. Therefore, there is such a case that setting beyond the range can be done. When the range is changed, be sure to reset the SP limit values of C17 and 18.

C7: AI1 linear input decimal point position [Undefined]

Only when the voltage, current input range numbers are set in C6.

In the case of the linear input (voltage, current input), a decimal point position is set for scaling.

0: x x x x x
1: x x x x. x
2: x x x. x x
3: x x. x x x
4: x. x x x x

C8: AI1 linear input low limit [Undefined] Only when the voltage, current input range numbers are set in C6.

−19999 to 26000U

In the case of the linear input (voltage, current input), the low limit value is set for scaling.

For example, when the 4 to 20mA input (Range No. 64) is selected, and the contents of the output side of 4mA are 0.000, set "3" in C7 to determine the decimal point position, and at the same time, set and input 0.000 with keys.

C9: AI1 linear input high limit [Undefined] Only when the voltage, current input range numbers are set in C6.

In the case of the linear input (voltage, current input), the high limit is set for scaling.

For example, when the contents are the same as the example of C8, and 20mA is 14.000, set and input 14.000 with keys.

The numerics of C8 and C9 are free in magnitude relation, so C8 > C9 is permitted for setting. In the above example, 14.000 and 0.000 can be set for the 4mA input and 20mA input, respectively.

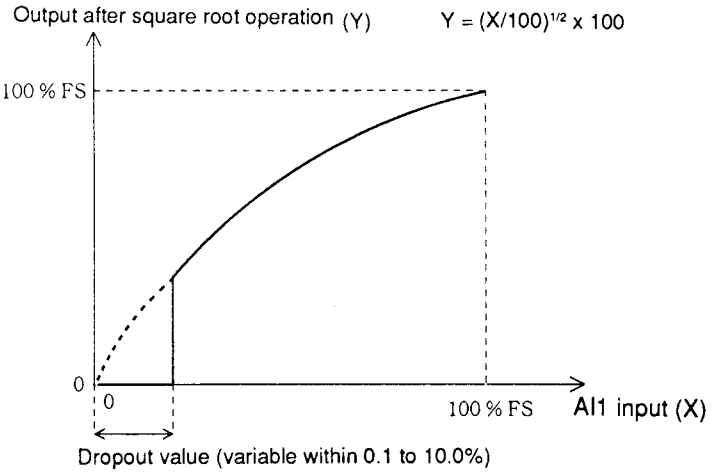
C10: AI1 linear input square root operation and dropout [0.0]

Only when the voltage, current input range numbers are set in C6.

In the case of the linear input (voltage, current input), a square root operation can be done. At the same time, a dropout value in the square root operation is set.

0.0: Square root operation is not provided.

0.1 to 10.0% FS: Square root operation is provided. At the same time, a dropout value (0.1 to 10.0%) is set.



Scaling processing is executed after the square root operation. However, when the square root operation is provided, a dropout value cannot be set to 0.0%

C11: AI2 (analog input 2) input type [0] Remote SP model, and internal cascade model only

AI2 is set in the remote SP model and internal cascade model.

In the remote SP model, AI2 is processed as a remote set point (RSP). In the internal cascade model, it is processed as the second PV input (PV2).

The following two input types only are available. When the input type is changed, the terminal numbers of the input connection are also changed. Refer to the terminal layout given on page 3-5.

0: 4 to 20mA

1: 1 to 5V

C12: AI2 decimal point position [0] Internal cascade model only

0: x x x x x

1: x x x x. x

2: x x x. x x

3: x x. x x x

4: x. x x x x

In the case of the remote SP model, the decimal point position of AI1 is used as it is as that of AI2.

C13: AI2 input low limit [0] Remote SP model, and internal cascade model only

−19999 to 26000U

C14: AI2 input high limit [0] Remote SP model, and internal cascade model only

−19999 to 26000U

The numerics of C13 and C14 are free in magnitude relation.

C15: AI2 square root operation and dropout [0.0] Remote SP model, and internal cascade model only

0.0: Square root operation is not provided.

0.1 to 10.0% FS: Square root operation is provided. At the same time, a dropout value is set.

C16: LSP setting system [0]

There are an LSP (local SP) and an RSP (remote SP) as SPs in the remote SP model and internal cascade model. It is set in this setup item whether only one LSP or more than one LSP (8 LSPs) are to be used. When the set values are decided by the control object, more than one LSP can be conveniently used without a setting change trouble. The PID number can be changed by key operation, except for the case where "3" is set in this setup, thus permitting all assignments using RSWs as well.

0: Only one LSP is used. The SP value can be changed usually. After changing the numeric with  key, press the ENT key, then the LSP value will be changed for the first time.

1: One LSP is used as in "0" above, but the direct change system is used to change the LSP value. In the direct change system, the LSP value is changed directly and internally at the same time as the numeric is changed with  keys. However, if the DISP key is pressed as it is without pressing the ENT key, the LSP value is reset to the value before pressing  keys. Therefore, be sure to press the ENT key finally to settle the LSP value.

The LSP direct change function has priority over the LSP ramp function, and the SP being indicated is taken in as an internal LSP as it is. This direct change system is effective to check a PV changing status while changing an LSP little by little, or to prevent an LSP from being changed suddenly.

2: 8 LSPs are used. The PID group number used can be changed by operating the SP/EV key. When the model is not provided with an RSW option, or it is provided with an RSW option, but the LSP selection is not assigned to any RSW, all 8 LSPs can be changed from the console. When the LSP selection is assigned to an RSW, the LSP group cannot be changed from the cnsole, since the RSW has priority. However, the LSP value can be changed.

3: 8 LSPs are used. This setting permits only the selection of an LSP group to be executed from the console or by an RSW, but inhibits the change of the LSP value and PID group. Therefore, this is used when the LSP value or PID group is not desired to be changed carelessly.

C17: Low limit of SP limit [−19999]

This setup decides the low limit values of the LSP and RSP. Use it when the SP value is not desired to be lower than this value. This function is effective for both LSP and RSP.

Since this value is kept unchanged when the range is changed, be sure to set a necessary value to assure safety.

C18: High limit of SP limit [26000]

The high limit value of the LSP and RSP is decided. Use this setup item when the SP value is not desired to be higher than this value. This function is effective for both LSP and RSP.

Even when the range is changed, this value is kept unchanged. For example, when the high limit of the range is 1200.0°C, 2600.0°C can be used with the set value at delivery from the factory kept as it is. Be sure to set a necessary value for this setup to assure safety.

C19: At AI overrange, contents selection of control output (MV) [0]

The control output quentity in the case where the AI1 or AI2 input causes an overrange (110% FS min) can be set in advance to the set value in C20. This setup is used to make this processing selectively when either input causes an overrange.

Particularly, when a burnout upscale is set in the T/C or RTD input range, or the mV input range is applied, an overrange occurs if the input is disconnected. This setup is used when the control output quantity is to be decided in advance so as be set to the safety side in such cases.

0: Not provided. The control output is continued, and its quantity is determined by the input indication value and internal operation (PID, etc.).

1: When AI1 causes an overrange, the quantity set in C20 is output.

2: When AI2 causes an overrange, the quantity set in C20 is output.

3: When either or both of AI1 and AI2 cause an overrange, the quantity set in C20 is output.

C20: At AI overrange, setting of control output quantity [0]

When the input selected in "1" to "3" of C19 causes an overrange, the control output quantity set in this setup is output.

–10 to 110%

In the heat/cool output model, the same value is output as MV1 and MV2.

C21: Manual change mode [0]

When the manual operation is to be done by the AUTO/MAN key on the console, or the AUTO/MANUAL selection of the Function No. 2 assigned to an RSW, the control output method is selected by this setup. Even when either case is used, the following manual output can be changed from the console.

0: Bumpless (the present output is held)

1: Preset (the set value in C22 is output)

When MANUAL is reset to AUTO, the control operation starts with the present output value.

Even when the fixed-value output of Function No. 17 to 19 is assigned to RSW, the MANUAL change has priority over these functions. It also has priority over the READY mode output.

C22: Preset MANUAL value [0]

The output value in the case where "1" (preset) is selected in C21 is set in this setup. If power failure occurs on the course of the MANUAL output change from the console, the set value in C22 is output after power recovery irrespective of option in C21.

–10 to 110%

C23: Fixed value output 1 by RSW [0] Only when RSW (OP) is provided

The fixed value output 1 in the case where Function No. 17 is assigned to an RSW is set in this setup item.

–10 to 110%

C24: Fixed value output 2 by RSW [0] Only when RSW (OP) is provided

The fixed value output 2 in the case where Function No. 18 is assigned to an RSW is set in this setup item.

–10 to 110%

C25: Fixed value output 3 by RSW [0] Only when RSW (OP) is provided

The fixed value output 3 in the case where Function No. 19 is assigned to an RSW is set in this setup item.

–10 to 110%

C26: Setting of control output quantity in READY mode [0]

The control output quantity in the READY mode is set in this setup item. In the heat/cool model, this functions as the control output on the heat side in the READY mode.

–10 to 110%

C27: Setting of cool side control output quantity in READY mode [0] Heat/cool model only

The control output quantity on the cool side in the READY mode of the heat/cool model is set in this setup.

–10 to 110%

C28: Event in READY mode [0]

The contents of an event action in the READY mode are selected in this setup. The non-action of an event can be selected only in this setup. The event action is enabled in any other case such as during the MANUAL operation or fixed value output.

0: Event action is enabled even in the READY mode.

1: Event action is disabled in the READY mode.

C29: Setting of internal RSP 0% [0] Internal cascade model only

In the internal cascade model, the scaling 0% value of I-RSP is set in this setup. The slave side RSP is connected with the master side control output internally.

–19999 to 26000U

The decimal point position is determined by the setting of AI (analog input) corresponding to the slave side input. For example, when –100 is set in the case of the decimal point position x x x x. x, the 0% value of the actual RSP is –10.0.

C30: Setting of internal RSP 100% [10000] Internal cascade model only

In the internal cascade model, the scaling 100% value of I-RSP is set in this setup.

–19999 to 26000U

The decimal point position is determined by the setting of AI (analog input) corresponding to the slave side input. For example, when 12000 is set in the case of the decimal point position x x x x. x, the 100% value of the actual RSP is 1200.0.

C31: AI1 and AI2 exchange [0]

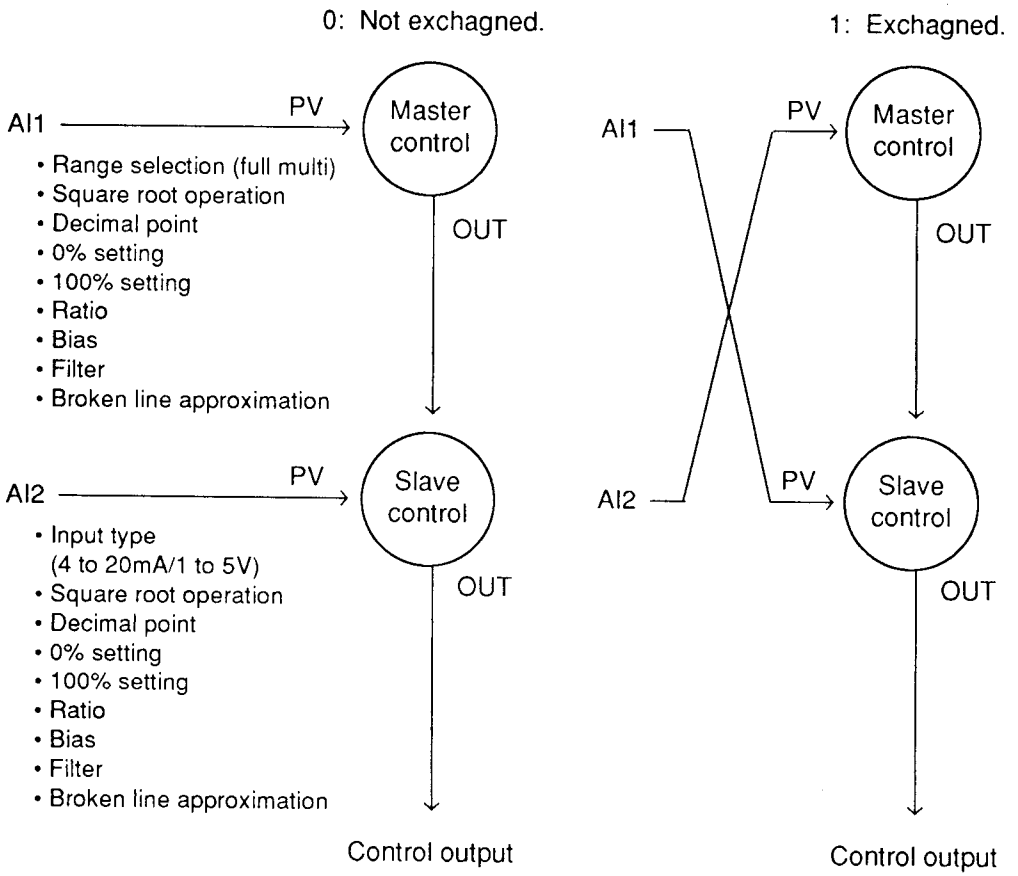
Internal cascade model only

It is selected in this setup whether each analog input of AI1 or AI2 is to be assigned as a master control PV or as a slave control PV in the internal cascade model.

0: Not exchanged (AI1 = Master control PV, AI2 = Slave control PV)

1: Exchanged (AI1 = Slave control PV, AI2 = Master control PV)

Particularly, since AI1 is of a full multi input type, a temperature converter can be omitted by selecting "1" (exchanged) in such an application that the slave control PV input is T/C or RTD, and the master control PV input is 4 to 20mA or 1 to 5V.



Since this exchange is executed internally, the connection of the input terminals need not be done.

C32: Type of auxiliary output 1 (AUX1) [0]

Only when the auxiliary output 1 (OP) is provided

The output contents of the auxiliary output (4 to 20mA) 1 are selected in this setup.

■ Standard model and external cascade model

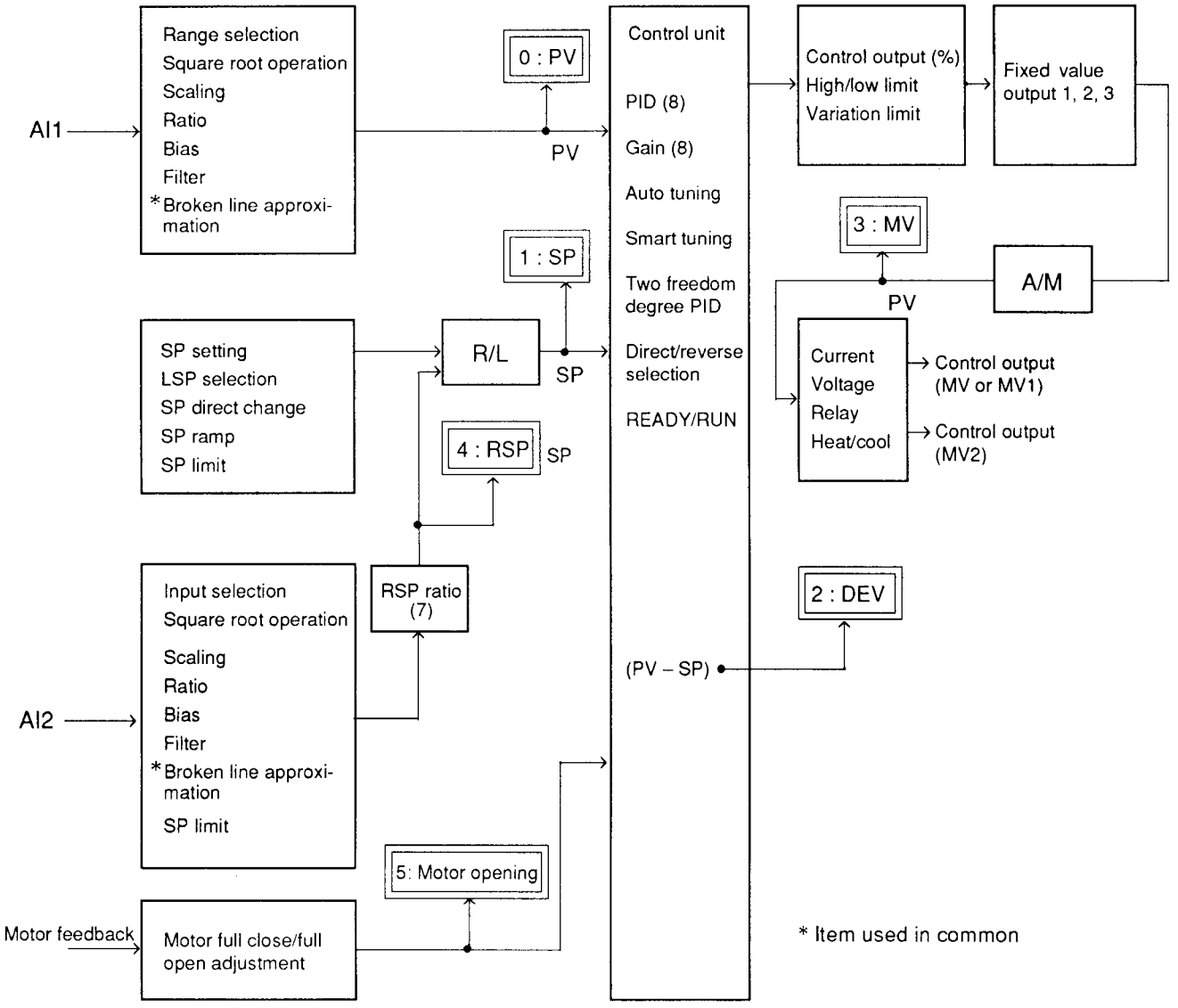
0: PV
1: SP
2: DEV
3: MV
4: RSP
5: Motor opening (MFB)

■ Internal cascade model

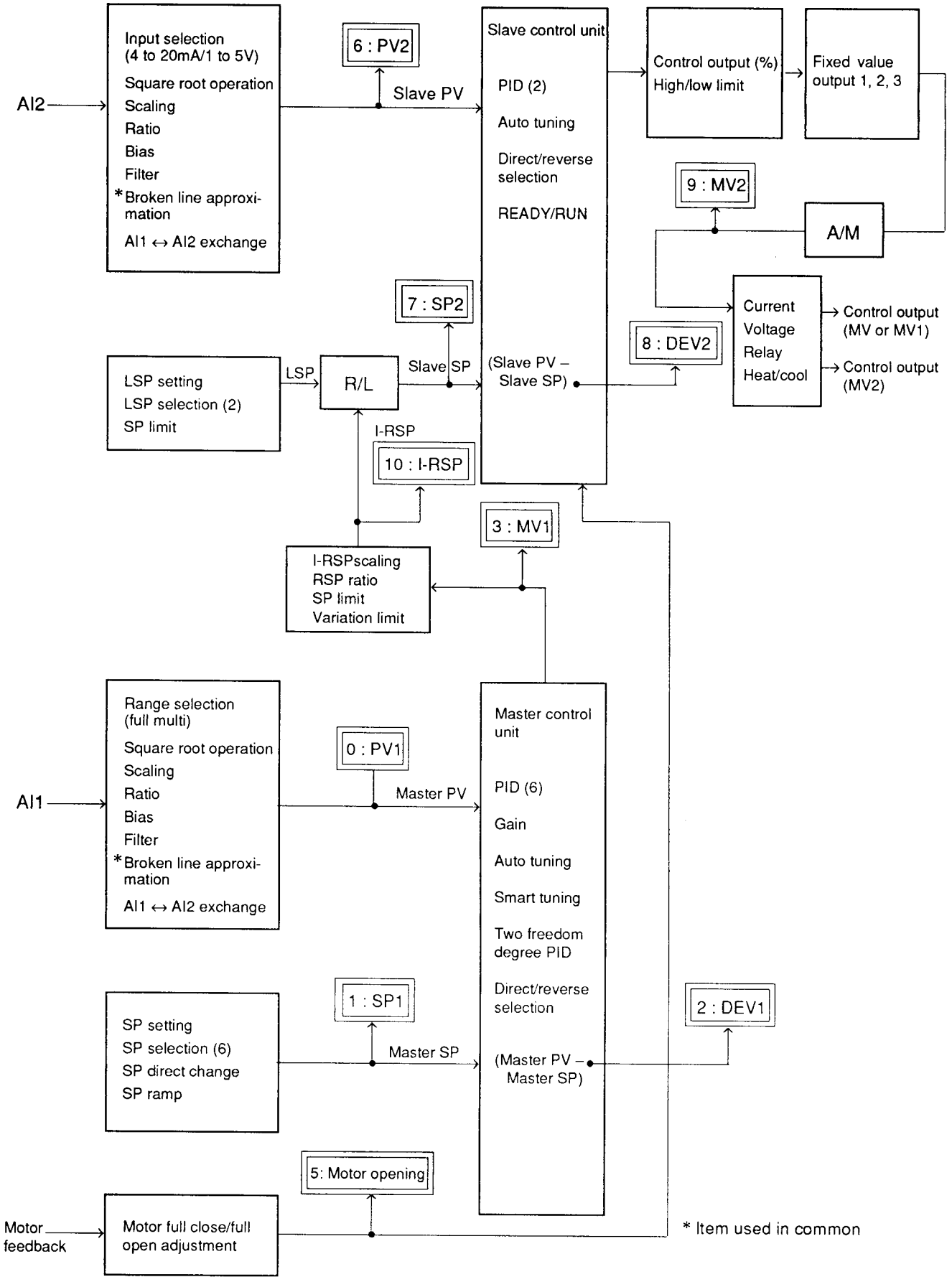
0: PV of master control (PV1)
1: SP " (SP1)
2: DEV " (DEV1)
3: MV " (MV1)
4: ···
5: MFB
6: PV of slave control (PV2)
7: SP " (SP2)
8: DEV " (DEV2)
9: MV " (MV2)
10: Internal RSP (I-RSP)

The individual output values are positioned as shown below.

■ Standard model and remote SP model



■ Internal cascade model



C33: Auxiliary output 1 4mA setting [0% FS] Only when the auxiliary output 1 (OP) is provided

C34: Auxiliary output 1 20mA setting [100% FS] Only when the auxiliary output 1 (OP) is provided

Scaling for the auxiliary output. This scaling can be set optionally within the following ranges. Expansion, shrinkage and reverse scaling can also be executed. The numerics of C33 and C34 are free in magnitude relation.

−19999 to 26000U

−1999.9 to 2600.0U (MV, motor opening)

Example 1: When the 0.0 to 1000.0°C of PV (K: 0.0 to 1200.0°C) are to be output as 4 to 20mA, set the numerics in C33 and C34 as follows;

C33 → 0

C34 → 10000

Example 2: When the MV (0 to 100%) is to be output reversely with 100% as 4mA, and 0% as 20mA, set the numerics in C33 and C34 as follows;

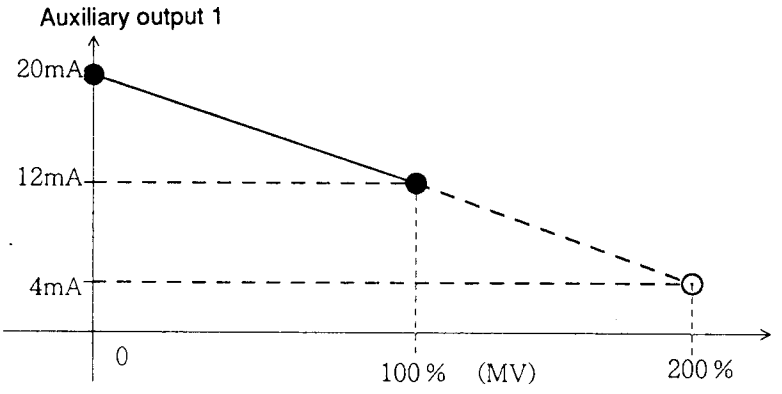
C33 → 100.0

C34 → 0.0

Example 3: When the MV is to be output with 100% as 12mA and 0% as 20mA in Example 2, set the follow-ing values in C33 and C34 since 200% is obtained if the MV at 4mA is found imaginarily.

C33 → 200.0

C34 → 0.0



C35: Auxiliary output 1 Output in READY mode [0] Only when the auxiliary output 1 (OP) is provided

The output system in the READY mode is selected in this setup.

0: Bumpless (The present output is held.)

1: Preset (The set value in C36 is output.)

C36: Auxiliary output 1 Setting of preset output quantity in READY mode [0]

Only when the auxiliary output 1 (OP) is provided

The output quantity in the case where the READY mode is set with C35 = 1 is set in industrial unit in this setup. The actual current output value is related with the settings of C33 and C34.

−19999 to 26000U

−1999.9 to 2600.0U (MV, motor opening)

For example, when 12mA is to be output in the READY mode in Example 1 of C34, set 5000 in this setup.

C37: Type of auxiliary output 2 (AUX2) [0] — Only when the auxiliary output 2 (OP) is provided
C38: Auxiliary output 2 (AUX2) 4mA setting [0% FS] — "
C39: Auxiliary output 2 (AUX2) 20mA setting [100% FS] — "
C40: Auxiliary output 2 (AUX2) Output in READY mode [0] — "
C41: Auxiliary output 2 (AUX2) Setting of preset output quantity in READY mode [0] — "

The contents of these setup items are equivalent to C32 to C36. The auxiliary output 1 and auxiliary output 2 are isolated from each other, so double setting can also be done.

C42:	RSW1 assignment	[0]	Only when the RSW (OP1) is provided
C43:	RSW2 assignment	[0]	"
C44:	RSW3 assignment	[0]	"
C45:	RSW4 assignment	[0]	"
C46:	RSW5 assignment	[0]	Only when the RSW (OP2) is provided
C47:	RSW6 assignment	[0]	"
C48:	RSW7 assignment	[0]	"
C49:	RSW8 assignment	[0]	"
C50:	RSW9 assignment	[0]	"
C51:	RSW10 assignment	[0]	"
C52:	RSW11 assignment	[0]	"
C53:	RSW12 assignment	[0]	"

Various actions can be selected and set by RSWs. The hold time of 200msec min is required to detect RSW ON or OFF.

The hold time of 1sec min is required to read the selection of LSP, PID, and AI2 Ratio No. This is intended to prevent malfunction from being caused by chattering.

The auto tuning starts and stops by detecting a change from OFF to ON. In this case, the hold time of 500msec min is required to detect ON. When restarting the auto tuning, turn OFF the RSW once.

When RUN/READY, AUTO/MANUAL, and REMOTE/LOCAL selection, LSP number selection and PID number selection are assigned to RSWs, these functions cannot be activated from the console.

If the same function, which causes a trouble when used doubly, is assigned to more than one RSW, the RSW having a younger number becomes effective, and the others have NOP function. A weight function such as 2° can be used doubly. However, when there is not a function (number) relevant to the sum of its weight numbers, this is equivalent to the selection of "0". The NOP function is totally effective when assigned to more than one RSW.

(Continuation of RSW assignment)

Each function of the RSW assignment is described below. In this description, [/] denotes (when the external contacts are closed) / (when the external contacts are open), and [–] indicates to have no effect on the operation.

0: NOP/–

NOP has no effect on the actual control or action, but it can be read on the host side only by the communication. Therefore, it can be used to obtain the contact input information by the host computer, or the like without affecting the control or action.

1: READY/RUN

The same contents as the RUN/READY selection function of the first PARA item can be executed. When this function is assigned, the RUN/READY selection operation cannot be done from the console.

2: MANUAL/AUTO

The same operations as the A/M key can be done. When this function is assigned, the AUTO/MAN key is ineffective.

3: REMOTE/LOCAL

The same operation as the R/L key can be done. When this function is assigned, the REMOTE/LOCAL key is ineffective.

4: AUTO TUNING Start/AUTO TUNING Stop

The AUTO TUNING is started by detecting an off to on (500msec min) change of an RSW. During the AUTO TUNING, the RSW must be kept on continuously. To interrupt the AUTO TUNING, turn off (500msec min) the RSW.

5: Inversion of control action/as set in C2

This setting is used when the heat source (heating source, cooling source) is changed over according to the season (summer, winter) in the temperature control of an air conditioner, or the like. In the internal cascade model, the slave side control action is not inverted, but the master side control action is inverted.

6: Undefined –/–
7: Undefined –/–
8: Undefined –/–
9: Undefined –/–

This assignment has no effect on any control or action.

10: LSP number selection 2^0 (+1)/LSP number selection 0
11: " 2^1 (+2)/ " 0
12: " 2^2 (+4)/ " 0

When C16 = 2 or 3, more than one LSP can be selected by RSWs.
(When C16 = 0 or 1, the assignment of this function is ignored.)
An LSP is selected by the sum of weight numbers of an assigned RSW. When the same weight is assigned to another RSW, the sum of the weight numbers can also be obtained.
The sum 0 to 7 of weight numbers corresponds to LSP No. 0 to LSP No. 7, respectively.

If the sum of weight numbers exceeds 8, LSP No. 0 is selected.

When each set value of an LSP is changed, only that, which can be used by the assigned RSW, is indicated.

Example 1: When two LSP Nos. 0 and 1 are selected;

RSW to which 10 (+1/0) is assigned	×	○
Sum of weight numbers	0	1
LSP No.	0	1

(×: Contact off, ○: Contact on)

Example 2: When eight LSP Nos. 0 to 7 are selected;

RSW to which 10 (+1/0) is assigned	×	○	×	○	×	○	×	○
RSW to which 11 (+2/0) is assigned	×	×	○	○	×	×	○	○
RSW to which 12 (+4/0) is assigned	×	×	×	×	○	○	○	○
Sum of weight numbers	0	1	2	3	4	5	6	7
LSP No.	0	1	2	3	4	5	6	7

The same result can also be obtained by making assignment doubly as shown below. In this case, however, the number of RSWs used must be many.

RSW to which 10 (+1/0) is assigned	×	○	○	○	○	○	○	○
"	×	×	○	○	○	○	○	○
"	×	×	×	○	○	○	○	○
"	×	×	×	×	○	○	○	○
"	×	×	×	×	×	○	○	○
"	×	×	×	×	×	×	○	○
"	×	×	×	×	×	×	×	○
Sum of weight numbers	0	1	2	3	4	5	6	7
LSP No.	0	1	2	3	4	5	6	7

13: PID number selection +1/PID number selection 0

14: " +2/ " 0

15: " +4/ " 0

(Continuation of RSW assignment)

The number of built-in PID groups is eight (No. 0 to No. 7). PID Group No. 0 cannot be selected by any RSW. When all the assigned RSWs are off, the PID number set by the SP/EV key (interlocked with SP number) is selected.

The selection by an RSW has priority over the PID number interlocking with SP number.

The PID is selected by the sum of the weight numbers of the assigned RSW.

When the same weight is assigned to another RSW, the sum of its weight numbers can also be obtained. If the sum of the weight number exceeds 8, the PID number (interlocking with SP number) set by the SP/EV key is selected.

Example 1: When PID1, which is being used for SP1 by interlocking, is changed over to PID2 by the RSW.

RSW to which 14 (+2/0) is assigned	×	○
Sum of weight numbers	0	2
PID No.	1	2

(×: Contact off, ○: Contact on)

(Interlocking with SP)

Example 2: When PID1, which is being used for SP1 by interlocking, is changed over to PID2 to 7 by the RSW according to the condition.

RSW to which 13 (+1/0) is assigned	×	○	×	○	×	○	×	○
RSW to which 14 (+2/0) is assigned	×	×	○	○	×	×	○	○
RSW to which 15 (+4/0) is assigned	×	×	×	×	○	○	○	○
Sum of weight numbers	0	1	2	3	4	5	6	7
LSP No.	0	1	2	3	4	5	6	7

(Interlocking with SP)

PID No. 1 selected by RSW. This is not changed since it is the same as the SP interlocking number.

To check what PID group number is selected by the RSW, press the PARA key in the RUN mode, and press the ENT key with [PID] indication. The PID group being then used is indicated at first.

16: S–LSP7/S–LSP6

It is determined which slave side LSP is to be selected in the internal cascade model. This selection can be done only by the RSW, and it is effective only by this assignment.

17: Fixed value output 1 (set value in C23) / –

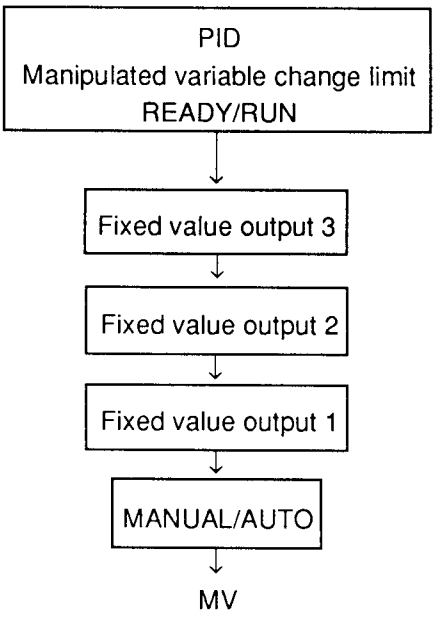
18: Fixed value output 2 (set value in C24) / –

19: Fixed value output 3 (set value in C25) / –

(Continuation of RSW assignment)

The fixed values set in C23 to C25 in advance can be output. The priority relation between the READY/RUN and MANUAL/AUTO is as follows;

The fixed value output has priority over the PID control or the READY mode output. Among the fixed value outputs, the fixed value output 1 has the highest priority. In any case, the manual operation has the highest priority.



Even when the fixed value is output, the event function is effective. When the fixed value selection is all off and the RUN and AUTO modes are selected, the result of PID operation is output in the bumpless mode.

The manipulated variable change limit is not activated at each changeover time.

20: LSP shift number 2^0 (+1) / 0

21: LSP shift number 2^1 (+2) / 0

22: LSP shift number 2^2 (+4) / 0

23: LSP shift number 2^3 (+8) / 0

24: LSP shift number 2^4 (+16) / 0

25: LSP shift number 2^5 (+32) / 0

26: LSP shift number 2^6 (+64) / 0

27: LSP shift number 2^7 (+128) / 0

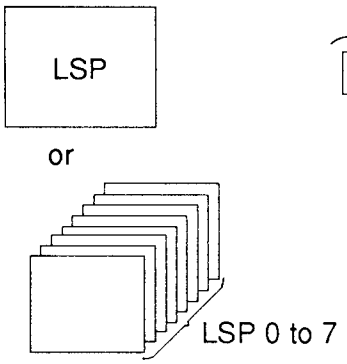
28: LSP shift number 2^8 (+256) / 0

29: LSP shift number 2^9 (+512) / 0

The LSP shift of 20 to 29 is assigned to an RSW, and the sum of the individual weight numbers (20 to 29) caused by the on/off of the RSW corresponds to the LSP shift number. The product of this LSP shift number and the LSP shift width set in C54 becomes the LSP shift quantity, and this is added to the LSP being executed (subtracted, depending upon setting in C54). The base LSP may be set from the console or may be selected by an RSW, but it cannot be added to the RSP. The SR ramp function also has effect on the LSP shift.

(Continuation of RSW assignment)

The LSP shift quantity is not stored in the memory.



LSP shift quantity

LSP shift number (C20 to 29) x SP shift width (C54) = Execution LSP

	↓		↓		↓		
Example 1:	100.0°C	+	192 ($2^6 + 2^7$)	x	0.1	=	119.2°C

The same result can be obtained by using the same shift number doubly as shown below.

Example 2:	100.0°C	+	192 ($2^6 + 2^6 + 2^6$)	x	0.1	=	119.2°C

30: RSP ratio number selection +1/0

31: RSP ratio number selection +2/0

32: RSP ratio number selection +4/0

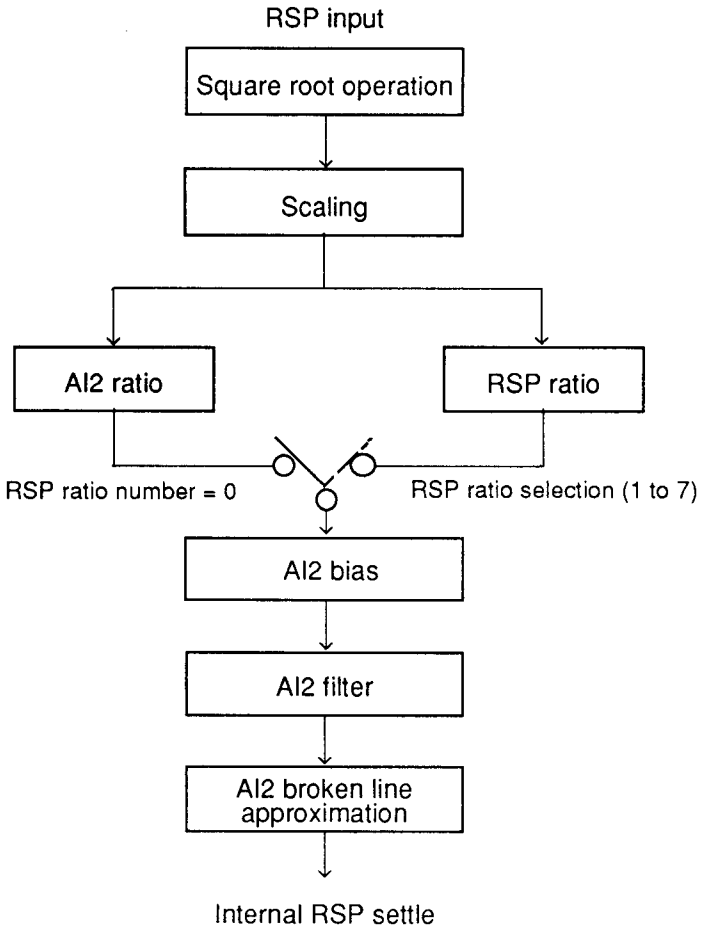
The RSP ratio is a function peculiar to the remote SP model and internal cascade model, and it is also used for gain setting in these models. Either ratio setting or gain setting is selected by Guide No. 49 of the PARA setting. Further, the seven ratio values of ratio 1 to ratio 7 are set within the range of 0.001 to 30.000 by Guide Nos. 50 to 56 of the PARA setting.

The RSP ratio is selected by the sum of the weight numbers of the assigned RSW. When the same weight is assigned to another RSW, the sum of its weight numbers can also be obtained.

The sum 1 to 7 of the weight numbers correspond to Ratio Nos. 1 to 7, respectively. When none is selected, the sum of the weight numbers becomes 0, and the RSP ratio selection function is ineffective. If the sum of the weight numbers exceeds 8 on the contrary, none is identified to be selected, and the RSP ratio selection function is also ineffective.

The ratio can be set to AI2 evenly by Guide No. 6 (AI2 ratio) of the PARA setting. When the RSP ratio number is selected with respect to this AI2 ratio, the RSP ratio is selected in priority as shown in the figure below. Unless the RSP ratio number is selected (when 0), the AI2 ratio is selected.

(Continuation of RSW assignment)



33: Computer backup system 1/MV signal output from host

34: Computer backup system 2/MV signal output from host

The computer backup is a function peculiar to the remote SP model. Usually, the control output of the host computer is output as it is. If the host computer is down, the control is maintained by RSW changeover. At this time, the output is of a bumpless type (only in system 1). Both computer backup systems 1 and 2 cannot be assigned simultaneously.

Computer backup system 1:

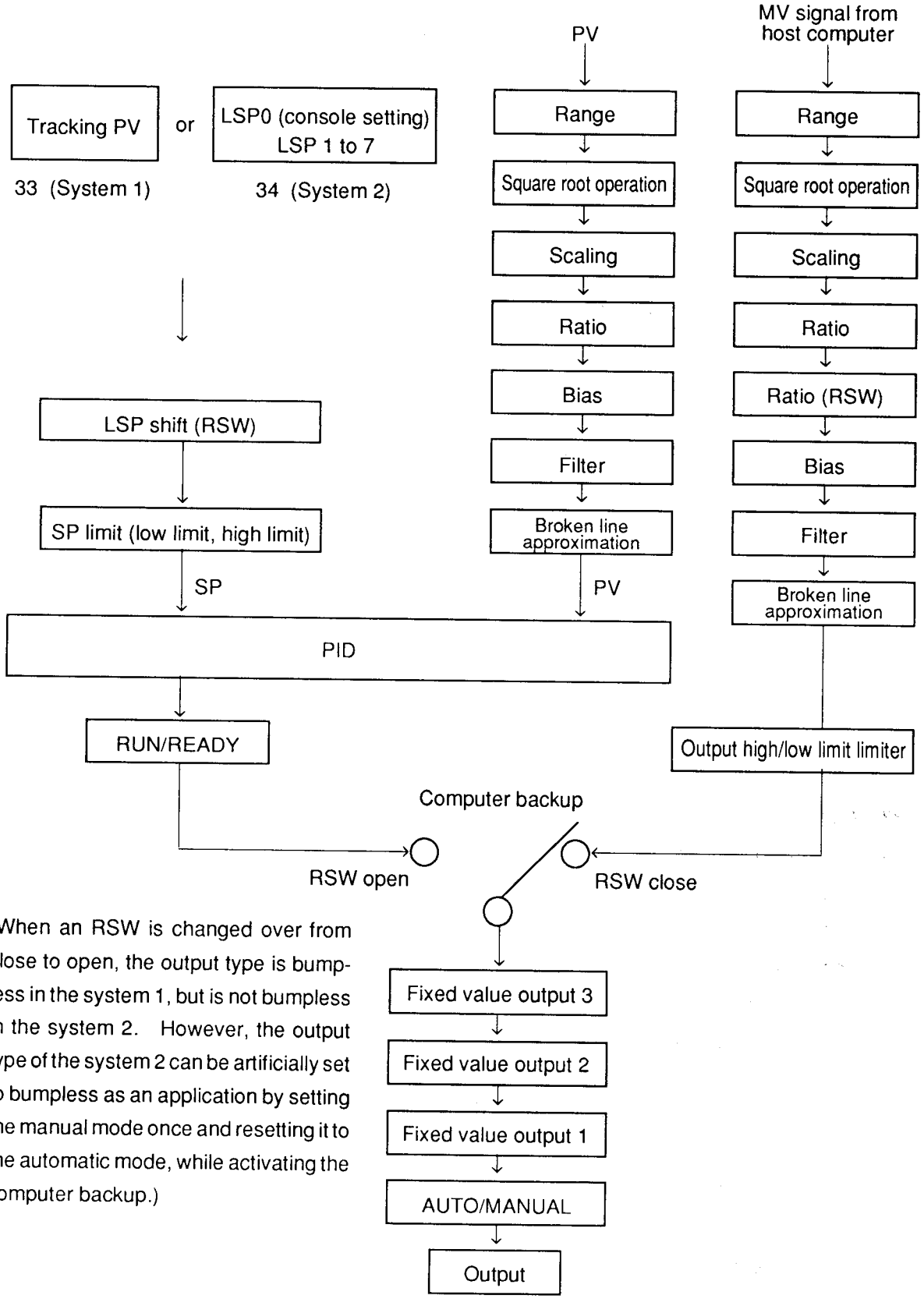
The present PV value is used as an LSP to continue the control. However, the PV written in the LSP is restricted by the SP limit value. The PV ramp function is activated as usual. The output type is bumpless.

Computer backup system 2:

The LSP set from the console or that selected by an RSW is used as an SP to continue the control. The output type is not bumpless. In particular, the deviation output of |SP – PV| is bumped.

Both computer backup systems 1 and 2 do not function, unless "1" (C/B) is set in C75. The REMOTE/LOCAL selection function is ineffective when the computer backup is assigned.

(Continuation of RSW assignment)



(When an RSW is changed over from close to open, the output type is bumpless in the system 1, but is not bumpless in the system 2. However, the output type of the system 2 can be artificially set to bumpless as an application by setting the manual mode once and resetting it to the automatic mode, while activating the computer backup.)

C54: LSP shift width by RSW [0] Only when RSW (OP) is provided

The shift width is set in this setup when the LSP shift is assigned to an RSW in C42 to C53.

−19999 to 10000U

C55: UF1 key basic register [0]

The contents assigned can be called and changed even in key lock status. Double assignment can be done to the UF1 key and UF2 key.

0: Not registered
1: Same as the AUTO/MAN key
2: Same as the REM/LOC key
3: Same as the AT key
4: Same as the RUN/READY function
5: Selection from among SP, EV, PARA, PID, and SETUP items

In assignment of "1" to "4". only one function can be registered in the UF1 key. The contents of the "4" assignment are the same as "5" is selected and C01 of the PARA setting is selected. When "5" is assigned, up to four items of C56 to C59 can be registered.

C56: UF1 assigned content 1 [0]
C57: UF1 assigned content 2 [0]
C58: UF1 assigned content 3 [0]
C59: UF1 assigned content 4 [0]

When C55 = 5, Guide No. of each setup to be registered plus the following radix are to be set in this setup. If an inexistent item number is set, this is ineffective, and non operation is done. For example, "0" set at delivery from the factory is an inexistent number, so it is ineffective.

SP radix; + 4000, EV radix; + 4500, PID radix; + 5000, PARA radix; + 5500,
SETUP radix; + 6000

Example: When LSP0 is registered in FU1;
4002 (SP radix + LSP0 value Guide No. = 4000 + 2 = 4002) is set in C56 with C55 = 5.

C60: UF2 key basic register [0]

The contents assigned can be called and changed even in key lock status. Double assignment can be done to the UF2 key and UF1 key. The assigning method and contents of the UF2 key are the same as in the UF1 key, but up to 8 items can be assigned to the UF2 key.

0: Ineffective (does not function)
1: Same as the AUTO/MAN key
2: Same as the REM/LOC key
3: Same as the AT key

4: Same as the RUN/READY function

5: Selection from among SP, EV, PARA, PID, and SETUP items

In assignment of "1" to "4". only one function can be registered in the UF1 key. The contents of the "4" assignment are the same as "5" is selected and (RUN/READY selection) of the PARA setting is selected. When "5" is assigned, up to four items of C61 to C68 can be registered.

C61: UF2 assigned content 1 [0]

C62: UF2 assigned content 2 [0]

C63: UF2 assigned content 3 [0]

C64: UF2 assigned content 4 [0]

C65: UF2 assigned content 5 [0]

C66: UF2 assigned content 6 [0]

C67: UF2 assigned content 7 [0]

C68: UF2 assigned content 8 [0]

When C60 = 5, Guide No. of each setup to be registered plus the following radix are to be set in this setup. If an inexistent item number is set, this is ineffective, and non operation is done.

SP radix; + 4000, EV radix; + 4500, PID radix; + 5000, PARA radix; + 5500, SETUP radix; + 6000

Example: When the EV1 set value is registered in UF2;
4501 (EV radix + EV1 set value Guide No. = 4500 + 1 = 4501) is set in C61 with C60 = 5.

C69: Basic register of UF LED indication [0]

It is selected in this setup when the UF LED (one) will light.

0: Not registered (does not light)

1: Lights when there is an item which is registered in the UF1 or UF2 key.

2: EV (lights when an event is on)

3: RSW (lights when RSW is on)

When "2" or "3" is selected, its contents are to be registered in C70.

C70: Assigned contents of UF LED indication [0]

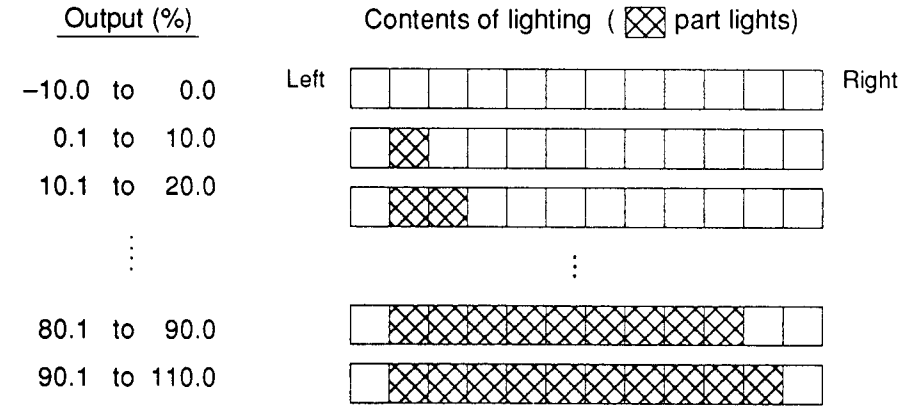
When "2" or "3" is selected in C69, its contents are registered in C70. When C69 = 2, the EV number (1 to 8) to be lighted is registered. When C69 = 3, the RSW number (1 to 12) to be lighted is registered. Although the settable range is within 0 to 255, the setting of any other than the above-mentioned numerics is ineffective, and it does not cause the UF LED to be lighted.

C71: Selection of indication contents of bar graph indicator [0]

The indication contents of the 12-segment bar graph indicator can be selected from among the following items in this setup.

0: Output monitor (OUT monitor)

The bar graph content LED (OUT LED) lights. Among the 12 segments, one each end segment of the left and right is not used, but the remaining 10 segments are lighted by the output (%) as shown below.



1: OK lamp (green belt)

The bar graph content LED (OUT LED) goes out.

When the instrument is in the READY mode, one second on and one second off are repeated alternately.

The READY mode indication is enabled only in this assignment, but it is disabled in any other assignment.

When the following conditions are all satisfied in the RUN mode, all the 12 segments light.

- (SP – Low limit of green belt) ≤ PV ≤ (SP + High limit of green belt)
- The above continues for 5sec min.
- An alarm (AL) does not occur.

There is no hysteresis between the on and off of the OK lamp. This lamp goes out when the deviation exceeds the set value.

2: Motor opening monitor (MFB monitor in the 2G model only)

The bar graph content LED (OUT LED) goes out.

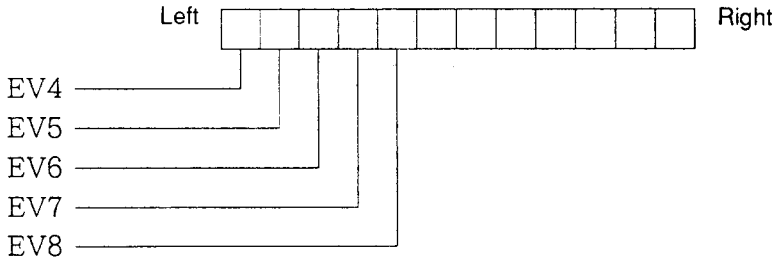
This LED lights according to the feedback (MFB) signal from the motor, as shown below

MFB (%)	Contents of lighting (▨ part lights)
to 0.0%	Left ▨□□□□□□□□□□ Right
0.1 to 10.0	▨▨□□□□□□□□□□
10.1 to 20.0	▨▨▨□□□□□□□□□
⋮	⋮
80.1 to 90.0	▨▨▨▨▨▨▨▨▨▨▨□□
90.1 to 110.0	▨▨▨▨▨▨▨▨▨▨▨▨□
100.1 to	▨▨▨▨▨▨▨▨▨▨▨▨▨

3: Event monitor (EV monitor)

The bar graph content LED (OUT LED) goes out.

The events 4 to 8 are assigned to the five segments, starting with the left end segment. When an event is turned on, the relevant segment lights, but the remaining segments do not light. The exclusive LEDs are prepared for the events 1 to 3.

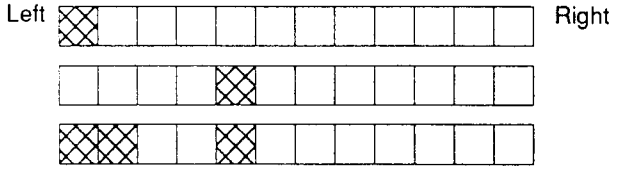


Example of indication:

Event 4 is on, and the others are off.

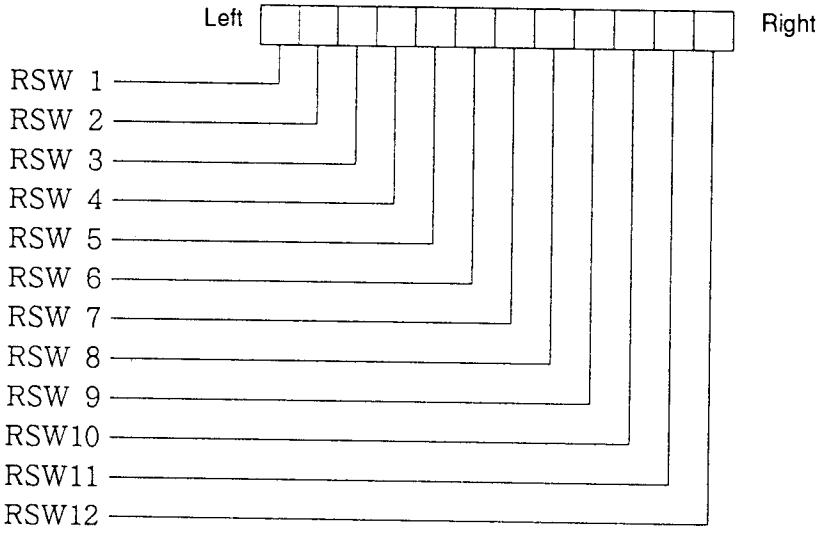
Event 8 is on, and the others are off.

Events 4, 5 and 8 are on, and the others are off.



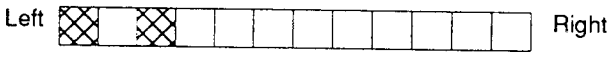
4: Remote switch monitor (RSW monitor)

The bar graph content LED (OUT LED) goes out. The RSW1 to 12 are assigned to all the 12 segments, starting with the left end. When an RSW is turned on, the relevant segment lights.



Example of indication:

The RSW1 and 3 are on, and the others are off.



C72: Input broken line approximation [0]

It is selected in this setup where the broken line pattern set in PARA 59 to 80 is to be used.

0: Not used.

1: Used for AI1 (PV or PV1).

2: Used for AI2 (RSP or PV2).

C73: Unused.

C74: Unused.

C75: RSP, C/B selection [0]

It is determined in this setup whether or not the computer backup is to be executed.

0: RSP (normal remote SP type)

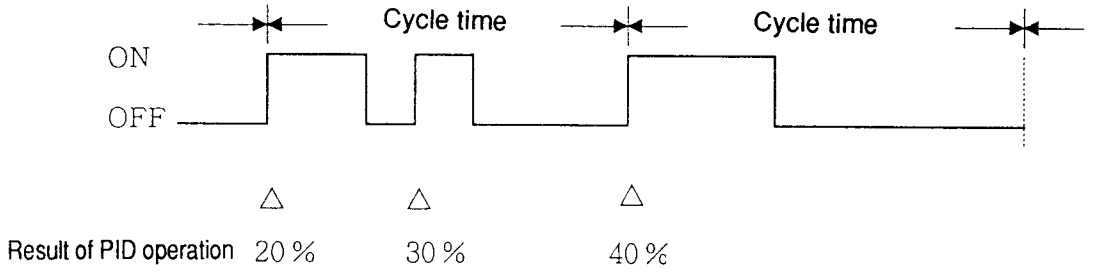
1: C/B (computer backup type)

When the computer backup is assigned to an RSW, be sure to set "1" in this setup.

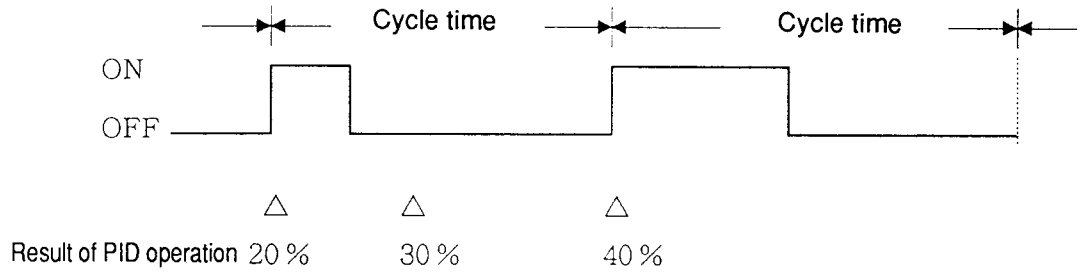
C76: Selection of output system of time proportional output [0] 6D model only

If the longer cycle time is set in the 6D model, and the result of the PID operation is increased on the course of the cycle time, the output cannot be obtained till the next cycle time in the old system (1). When the initial value (0) is selected, the output can be obtained again within the same cycle time by the increment of the result of the PID operation.

0: Turned on again within the cycle.



1: Not turned on within the cycle (normal system)



If the result of the PID operation increases during the on period, the on time is extended according to that result in each case. On the contrary, if the result of the PID operation decreases in such a case, the on time is shortened.

C77: Compensation of thermocouple cold junction [0]

The temperature of the wiring junction of a thermocouple can be compensated for, using an ice box or the like externally, without using the internal cold junction compensation function.

0: Inside

1: Outside

However, the external compensation temperature is intended to be 0°C only (an ice box, or the like is used as a precondition).

C78: S/W action in AI1 (PV or PV1) disconnection [0]

When the thermocouple, mV, or RTD input is applied, the direction of burnout can be determined by a switch.

0: Upscale

1: Downscale

C79: Adjustment of voltage output 1 (I_{1OUT}) [15]
2 to 22mA

C80: Adjustment of voltage output 2 (I_{2OUT}) [15]
2 to 22mA

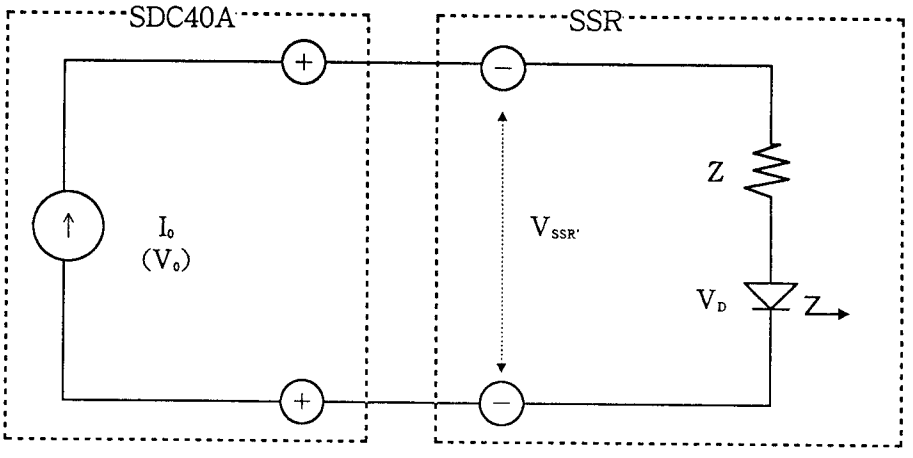
When an SSR is driven in the 6D model, it is necessary that the output voltage of the instrument is put in the rated input voltage (optimum trigger voltage) range of that SSR. This instrument employs the variable output system newly developed so that an optimum trigger voltage can be output even when more than one SSR are driven. In this system, an appropriate current is set and output by this instrument so that an optimum trigger voltage may be obtained with respect to the internal impedance of the SSR side. The equivalent circuit of this system and the associated expressions are shown below.

[Description of Symbols]

[Contents]

I_0	:	Set output current of SDC40A (setting range: 2 to 22mA)
V_0	:	Load open voltage (approx. 14.6V)
$V_{SSR'}$	:	Actual input voltage to SSR
V_{SSR}	:	Rated SSR input voltage range ($V_{SSR/MIN}$ to $V_{SSR/MAX}$)
$V_{SSR/MIN}$	:	Rated minimum input voltage of SSR
$V_{SSR/MAX}$	:	Rated maximum input voltage of SSR
Z	:	Internal impedance of SSR
V_D	:	Internal voltage drop of SSR (usually, approx. 1 to 2V)

[Equivalent Circuit with One SSR Connected]



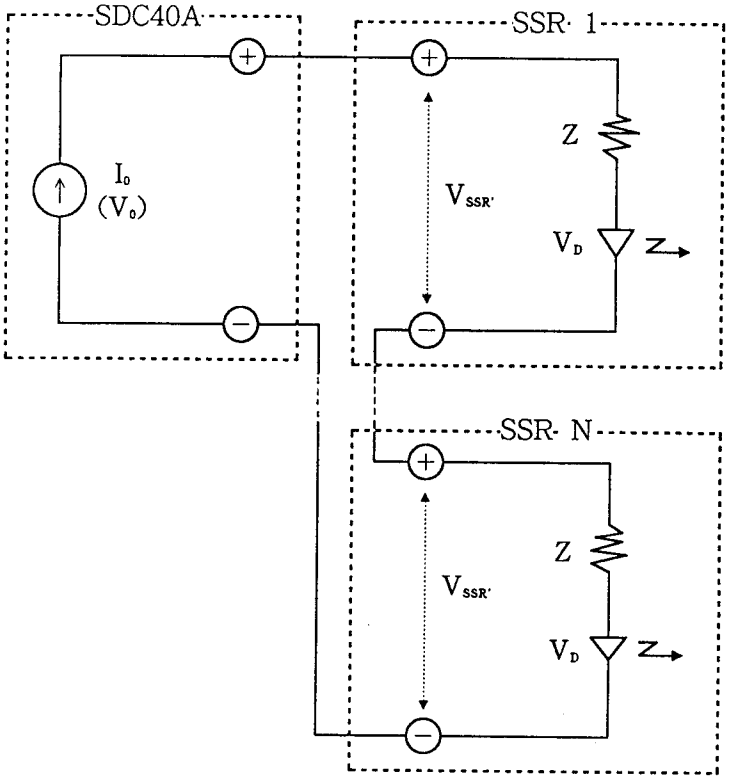
— Neccessary expressions: The following two expressions must be satisfied.

$V_{SSR/MIN} \leq I_0 \times Z + V_D \leq V_0$ Expression ①

$V_{SSR'} \leq V_{SSR/MAX}$ Expression ②

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

[Equivalent Circuit with n SSRs Connected in Series]



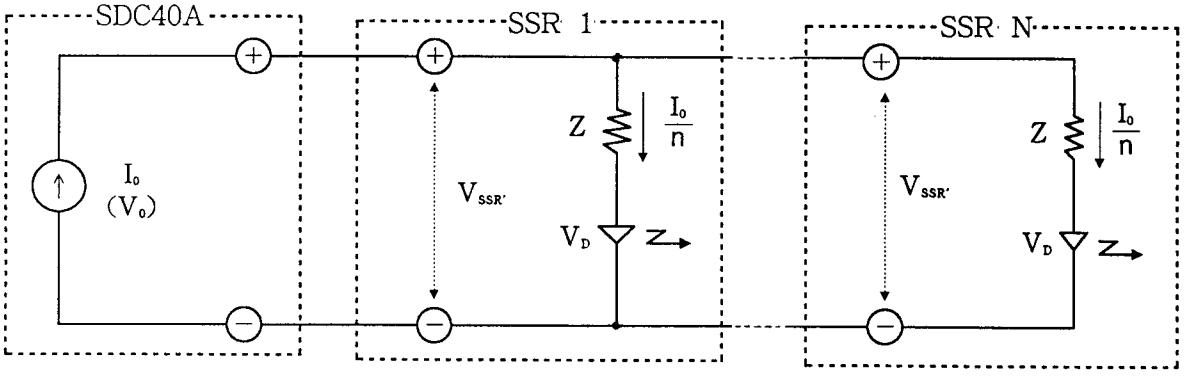
— Necessary expressions: The following two expressions must be satisfied.

$$V_{SSR/MIN} \leq I_0 \times Z + V_D \leq \frac{V_0}{n} \qquad \text{Expression ③}$$

$$V_{SSR'} \leq V_{SSR/MAX} \qquad \text{Expression ④}$$

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

[Equivalent Circuit with n SSRs Connected in Parallel]



— Necessary expressions: The following two expressions must be satisfied.

$$V_{SSR/MIN} \leq \frac{I_0}{n} \times Z + V_D \leq V_0 \qquad \text{Expression ⑤}$$

$$V_{SSR'} \leq V_{SSR/MAX} \qquad \text{Expression ⑥}$$

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

[Example; In case Honeywell PGM is used]

* Specifications of Honeywell PGM (D2W110ED to 215ED)

V_{SSR} : 3 to 6V
$V_{SSR/MIN}$: 3V
$V_{SSR/MAX}$: 6V
Z : 220Ω
V_0 : 1.6V

— How is the set value of I_0 found, when one PGM is connected to the SDC40A ?

From the expression ①, $V_{SSR/MIN} \leq I_0 \times Z + V_D \leq V_0$

When this expression is transformed,

$$\frac{V_{SSR/MIN} - V_D}{Z} \leq I_0 \leq \frac{V_0 - V_D}{Z}$$

$0.0064 \leq I_0 \leq 0.059$ Expression ①'

From the expression ②, $V_{SSR'} \leq V_{SSR/MAX}$

$I_0 \times 220 + 1.6 \leq 6$

$I_0 \leq 0.02$ Expression ②'

The set value of I_0 can be selected from among 7mA to 20mA according to the expressions ①' and ②', so the set value of 15mA at delivery from the factory can be used as it is.

— How many PGMs can be connected in series ?

From the expression ③, $V_{SSR/MIN} \leq I_0 \times Z + V_D \leq \frac{V_0}{n}$

$$3 \leq I_0 \times 220 + 1.6 \leq \frac{14.6}{n}$$

From the left side inequality, $\frac{3 - 1.6}{220} \leq I_0$

Therefore, $0.0064 \leq I_0$ Expression ③'

From the right side inequality, $n \leq \frac{14.6}{I_0 \times 220 + 1.6}$ Expression ③"

Therefore, $n \leq 4.6$ when $I_0 = 0.007$ (7mA).

From the expression ④, $I_0 \leq 0.02$ Expression ④'

According to ③", n is increased as I_0 becomes smaller.

However, since there is a restriction of the expression ③', the maximum number of PGMs in series, which can be driven by the SDC40C, is 4 units. At this time, the set value of I_0 may also be 7mA.

If two PGMs are connected in series, the set value of I_0 is within the range of 7mA to 20mA according to $0.0064 \leq I_0 \leq 0.025$, which is obtained from the expressions ③' and ③" (when 2 is substituted for n), and the expression ④', so the set value of 15mA at delivery from the factory can also be used as it is.

Similarly, the set value of I_0 is within 6.4mA to 14mA when three PGMs are connected in series.

— How many PGMs can be connected in parallel ?

From the expression ⑤, $V_{SSR/MIN} \leq \frac{I_0}{n} \times Z + V_D \leq V_0$

$3 \leq \frac{I_0}{n} \times 220 + 1.6 \leq 14.6$

$0.0064 \leq \frac{I_0}{n} \leq 0.059$

From the left side inequality, $n \leq I_0 \times 156$ Expression ⑤'

From the expression ⑥, $\frac{I_0}{n} \times Z + V_D \leq V_{SSR/MAX}$

$I_0 \times 50 \leq n$ Expression ⑥'

I_0 may take a maximum value according to the expression ⑥'.

Therefore, $n \leq 3.43$, when $I_0 = 0.022$.

Namely, up to three PGMs can be connected in parallel with the SDC40A.

— Which should be selected, series connection or parallel connection ?

When the internal impedance of SSR is small as in the abovementioned example, the series connection of SSRs is more suitable.

C81: Extension setting 1 [– –]

C82: Extension setting 2 [0]

0: Extension is not provided.

1: Extension is provided.

C83: Extension setting 3 [0]

0: Extension is not provided.

1: Externsion is provided.

The extension settings 1, 2 and 3 are used for maker service. Usually, don't change the figure in brackets [ ], which is the set value at delivery from the factory.

C84: Communication address [0] Only when communication (OP) is provided

0 to 127

When "0" is set in this setup, the communication is disabled. If instruments having the same address (other than 0) exist on the same communication line, these instruments may be damaged by the communication. Be sure to change their addresses.

C85: Transmission speed and code [0]

Only when communication (OP) is provided

0: 9600bps, even parity, 1 stop bit

1: 9600bps, non parity, 2 stop bits

2: 4800bps, even parity, 1 stop bit

3: 4800bps, non parity, 2 stop bits

C86: Unused

C87: "

C88: "

C89: "

C90: Special function 1 [0]

C91: " 2 [– –]

C92: " 3 [– –]

C93: " 4 [– –]

C94: Unused

C95: "

C96: Hardware type 1

C97: Hardware type 2

C98: ROM ID

C99: ROM item

C00: ROM revision

C81 to C83, and C86 to C95 are all used for maker service. Never change the set values of these setup items. Otherwise, this instrument may malfunction. C96 to C00 permit only the indication of the contents, and they cannot be changed.

— MEMO —

Chapter 8 USER FUNCTION KEYS UF1 AND UF2

8-1 How to Use the User Function Keys

The SDC40A is provided with two user function keys (UF1 and UF2) as standard so that the user himself can register the key functions. The operation time cannot only be shortened by registering the functions to be used frequently, but also careless operations can be prevented by using the key lock function together. The instrument is equipped with these operator's oriented keys to make the high level functions compatible with the simple operation.

All the contents of PARA, PID, SETUP, SP and EV as well as the mode selection functions of A/M, R/L, AT, and RUN/READY can be registered.

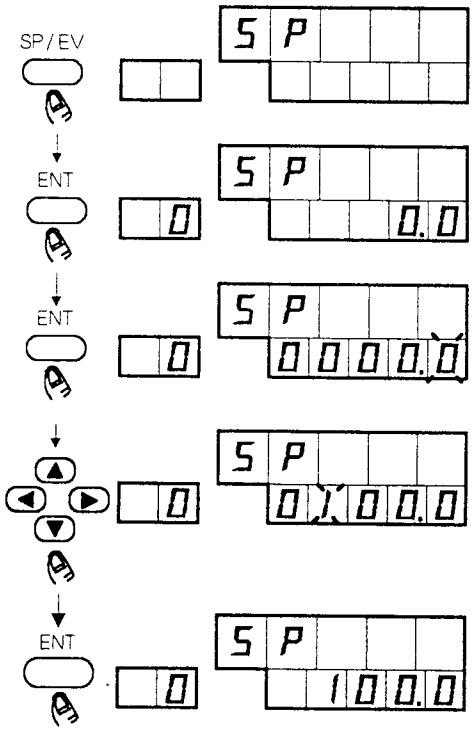
Up to 4 functions can be registered in the UF1 key, and up to 8 functions in the UF2 key. When one mode selection function is registered in one user function key, any other function cannot be registered in it any longer.

When PARA, PID, SETUP, SP and EV are registered, they can be called in the item code order one by one every time a user function key is pressed, and the set contents can be readily changed. The original status can be restored by pressing the DISP key. When a mode selection function is registered, the relevant mode is set immediately by pressing the UF key, and the original mode is restored by pressing it again.

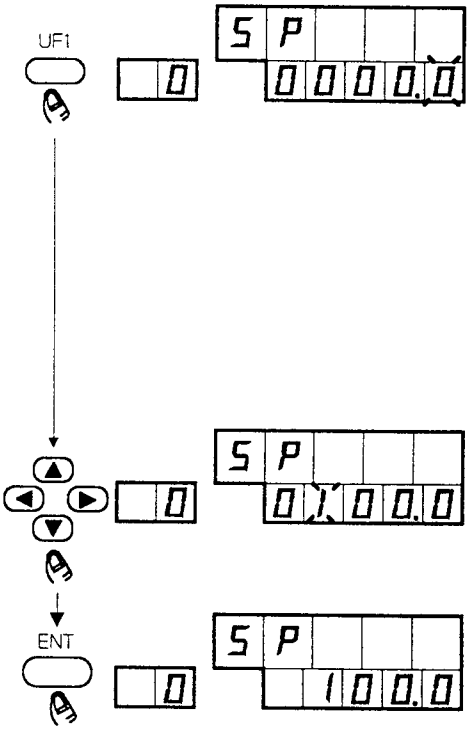
When a SETUP item is registered, that item can be changed even in other than the READY mode.

Example: Change of SP value

[Normal change method]



[Change method using UF key]



8-2 How to Register a Function in User Function Key

1. Item code range for register

   SETUP items : C55 to C59 (UF1 key), C60 to C68 (UF2 key)

2. Registering method

   The UF1 key registering method is described below. The UF2 key registering method is the same as in the UF1 key, although the number of functions which can be registered is increased up to 8 functions.

   ① Execute the basic register for registering a function in the UF1 key by C55.

Mode selection function	0:	Not registered.
	1:	AUTO/MAN (the same function as the A/M key)
	2:	REM/LOC (the same function as the R/L key)
	3:	AT (the same function as the AT key)
	4:	RUN/READY (RUN/READY selection is executed by once key operation)
	5:	Selection from among SP, EV, PARA, PID, and SETUP items

   "1" to "4" above are included in the mode selection function. When the mode selection function is registered in the UF1 key, any other function cannot be registered in it any longer. As for "5" above the four functions selected from among the individual items arbitrarily can be registered in the UF1 key (8 functions in the UF2 key). The contents of assignment are selected by C56 to C59.

   ② Select the contents of assignment from among the SP, EV, PARA, PID and SETUP items by C56 to C59. Add the following radix predetermined every item to Guide No. of each function, and input the result to register the contents.

Item		Radix
SP	:	+ 4000
EV	:	+ 4500
PID	:	+ 5000
PARA	:	+ 5500
SETUP	:	+ 6000

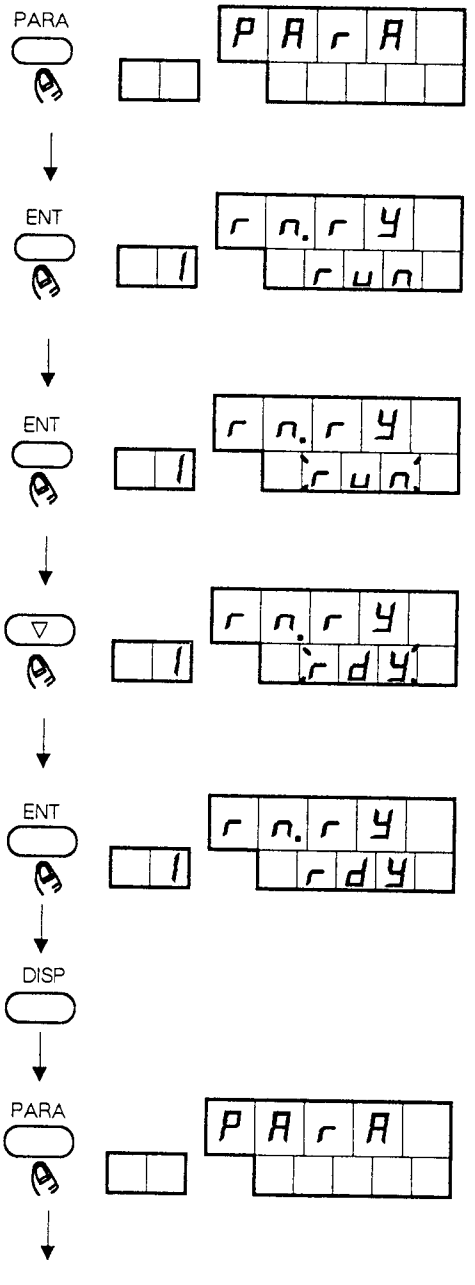
3. Release of register

   To keep the UF key unused, input "0" in C55 (UF1 key) or C60 (UF2 key). To release the register of the contents assigned to C56 to C59 (UF1 key) or C61 to C68 (UF2 key), input an inexistent item number. For example, the above-mentioned radix (4000, 5000 ·····) is an inexistent item number. When a radix is input, the registered contents are released. The set value at delivery from the factory is "0". Once any nuermic is set, any value less than "4000" cannot be selected any longer by the operation of the setting range limiter to assure safety.

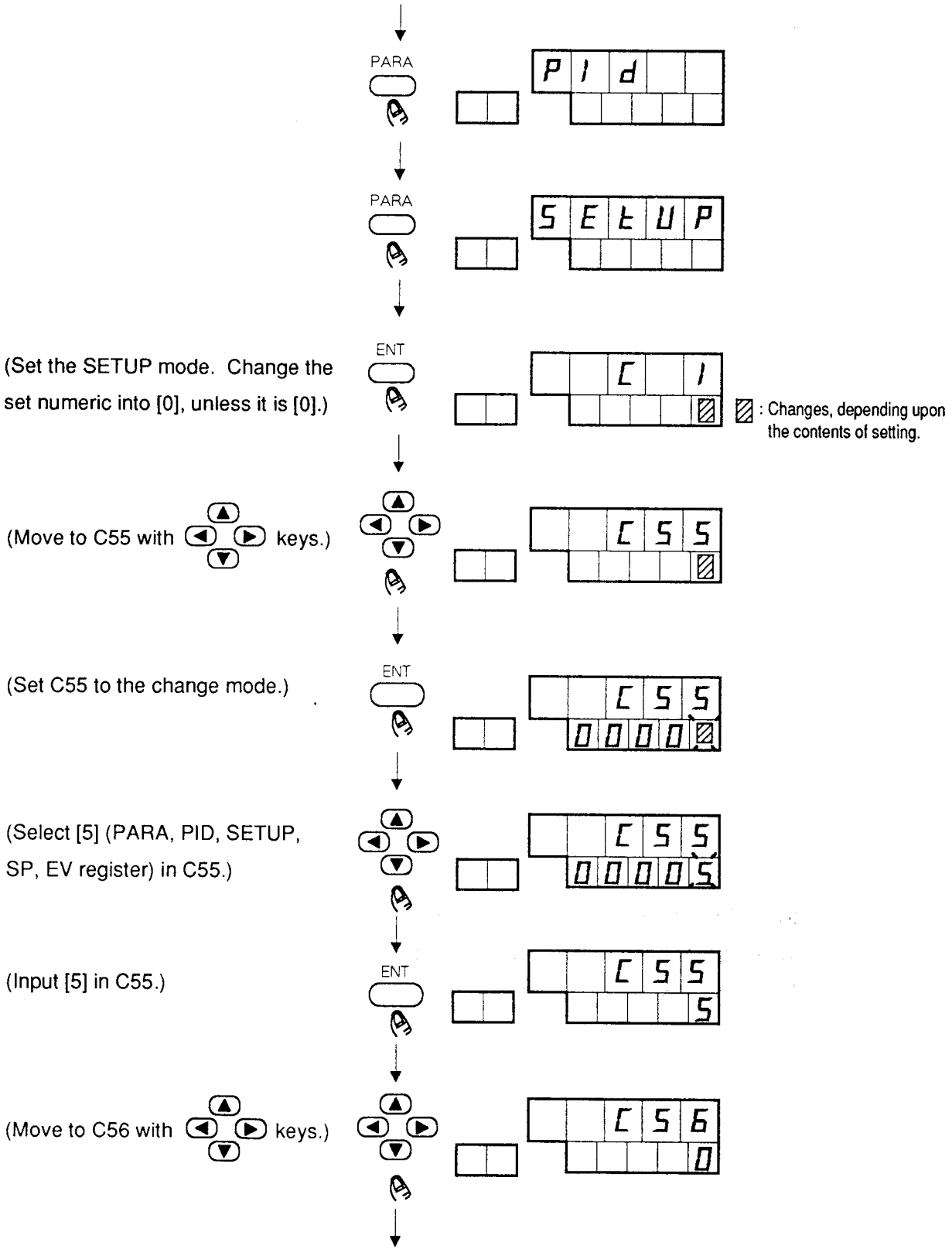
4. Example of registering

The definite procedure for registering SP0 in the UF1 key is shown below.

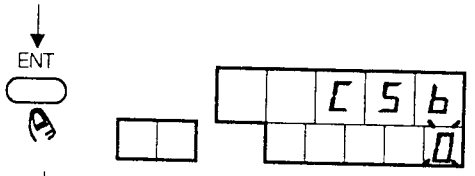
① Set the READY mode.



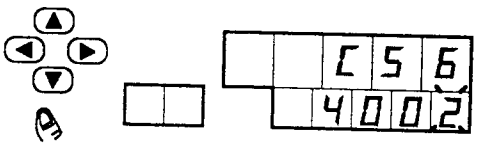
② Call the SETUP, and input item [5] (PARA, PID, SETUP, SP, EV register). Further, input 4002 (4000 + 2 (Guide No. of SP0)) in C56 to call SP0.


PARA
PID
PARA
SETUP
(Set the SETUP mode. Change the set numeric into [0], unless it is [0].)
ENT
C 1
: Changes, depending upon the contents of setting.
(Move to C55 with keys.)
C55
(Set C55 to the change mode.)
ENT
C55
0000
(Select [5] (PARA, PID, SETUP, SP, EV register) in C55.)
C55
0005
(Input [5] in C55.)
ENT
C55
5
(Move to C56 with keys.)
C56
0

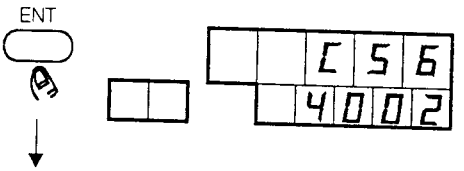
(Set C56 to the change mode.)



(Select [4002] in C56.)



(Input [4002] in C56.)



(Press the DISP key to reset to the basic indication status.)

— MEMO —

Chapter 9 OPERATION

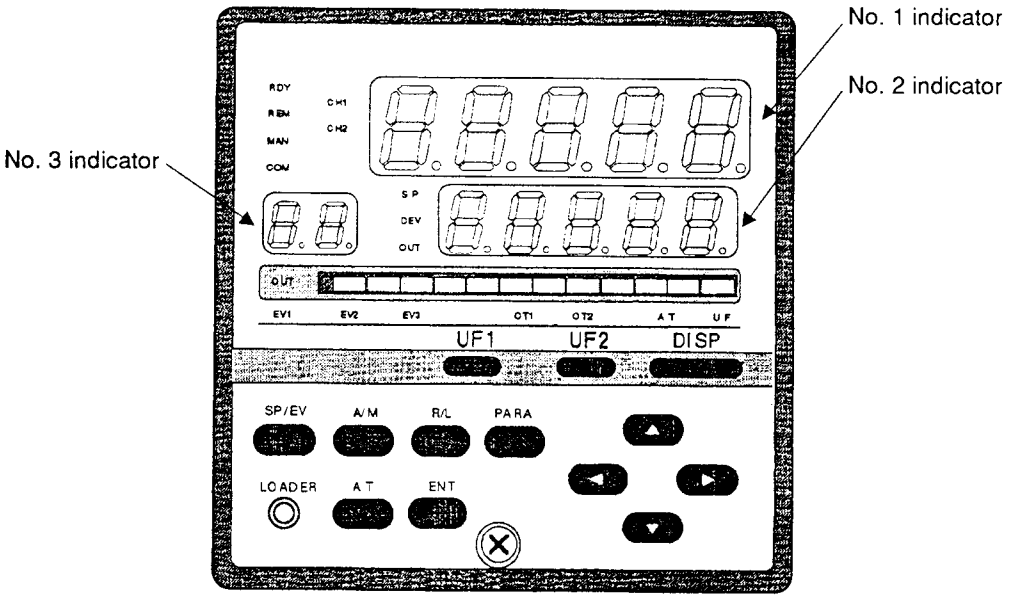
9-1 Power ON

The SDC40A main body is not provided with a power switch or protective fuse. If necessary, provide them outside the instrument.

Supply the power of 90 to 264V AC between the terminals ① and ② of the main body. The instrument starts up about 10 sec after to begin the indication and control. During the start-up time, the 10 LEDs of the bar graph indicator light sequentially at unequal intervals, starting with the second LED as counted from the lefthand side.

9-2 Indication Changeover

When the DISP key is pressed, the indications of No. 2 indicator and No. 3 indicator are changed over as shown below. Since this has no effect on the control, the necessary indications can be checked selectively, as required. The contents of indication of the bar graph indicator are determined, depending upon the setting of C71, and cannot be changed by the DISP key.



(1) Standard model and remote SP model

There are six indication types ① to ⑥ as shown on the next page. Immediately after the power supply is turned on, the indication type ① is indicated in the AUTO mode, and the indication type ③ in the MANUAL mode.

The indication type is changed oever repestedly as shown below, depending upon the output model.

In case of 0D, 6D, 5G output : ① → ② → ③ → ① → ·····

In case of 2G output : ① → ② → ③ → ④ → ① → ·····

In case of heat/cool output : ① → ② → ③ → ⑤ → ⑥ → ① → ·····

① No. 1 indicator : PV
No. 2 indicator : SP
No. 3 indicator : • Goes out with one LSP.
• In the LSP mode with 8 LSPs, the selected LSP number (0 to 7) is indicated.
• In the RSP mode with 8 LSPs, [r-] denoting RSP is indicated at the left digit, and the selected LSP No. (0 to 7) is indicated at the right digit.
SP, DEV, OUT lamp : SP lights.

② No. 1 indicator : PV
No. 2 indicator : Deviation (DEV). This is a value calculated from PV – SP.
No. 3 indicator : Goes out.
SP, DEV, OUT lamp : DEV lights.

③ No. 1 indicator : PV
No. 2 indicator : Manipulated variable output %
(A changeable digit flashes in MANUAL mode.)
No. 3 indicator : Goes out.
SP, DEV, OUT lamp : OUT lights.

④ This indication is given in the 2G output type only.
No. 1 indicator : PV
No. 2 indicator : Motor opening %
No. 3 indicator : [Fb] is indicated.
SP, DEV, OUT lamp : Goes out.

⑤ This indication is given in the heat/cool output type only.
No. 1 indicator : PV
No. 2 indicator : Heat side output %
No. 3 indicator : [HE] is indicated.
SP, DEV, OUT lamp : OUT lights.

⑥ This indication is given in the heat/cool output type only.
No. 1 indicator : PV
No. 2 indicator : Cool side output %
No. 3 indicator : [cL] is indicated.
SP, DEV, OUT lamp : OUT lights.

(2) Internal cascade model

There are seven indication types ① to ⑦ as shown below. Immediately after the power supply is turned on, the indication type ① is indicated in the AUTO mode, and the indication type ④ in the MANUAL mode.

The indication type is changed over repeatedly as shown below, depending upon the output model.

In case of 0D, 6D, 5G output : ① → ② → ③ → ④ → ① → ·····
In case of 2G output : ① → ② → ③ → ④ → ⑤ → ① → ·····
In case of heat/cool output : ① → ② → ③ → ④ → ⑥ → ⑦ → ① → ·····

① No. 1 indicator : Master PV
No. 2 indicator : Master SP (M – LSP)
No. 3 indicator : • Goes out with one master SP.
• Selected LSP No. (0 to 5) is indicated with six master SPs.
SP, DEV, OUT lamp : SP lights.
CH indication : CH1 lights.

② No. 1 indicator : Master PV
No. 2 indicator : Master OUT
No. 3 indicator : Goes out.
SP, DEV, OUT lamp : OUT lights.
CH indication : CH1 lights.

③ No. 1 indicator : Slave PV
No. 2 indicator : Slave SP (S – LSP)
No. 3 indicator : • Selected LSP number (6 or 7) is indicated in the LSP mode.
• [⌐] denoting RSP is indicated at the left digit, and selected RSP number (6 or 7) at the right digit.
SP, DEV, OUT lamp : SP lights.
CH indication : CH2 lights.

④ No. 1 indicator : Slave PV
No. 2 indicator : Slave OUT (control output quantity)
No. 3 indicator : Goes out.
SP, DEV, OUT lamp : OUT lights.
CH indication : CH2 lights.

⑤ No. 1 indicator : Slave PV
No. 2 indicator : Motor opening %
No. 3 indicator : [Fb] is indicated.
SP, DEV, OUT lamp : Goes out.
CH indication : CH2 lights.

⑥ No. 1 indicator : Slave PV
No. 2 indicator : Heat side output % (control output quantity)
No. 3 indicator : [Ht] is indicated.
SP, DEV, OUT lamp : OUT lights.
CH indication : CH2 lights.

⑦ No. 1 indicator : Slave PV
No. 2 indicator : Cool side output % (control output quantity)
No. 3 indicator : [cL] is indicated.
SP, DEV, OUT lamp : OUT lights.
CH indication : CH2 lights.

9-3 Setting of SP and SP Number

SP: Set Point (set value)

(1) Prior to SP setting

How to set a reference value (SP) for actual control is described below.

There are an LSP and an RSP as SPs. The LSP is set by key operation from the console, and the RSP is set by a signal given from outside. Up to eight LSPs are stored by the setup operation, and they can be called and used by the keys or RSWs. This is called a multi SP function. An arbitrary PID group number is assigned to each LSP or RSP so that the optimum control may be done, and in addition, the settable ranges can also be limited by setting the SP limit values, thus preventing a malfunction from occurring.

LSP : Local Set Point
RSP : Remote Set Point
RSW : Remote Switch

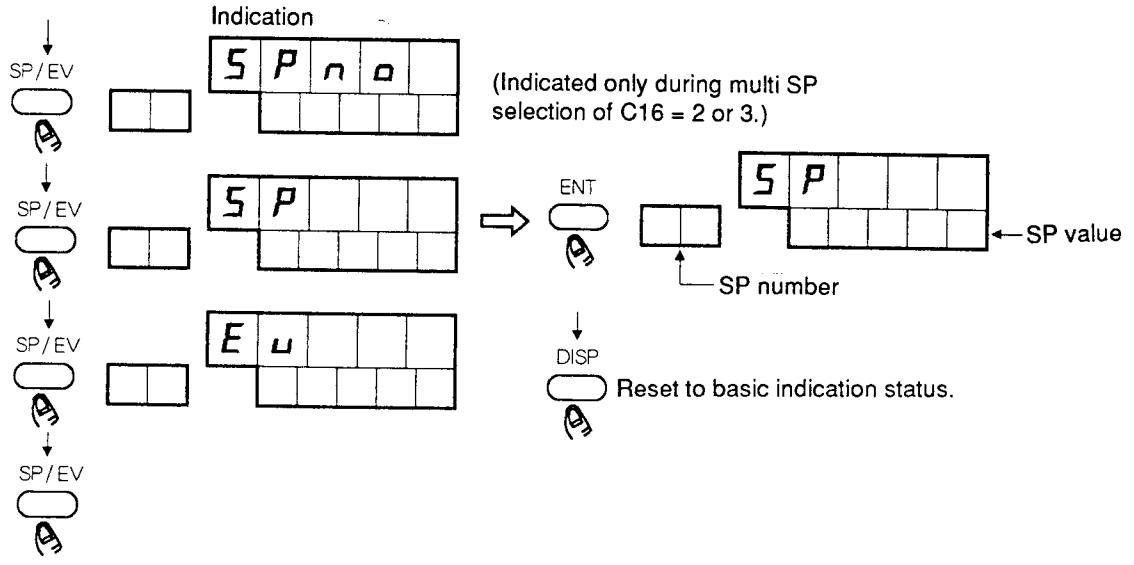
There are the following other set items related with the SP setting. If a trouble should occur in SP setting, recheck these items.

Parameter setting items (PARA)		Setup items (SETUP)
33: SPU	LSP up ramp	C1 : Key lock
34: SPd	LSP down ramp	C16: LSP setting system
35: rSPU	RSP up ramp	C17: Low limit of SP limit
36: rSPd	RSP down ramp	C18: High limit of SP limit
37: rA-t	Setting of SP ramp unit	C42 to C53: RSW assignment (When an LSP is selected by the RSW, it cannot be selected from the console.)

(2) How to set and reset the SP setting mode

SP values can be set even in any selection mode of RUN/READY, AUTO/MAN and REMOTE/LOCAL, etc., unless PARA, PID, or SETUP item setting is being executed, and key lock is applied.

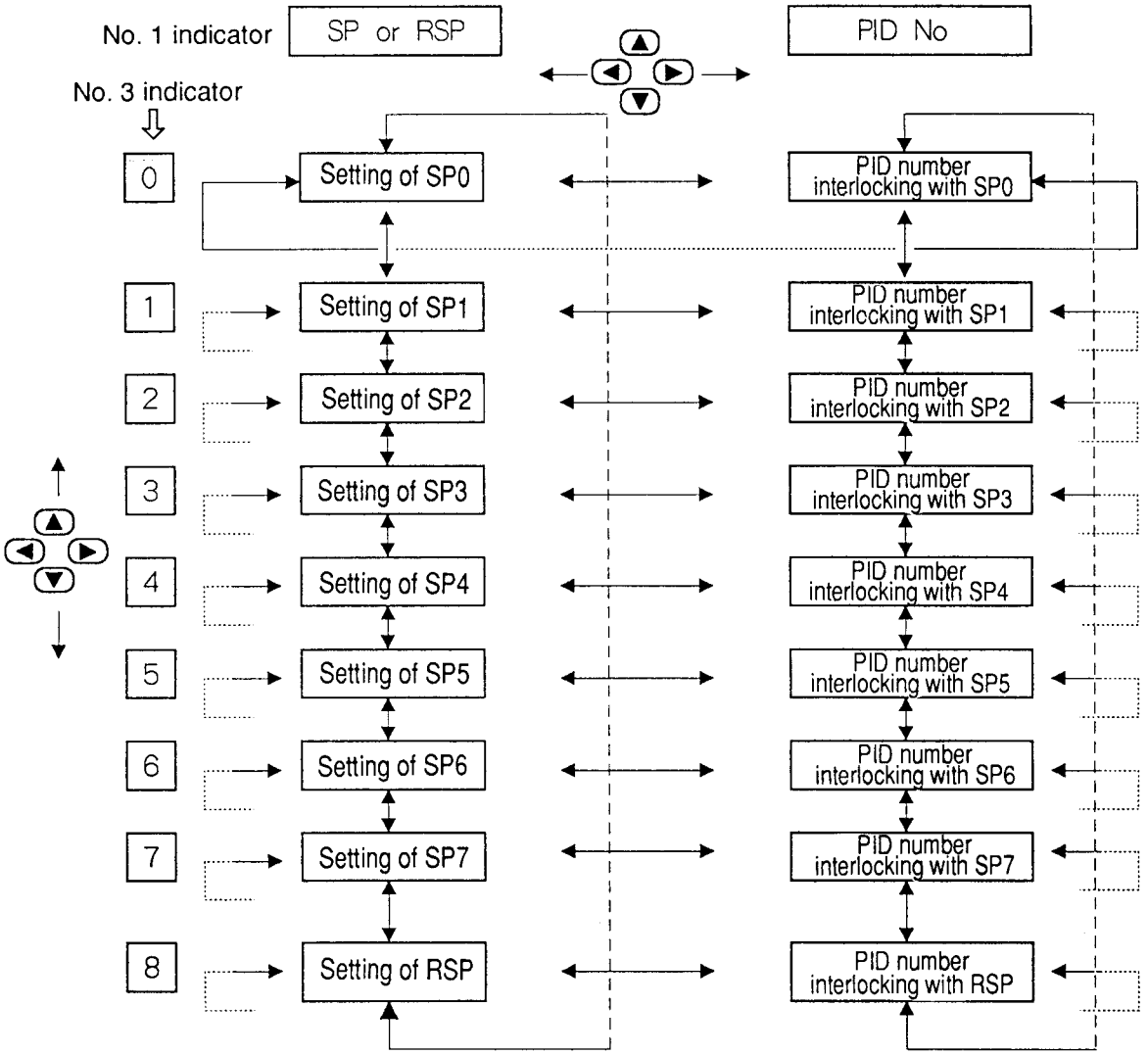
Press the SP/EV key, and the following three (two unless the multi SP function is used) setting groups can be called in turn. Further, press the ENT key, and each setting can be done. To reset the SP setting mode, press the DISP key in any status. The basic indication status can be restored.



(3) How to move an SP item

The SP items have a simple matrix construction together with the selection of PID numbers used as shown below. Each item can move optionally with ▲▼◀▶ keys.

When "0" or "1" is set in the setup C16, the settings of SP1 to SP7 are skipped, but those of SP1 to SP5 are skipped in the internal cascade model.



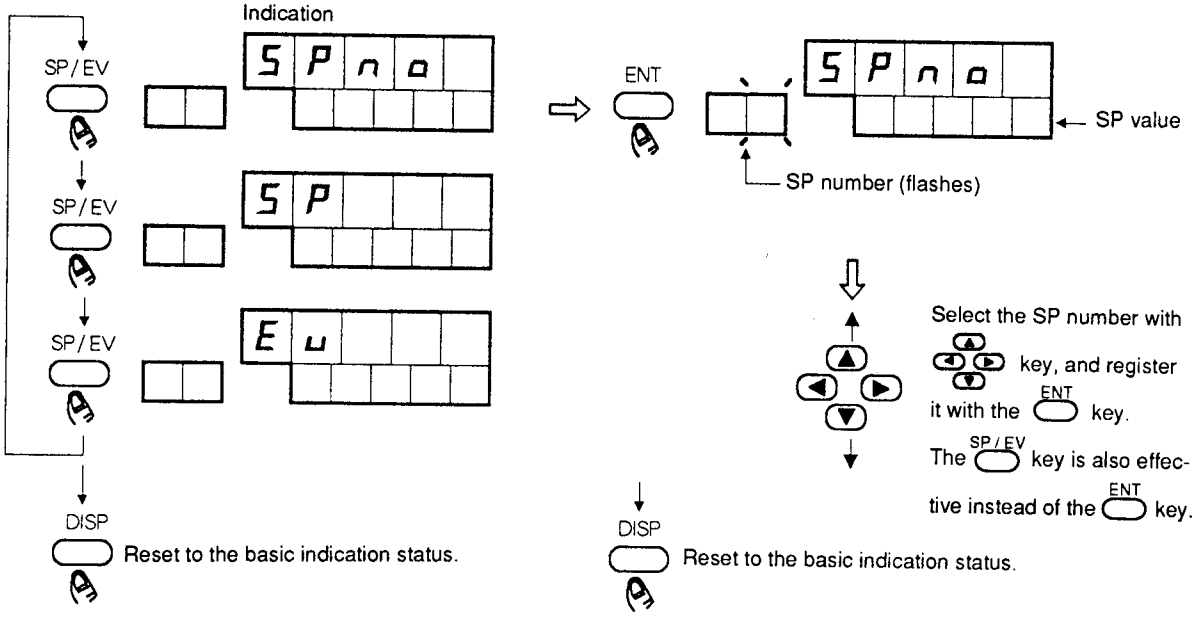
(4) How to change the set value of SP item

To change the set value of an SP item, press the ENT key when that item is indicated. Since the set value on No. 2 indicator flashes to indicate that the set value can be readily changed, set a desired value with ▲▼◀▶ keys, and press the ENT key again. The set value is stored, and flashing stops. An RSP item is only indicated, but cannot be changed. The remote SP value can be checked even in the local mode. When "3" is set in C16, the SP value change input is not accepted.

To restore the previous value during flashing of the set value, press not the ENT key, but the DISP key. After the basic indication status is restored, execute the same setting operation, or go to the next item with the SP/EV key, and then return to the original item with ▲▼◀▶ key. The present set value is not stored, but the previous set value is maintained.

(5) Selection of SP number (SP No.)

When "2" or "3" is set in C16, and an LSP number is not selected by an RSW, an SP number can be selected from the console as shown below.



(6) SP item table (including the selection of LSP group number)

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
1	SP n o	Selection of LSP group number	0		0 to 7 Supplement When C16 = 0 or 1, this item is skipped. Or, when the LSP selection is assigned to an RSW, it is also skipped.
2	SP N N N *2 N 0	LSP0 value	0U		• When C16 = "0" or "1", LSP1 to 7 are not indicated. When the C16 value is set to "2" once, and each SP value is changed, its value is stored even if the C16 value is changed into "0" or "1" and reset to "2" again. • Each of LSP and RSP is limited by the low limit of SP limit (C17) and the high limit of SP limit (C18). • In the internal cascade model, LSP (master side SP) is not limited, but it is within the range of –19999 to 26000U. • In the internal cascade model, LSP6 and LSP7 are used as the slave side LSPs.
3	SP N N N N N 1	LSP1 value	0U		
4	SP N N N N N 2	LSP2 value	0U		
5	SP N N N N N 3	LSP3 value	0U		
6	SP N N N N N 4	LSP4 value	0U		
7	SP N N N N N 5	LSP5 value	0U		
8	SP N N N N N 6	LSP6 value	0U		
9	SP N N N N N 7	LSP 7 value	0U		
10	r SP A A A *3 A 8	RSP value	—		

*1. Upper stage : No. 1 indicator
Middle stage : No. 2 indicator
Lower stage : No. 3 indicator

*2. The contents of NNNNN differ, depending upon the setting item.

*3. AAAAA denotes the set value of a remote SP.

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
11	PIdnoN 0	Designation of PID number (when LSP0 is used)	0 [0]		• The designation range of a PID number is usually within 0 to 7. In the heat/cool model, however, it is within 0 to 3, and when any of 4 to 7 is set, it is regarded as 0. • In the internal cascade model, only the setting of PID Nos. 0 to 5 with respect to LSP0 to 5, and the setting of PID Nos. 6 and 7 with respective to the slave side LSP6 and 7 are permitted. • Figure in brackets [ ] denotes the set value at delivery from the factory in case of the cascade model. • A PID number is designated to operate it, interlocking with each of LSP or RSP. If another PID number is selected by an RSW, this has priority over the above designation, and the interlocking is cut off. When it is then desired to identify what PID number is used, select the PID number by the PARA key from the console. The PID number indicated at first is that which is used currently.
12	PIdnoN 1	Designation of PID number (when LSP1 is used)	0 [0]		
13	PIdnoN 2	Designation of PID number (when LSP2 is used)	0 [0]		
14	PIdnoN 3	Designation of PID number (when LSP3 is used)	0 [0]		
15	PIdnoN 4	Designation of PID number (when LSP4 is used)	0 [0]		
16	PIdnoN 5	Designation of PID number (when LSP5 is used)	0 [0]		
17	PIdnoN 6	Designation of PID number (when LSP6 is used)	0 [6]		
18	PIdnoN 7	Designation of PID number (when LSP7 is used)	0 [6]		
19	PIdnoN 8	Designation of PID number (when RSP is used)	0 [6]		

9-4 EV Setting

EV: Event (alarm or the like)

(1) Prior to EV setting

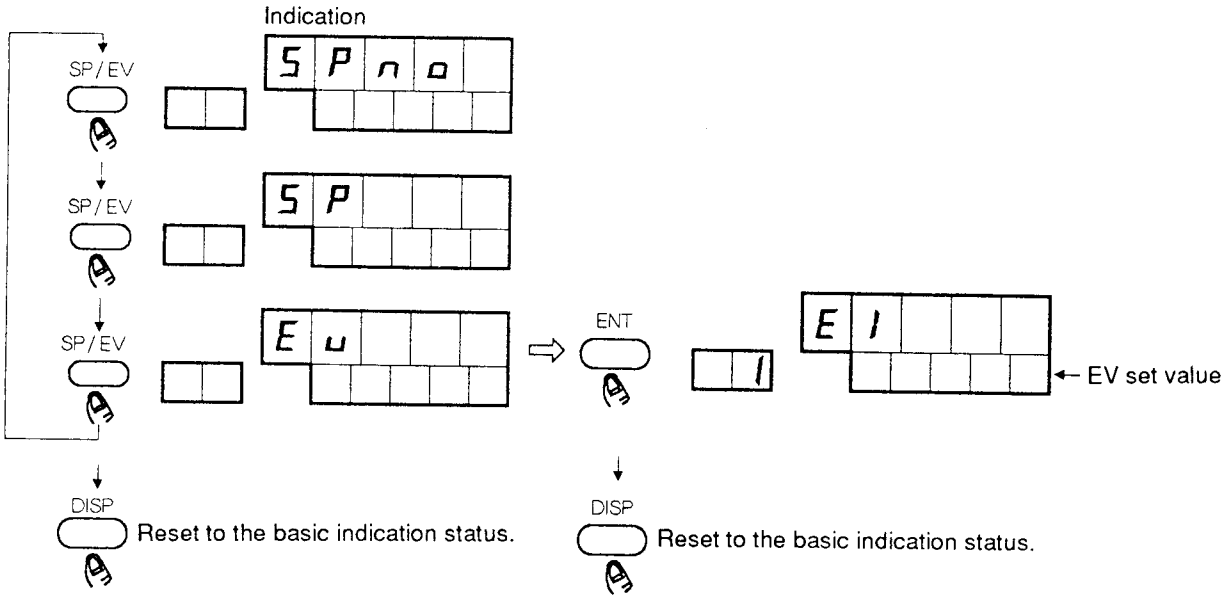
How to set an EV value to be actually set is described below. There are the following other setting items related with the EV setting such as the EV type.

Parameter setting items		
15:	EE 1	Event 1 type
16:	Ed 1	Event 1 stand-by
∫	∫	∫
29:	EE8	Event 8 type
30:	Ed8	Event 8 stand-by
31:	dLE	Event on delay time unit

(2) How to set and reset the EV setting mode

EV values can be set even in any selection mode of RUN/READY, AUTO/MAN and REMOTE/LOCAL, etc., unless PARA, PID, or SETUP item setting is being executed, and key lock is applied.

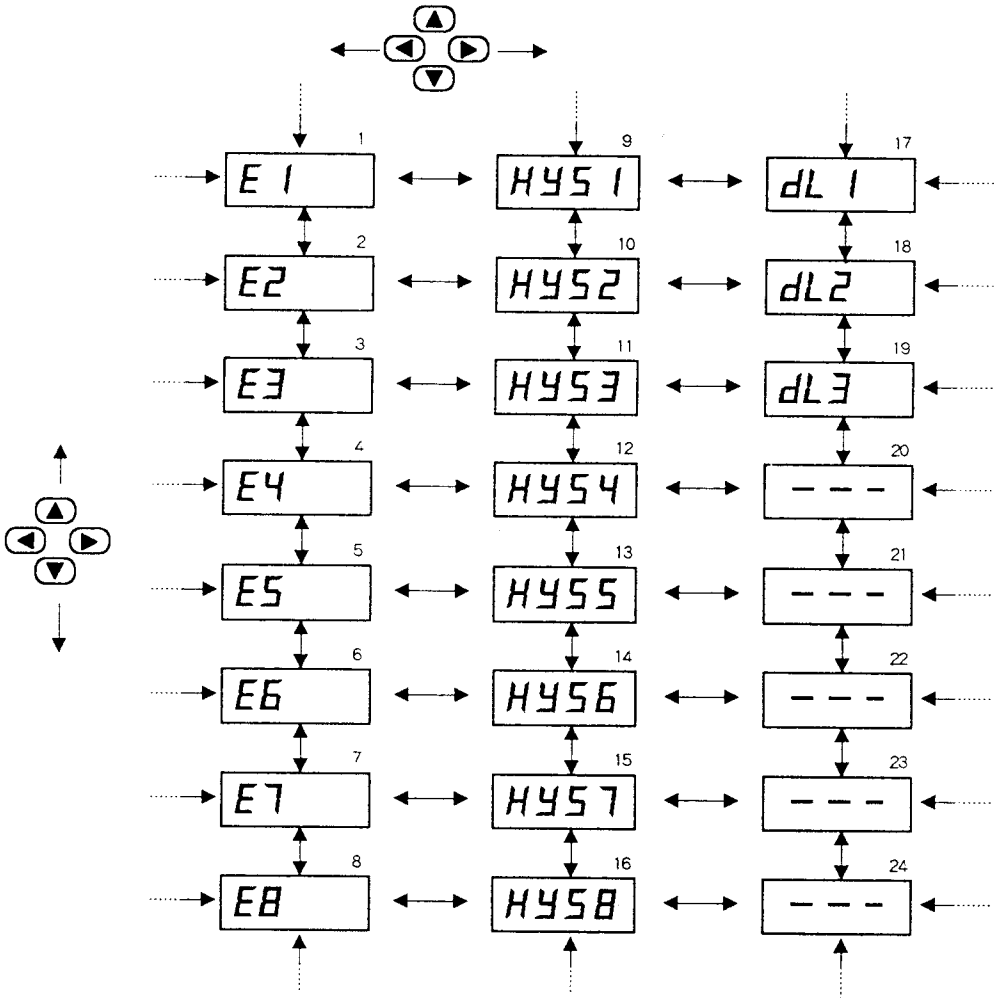
Press the SP/EV key, and the following three (two unless the multi SP function is used) setting groups can be called in turn. Further, press the ENT key, and each setting can be done. To reset the SP setting mode, press the DISP key in any status. The basic indication status can be restored.



(3) How to move each EV item

The EV items have a matrix construction together with the respective differential gaps and the setting of on delay time (in EV1 to 3 only) as shown below, and each EV item can be moved optionally with keys.

2 EVs, 3 EVs or 8 EVs are available according to the model number. The figure at the right top of each frame denoting an item indicates Guide No. The same number is indicated on No. 3 indicator.



(4) How to change the set value of EV item

To change the set value of an EV item, press the ENT key when this item is indicated. The set value on No. 2 indicator flashes to indicate that it can be readily changed. Set a desired value with keys, and press the ENT key again. The set value is stored and flashing stops.

To restore the previous value while the set value flashes, press not the ENT key, but the DISP key. After the basic indication status is restored, repeat the same setting operation.

(5) EV item table

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
1	E 1	Set value of event 1	26000U		PV : −19999 to 26000U DEV : −19999 to 26000U | DEV | : 0 to 26000U RSP : −19999 to 26000U SP : −19999 to 26000U MV : − 10.0 to 110.0% MFB : −10.0 to 110.0% Process : −10.0 to 110.0% • When the event type is 15 to 21, or 34, indication is not given (setting is disabled). • The above-mentioned setting ranges are effective, only when the event types are set earlier.
2	E 2	Set value of event 2	26000U		
3	E 3	Set value of event 3	26000U		
4	E 4	Set value of event 4	26000U		
5	E 5	Set value of event 5	26000U		
6	E 6	Set value of event 6	26000U		
7	E 7	Set value of event 7	26000U		
8	E 8	Set value of event 8	26000U		

Guide No.	Item code	Item	Set value at delivery from factory	User's setting column	Setting
9	HY5 1	Event 1 hysteresis (differential gap)	50U		PV : 0 to 200U DEV : 0 to 200U |DEV| : 0 to 200U RSP : 0 to 200U SP : 0 to 200U MV : 0.0 to 20.0% MFB : 0.0 to 20.0% Process: 0 to 200U • When the event type is 15 to 21, or 34, no indication is given (setting is disabled).
10	HY52	Event 2 hysteresis (differential gap)	50U		
11	HY53	Event 3 hysteresis (differential gap)	50U		
12	HY54	Event 4 hysteresis (differential gap)	50U		
13	HY55	Event 5 hysteresis (differential gap)	50U		
14	HY56	Event 6 hysteresis (differential gap)	50U		
15	HY57	Event 7 hysteresis (differential gap)	50U		
16	HY58	Event 8 hysteresis (differential gap)	50U		
17	dL 1	Event 1 on delay time	0		0 to 20000s or min • Functions only in event 1 to 3. Not provided for event 4 to 8. • s or min is selected in Parameter No. 31
18	dL2	Event 2 on delay time	0		
19	dL3	Event 3 on delay time	0		

Guide Nos. 20 to 24 are blank, so none can be set in them.

— MEMO —

Chapter 10 TROUBLESHOOTING

10-1 Alarm Indication

If an input error or instrument error is detected in the basic indication status (when each setting mode of PARA, PID, SETUP, SP No., SP, and EV is not set), the SDC40A gives an alarm code indication and normal indication on No. 1 indicator alternately every 1s. If more than one error have occurred, the alarm code given in the alternate indication is changed over in turn, starting with a younger error code.

Alarm code	Name of alarm	Contents	Remedial measure
AL01	AI1 overrange	AI1 exceeds 110% FS.	Check AI1 input.
AL02	AI1 underrange	AI1 is reduced below –10% FS.	
AL03	AI2 overrange	AI2 exceeds 110% FS. (*1)	Check AI2 input.
AL04	AI2 underrange	AI2 is reduced below –10% FS. (*1)	
AL07	RTD disconnection A	A wire of RTD is disconnected.	Check whether or not RTD (resistance thermometer bulb) connected to AI1 is disconnected or terminal connection is proper.
AL08	RTD disconnection B	B wire of RTD is disconnected, or all A, B and C wires are disconnected.	
AL09	RTD disconnection C	C wire of RTD is disconnected.	
AL10	MFB disconnection	One or all of Y, T, and G wires of MFB are disconnected.	Check wiring of MFB (motor feedback).
AL11	MFB short circuit	Y-G or Y-T-G short circuit.	
AL12	MFB adjustment failure	Miswiring or motor trouble	Check MFB or on/off relay wiring.
AL70	A/D1 fault	A/D converter 1 is defective.	Ask for repair.
AL71	A/D2 fault	A/D converter 2 is defective.	
AL80	Output configuration error	Output configuration is not adaptable to hardware.	There is possibility that this error can be corrected at site. Contact nearest YH representative.
AL97	Parameter error	Set value is abnormal. (*2)	Reset abnormal PARA, PID or SETUP item. When there is no error in them, reset the following 3 items. • Proportional band 0 (P-0) • SP up ramp (SPU) • Indication 1 digit masking (dI SP) If error occurs again, ask for repair.
AL98	Adjusting value error	AI or AO data is destroyed.	Ask for repair.
AL90	ROM error	ROM data is destroyed.	Ask for repair.

*1: In the remote SP model, AL03 and 04 are not indicated in the LOCAL mode.

*2: If power failure occurs within 10s after each setting is done, AL97 alarm may be issued even when the set values are normal.

10-2 When SETUP after C2 cannot be changed.

(1) Althrough all the contents of SETUP can be checked in the RUN mode, the ENT key input except for the C1 key lock is not accepted, and setting change cannot be done. To change the SETUP items, it is necessary to set the instrument to the READY mode.

(2) When the key lock (C1) is applied (C = 1, 2, 3, or 4), the indications after C2 cannot be checked. After releasing the key lock (C1 = 0), perform setting change.

10-3 When RUN/READY cannot be selected by key operation.

The RUN/READY selection function has been assigned to a remote switch. Turn on (closed) the relevant remote switch, and set the READY mode, and then release the assigned SETUP item from the remote switch. The relevant RSW number can be identified by checking the contents of SETUP ("1" is assigned in any of C42 to C53).

10-4 When the control output is not obtained normally.

(1) When the output is a fixed value and not changed, or is not obtained at all.
Check whether or not any of the following modes is set.
- — READY mode
- — MANUAL mode
- — Fixed value output 1 to 3

(2) When the output is difficult to change or is not changed beyond a certain value.
Check the following items.
- — Control output variation limit (PARA 10, 11)
- — PID values (including OL, OH)
- — Variable gain (PARA 49 to 58)

10-5 When the computer backup function is not activated normally.

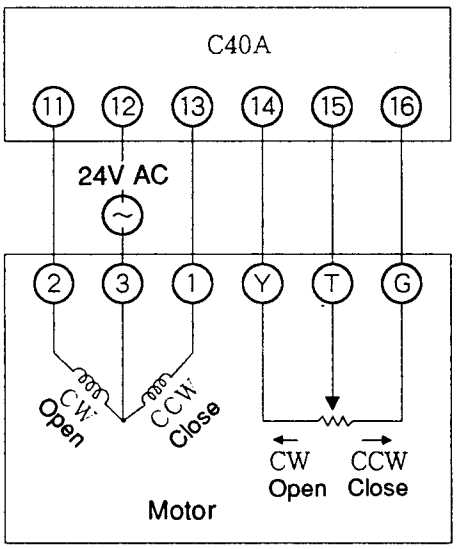
(1) The output is kept delivered.
Check the high/low limit scaling (C13, C14) of AI2.
Set 0.0 in C13 and 100.0 in C14.

(2) When the RSW, to which the computer backup selection is assigned, is turned on/off, the computer backup is not selected.
Set "1" in C75 (RSP, C/B selection).

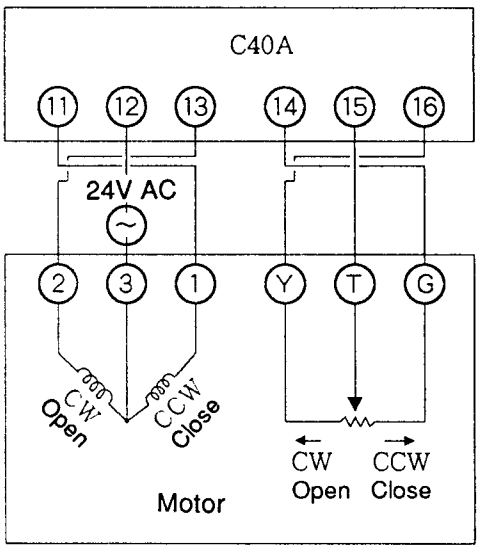
10-6 When the motor cannot be adjusted.

The connection methods between the motor and controller are classified into two types as shown below; [direct direction connection] and [reverse direction connection]. The YH digital controllers including the SDC40A are designed to permit the direction (direct/reverse) of the control action to be changed over. Therefore, when the connection with the motor is in the [direct direction], the instrument can cope with the control actions in both directions by simple viewing method. It is recommended to connect the motor in the [direct direction]. This also facilities troubleshooting if a trouble should occur.

[Connection in direct direction]



[Connection in reverse direction]



CW : ClockWise (Means rightward turning like the hand of a clock.)
CCW : CounterClockWise (Means leftward turning.)

The SDC40A is provided with the functions of detecting misconnection with the motor, and of disconnection or short circuit of MFB (AL10 to 12). However, the connection in reverse direction is regarded as [normal connection] as in the connection in direct direction, and no alarm is then issued.

When the set value of PARA No. 40 is kept at "0" set at delivery from the factory, the operation is kept continued even if MFB is disconnected. The following table lists what phenomena occur according to the connection, when the motor is automatically adjusted (PARA No. 41). The SDC40A start with that the control action setting (C2 or C3) is the reverse action, and the motor is at the closed position (fully counterclockwise). In this table, the numerics in No. 2 indicator are reference values (examples). An alarm is indicated after the motor is fully closed or fully opened.

[In case of normal connection in direct direction]

No.1 indicator	Lighting LED	No.2 indicator	Motor movement	Remarks
CA.CL ↓ CA.OP	OT2 OT1	Stabilized after decreased as 1000 → 500. Stabilized after increased as 500 → 9500.	CCW CW	When the motor is turned counter-clockwise with OT2 lighted, the terminals 1 and 2 of the motor are connected in the direct direction.

[In case of normal connection in reverse direction]

No.1 indicator	Lighting LED	No.2 indicator	Motor movement	Remarks
CA.CL ↓ CA.OP	OT2 OT1	Stabilized after decreased as 9000 → 500. Stabilized after increased as 500 → 9500.	CW CCW	1 ↔ 2 reverse and G ↔ Y reverse. When the motor is turned clockwise with OT2 lighted, the terminals 1 and 2 of the motor are connected in the reverse direction.

[Indications and causes of misconnection alarm]

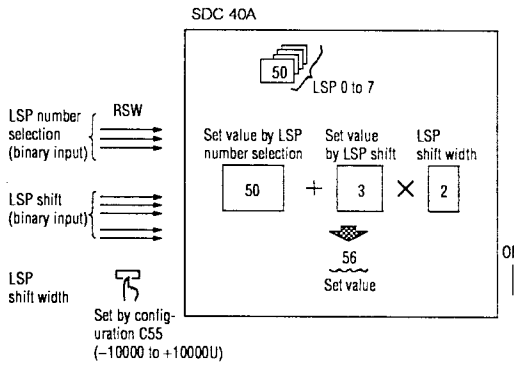
No.1 indicator	Lighting LED	No.2 indicator	Motor movement	Alarm indication	Cause
CA.CL ↓ CA.OP	OT2 OT1	Stabilized after increased. Stabilized after decreased.	CCW CW	AL12	G ↔ Y reverse
CA.CL ↓ CA.OP	OT2 OT1	Stabilized after decreased. Stabilized at 15000	CCW CW	AL12	T ↔ G reverse
CA.CL	OT2	Stabilized at 15000	CCW	AL11 AL12	T ↔ Y reverse
CA.CL ↓ CA.OP	OT2 OT1	Stabilized after increased. Stabilized after decreased.	CW CCW	AL12	1 ↔ 2 reverse
CA.CL	OT2	Stabilized at 15000	CW	AL11 AL12	1 ↔ 2 reverse and T ↔ G reverse
CA.CL ↓ CA.OP	OT2 OT1	Stabilized after increased. Stabilized after 15000	CW CCW	AL12	1 ↔ 2 reverse and T ↔ Y reverse

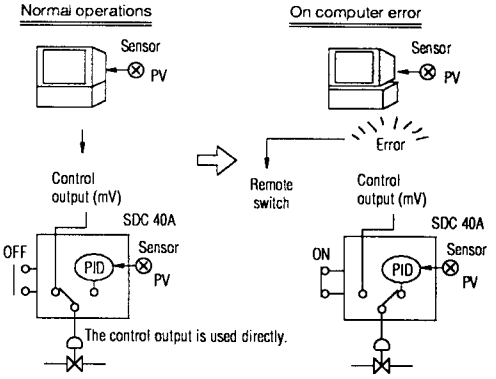
Chapter 11 SPECIFICATION

Analog Input 1 (PV1 input)	**Type of inputs**	A variety of thermocouples, RTDs, mV and mA.
	Input display accuracy	±0.1% FS (under standard conditions) This may be affected by indication value conversion.
	Input sampling cycle	100ms
	Input digital filter	Variable 0.0 to 120.0s (there is no filter at 0.0)
	Input bias	−1000 to +1000U (U: °C, KPa, % and other standard industrial units)
	Input ratio	0.001 to 9.999
	Input broken line approximation	12 point broken line approximation can be assigned to analog inputs 1 or 2.
	Square root operation dropout	0.0 to 10.0% FS (no square root calculation is performed at 0.0)
	Input bias current	Thermocouple, DC voltage input: ±1.3μA max. (peak, standard conditions) −3μA max. in the linear V range above 1V
	Input impedance	DC current input: 50Ω ±10% (under operating conditions)
	Measuring current	RTD input: 1.04mA±0.02mA, terminal A (under operating conditions)
	Influence of wiring resistance	Thermocouple: Variation in the displayed value due to input μv conversion when the wiring resistance at both ends is 250Ω : • M01, L02; 35μV max. • L01; 60μV max. • Others; 750μV max. RTD: ±0.01% FS/Ω max. within wiring resistance range of 0 to 10Ω. ±0.02% FS/Ω in the range whose minimum resolution is 0.01°C. The allowable wiring resistance is 85Ω max. (except for 0.01°C resolution) (A zener barrier is available for on site adjustment.)
	Allowable parallel resistance	Allowable parallel resistance for thermocouple break detection is 1MΩ min.
	Maximum allowable input	Thermocouple, mV input: +15 to −5V mA input: 28mA

Analog Input 1 (PV1 input)	**Burnout**	Thermocouple input: Upscale + Alarm indication (AL01) (including the DC mV range) DC voltage input: Downscale + Alarm indication (AL02) DC current input: Downscale + Alarm indication (AL02) However, near 0% FS in the 0 to 20mA range, neither burnout nor alarm indication is performed. RTD input: When "C" wire is broken: Upscale + Alarm indication (AL01 + AL09) When resistance element and "A" wire, or resistance element and "B" wire, or "A" wire and "B" wire are broken: Upscale + Alarm indication (AL01 + AL07) When "B" wire, or resistance element and "C" wire, or "A" wire and "C" wire, or "B" wire and "C" wire, or resistance element, "B" wire and "C" wire, or "A" wire, "B" wire and "C" wire are broken: Upscale + Alarm indication (AL01 + AL08)
	Over range detection threshold	Higher than 110% FS: Upscale Lower than –10% FS: Downscale (however, downscaling is not performed by F50 and P50 models. The lower indication limit of the B19 model is 20°C/60°F.)
	Cold junction compensation accuracy	±0.5°C (standard conditions)
	Cold junction compensation method	Compensation inside the instrument or compensation outside the instrument (0°C only) is selectable.
Analog Input 2 (RSP input of remote SP model or PV2 input of internal cascade model)	**Type of input**	4 to 20mA or 1 to 5V dc
	Input indication accuracy	±0.1% FS (standard conditions), when converted to displayed value (may differ, depending on range)
	Input sampling cycle	0.1s
	Input digital filter	Variable 0.0 to 120.0s (there is no filter at 0.0)
	Input bias	–19999 to +30000U
	Input ratio	0.001 to 30.000 (gain cannot be used in case of selection of the multi ratio of 8 groups. Trade off.)
	Input broken line approximation	12 broken lines of approximation (which can be assigned to either of analog inputs 1 or 2.)
	Square root operation threshold	0.0 to 10.0% FS (no square root calculation is performed at 0.0.)
	Scaling	–19999 to +26000U (reverse scaling is also possible. The decimal point position can be changed. Resolution is 1/20000.)
	Input bias current	1 to 5V input: ±10μA max. (under operating conditions)
	Input impedance	1 to 5V input: 1MΩ min. (under operating conditions) 4 to 20mA input: 50Ω ±10% (under operating conditions)
	Allowable maximum input	1 to 5V input: +6V to 0V 4 to 20mA input: 28mA
	Burnout	Downscale + Alarm indication (AL04)
	Over range detection threshold	More than 110% FS: Regarded as upscale.
		Less than –10% FS: Regarded as downscale.
	PV1 ↔ PV2 switch	Internally switchable in the internal cascade model.
Indications and Setting	**PV and SP indication**	5-digit 7-segment LED
	Function indication	2-digit 7-segment LED
	LED bar	Ten LED segments out of twelve indicate control output: • When motor opening indication (2G) is selected, ten segments are used. • When the OK indicator function is selected, all twelve segments are used as a "green belt". • This LED bar can also be used to monitor events 4 to 8 and RSW 1 to 12.
	Status indication	18 LEDs (some models do not include all indicators)
	Operating keypad	13 rubber keys (there may be dead keys depending on model).
	Number of set points	1 to 8 points (selection and changeover use available) with the internal cascade model, up to 6 points are allowed on the master side, up to 2 points are allowed on the slave side.
	Memory storage	Non-volatile semiconductor memory (EEPROM)
	Indication ranges	–10 to +110% FS of range or scaling value (–10% FS is not applicable for F50, P50 and B18 models.)
	Setting range	–19999 to +26000U (when an SP limit is applied, the relevant value is used.)
	Indication masking	The least significant digit can be masked for 4-digit indication.

Indications and Setting	**SP limits**	Low limit: −19999U to high limit value High limit: Low limit value to 26000U				
	SP ramp (separately set for LSP and RSP)	Up ramp: 0 to 26000U (no ramp at 0) Down ramp: 0 to 26000U (no ramp at 0) The measurement interval can be selected from among the following: • U/hr • 0.1U/hr • U/min • 0.1U/min				
Control Output	**Model number**	0D	2G	5G	6D	3D, AK, 5K, 9K, BK
	Type of output	SPDT relay contact output	M/M driving relay contact output	Current output (4 to 20mA dc)	Voltage output (load current is adjustable)	* See Table 1.
	Control action	Time proportional PID	Position proportional PID	Current proportional PID	Time proportional PID	2-stage (heat/cool) PID
	No. of PID groups	8 groups	8 groups	8 groups	8 groups	4 groups on each of heat and cool sides
	PID autotuning	Autotuning allowed.	Autotuning allowed.	Autotuning allowed.	Autotuning allowed.	Autotuning not allowed.
	Output rating	Contact rating: 5A (30V dc/120V ac, resistive load) 4A (240V dc, resistive load) Allowable contact voltage: 250V ac, resistive load 125V dc, resistive load Maximum switching power: 150W, 960VA (resistive load) Mechanical life: 10,000,000 repetitions Electrical life: 100,000 repetitions (at contact rating, COS φ = 1, frequency 30 times/min) Minimum switching voltage: 5V Minimum switching current: 100mA Minimum on/off time: 100ms on, on/off control 100ms on, time proportional control	Contact ratings: 2.5A (30V dc L/R = 0.7ms) 4A (120V ac COS φ = 0.4) 2A (240V ac COS φ = 0.4) Allowable contact voltage: 250V ac, resistive load 125V dc, resistive load 125V dc L/R = 0.7ms 250V ac COS φ = 0.4 Maximum switching power: 75W (L/R = 0.7ms) 480VA (COS φ = 0.4) Mechanical life: 10,000,000 repetitions Electrical life: 100,000 repetitions (at contact rating, COS φ = 0.4, frequency 30 times/min) Minimum switching voltage: 5V Minimum switching current: 100mA	Max. allowable load resistance: 680Ω (under operating conditions) Output accuracy: ±0.1% FS max. (under operating conditions) Output resolution: 1/2000min Inrush current: 25mA max., 50ms max. (with 250Ω load) Maximum output current: 21.6mA DC Minimum output current: 2.4mA DC Opening terminal voltage: 25V max. Output update cycle: 100ms	Max. allowable load internal resistance: 680Ω (under operating conditions) Load current setting accuracy: ±0.2% FS max. (under operating conditions) Load current setting resolution: 1/200min Inrush current: 25mA max. 50ms max. (with 250Ω load) Maximum output current: 21.6mA dc Minimum output current: 2.4mA dc Off time leak current: 100 μA max. (with load is shorted under operating conditions) Output update cycle: 100ms Minimum on-off time: 100ms on, on-off control 100ms on, time proportional control (cycle time: 10s min.) 0.1% of cycle time (cycle time: less than 10 sec.)	Table 1 Heat side / Cool side 3D: 0D / 0D AK: 0D / 5G 5K: 5G / 5G 9K: 0D / 6D BK: 5G / 6D In the heat/cool model, the output type differs between the heat side and cool side as shown in the above table. Each output rating is the same as for 0D, 2G, 5G, or 6D. • The heat side and cool side can be switched. • Direct or reverse action can be selected by remote switching, as in the other models.
	Proportional band (P)	0.0 to 1000.0% FS (On-off operation when P=0)	0.1 to 1000.0% FS (On-off operation is not allowed)	0.1 to 1000.0% FS (On-off operation is not possible)	0.0 to 1000.0% FS (On-off operation when P=0)	0.1 to 1000.0% FS (On-off operation is not allowed)
	Cycle time	5 to 120 s (setting possible every second)	—	—	1 to 60 sec. (setting possible every second)	Same as for each type of output
	Integral time (I)	0 to 3600 s (PD action when I=0)	0 to 3600 s (PD action when I=0)	0 to 3600 s (PD action when I=0)	0 to 3600 s (PD action when I=0)	0 to 3600 s (PD action when I=0)
	Derivative time (D)	0 to 1200 s (PI action when D=0)	0 to 1200 s (PI action when D=0)	0 to 1200 s (PI action when D=0)	0 to 1200 s (PI action when D=0)	0 to 1200 s (PI action when D=0)
	Differential gap	0 to 1000U (in on-off operation)	—	0 to 1000U (in on-off operation)	0 to 1000U (in on-off operation)	Same as in each output type.
	Dead band	—	0.5 to 25.0%OUT	—	—	−100.0 to +5.0% OUT
	Output limiter	Low limit value: -10% to high limit value (-10 to 0% become 0%) High limit value: Low limit value to 110% (100 to 110% become 100%)	Low limit value: -10% to high limit value High limit value: Low limit value to 110%	Low limit value: -10% to high limit value High limit value: Low limit value to 110%	Low limit value: -10% to high limit value (-10 to 0% become 0%) High limit value: Low limit value to 110% (100 to 110% become 100%)	Low limit value: -10% to high limit value High limit value: Low limit value to 110%

<table>
<tr><td rowspan="5">Control Output</td><td>Model number</td><td>0D</td><td>2G</td><td>5G</td><td>6D</td><td>3D, AK, 5K, 9K, BK</td></tr>
<tr><td>Manipulated variable change rate limiter</td><td>1 to 100%
(every 100 ms)</td><td>1 to 100%
(every 100 ms)</td><td>1 to 100%
(every 100 ms)</td><td>1 to 100%
(every 100 ms)</td><td>1 to 100%
(every 100 ms)</td></tr>
<tr><td>MFB (Motor Feed back) input range</td><td>—</td><td>100 to 2500Ω</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>MFB (Motor Feed back) break control</td><td>—</td><td>Whether action is to be continued is selected by MFB position assumption.</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>Variable gain</td><td colspan="5">If the load characteristic of the control system is non-linear, stable control characteristics are obtained by changing the gain according to the deviation. Control conforms to the following equation:
Set proportional band (p) × $\frac{1}{\text{Gain value}}$ = Real proportional band.
Set value range: 0.01 to 300.00
Gain 1: when +20% FS
Gain 2: when +10% FS
Gain 3: when +5% FS
Gain 4: when +2% FS
Gain 5: when 0% FS
Gain 6: when −2% FS
Gain 7: when −5% FS
Gain 8: when −10% FS
Gain 9: when −20% FS
The gain ramp is automatically calculated using set gains. When the deviation is less than −20% or more than 20%, calculation uses the extended characteristic.</td></tr>
<tr><td rowspan="11">Remote Switch Input (RSW)</td><td>No. of input points</td><td colspan="5">4 or 12 (option)</td></tr>
<tr><td>Connectable outputs</td><td colspan="5">Dry contact (relay contact) and open collector (current sink to ground)</td></tr>
<tr><td>Opening terminal voltage</td><td colspan="5">12V + 0.6/−1.6V between common terminal (No. 25) and each input terminal (under operating conditions)</td></tr>
<tr><td>Shorting terminal current</td><td colspan="5">The current from each terminal is 6mA +0.6/−1.0mA (under operating conditions)</td></tr>
<tr><td>Allowable contact resistance (dry contact)</td><td colspan="5">On: Less than 700Ω (under operating conditions)
Off: More than 10kΩ (under operating conditions)</td></tr>
<tr><td>Residual voltage at open collector on time</td><td colspan="5">3V max. (under operating conditions)</td></tr>
<tr><td>Leak current at open collector off time</td><td colspan="5">100μA max. (under operating conditions)</td></tr>
<tr><td>Parallel connection with other instrument</td><td colspan="5">Interconnection of SDC 40A units is possible. Connection with compatible units other than SDC 40A is also allowed.</td></tr>
<tr><td>Input sampling cycle</td><td colspan="5">0.1 s</td></tr>
<tr><td>Minimum hold time of on detection</td><td colspan="5">0.2 s</td></tr>
<tr><td>Function allocation</td><td colspan="5">NOP, RUN/READY, AUTO/MANUAL, REMOTE/LOCAL, AT start/stop, direct/reverse action, LSP number and PID number selection 0/+1, 0/+2, and 0/+4 (PID No. 0 cannot be selected)
Fixed MV value output 1, 2 and 3
LSP shift 0/+1, 0/+2, 0/+4, 0/+8, 0/+16, 0/+32, 0/+64, 0/+128, 0/+256, 0/+512
Analog input 2 ratio number selection 0/+1, 0/+2, 0/4
Computer backup system 1 and 2
How to use LSP number / LSP shift
 

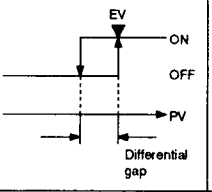
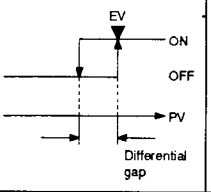
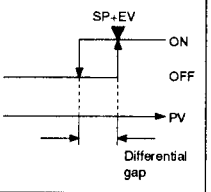
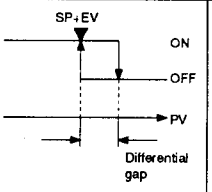
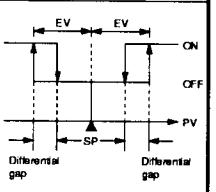
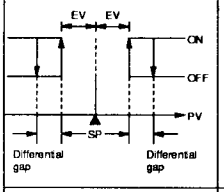
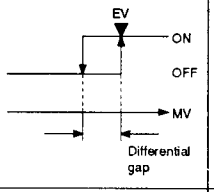
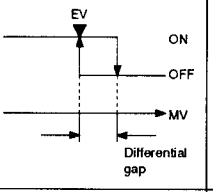
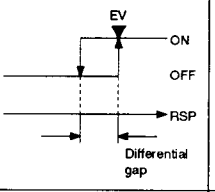
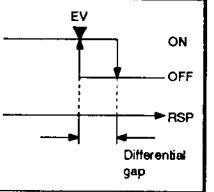
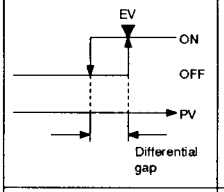
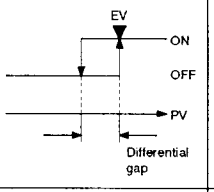
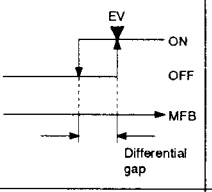
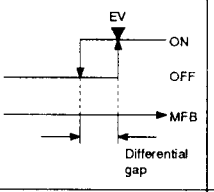
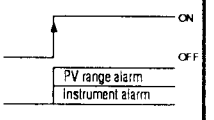
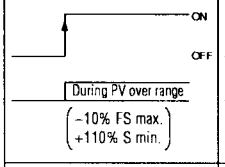
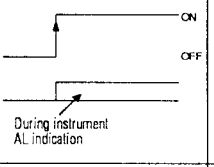
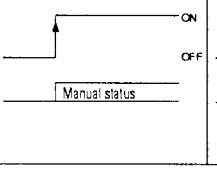
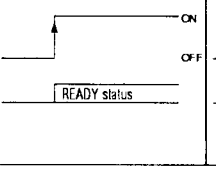
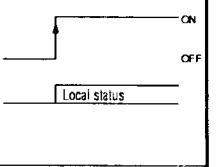
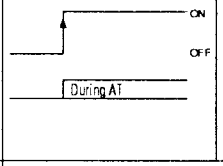
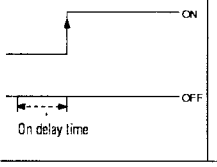
Computer backup system usage
 

The output is changed over by remote switch input to control by SDC 40A. One of the following two configurations must then be selected by the remote switch:
① PV at changeover is used as SP.
② LSP preset is used as SP.</td></tr>
</table>

Event

No. of output points	2 points: standard (SPST relay contact). 1 point (SPDT relay contact) and 5 points (open collector output) can optionally be added.

Event setting

Direct PV	Reverse PV	Direct deviation	Reverse deviation	Direct absolute deviation value
				
Reverse absolute deviation value	Direct MV	Reverse MV	Direct RSP	Reverse RSP
				
Direct SP	Reverse SP	Direct motor feedback	Reverse motor feedback	All alarm sum
				
PV range alarm	Instrument alarm	Manual status	READY status	Local status
				
Auto tuning status	Process diagnosis *			
				

* **Process diagnosis event:**
This is turned ON if the event on delay time is exceeded, but the temperature does not rise beyond the differential gap (does not lower in the case of direct action) when the manipulated variable is larger than the event set output value.

Setting range	PV (direct, reverse) : −19999 to +26000U Deviation (direct, reverse) : −19999 to +26000U Absolute deviation value : 0 to 26000U MV (direct, reverse) : −10.0 to +110.0% RSP (direct, reverse) : −19999 to +26000U MFB (direct, reverse) : −10.0 to +110.0% Process diagnostics : −10.0 to +110.0%
Differential gap (hysteresis) setting range	MV event, other than MFB: 0 to 200U, MV event, MFB: 0.0 to 20.0% However, when alarm event or status alarm is set, no differential gap can be set.
On delay time	0 to 20000s or 0 to 20000 min. The on delay time can be set for event output EV1 to EV3.
Output action	On-off

		Item \ Event	EV_1, EV_2 (standard)	EV_3 (option)	EV_4 to E_8 (option)
Event	**Output rating**	Type of output	SPST (1a) relay contact	SPDT (1a1b) relay contact	Open collector output
		Contact rating	1A (30V dc/250V ac with resistive load)	2A (30V dc/250V ac with resistive load)	—
		Allowable contact voltage	250V ac with resistive load 30V dc with resistive load	250V ac with resistive load 30V dc with resistive load	—
		Mechanical life	20,000,000 cycles	50,000,000 cycles	—
		Electrical life	100,000 cycles (at contact rating, and frequency of 20 times/min.), COS ϕ = 1	100,000 cycles (at contact rating, and frequency of 20 times/min.), COS ϕ = 1	—
		Minimum on-off voltage	10V	10V	—
		Minimum on-off current	10mA (Use a bleeder resistor if necessary.)	10mA (Use a bleeder resistor if necessary.)	—
		Load drive power voltage range	—	—	10V dc to 29V dc
		Maximum output current	—	—	70mA/point max. (under operating conditions)
		Off time leak current	—	—	0.1mA/point max. (under operating conditions, within load drive power voltage range)
		Off time residual voltage	—	—	1.6V max. (under operating conditions, within load drive power voltage range, and at maximum output current)
Auxiliary output	**No. of output points**	1 or 2 (1 point in 2G, 3D, AK, 5K, 9K, and BK models)			
	Type of output	Selectable from PV, SP, DEV, RSP, MV and MFB.			
	Output rating	4 to 20mA dc. Max. allowable load resistance: 680Ω			
	Output accuracy	±0.1% FS (under standard conditions)			
	Output resolution	1/2000 (numeric value of independent resolution; for example, the input resolution of PV or MFB is not included)			
	Inrush current	25mA max. 50ms max. (with 250Ω load)			
	Maximum output current	21.6mA			
	Minimum output current	2.4mA			
	Opening terminal voltage	25V max.			
	Output update cycle	0.1s			
Communication	**Communication system**	Communication protocols	RS-485 (Note 1)	RS-232C	
		Network	Multidrop The device is provided only with the slave station function. 1 to 16 units max. (DIM), 1 to 31 units max. (CMA, SCM).	The device is provided only with the slave station function.	
		Data flow	Half duplex	Half duplex	
		Synchronization	Start/stop synchronization	Start/stop synchronization	
	Interface system	Transmission system	Balanced (differential)	Unbalanced	
		Data line	Bit serial	Bit serial	
		Signal lines	5 transmit/receive lines (3-wire connection is also possible)	3 transmit/receive lines	
		Transmission speed	4800, 9600 bps	4800, 9600 bps	
		Communication distance	500m max. (total)	15m max.	
		Protocol	RS-485	RS-232C	
	Message characters	Character configuration	11 bits/character	11 bits/character	
		Format	1 start bit, even parity, and 1 stop bit, or 1 start bit, no parity, and 2 stop bits	1 start bit, even parity, and 1 stop bit, or 1 start bit, no parity, and 2 stop bits	
		Data length	8 bits	8 bits	
	Isolation	Completely isolated between the input and output.			
	Note: 1. For RS-485 communications, the device can be connected not only to computers equipped with RS-485, but also to **Yamatake Corporation's** MX200, MA500 (DK link II DIM) or CMA50 controllers.				

General specifications	**Memory backup**	Non-volatile semiconductor memory (EEPROM)	
	Rated power voltage	90 to 264V ac, 50/60Hz	
	Power consumption	25VA max.	
	Power switching inrush current	15A max. 10ms (under operating conditions) Caution: When applying power to a number of SDC 40As simultaneously, ensure sufficient power is supplied, or start up the SDC 40As in series. Otherwise, the controllers may not start up normally due to voltage drop from the inrush current. It is necessary to reach the stable voltage within 2 sec. of power being supplied.	
	Insulation resistance	More than 20MΩ between power terminal 1 or 2 and ground terminal 3 (using 500V dc megger).	
	Dielectric strength	1500V ac, 50/60Hz for 1 min. between power terminal and ground terminal 1500V ac, 50/60Hz for 1 min. between relay output and ground terminal 500V ac, 50/60Hz for for 1 min. between any other part and ground terminal 500V ac, 50/60Hz for 1 min. between isolated terminals	
	Standard conditions	Ambient temperature	23±2°C
		Ambient humidity	60±5% RH
		Rated power voltage	105V ac ±1%
		Power frequency	50±1Hz or 60±1Hz
		Vibration resistance	0m/s^2
		Shock resistance	0m/s^2
		Mounting angle	Reference plane (vertical) ±3°
	Operating conditions	Ambient temperature range	0 to 50°C
		Ambient humidity range	10 to 90% RH (non-condensing)
		Rated power voltage	90 to 264V ac
		Power frequency	50±2Hz or 60±2Hz
		Vibration resistance	0 to 1.96m/s^2
		Shock resistance	0 to 9.80 m/s^2
		Mounting angle	Reference plane (vertical) ±10°
	Transport/storage conditions	Ambient temperature range	−20 to +70°C
		Ambient humidity range	10 to 95% RH (non-condensing)
		Vibration resistance	0 to 4.90m/s^2 (10 to 60Hz, for 2hr each in X, Y and Z directions)
		Shock resistance	0 to 490m/s^2 (3 times in vertical direction)
		Package drop test	Drop height: 60cm (1 angle, 3 edges, 6 planes, freefall)
	Materials of mask and case	Mask: Multilon Case: Polycarbonate	
	Colors of mask and case	Mask: Dark gray (Munsell 5Y3.5/1) Case: Light gray (Munsell 2.5Y7.5/1)	
	Mounting	Panel flush type, using the dedicated mounting bracket	
	Weight	Approx. 750g (Extension terminal base: Approx. 150g)	

	Name	Model No.	Q'ty		Name	Model No.
Standard accessories	Unit indicating label	N-3132	1	**Options**	Hard dust-proof cover set	81446083-001
	Mounting bracket	81405411-001	1 set (2 brackets)		Soft dust-proof cover set	81446087-001
	Instruction manual	CP-UM-1580E	1		Terminal cover set	81446084-001

Specification are subject to change without notice.

YAMATAKE

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