Operation Specifications

Model: TTM-509
Designation: Digital controller
Development code: K163

APPROVED	APPROVED	CHECKED	DESIGNED	DATE December 16, 2003	Job. No. K163	TITLE TTM-509 Operation Specifications	
				MODEL TTM-509		DWG. No.	PAGE
				TOHO ELECTRONICS INC.		45-4199-E	1/66

Common document | Technical document

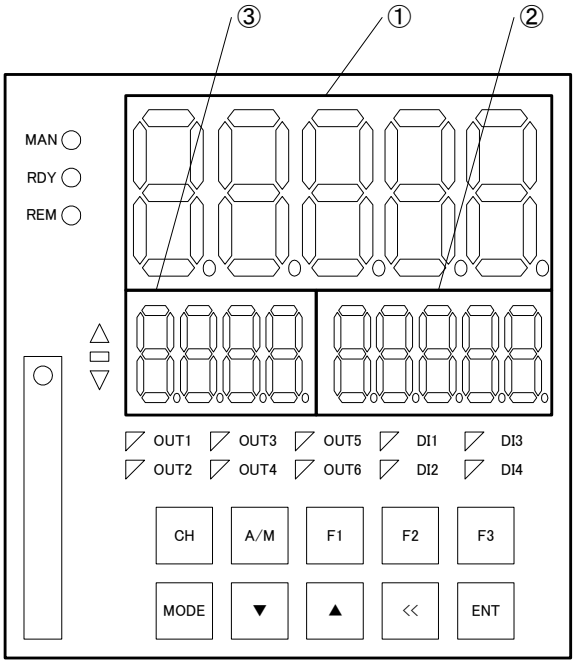
Contents

1. Scope

This set of specifications applies to Digital Controller TTM-509.

2. LED description

2.1 7-segment LED

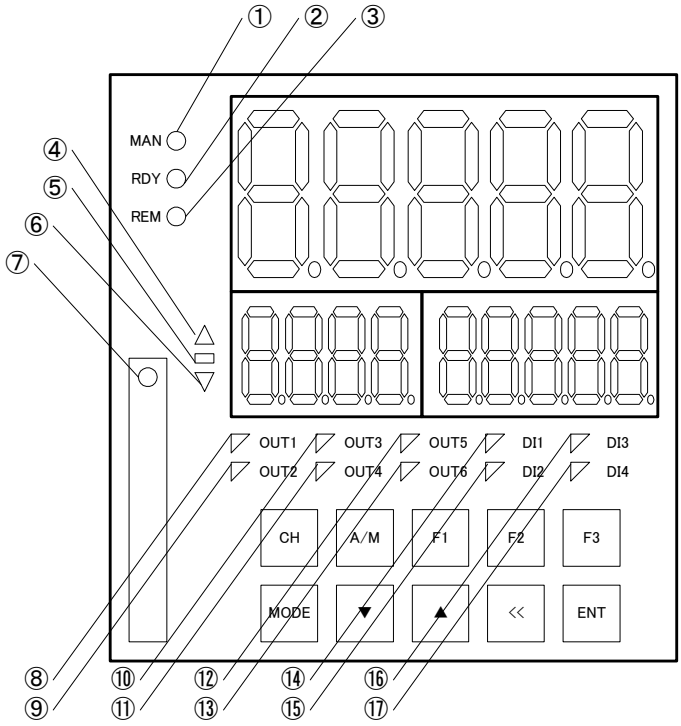


① PV, 7-segment
Displays PV and characters being set.

② SV, 7-segment
Displays SV, settings, and monitor.

③ Auxiliary display, 7-segment
Displays CH and/or other details.

2.2 LED lamp



① MAN lamp
Lights up when in the manual mode.

② RDY lamp
Lights up when in the RDY (Ready) mode.

③ REM lamp
Lights up when in the REM (remote) mode.

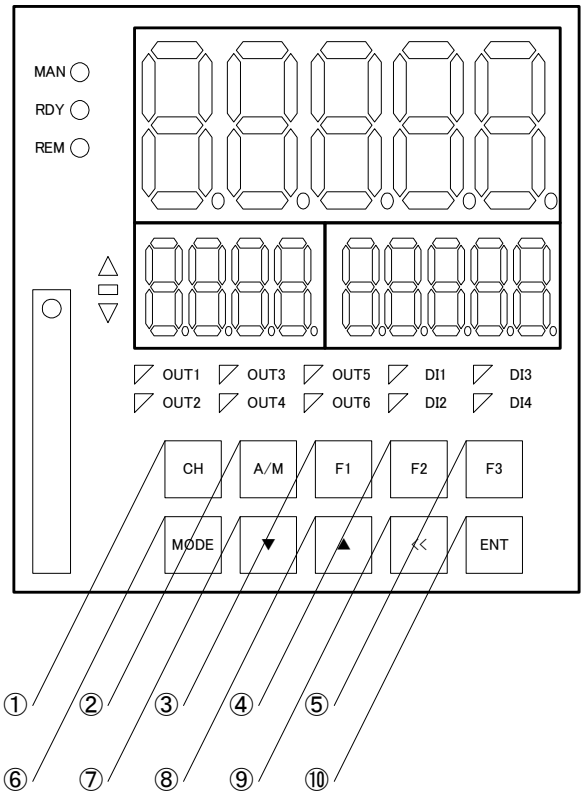
④ Over-the-deviation lamp
⑤ Within-the-deviation lamp
⑥ Below-the-deviation lamp
Displays the relational status of the PV and SV.

⑦ SD card lamp
When the SD card is accessed: Blinks.
When an SD card is inserted: Lit (except when being accessed)

⑧ OUT1 lamp
⑨ OUT2 lamp
⑩ OUT3 lamp
⑪ OUT4 lamp
⑫ OUT5 lamp
⑬ OUT6 lamp
Lit when the output of the output monitor is ON (active).

⑭ DI1 lamp
⑮ DI2 lamp
⑯ DI3 lamp
⑰ DI4 lamp
Lit when the input of the input monitor is ON (active).

3. Key description



① CH key
Changes displayed channels.

② A/M key
Toggles the system between Auto and Manual.

③ F1 key
④ F2 key
⑤ F3 key
Serve as function keys, thus setting an operation.

⑥ MODE key
Changes screens.

⑦ ▼ key
⑧ ▲ key
Change the setting.

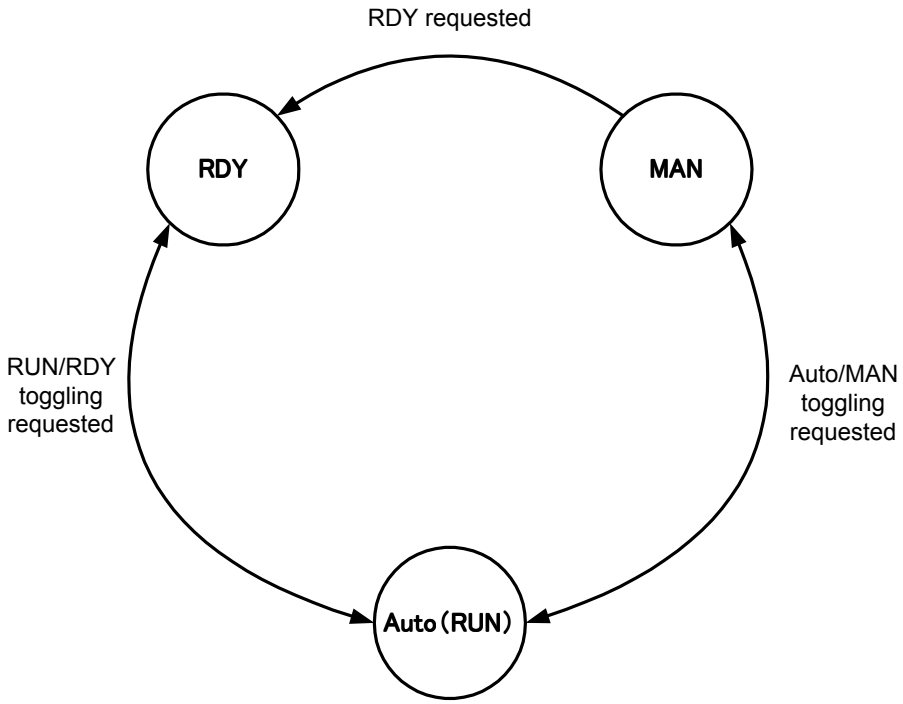
⑨ ≪ key
Moves the setting change digit.

⑩ ENT key
Finalizes a setting entered.

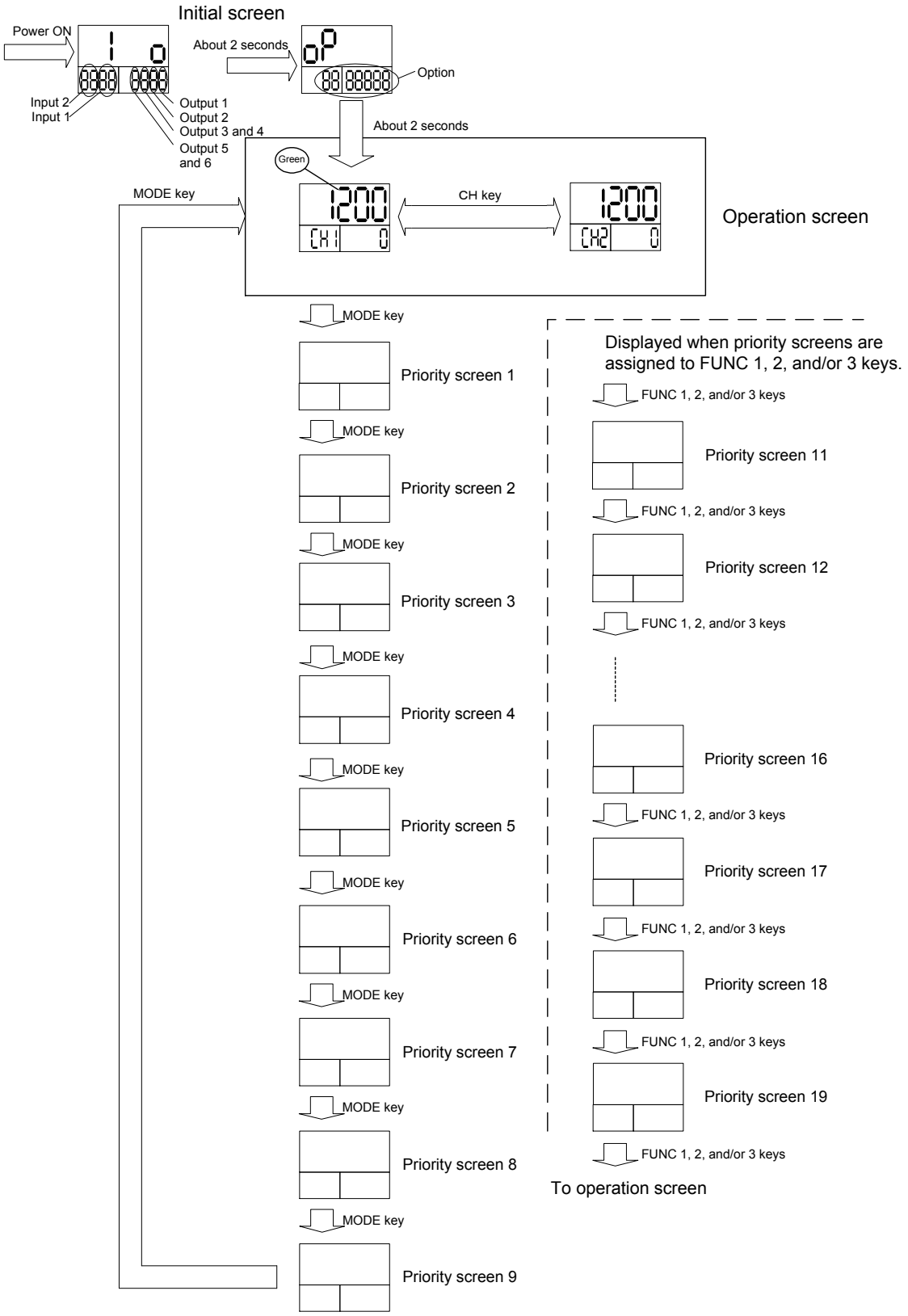
4. State description

4.1 Operation state

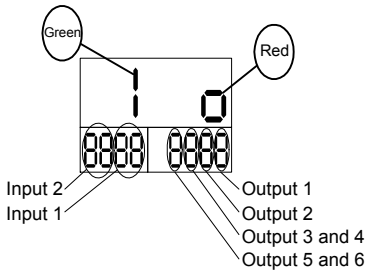
Functions can be assigned to DI and keys to toggle the system between Auto and MAN, and between RUN and RDY.



- The operation state of CH1 and that of CH2 are asynchronous.
  Pressing the A/M key on the entire surface changes the channel displayed currently.
- Setting a DI to Auto/MAN or RUN/RDY disables the changeover of the operation status with keys.


Initial screen
Power ON
About 2 seconds
Option
Input 2
Input 1
Output 1
Output 2
Output 3 and 4
Output 5 and 6
About 2 seconds
Green
MODE key
CH key
Operation screen
MODE key
Priority screen 1
MODE key
Priority screen 2
MODE key
Priority screen 3
MODE key
Priority screen 4
MODE key
Priority screen 5
MODE key
Priority screen 6
MODE key
Priority screen 7
MODE key
Priority screen 8
MODE key
Priority screen 9
Displayed when priority screens are assigned to FUNC 1, 2, and/or 3 keys.
FUNC 1, 2, and/or 3 keys
Priority screen 11
FUNC 1, 2, and/or 3 keys
Priority screen 12
FUNC 1, 2, and/or 3 keys
Priority screen 16
FUNC 1, 2, and/or 3 keys
Priority screen 17
FUNC 1, 2, and/or 3 keys
Priority screen 18
FUNC 1, 2, and/or 3 keys
Priority screen 19
FUNC 1, 2, and/or 3 keys
To operation screen

About the initial screen
Initial screen 1 (input/output check screen)



Input 1: See "Input 1 setting type, 4.4.4 Initial setting mode."
Input 2: See "Input 2 setting type, 4.4.4 Initial setting mode."

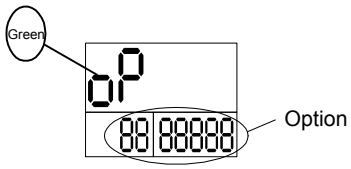
Output 1: Output 1 type
0: None
1: Relay
2: SSR drive
3: Open collector
4: Voltage 0-1V DC
5: Voltage 0-5V DC
6: Voltage 1-5V DC
7: Voltage 0-10V DC
8: Current 4-20mA DC

Output 2: Output 2 type
0: None
1: Relay
2: SSR drive
3: Open collector
4: Voltage 0-1V DC
5: Voltage 0-5V DC
6: Voltage 1-5V DC
7: Voltage 0-10V DC
8: Current 4-20mA DC

Outputs 3 and 4: Output 3 and 4 types
0: None
1: Open collector
2: Relay contact (common independent)

Outputs 4 and 5: Output 5 and 6 types
0: None
1: Open collector
2: Relay contact (common independent)

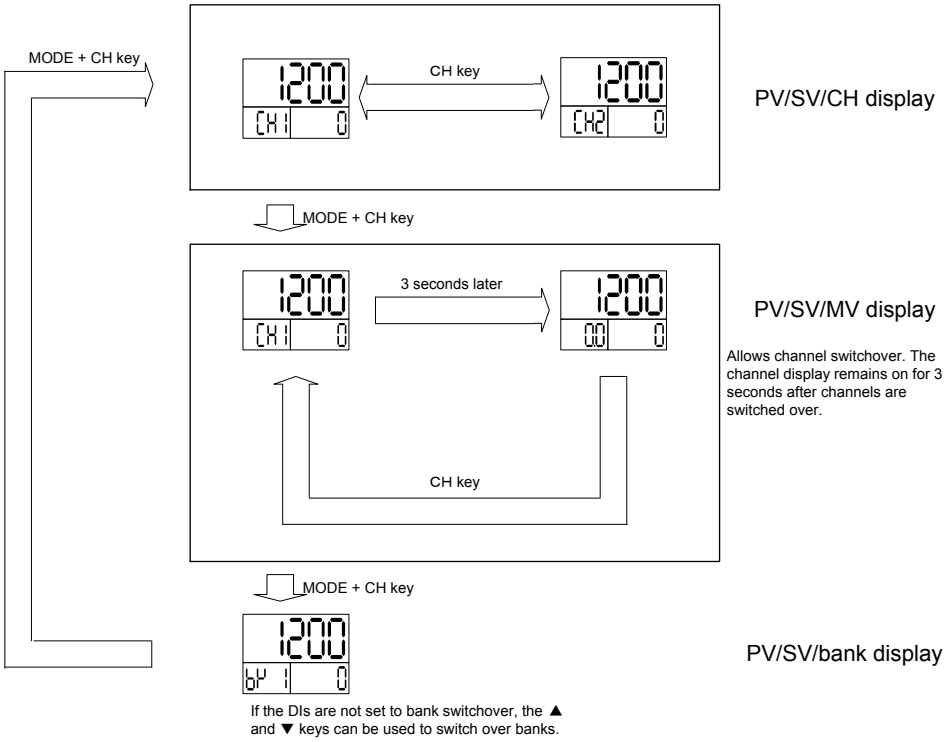
Initial screen 2 (option check screen)



Options: Option types

0: Communications (RS-485/RS-232C)
1: CT1, CT2 (measurement range, 0-50A)
2: CT1, CT2 (measurement range, 0-120A)
3: Event input
4: Infrared communications
5: Sensor power supply
6: Data log
7: Transmission output (voltage 0-1V DC)
8: Transmission output (voltage 0-5V DC)
9: Transmission output (voltage 1-5V DC)
A: Transmission output (voltage 0-10V DC)
b: Transmission output (current 4-20mA DC)

About the operation screen



The auxiliary screen in the PV/SV/MV display switches over among CH1MV1, CH1MV2, CH2MV1, and CH2MV2 every time the CH key is pressed.

When banks are switched over with DIs, the method of switchover varies according to the number of DIs to be assigned.

When one DI is assigned

DI non-active, BANK0; DI active, BANK1

When two DIs are assigned

Status of DI2	Status of DI1	Banks selected
Non-active	Non-active	0
Non-active	Active	1
Active	Non-active	2
Active	Active	3

When three DIs are assigned

Status of DI3	Status of DI2	Status of DI1	Banks selected
Non-active	Non-active	Non-active	0
Non-active	Non-active	Active	1
Active	Active	Non-active	2
Non-active	Active	Active	3
Active	Non-active	Non-active	4
Active	Non-active	Active	5
Active	Active	Non-active	6
Active	Active	Active	7

4.2 Timer state

4.2.1 Setting a timer output destination

The timer output can be connected to "control" or "event output (1-6)" to control "control" and events 1 and 3 with the timer. It can thus be set to a desired setting.

In the case of "timer disabled," set the timer time to 0:00.

4.2.2 Setting a timer function

The options available are "auto start," "manual start," "event start," and "SV start."

(1) Auto start

The timer automatically begins to operate when it is turned on.

(2) Manual start

The timer starts when a function key or DI is set to timer start and its action is generated.

(3) Event start

The timer starts when either of the events in progress is activated.

(4) SV start

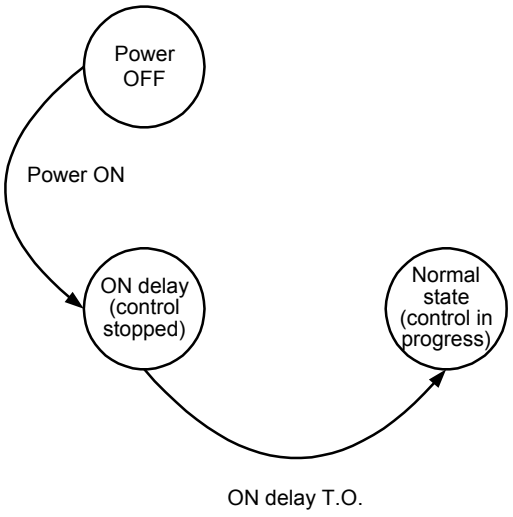
The timer starts when it is turned on and it goes beyond the SV value + the SV start tolerance setting (for OFF delay only).

4.2.3 Setting a timer type

The options available are "inactivate timer," "ON delay," "OFF delay," and "repeat." After that, the timer types will be described on the assumption that the timer function is set to "auto start."

(1) ON delay

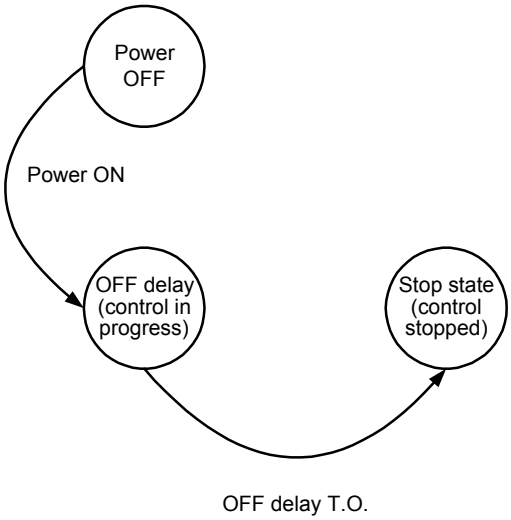
Turning on the system starts it in a startup setting state. When a set time is up, control begins.



(2) OFF delay

Turning on the system starts it in a startup setting state.

When a set time is up, control stops.



(3) Repeat

Turning on the system starts it in a startup setting state.

It will repeat a set number of ON delays and OFF delays, then ends in a final setting state.

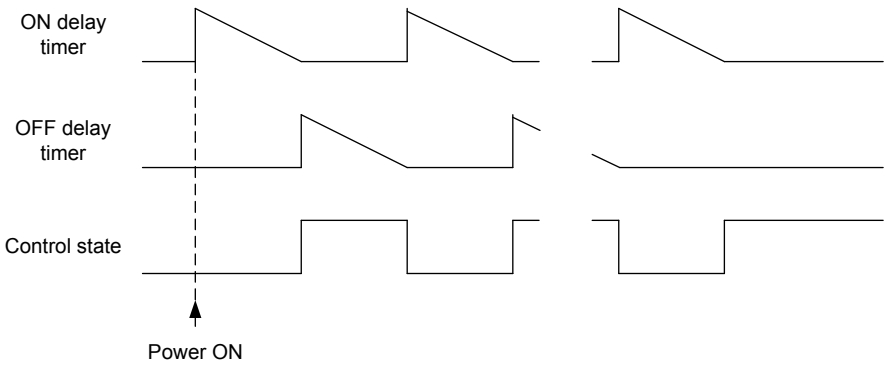
The set repetition frequency will be the number of timer starts for reaching the final state.

To terminate the final state with control, for example, set the number of ON delays to be executed, with the repetition frequency.

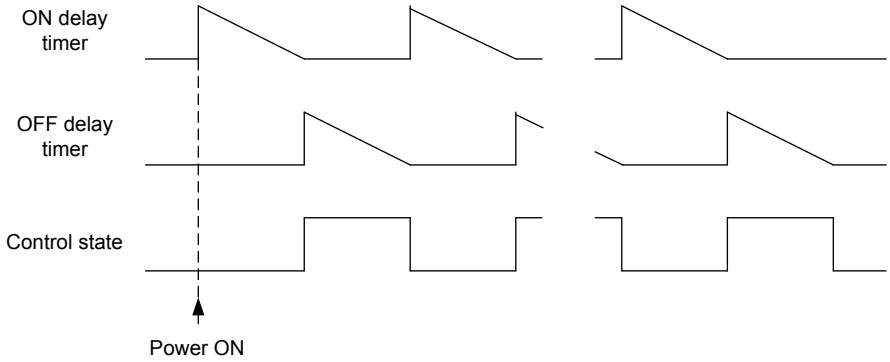
If the ON delay, OFF delay, or repetition frequency is set to a "0," it will enter the final state the moment it is turned on.

Following is a timing chart.

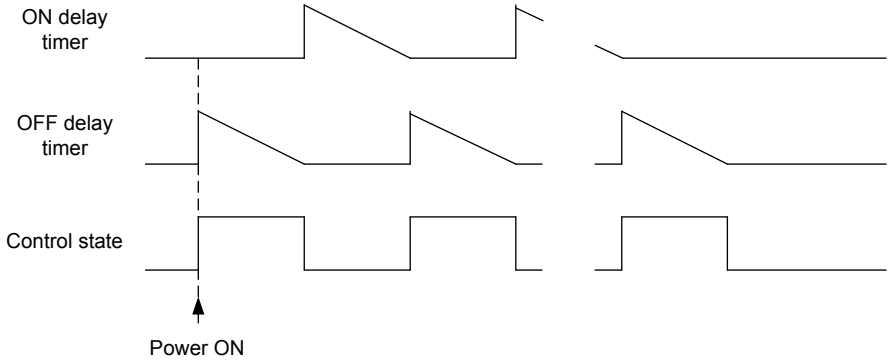
Startup state, RDY; stop state, RUN



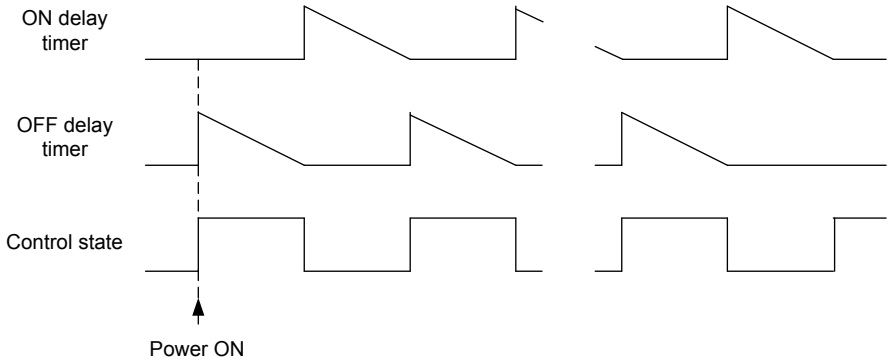
Startup state, RDY; stop state, RDY



Startup state, RUN; stop state, RDY



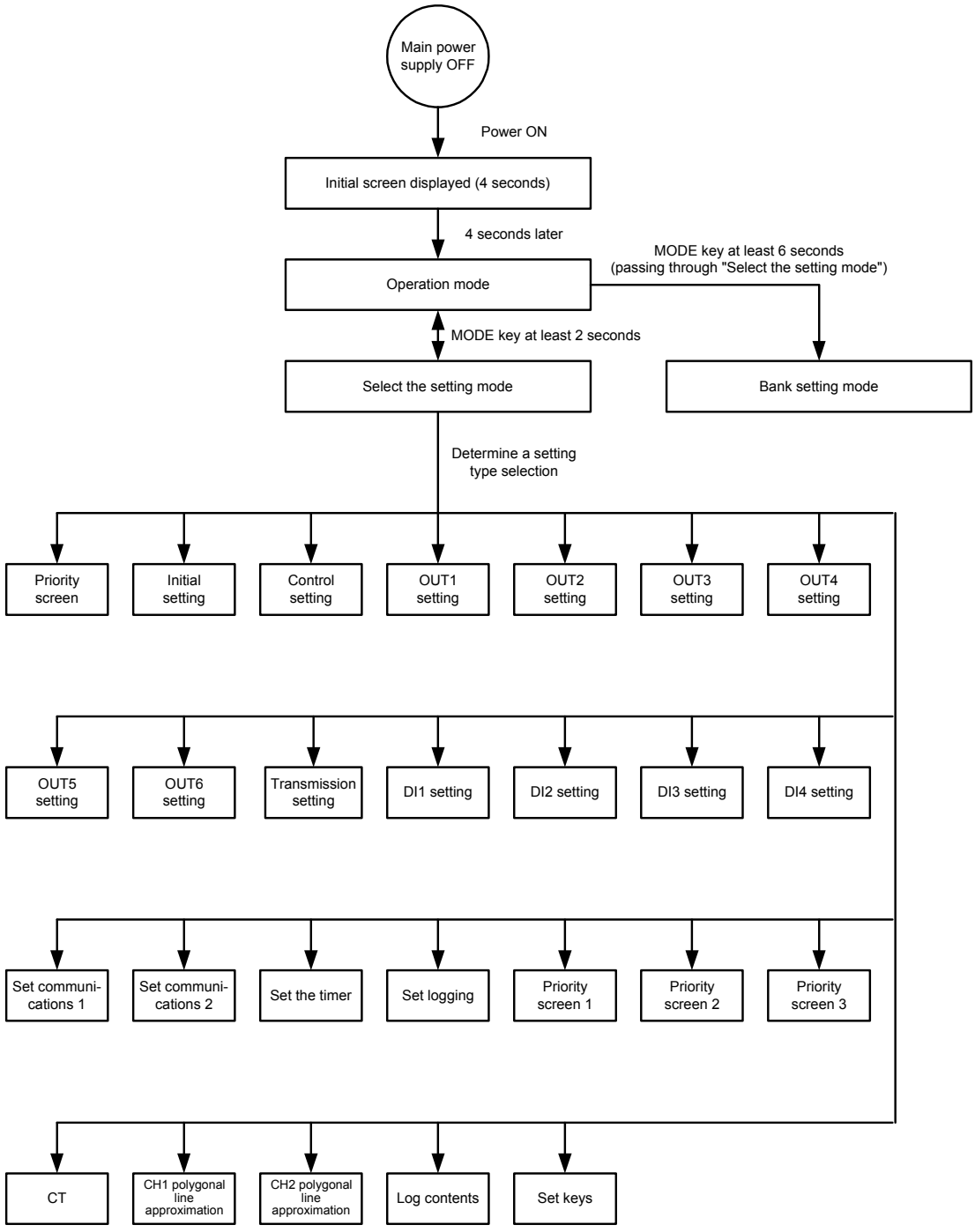
Startup state, RUN; stop state, RUN



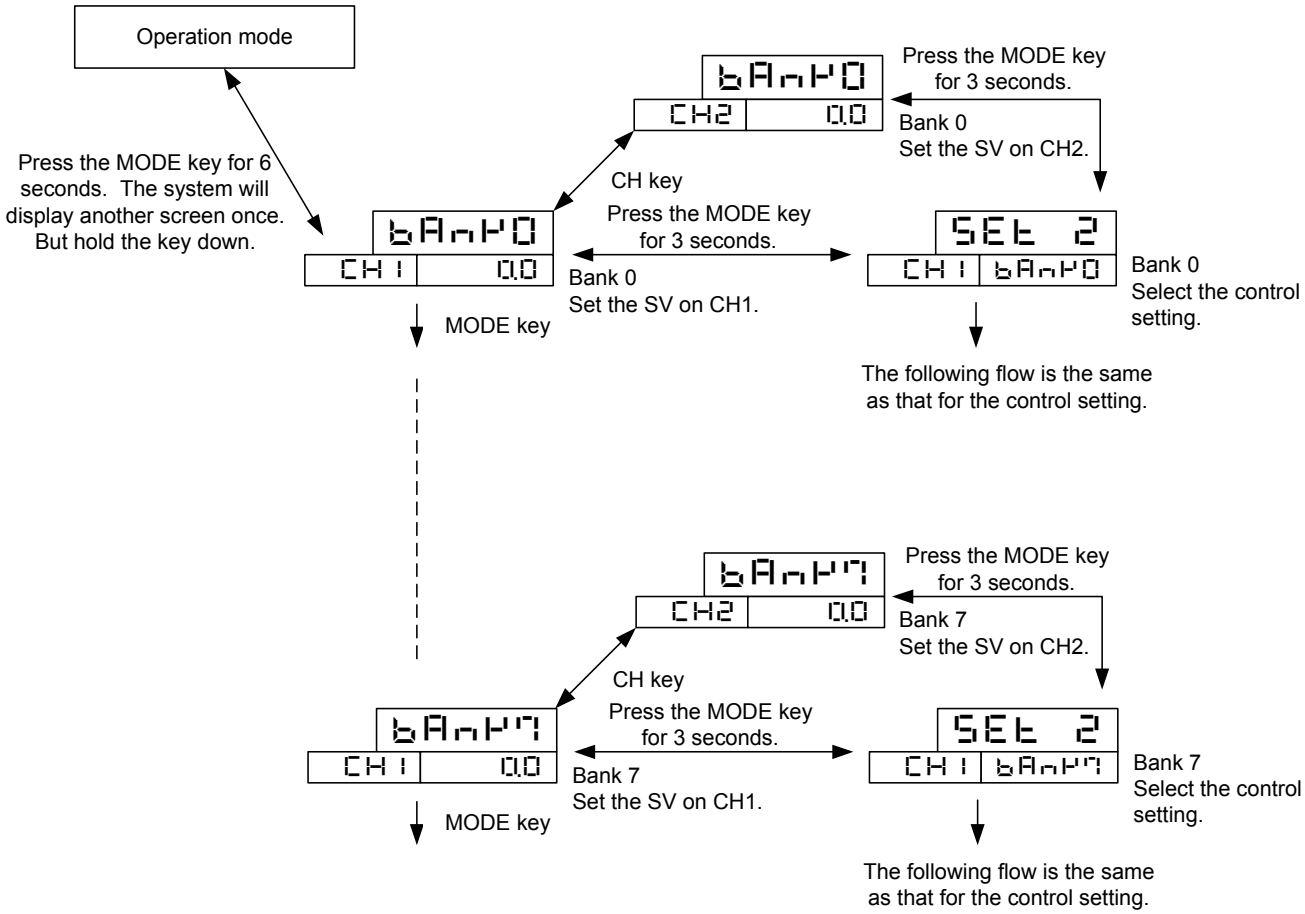
4.3 Setting mode

Press the MODE key for 3 seconds while in the operation mode. The system will then switch to the "Select the setting mode" screen.

While in that state, use the ▲ and ▼ key to select a setting category and press the MODE key to enter the setting mode for a specific category.



Bank setting mode



While in the operation mode, press the MODE key for 3 seconds. The system will then switch to the "Select the setting mode" screen. But hold the key down for a total of 6 seconds or more until the system switches to the bank setting mode. The bank setting mode comes in the SV setting mode and the control selection setting mode.

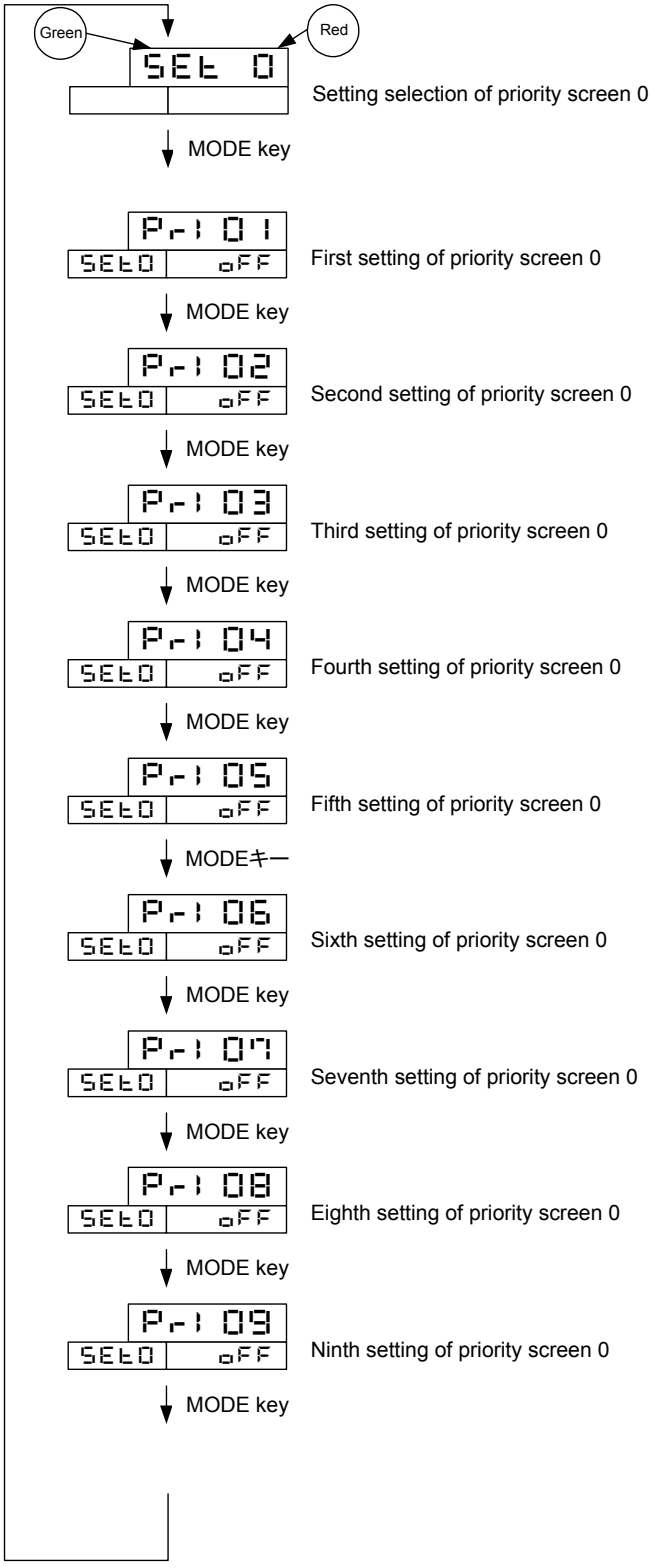
(1) SV setting mode

This mode allows the SVs on banks 0 to 7 to be set.

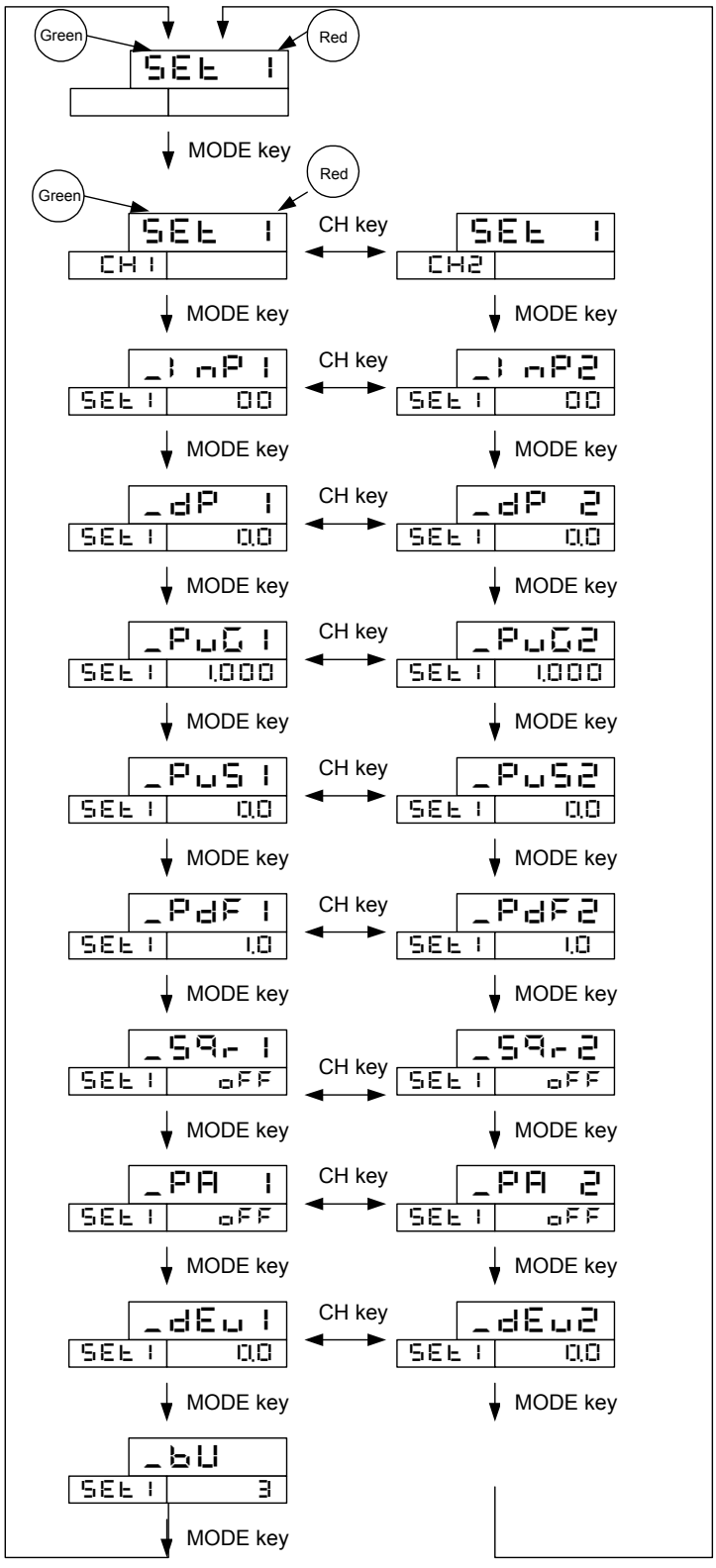
(2) Control selection setting mode

Select a bank and press the MODE key to enter the "control selection mode." The method of setting is the same as in the usual control setting mode (to be described later).

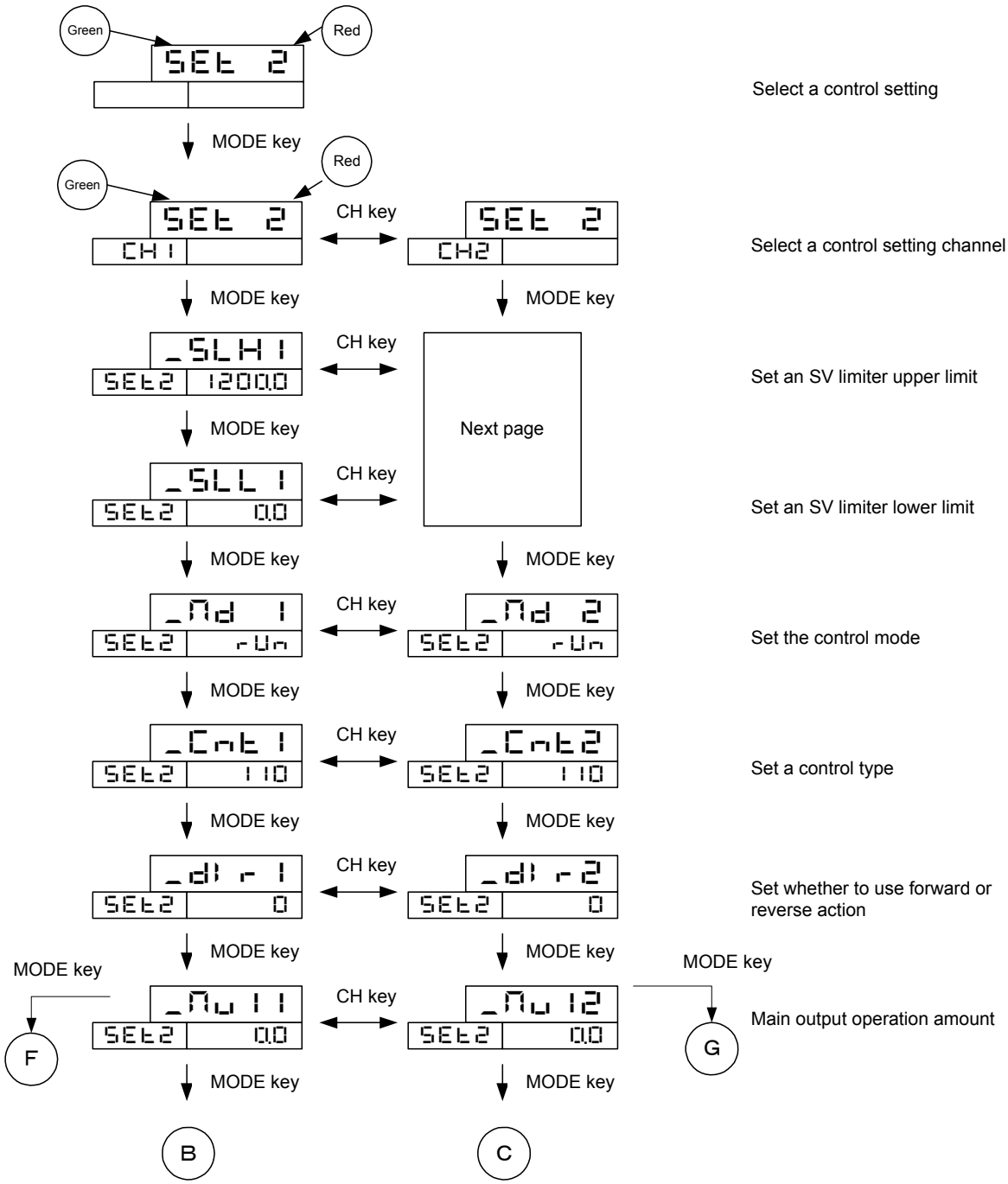
4.3.1 Priority screen 0

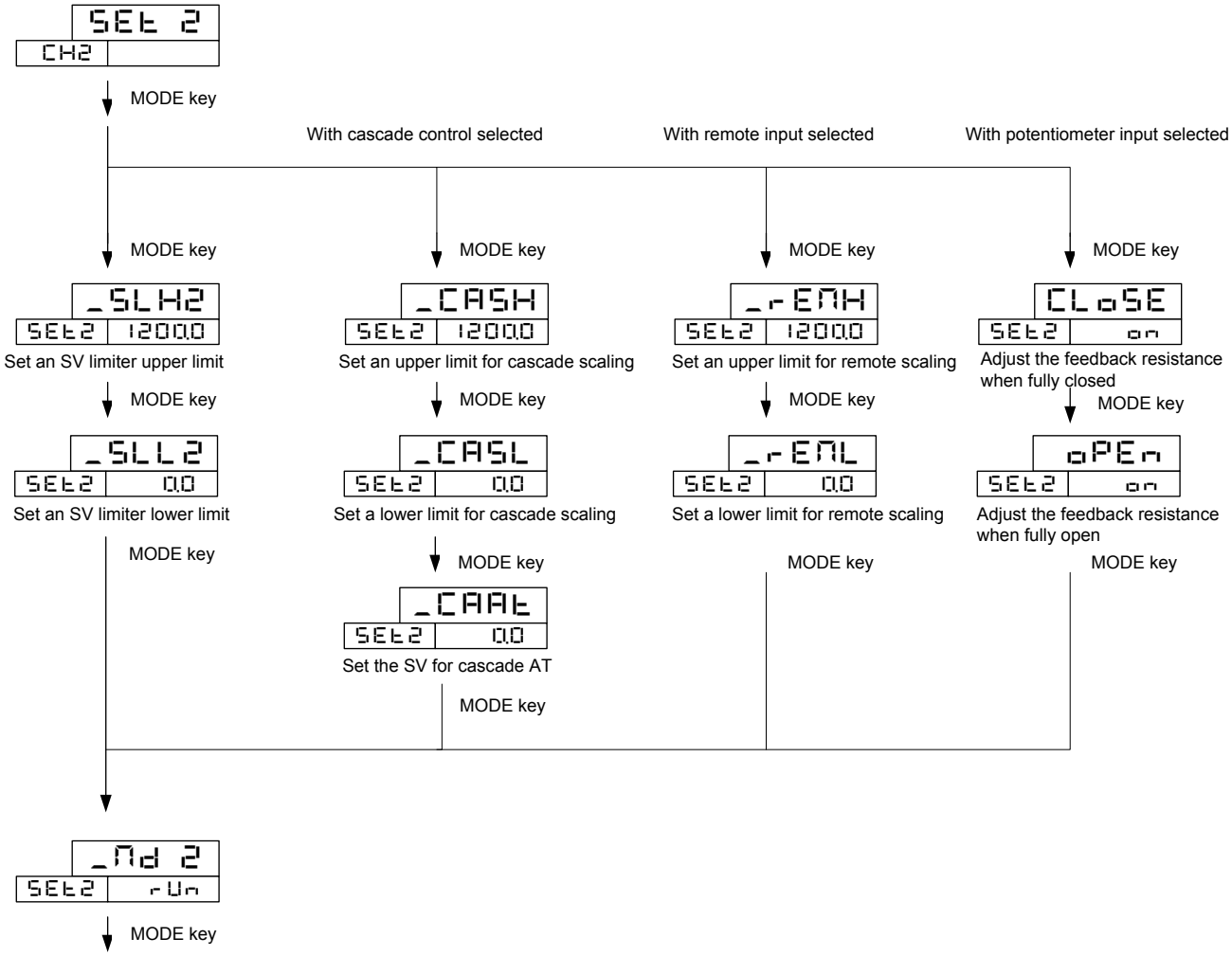


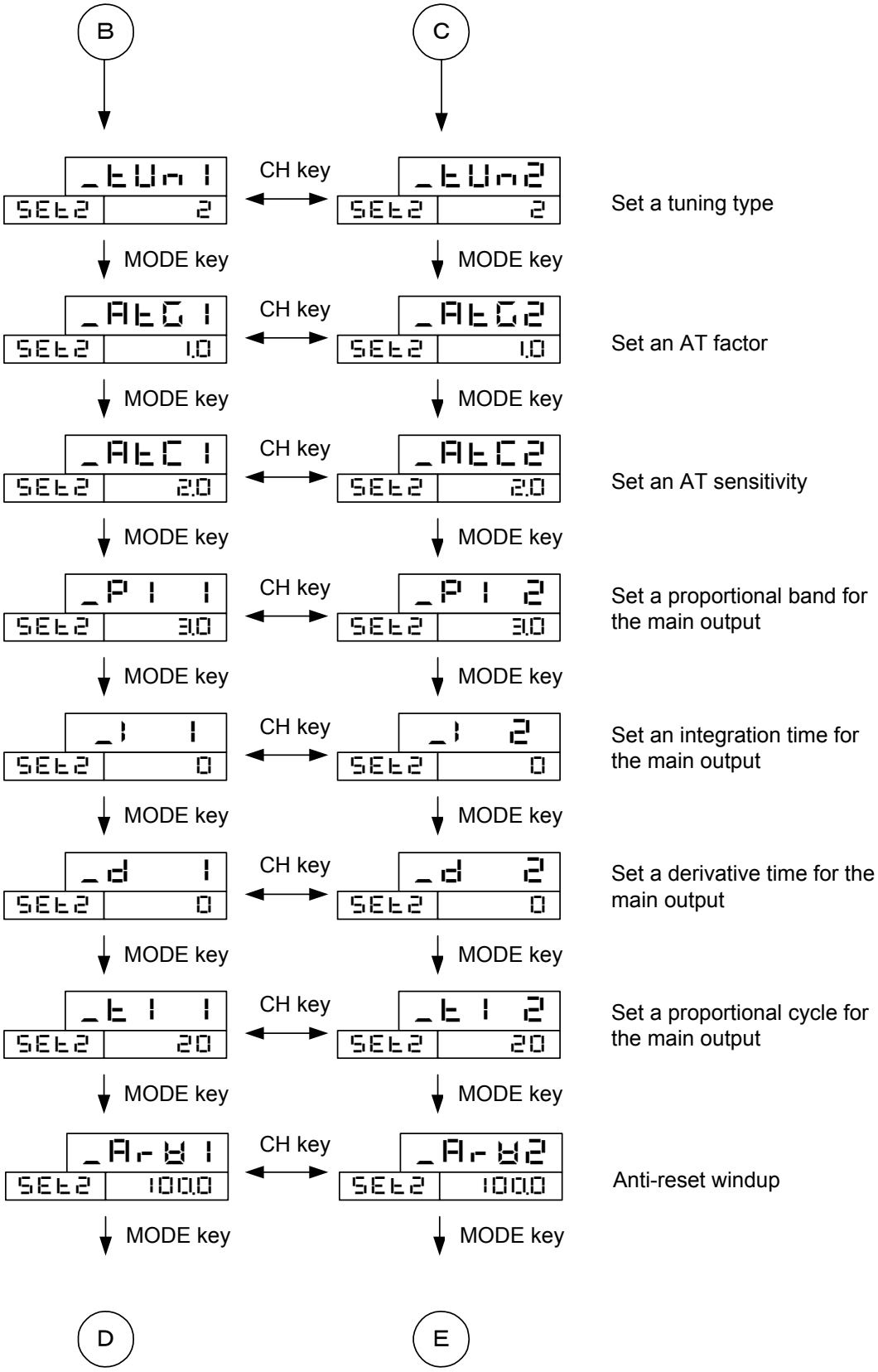
4.3.2 Initial setting

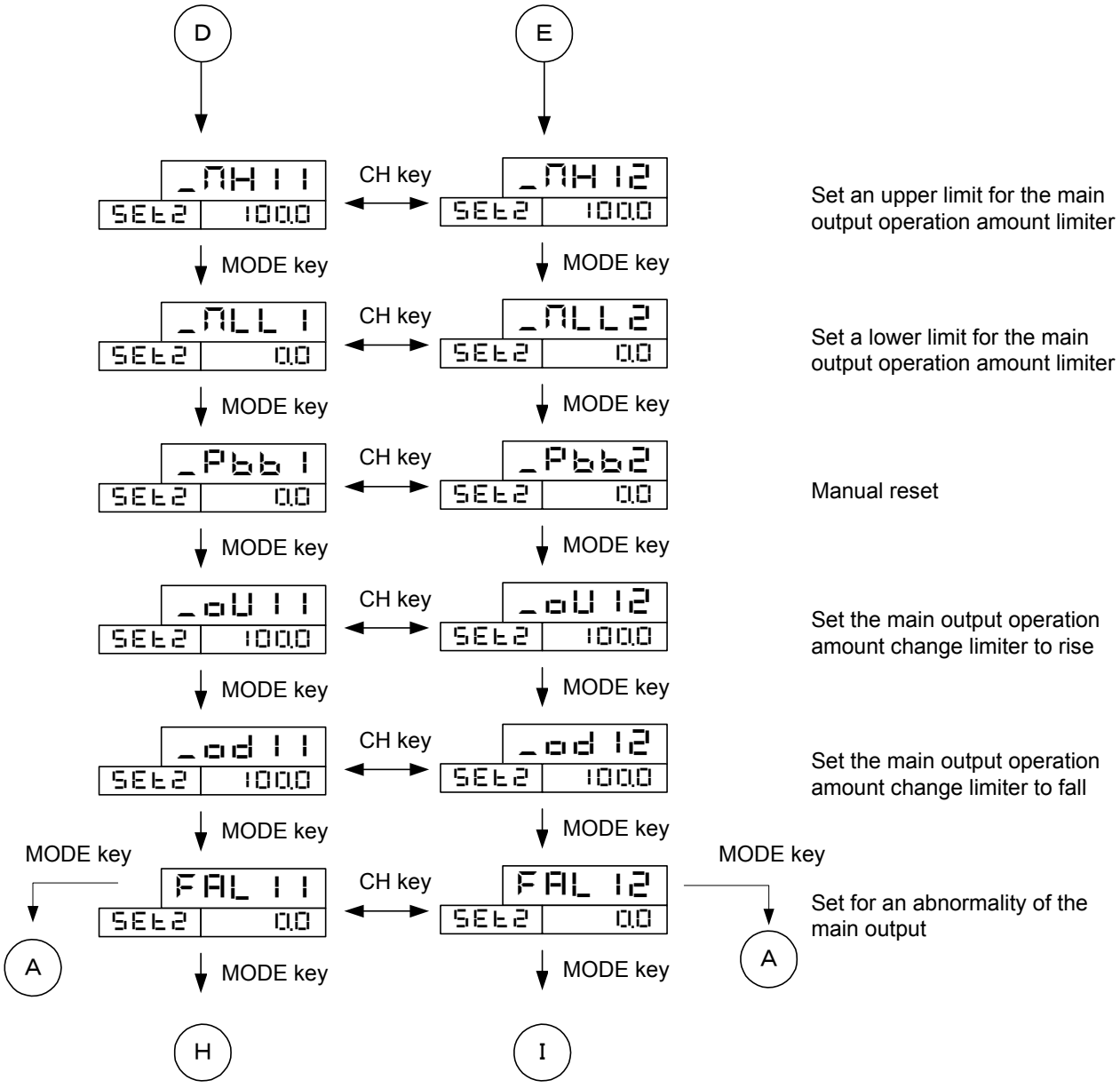


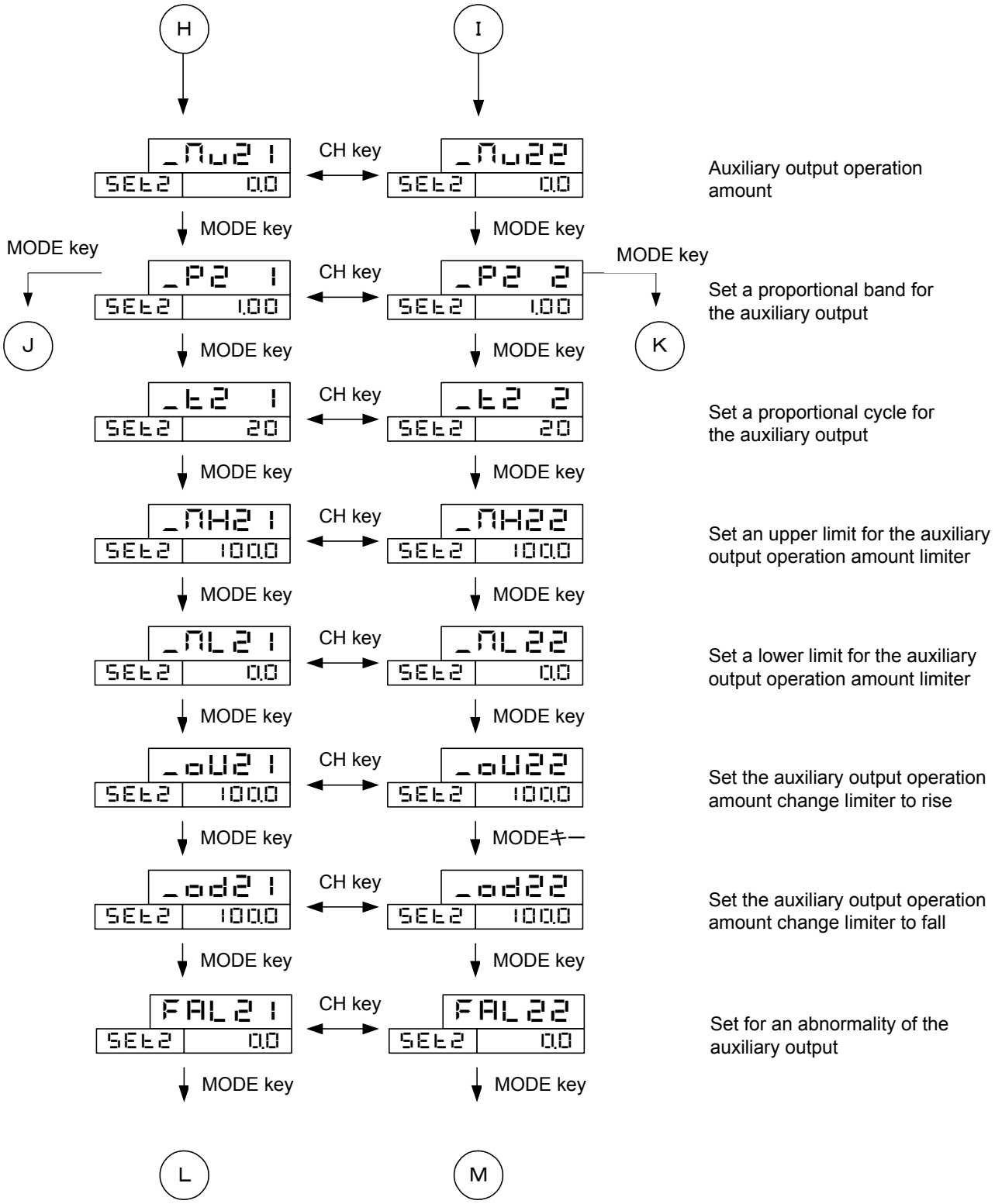
4.3.3 Control setting

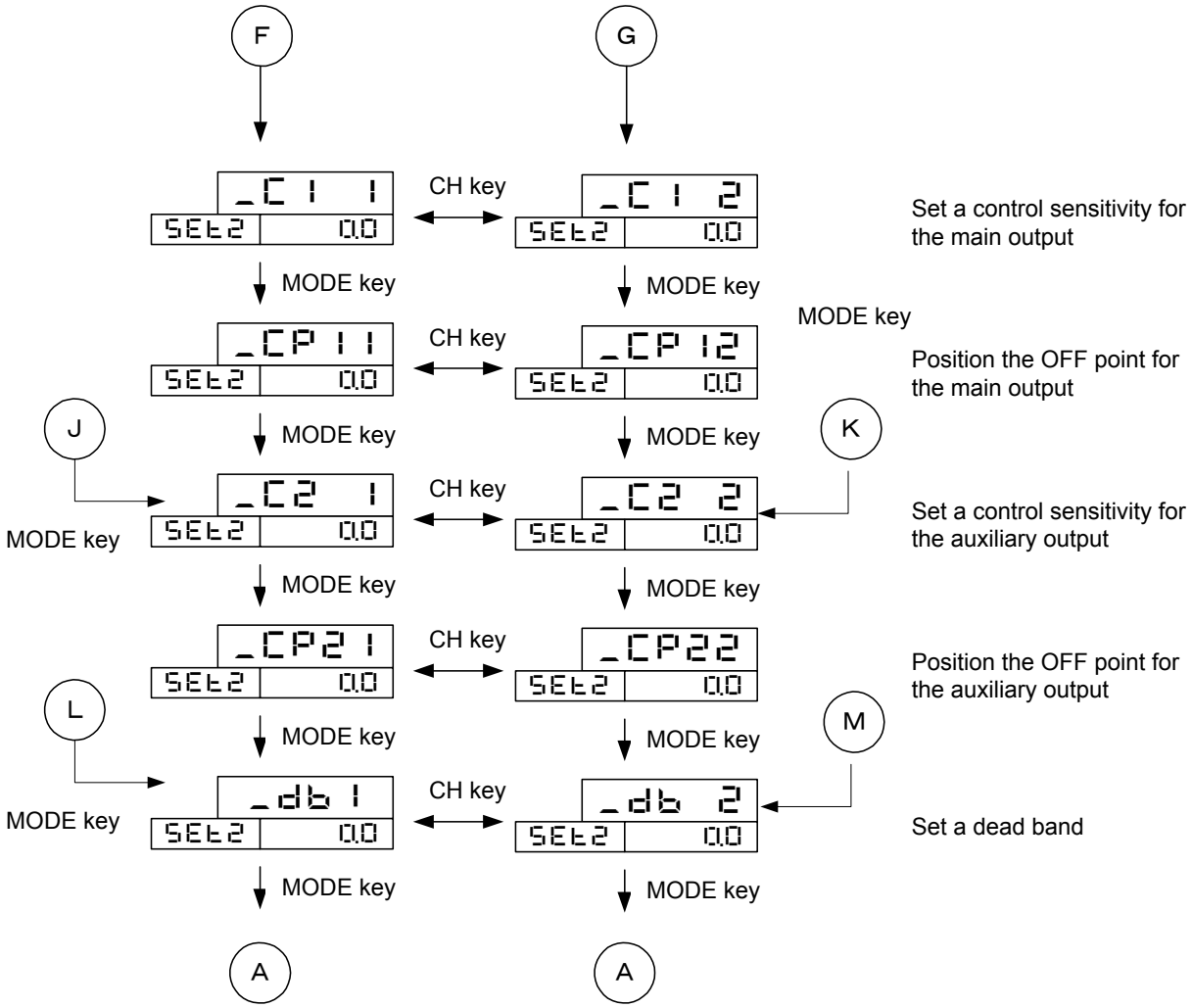



SEt 2
CH2
MODE key
With cascade control selected
With remote input selected
With potentiometer input selected
MODE key
MODE key
MODE key
MODE key
_SLH2
SEt2 1200.0
Set an SV limiter upper limit
_CASH
SEt2 1200.0
Set an upper limit for cascade scaling
_rEMH
SEt2 1200.0
Set an upper limit for remote scaling
CLoSE
SEt2 on
Adjust the feedback resistance when fully closed
MODE key
MODE key
MODE key
MODE key
_SLL2
SEt2 0.0
Set an SV limiter lower limit
_CASL
SEt2 0.0
Set a lower limit for cascade scaling
_rEML
SEt2 0.0
Set a lower limit for remote scaling
oPEn
SEt2 on
Adjust the feedback resistance when fully open
MODE key
MODE key
MODE key
MODE key
_CAAt
SEt2 0.0
Set the SV for cascade AT
MODE key
_Md 2
SEt2 rUn
MODE key

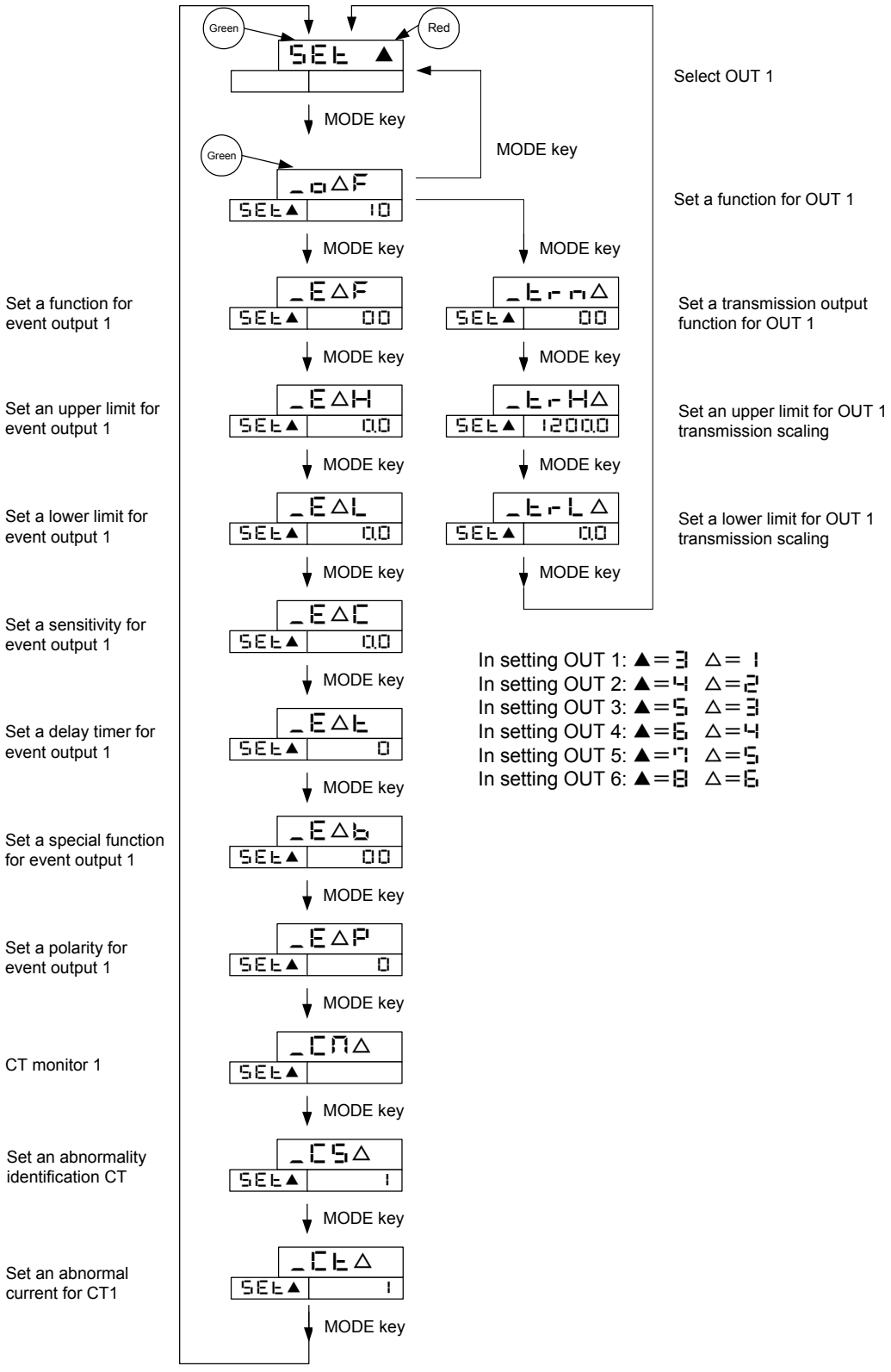

B
C
_tUn1
SEt2 2
CH key
_tUn2
SEt2 2
Set a tuning type
MODE key
MODE key
_AtG1
SEt2 1.0
CH key
_AtG2
SEt2 1.0
Set an AT factor
MODE key
MODE key
_AtC1
SEt2 2.0
CH key
_AtC2
SEt2 2.0
Set an AT sensitivity
MODE key
MODE key
_P1 1
SEt2 30
CH key
_P1 2
SEt2 30
Set a proportional band for the main output
MODE key
MODE key
_I 1
SEt2 0
CH key
_I 2
SEt2 0
Set an integration time for the main output
MODE key
MODE key
_d 1
SEt2 0
CH key
_d 2
SEt2 0
Set a derivative time for the main output
MODE key
MODE key
_t1 1
SEt2 20
CH key
_t1 2
SEt2 20
Set a proportional cycle for the main output
MODE key
MODE key
_Ar-B1
SEt2 100.0
CH key
_Ar-B2
SEt2 100.0
Anti-reset windup
MODE key
MODE key
D
E


D
E
_MH 1 1
SEt2 100.0
CH key
_MH 12
SEt2 100.0
Set an upper limit for the main output operation amount limiter
MODE key
MODE key
_MLL 1
SEt2 0.0
CH key
_MLL2
SEt2 0.0
Set a lower limit for the main output operation amount limiter
MODE key
MODE key
_Pbb 1
SEt2 0.0
CH key
_Pbb2
SEt2 0.0
Manual reset
MODE key
MODE key
_oU 1 1
SEt2 100.0
CH key
_oU 12
SEt2 100.0
Set the main output operation amount change limiter to rise
MODE key
MODE key
_od 1 1
SEt2 100.0
CH key
_od 12
SEt2 100.0
Set the main output operation amount change limiter to fall
MODE key
MODE key
MODE key
FAL 1 1
SEt2 0.0
CH key
FAL 12
SEt2 0.0
MODE key
Set for an abnormality of the main output
A
A
MODE key
MODE key
H
I

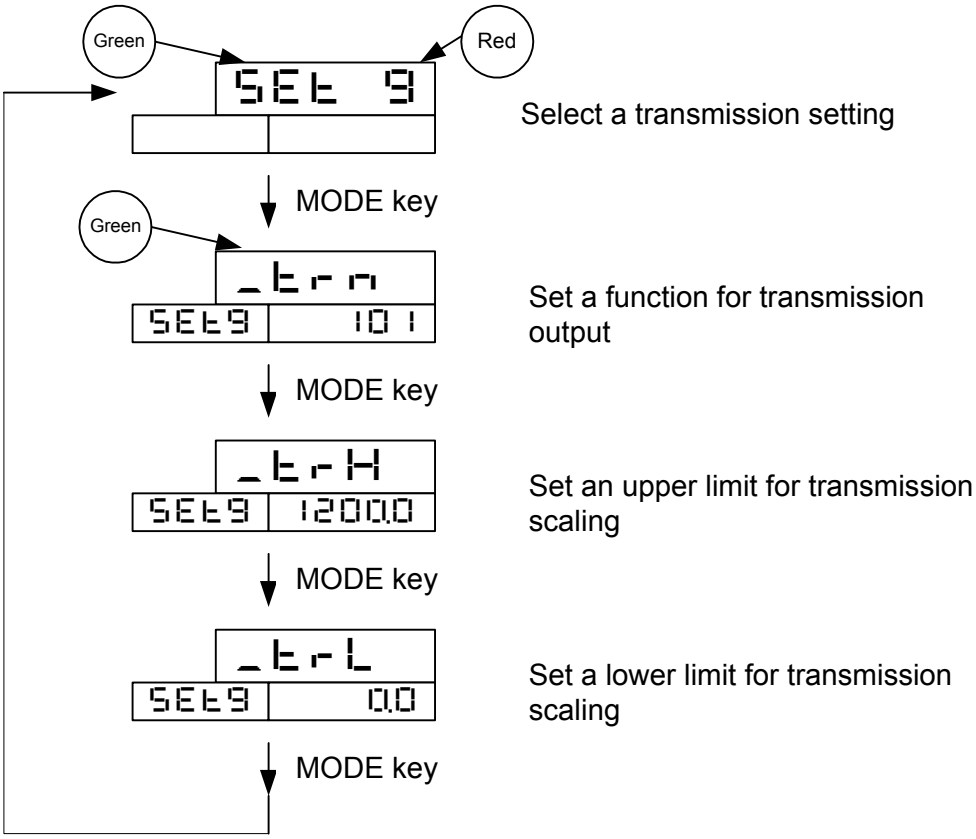

H
I
_Ou21
SEt2 0.0
CH key
_Ou22
SEt2 0.0
Auxiliary output operation amount
MODE key
MODE key
MODE key
MODE key
_P2 1
SEt2 1.00
CH key
_P2 2
SEt2 1.00
Set a proportional band for the auxiliary output
J
K
_t2 1
SEt2 20
CH key
_t2 2
SEt2 20
Set a proportional cycle for the auxiliary output
_OH21
SEt2 100.0
CH key
_OH22
SEt2 100.0
Set an upper limit for the auxiliary output operation amount limiter
_OL21
SEt2 0.0
CH key
_OL22
SEt2 0.0
Set a lower limit for the auxiliary output operation amount limiter
_oU21
SEt2 100.0
CH key
_oU22
SEt2 100.0
Set the auxiliary output operation amount change limiter to rise
MODEキー
_od21
SEt2 100.0
CH key
_od22
SEt2 100.0
Set the auxiliary output operation amount change limiter to fall
FAL21
SEt2 0.0
CH key
FAL22
SEt2 0.0
Set for an abnormality of the auxiliary output
L
M


F
G
_C 1 1
SEt2 0.0
CH key
_C 1 2
SEt2 0.0
Set a control sensitivity for the main output
MODE key
MODE key
MODE key
_CP 1 1
SEt2 0.0
CH key
_CP 1 2
SEt2 0.0
Position the OFF point for the main output
J
MODE key
MODE key
K
_C2 1
SEt2 0.0
CH key
_C2 2
SEt2 0.0
Set a control sensitivity for the auxiliary output
MODE key
MODE key
_CP2 1
SEt2 0.0
CH key
_CP22
SEt2 0.0
Position the OFF point for the auxiliary output
L
MODE key
MODE key
M
_db 1
SEt2 0.0
CH key
_db 2
SEt2 0.0
Set a dead band
MODE key
MODE key
A
A

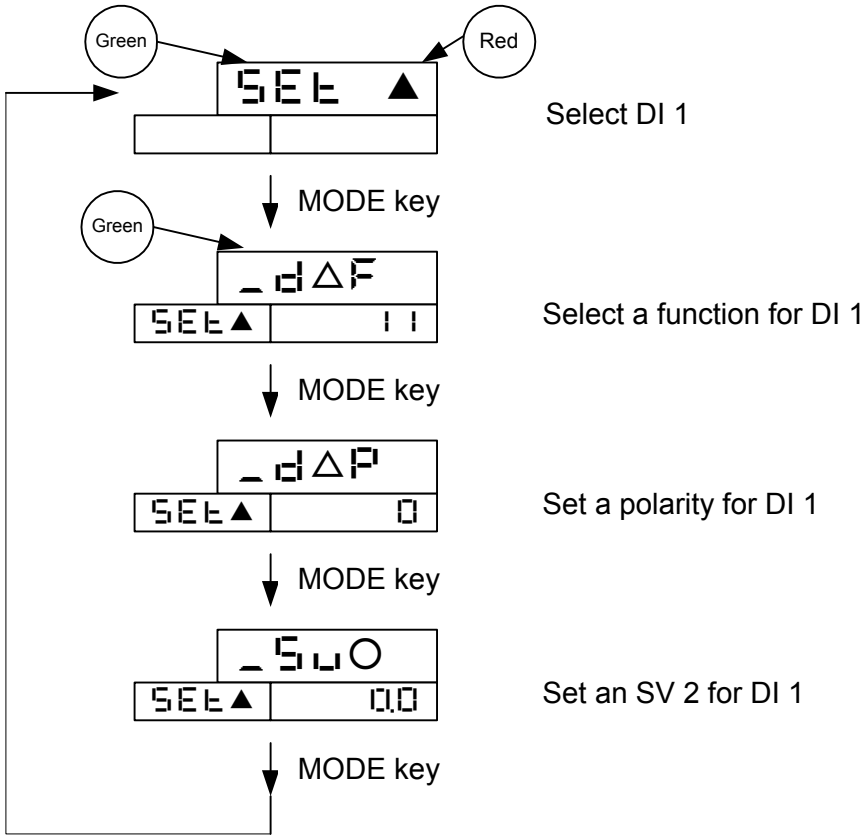
4.3.4 Setting OUT 1 to 6



4.3.5 Setting a transmission

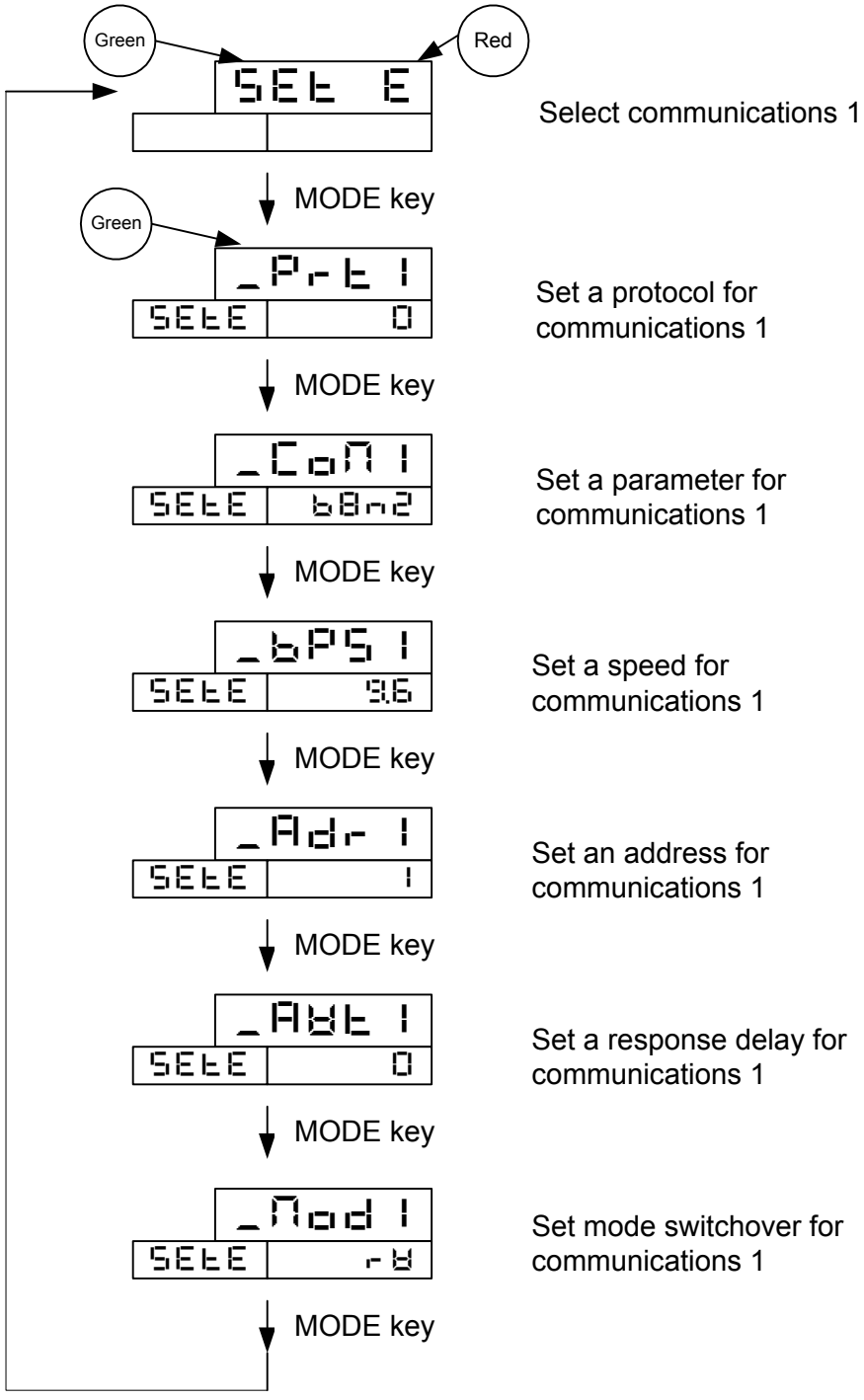


4.3.6 Setting DI 1 to 4

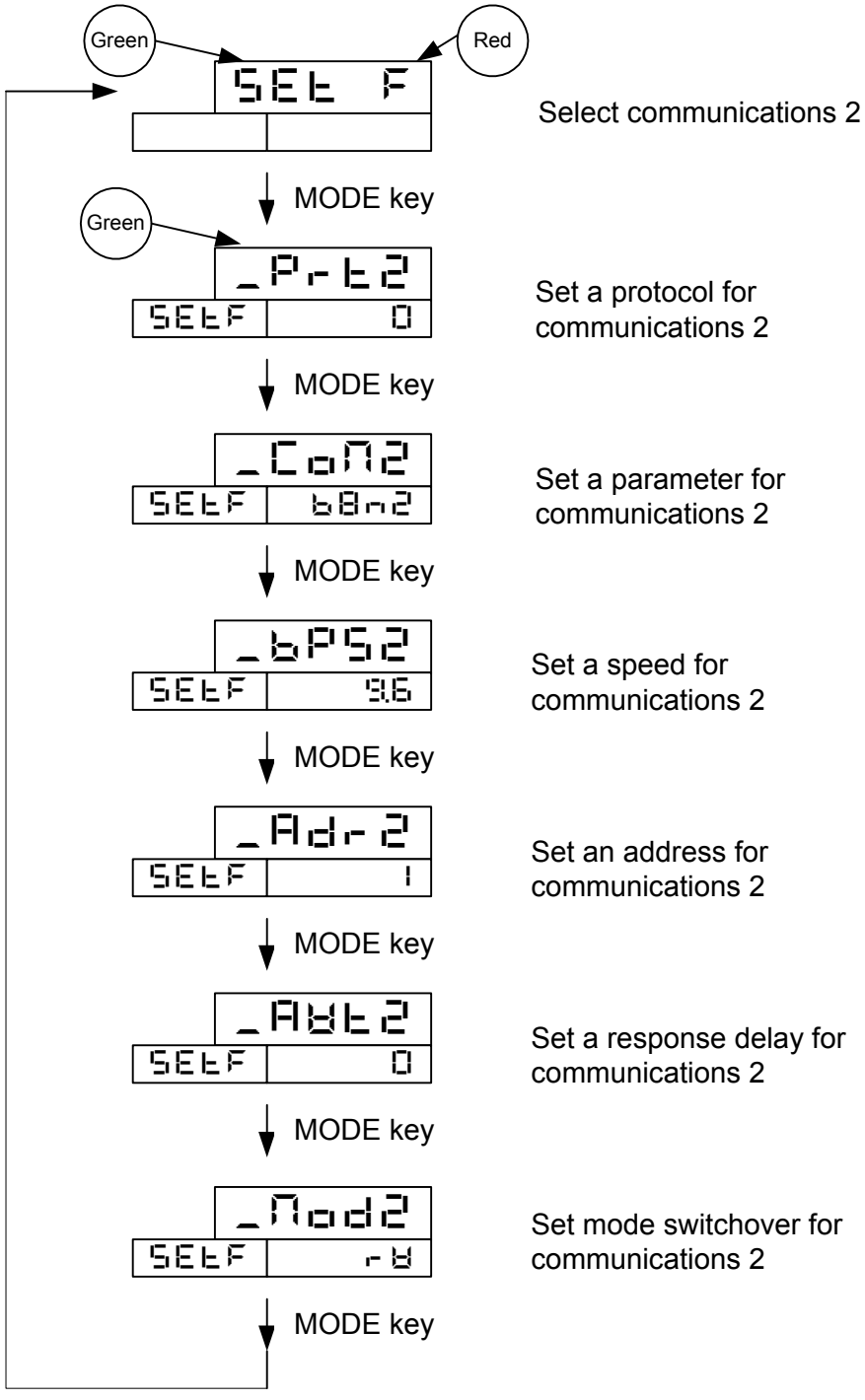


In setting DI 1: ▲=A △= 1 ○=2
In setting DI 2: ▲=b △=2 ○=3
In setting DI 3: ▲=C △=3 ○=4
In setting DI 4: ▲=d △=4 ○=5

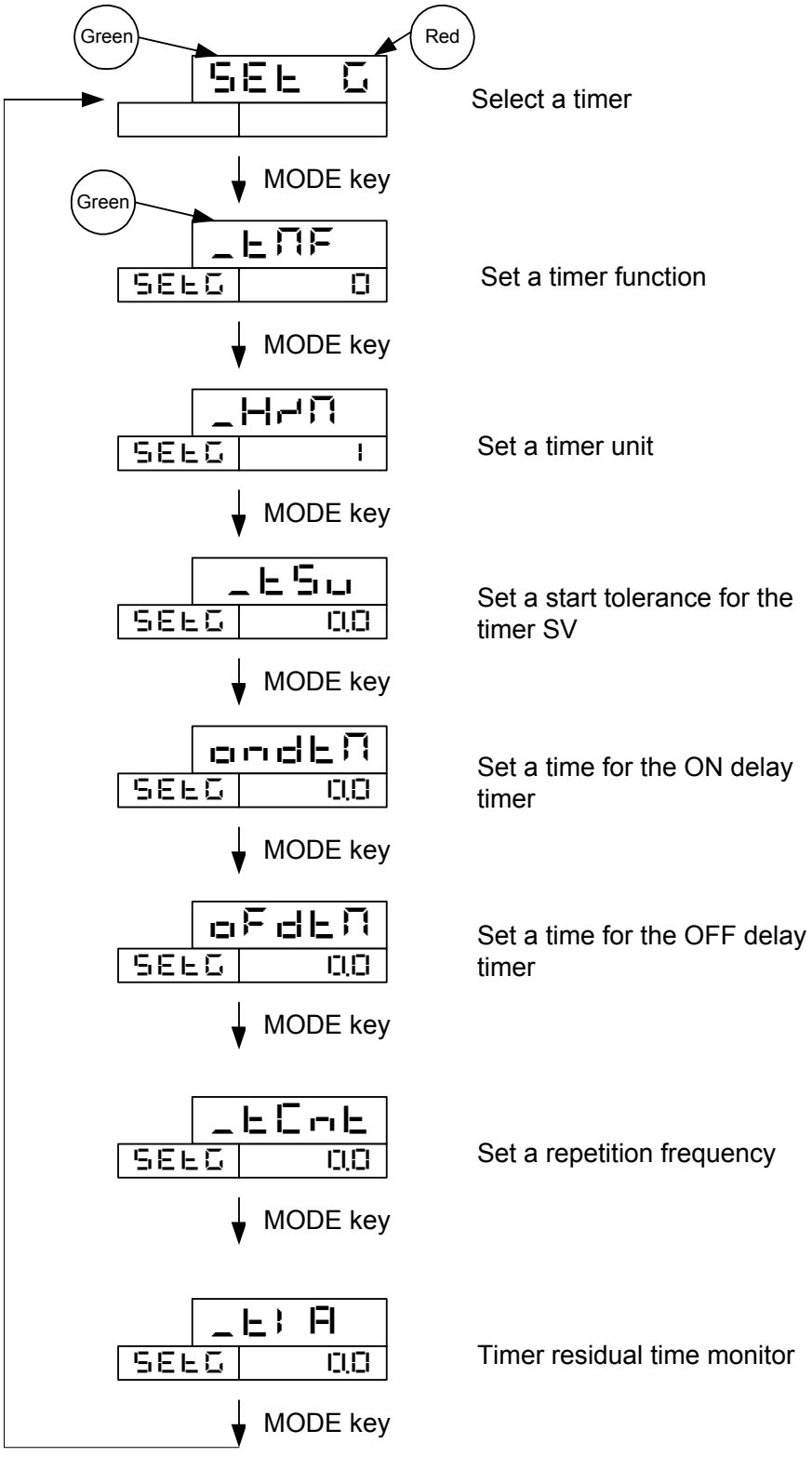
4.3.7 Setting communications 1



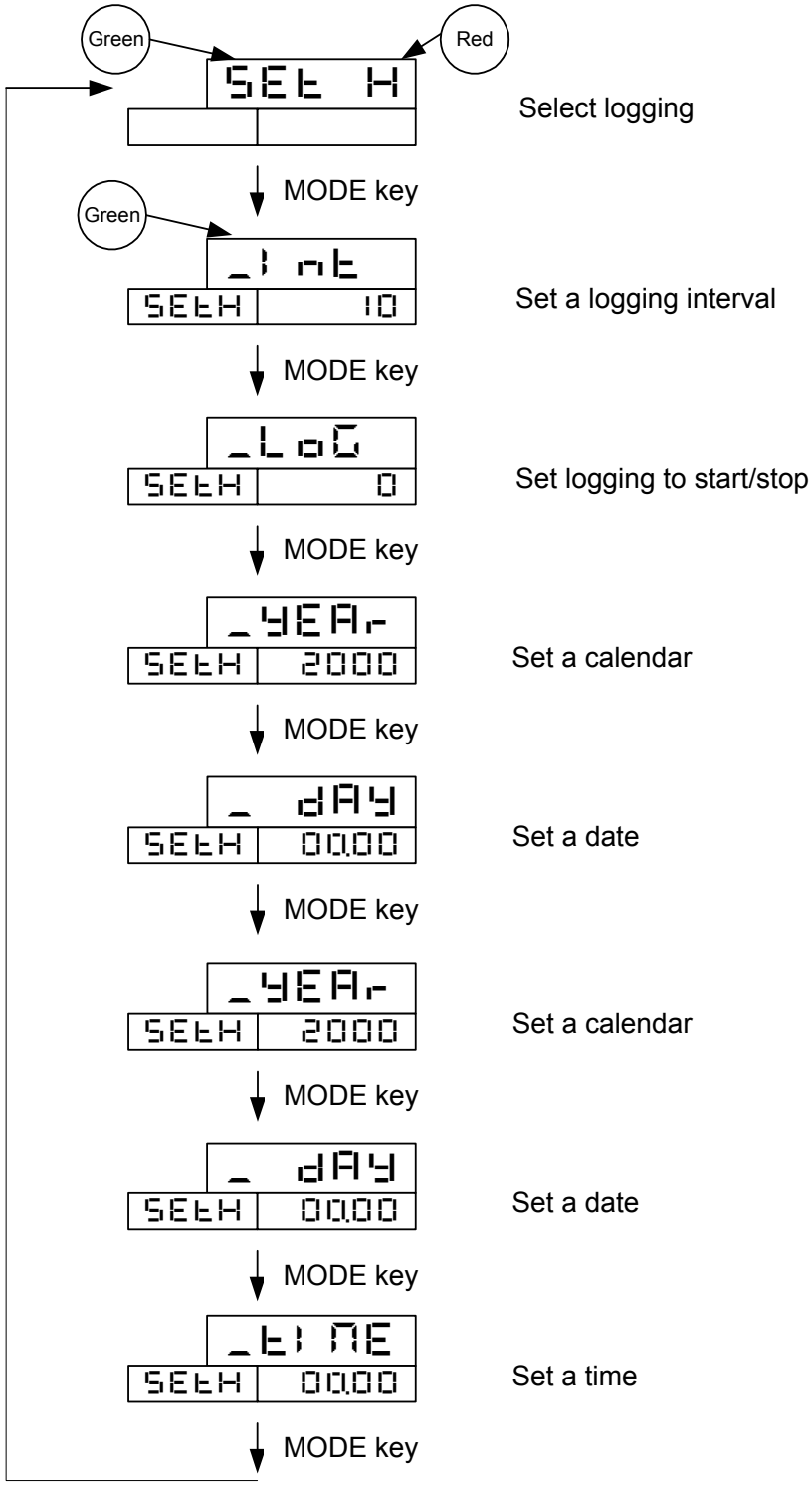
4.3.8 Setting communications 2



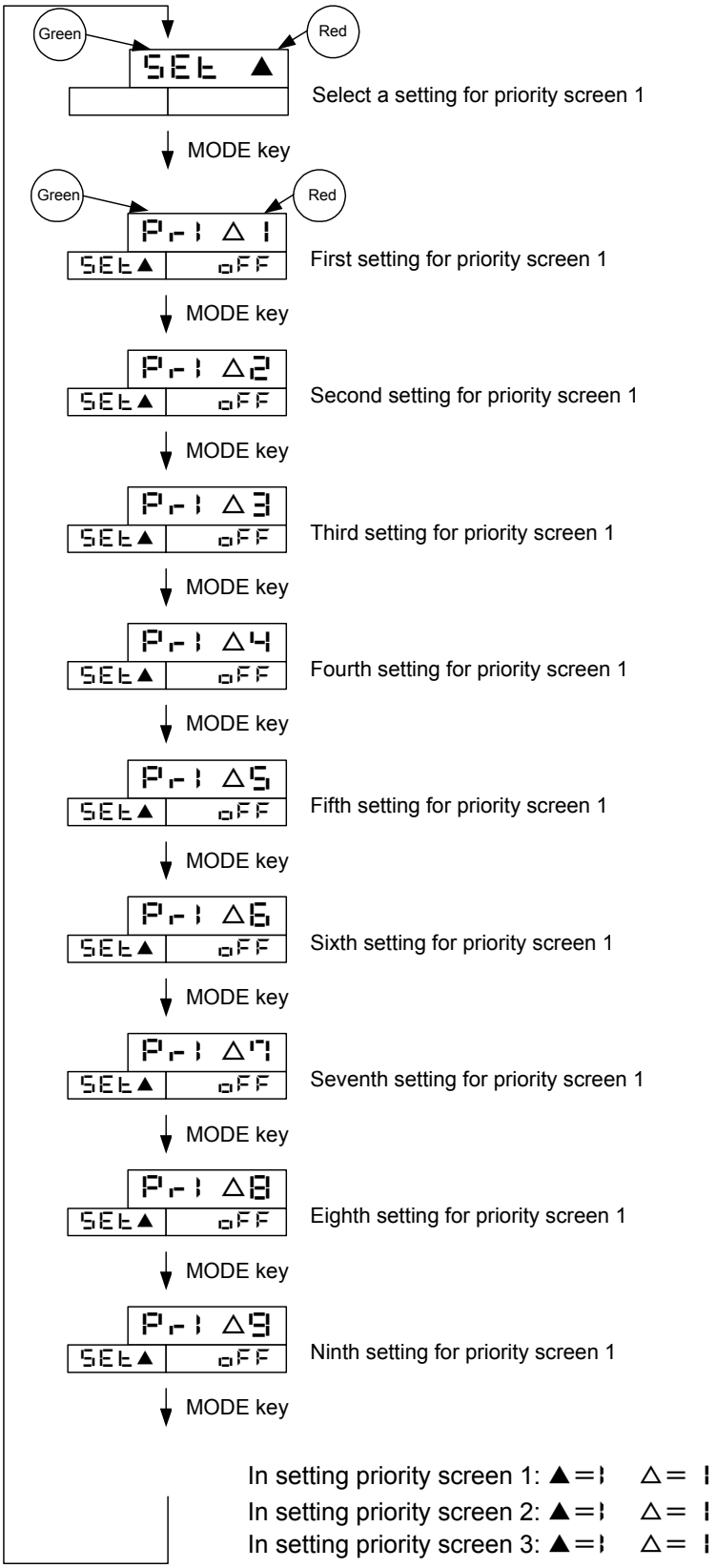
4.3.9 Setting a timer



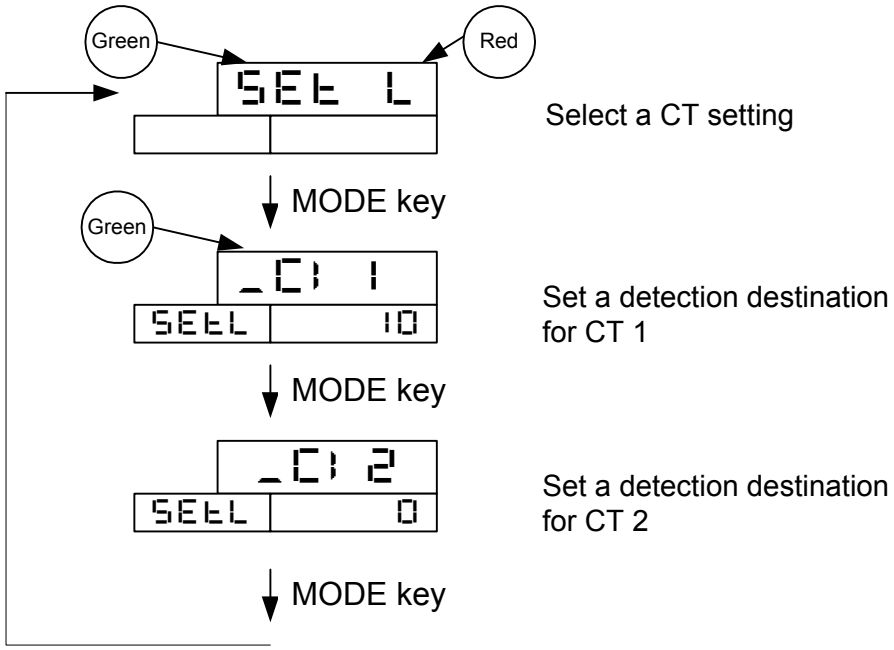
4.3.10 Set logging



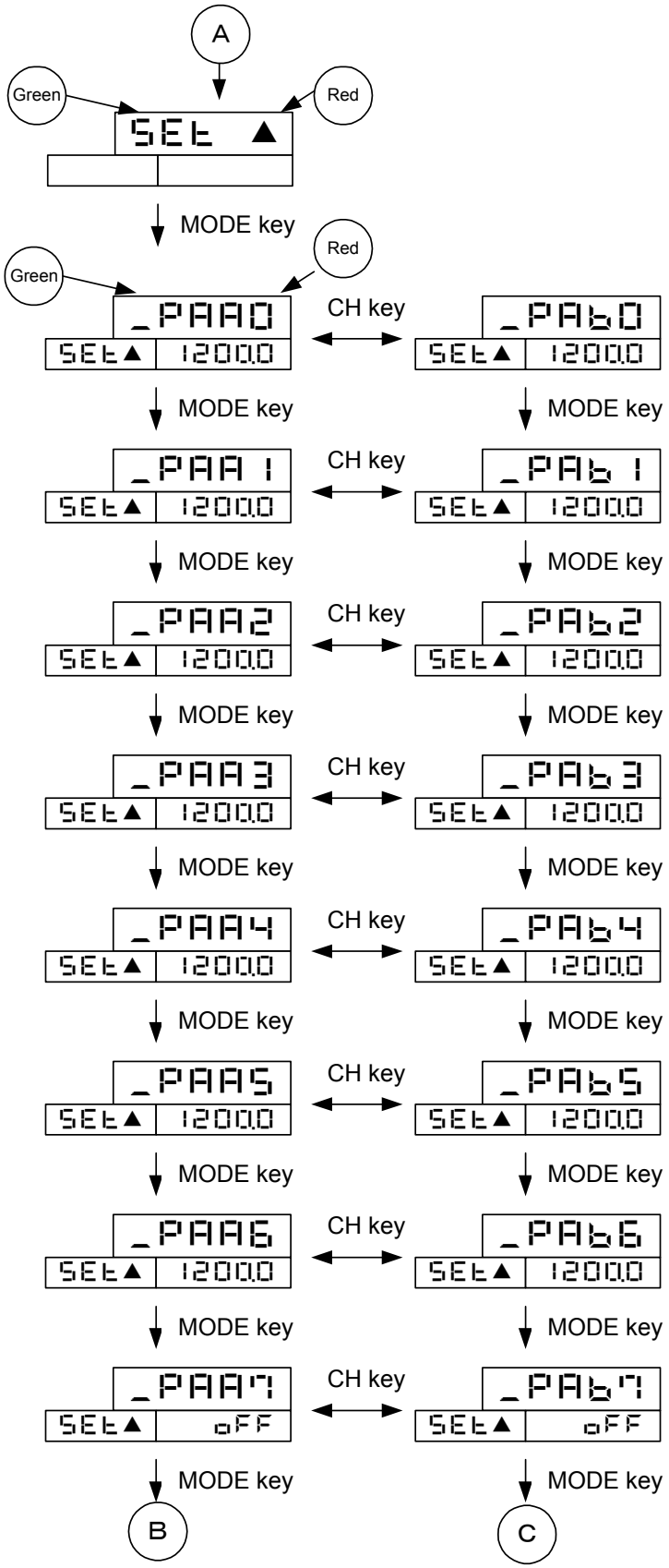
4.3.11 Setting priority screens 1 to 3



4.3.12 Setting a CT



4.3.13 Polygonal line approximation for CH1 and 2



Select polygonal line approximation

Set an input for polygonal line approximation 0

Set an input for polygonal line approximation 1

Set an input for polygonal line approximation 2

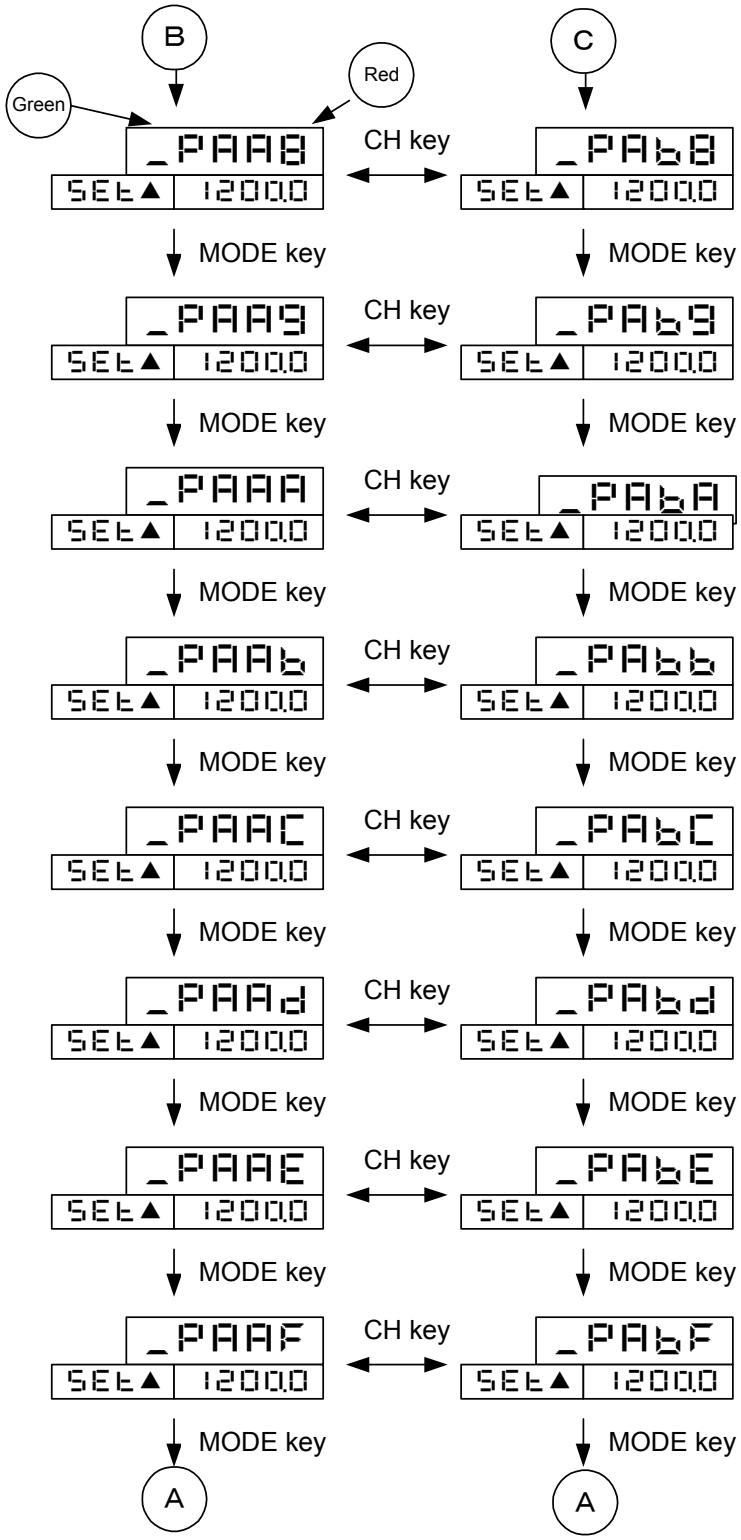
Set an input for polygonal line approximation 3

Set an input for polygonal line approximation 4

Set an input for polygonal line approximation 5

Set an input for polygonal line approximation 6

Set an input for polygonal line approximation 7



Set an input for polygonal line approximation 8

Set an input for polygonal line approximation 9

Set an input for polygonal line approximation 10

Set an input for polygonal line approximation 11

Set an input for polygonal line approximation 12

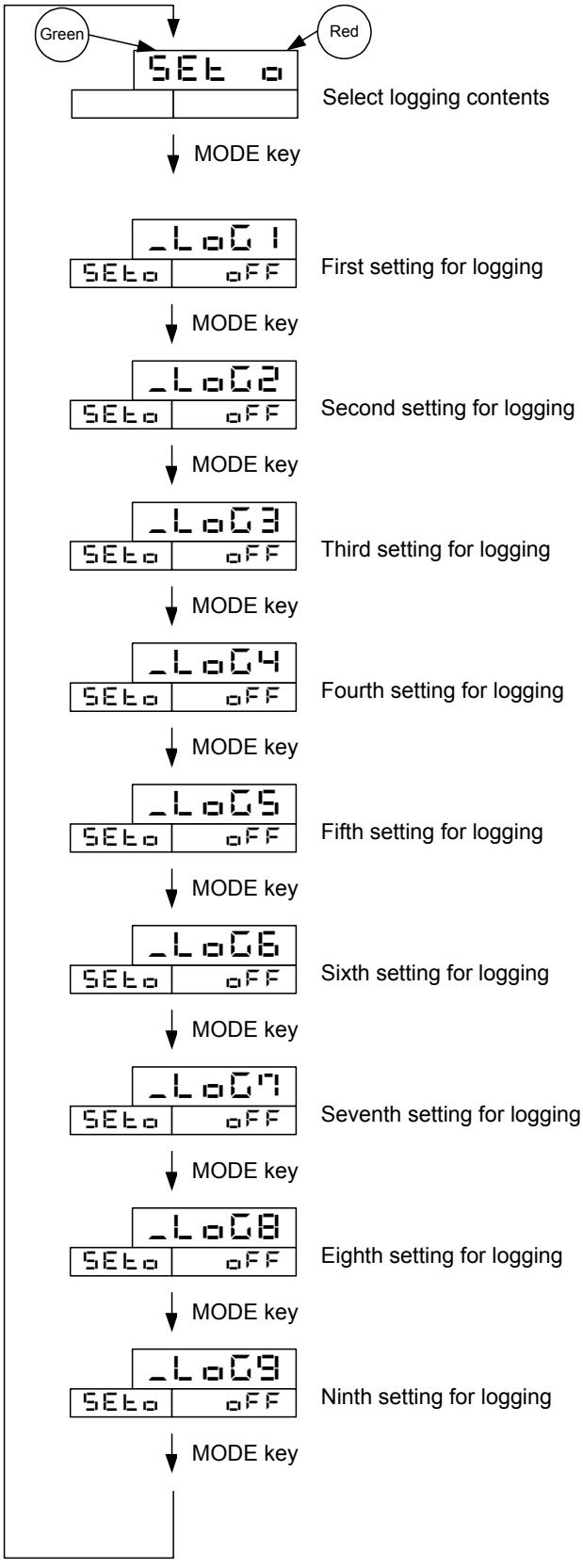
Set an input for polygonal line approximation 13

Set an input for polygonal line approximation 14

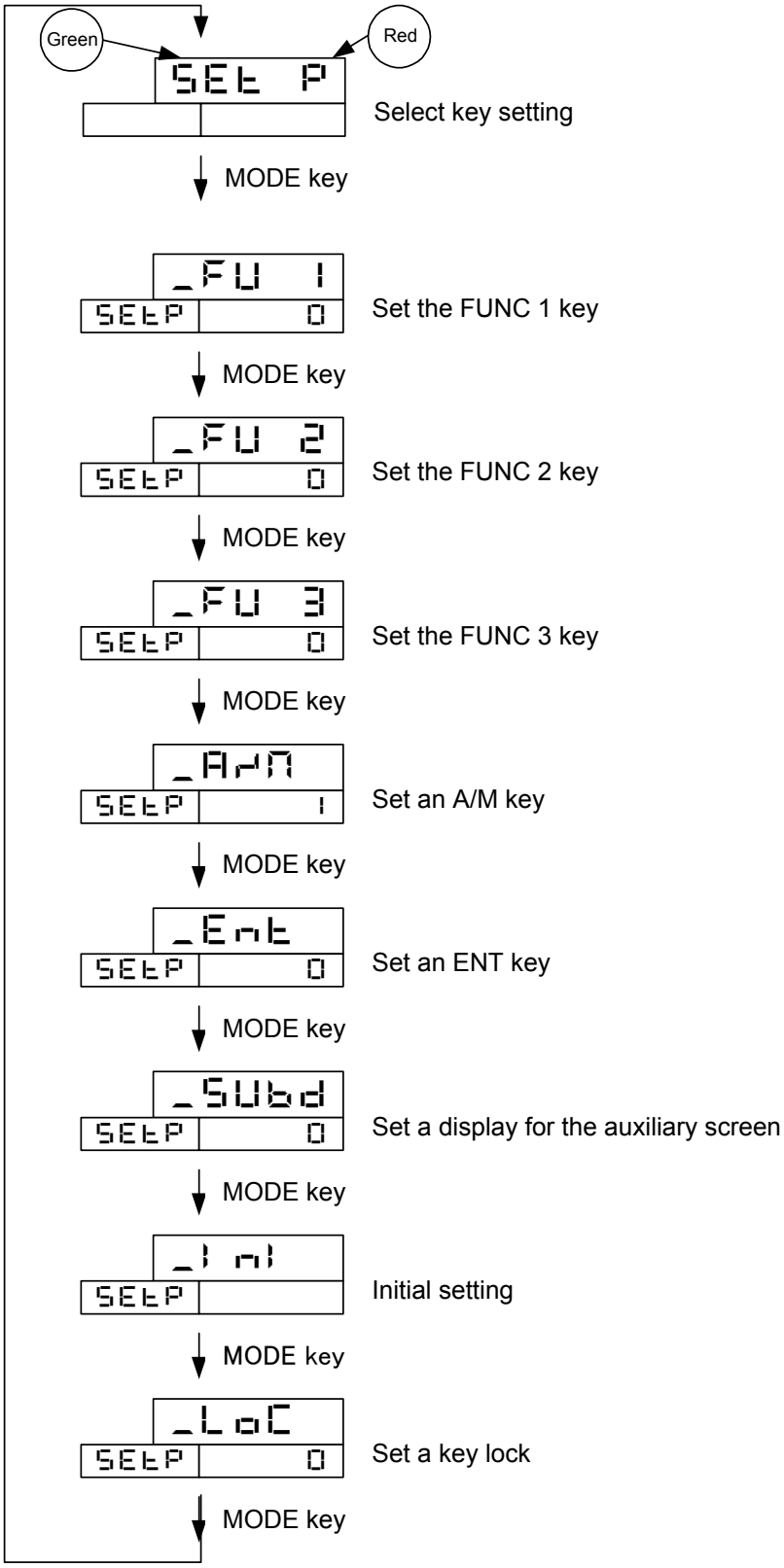
Set an input for polygonal line approximation 15

In CH1 polygonal line approximation ▲=Π
In CH2 polygonal line approximation ▲=n

4.3.14 Logging contents



4.3.15 Setting keys



4.4 Setting initial value and setting range

4.4.1 Operation mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	PV value (CH/MV/BANK display)	Control setting	Setting range: SLL 1 to SLH 1 (CH1) SLL 2 to SLH2 (CH2) Setting unit: °C (thermocouple, resistance bulb) digit (current and voltage inputs) CH2 only, % (potentiometer)	0.0
2 to 10		Priority screens 1 to 9	They display a screen preset in priority screen 0 setting. Use the MODE key for switchover.	
11 to 19		Priority screens 11 to 19	They display a screen preset in priority screen 1 setting. Set the FUNC 1 key to "Switch over priority screens" to perform switchover.	
20 to 28		Priority screens 21 to 29	They display a screen preset in priority screen 2 setting. Set the FUNC 2 key to "Switch over priority screens" to perform switchover.	
29 to 37		Priority screens 31 to 39	They display a screen preset in priority screen 3 setting. Set the FUNC 3 key to "Switch over priority screens" to perform switchover.	

4.4.2 Bank setting mode

The code "bk" represents bank numbers (n1 to n1).

While in the operation mode, pres the MODE key for 3 seconds. When in the setting mode, press the key. Hold it down for a total of 6 seconds or more until the system enters the bank setting mode.

To go back to the operation mode, hold the MODE key for 6 seconds or more while in the "Set bank bk SV" screen.

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	bAnK bk (□CH 1/ □CH2)	"Set bank bk SV" screen	Setting range: SLL 1 to SLH 1 (CH1) SLL 2 to SLH2 (CH2) Setting unit: °C (thermocouple, resistance bulb) digit (current and voltage inputs) CH2 only, % (potentiometer)	0.0
2	SEt□2 (□CH 1/ □CH2)	Display bank bk	This displays bank numbers on the SV screen. bAnK bk (0 to 7)	
			The subsequent operation flow is the same as SEt□2.	

4.4.3 Setting mode for priority screens 0 to 3

The code "pr" represents priority screen numbers (1 to 9).

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□0 □□□□	Select priority screen 0 setting.	Setting concerning priority screen 0	
2	Pr1 1 pr SEt△	The pr-th setting for priority screen 0	This sets a screen pr (1 to 9) to be displayed on priority screen 0. The △ accommodates the code for the mode to which a set parameter belongs. Provided that a setting mode screen for polygonal line approximation for SEt n, n cannot be set.	oFF

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□1 □□□□	Select priority screen 1 setting.	Setting concerning priority screen 1	
2	Pr1 1 pr SEt△	The pr-th setting for priority screen 1	This sets a screen pr (1 to 9) to be displayed on priority screen 1. The △ accommodates the code for the mode to which a set parameter belongs. Provided that a setting mode screen for polygonal line approximation for SEt n,n cannot be set.	oFF

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□2 □□□□	Select priority screen 2 setting.	Setting concerning priority screen 2	
2	Pr1 2 pr SEt△	The pr-th setting for priority screen 1	This sets a screen pr (1 to 9) to be displayed on priority screen 2. The △ accommodates the code for the mode to which a set parameter belongs. Provided that a setting mode screen for polygonal line approximation for SEt n,n cannot be set.	oFF

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□3 □□□□	Select priority screen 3 setting.	Setting concerning priority screen 3	
2	Pr1 3 pr SEt△	The pr-th setting for priority screen 1	This sets a screen pr (1 to 9) to be displayed on priority screen 3. The △ accommodates the code for the mode to which a set parameter belongs. Provided that a setting mode screen for polygonal line approximation for SEt n,n cannot be set.	oFF

4.4.4 Initial setting mode

The code "ch" represents input channels (1 to 2).

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□ 1 □□□□	Select an initial setting	Setting concerning initial setting	
2	SEt□ 1 (□CH 1/ □CH2)	Select an initial setting channel		
3	_1 InP ch SEt 1	Set an input type	Multi-input model □□□00: Thermocouple K □□□0 1: Thermocouple J □□□02: Thermocouple T □□□03: Thermocouple E □□□04: Thermocouple R □□□05: Thermocouple S □□□06: Thermocouple B □□□07: Thermocouple N □□□08: Thermocouple U □□□09: Thermocouple L □□□ 10: Thermocouple WRe5-26 □□□ 1 1: Thermocouple PR40-20 □□□ 12: Thermocouple PL II □□□ 13: Pt100 □□□ 14: Pt100 (Display of the second decimal place: -120.00 to 120.00) □□□ 15: JPt100 □□□ 16: JPt100 (Display of the second decimal place: -120.00 to 120.00) □□□ 17: Pt1000 □□□ 18: Pt1000 (Display of the second decimal place: -120.00 to 120.00) □□□ 19: 0 to 1 VDC □□□20: 0 to 5 VDC □□□21: 1 to 5 VDC □□□22: 0 to 10 VDC □□□23: 0 to 10 mVDC	00
			For the 2ch side, not only the above inputs but the following input can be selected as well: 24: Potentiometer (selectable on the 2ch side only)	
			25: Pt100, 4-wire type (selectable on the 1ch side only) Settable when an option is selected only. The 2ch side cannot be selected when a 4-wire type is selected.	25

	Character PV screen Auxiliary screen	Designation	Description	Initial value
4	_dP□ch SEt 1	Set a decimal place	Thermocouple input: 0/0.0 Resistance bulb (including a 4-wire type): 0/0.0/0.00 *For 0.00, set an input type: In the range from -120.00 to 120.00 only Current and voltage: Set it to a desired digit. Potentiometer: Fixed at 0.0	0.0
5	_PuG ch SEt 1	Set a PV correction gain	Setting range: 0.500 to 2.000 Setting unit: Times	1.000
6	_PuS ch SEt 1	Set a PV correction zero point	Thermocouple input Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C Resistance bulb input Setting range: -199 to 999 or –199.9 to 999.9 or –199.99 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -19999 to 99999 The decimal place can be set to a desired position. Setting unit: digit --- Potentiometer input Setting range: -199.9 to 999.9 Setting unit: %	0.0
7	_PdF ch SEt 1	Set a PV filter	0.0 to 99.9 seconds	1.0
8	_Sqr ch SEt 1	Set whether to perform square-root operations	on: Enable operation oFF: Disable operation	oFF
9	_PA□ch SEt 1	Set whether to perform polygonal line approximation	on: Enable polygonal line approximation oFF: Disable polygonal line approximation	oFF

	Character PV screen Auxiliary screen	Designation	Description	Initial value
10	_dEv ch SEt 1	Set a deviation display range	Thermocouple input Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C Resistance bulb input Setting range: 0 to 999 or 0.0 to 999.9 or 0.00 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: 0 to 99999 The decimal place can be set to a desired position. Setting unit: digit 0.0 turns off the display of the deviation. --- Potentiometer input Setting range: 0.0 to 999.9 Setting unit: %	0.0
11	_bU□□ SEt 1	Set the buzzer	0: Buzzer OFF 1: ON when a key is operated 2: ON when an event occurs 3: ON when a key is operated and when an event occurs	3

4.4.5 Control setting mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□2 □□□□	Select control setting	Setting concerning control	
2	SEt□2 (□CH 1/ □CH2)	Select a control setting channel		
3	_SLH ch SEt2	Set an upper limit for the SV limiter	Setting range: lower limit to the upper limit for the SV setting range In the case of analog input, increasing the span does not increase resolution to 30,000 or more. (Measurements will become discrete.)	Multi-input 1200.0 4-wire type 500.0
4	_SLL ch SEt2	Set a lower limit for the SV limiter	Setting range: lower limit to the upper limit for the SV setting range	Multi-input 0.0 4-wire type -100.0
5	_CASL SEt2	Set an upper limit for cascade scaling	Setting range: lower limit to the lower limit for the SV setting range	Multi-input 1200.0 4-wire type 500.0
6	_CASL SEt2	Set a lower limit for cascade scaling	Setting range: lower limit to the lower limit for the SV setting range	Multi-input 0.0 4-wire type -100.0
7	_CAAt SEt2	Set the SVs for cascade AT	Setting range: _CASL to _CASH	0
8	_rEH□ SEt2	Set an upper limit for remote scaling	Setting range: lower limit to the lower limit for the SV setting range	Multi-input 1200.0 4-wire type 500.0
9	_rEL□ SEt2	Set a lower limit for remote scaling	Setting range: lower limit to the lower limit for the SV setting range	Multi-input 0.0 4-wire type -100.0
10	CLoSE SEt2	Adjust feedback resistance when fully closed	This adjusts feedback resistance when fully closed. When the valves and/or other components are fully closed, press the ENTER key (for storage).	on
11	oPEn□ SEt2	Adjust feedback resistance when fully open	This adjusts feedback resistance when fully opened. When the valves and/or other components are fully opened, press the ENTER key (for storage).	on
12	_Md□ch SEt2	Set the control mode	This serves in setting the control mode. run: Executes control. rdy: Stops control (to output the lower limit in the operation limiter) MAn: Manual control	run

	Character PV screen Auxiliary screen	Designation	Description	Initial value
13	_Cnt ch SEt2	Set a control type	Timer connection channel 0___: Unrelated to the timer 1___: The timer starts/stops control. Control operation _0__: TYPE A _1__: TYPE B (overshoot inhibition function) Main output control type __1_: PID control __2_: ON/OFF control __3_: Cascade control (CH2 only) __4_: Remote control (CH2 and only when the input type is between 19 and 23) Type of auxiliary output control ___0: Disabled ___1: PID ___2: ON/OFF	0 1 10
14	_dir r ch SEt2	Set forward/ reverse action switchover	0: Reverse action 1: Forward action	0
15	_Mv 1 ch SEt2	Main output operation amount	Used to monitor the main output operation amount and to set the operation amount in manual control. In automatic control Display range: 0.0 to 100.0 (-10.0 to -110.0: in analog output) Display unit: % In manual control Setting range: Lower limit to the upper limit for the operation amount limiter Setting unit: %	0.0
16	_tUn ch SEt2	Set a tuning type	1: Auto-tuning (output 1) 2: Self-tuning (output 1) 3: Auto-tuning (output 2) 4: Self-tuning (output 2) 5: Auto-tuning (output 1, output 2) Select 1/3/5 and press the FUNC 1 key to start the auto-tuning. Press the FUNC 1 key during the auto-tuning to release it.	2
17	_AtG ch SEt2	Set an AT factor	Setting range: 0.1 to 10.00 Setting unit: Times	1.0

	Character PV screen Auxiliary screen	Designation	Description	Initial value
18	_AtC ch SEt2	Set an AT sensitivity	Thermocouple input Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C Resistance bulb input Setting range: 0 to 999 or 0.0 to 999.9 or 0.00 to 999.99 (when the input type is, 14 , 16 or 18) Setting unit: °C Current and voltage inputs Setting range: 0 to 99999 The decimal place can be set to a desired position. Setting unit: digit --- CH2 only Potentiometer input Setting range: 0.0 to 999.9 Setting unit: %	2.0
19	_P 1□ch SEt2	Set a proportional band for the main output	Setting range: 0.0 to 200.0 Setting unit: % of SLL ch to SLH ch	3.0
20	_ 1□□ch SEt2	Set an integration time for the main output	Setting range: 0 to 3,600 seconds	0
21	_d□□ch SEt2	Set a derivative time for the main output.	Setting range: 0 to 3,600 seconds	0
22	_t 1□ch SEt2	Set a proportional cycle for the main output	Setting range: 1 to 120 seconds	20
23	_Ar W ch SEt2	Anti-reset windup	Setting range: 0.0 to 100.0 (-10.0 to -110.0: in analog output) Setting unit: %	100.0
24	_MH 1 ch SEt2	Set an upper limit for the main output operation amount limiter	Setting range: Set a lower limit for the operation amount limiter to 100.0 (-110.0: in analog output) Setting unit: %	100.0
25	_ML 1 ch SEt2	Set a lower limit for the main output operation amount	Setting range: Set the system to 0.0 (-10.0: in analog output) to an upper limit for the operation amount limiter Setting unit: %	0.0
26	_Pbb ch SEt2	Manual reset	Setting range: 0.0 to 100.0 -100.0 to 100.0 (heating/cooling) Setting unit: %	0.0

	Character PV screen Auxiliary screen	Designation	Description	Initial value
27	_oU 1 ch SEt2	Set the main output operation amount change limiter to rise	Setting range: 0.0 to 120.0 Setting unit: %/sampling cycle	100.0
28	_od 1 ch SEt2	Set the main output operation amount change limiter to fall	Setting range: 0.0 to 120.0 Setting unit: %/sampling cycle	100.0
29	FAL 1 ch SEt2	Set for a main output abnormality	Setting range: 0.0 to 100.0 (-10.0 to -110.0: in analog output) Setting unit: %	0.0
30	_Mu2 ch SEt2	Auxiliary output operation amount	Used to monitor the auxiliary output operation amount and to set the operation amount in manual control. In automatic control Display range: 0.0 to 100.0 (-10.0 to -110.0: in analog output) Display unit: % In manual control Setting range: Lower limit to the upper limit for the operation amount limiter Setting unit: %	0.0
31	_P2□ch SEt2	Set a proportional band for the auxiliary output	Setting range: 0.00 to 10.00 Setting unit: Magnification with regard to the proportional band for the main output	1.00
32	_t2□ch SEt2	Set a proportional cycle for the auxiliary output	Setting range: 1 to 120 seconds	20
33	_MH2 ch SEt2	Set an upper limit for the auxiliary output operation amount limiter	Setting range: Set a lower limit for the operation amount limiter to 100.0 (-110.0: in analog output) Setting unit: %	100.0
34	_ML2 ch SEt2	Set a lower limit for the auxiliary output operation amount limiter	Setting range: Set the system to 0.0 (-10.0: in analog output) to an upper limit for the operation amount limiter Setting unit: %	0.0
35	_oU2 ch SEt2	Set the auxiliary output operation amount change limiter to rise	Setting range: 0.0 to 120.0 Setting unit: %/sampling cycle	100.0
36	_od2 ch SEt2	Set the auxiliary output operation amount change limiter to fall	Setting range: 0.0 to 120.0 Setting unit: %/sampling cycle	100.0
37	FAL2 ch SEt2	Set for an auxiliary output abnormality	Setting range: 0.0 to 100.0 (-10.0 to -110.0: in analog output) Setting unit: %	0.0

	Character PV screen Auxiliary screen	Designation	Description	Initial value
38	C 1□ch SET 2	Set a control sensitivity for the main output	Thermocouple input Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C	0.0
40	C2□ch SET 2	Set a control sensitivity for the auxiliary output	Resistance bulb input Setting range: 0 to 999 or 0.0 to 999.9 or 0.00 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: 0 to 99999 The decimal place can be set to a desired position. Setting unit: digit * The differential gap (sensitivity) of the potentiometer is set with the dead band.	0.0
39	CP 1 ch SET 2	Position the OFF point of the main output	Thermocouple input Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C	0.0
41	CP2 ch SET 2	Position the OFF point of the auxiliary output	Resistance bulb input Setting range: -199 to 999 or -199.9 to 999.9 or -199.99 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -19999 to 99999 The decimal place can be set to a desired position. Setting unit: digit	0.0

	Character PV screen Auxiliary screen	Designation	Description	Initial value
42	dP□ch SEt2	Set a dead band	Thermocouple input Setting range: -100 to 100 or -100.0 to 100.0 Setting unit: °C Resistance bulb input Setting range: -100 to 100 or -100.0 to 100.0 or -100.00 to 100.00 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -1000 to 1000 The decimal place can be set to a desired position. Setting unit: digit --- CH2 only Potentiometer input Setting range: 0.0 to 999.9 Setting unit: % In the case of a potentiometer, this setting will become a differential gap (sensitivity) between the open and the closed output.	0.0

4.4.6 OUT 1 to 6 setting mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□3 □□□□ to SEt□8 □□□□	Select OUT 1 to OUT 6	Setting concerning outputs 1 to 6	
2	_o 1F□ SEt 3 to _o6F□ SEt8	Set an OUT 1 function to OUT 6 function	Output connection channel 1_: Connect it to CH1 2_: Connect it to CH2 (displayed when CH2 is available) Type of output connection port _0: Connect it to the main output (an open signal in the case of potentiometer input) _ 1: Connect it to the auxiliary output (a closed signal in the case of potentiometer input) _2: Connect it to the event _3: Connect it to transmission (displayed when the output is analog) * For open and close signals for the position proportional control with a potentiometer, set the output connection channel to 2CH. * This has no transmission functions in _o5F and _o6F.	In the case of 509-0N _O1F/_O2F 10/11 _O3F/_O6F 12 In the case of 509-00 _O1F/_O2F 10/20 _O3F/_O6F 12
3	_E 1F□ SEt 3 to _E6F□ SEt8	Set a function for event output 1 to 6 (PV event)	Display color switchover 0__: The PV display color remains unchanged even if the PV event is turned on. 1__: The PV display color changes if the PV event is turned on. Additional functions _0_: Disabled _1_: Hold _2_: Standby sequence _3_: Hold + standby sequence PV event functions __0: Disabled __1: Deviation upper and lower limit __2: Deviation upper limit __3: Deviation lower limit __4: Deviation range __5: Upper and lower limit __6: Upper limit __7: Lower limit __8: Range __9: Connect to timer	000

	Character PV screen Auxiliary screen	Designation	Description	Initial value
4	_E 1H□ SEt 3 to _E6H□ SEt8 _E 1L□ SEt 3 to _E6L□ SEt8	Set an upper limit for event output 1 to 6 Set a lower limit for event output 1 to 6	Thermocouple input Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C Resistance bulb input Setting range: -199 to 999 or -199.9 to 999.9 or -199.99 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -19999 to 99999 The decimal place can be set to a desired position. Setting unit: digit --- CH2 only Potentiometer input Setting range: -199.9 to 999.9 Setting unit: %	0.0
5	_E 1C□ SEt 3 to _E6C□ SEt8	Set a sensitivity for event output 1 to 6	Thermocouple input Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C Resistance bulb input Setting range: 0 to 999 or 0.0 to 999.9 or 0.00 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: 0 to 99999 The decimal place can be set to a desired position. Setting unit: digit --- CH2 only Potentiometer input Setting range: 0.0 to 999.9 Setting unit: %	0.0
6	_E 1t□ SEt 3 to _E6t□ SEt8	Set a delay timer for event output 1 to 6	Setting range: 0 to 9999 seconds	0

	Character PV screen Auxiliary screen	Designation	Description	Initial value
7	_E 16□ SEt3 to _E6b□ SEt8	Set a special function for event output 1 to 6 (special)	Display color switchover 0__: The PV display color remains unchanged even if the special event is turned on. 1__: The PV display color changes if the special event is turned on. Additional functions _0_: Disabled _1_: Hold Special event functions __0: Disabled __1: PV abnormality __2: Heater abnormality __3: PV abnormality + heater abnormality	000
8	_E 1P□ SEt3 to _E6P□ SEt8	Set a polarity for event output 1 to 6	0: Normally open 1: Normally closed	0
9	_CM 1□ SEt3 to _CM6□ SEt8	CT monitor 1 to 6	Monitoring the selected CTs Measurement range: 0 to 50A (in the case of option 1) Measurement range: 0 to 120A (in the case of option 2)	
10	_CS 1□ SEt3 to _CS6□ SEt8	Set a CT for abnormality identification	This specifies the CT whose result activates this event. 1: Select CT 1 2: Select CT 2	1
11	_Ct 1□ SEt3 to _Ct6□ SEt8	Set a CT 1 to CT 6 abnormal current	Setting range: 1 to 30A (in the case of option 1) Setting range: 1 to 100A (in the case of option 2)	1
12	_trn 1 SEt3 to _trn6 SEt8	Set the transmission output for OUT 1 to OUT 6	Select a type of transmission control 0_: Forward action 1_: Reverse action Transmission functions _1: PV (measurements) output _2: SV (settings) output _3: MV (operation amount) output (main output) _4: MV (operation amount) output (auxiliary output)	0 1
13	_trn 1 SEt3 to _trH6 SEt6	Set an upper limit for transmission scaling of OUT 1 to OUT 6	Setting range: Lower limit to the upper limit in the SV limit range	Multi-input 1200.0 4-wire type 500.0
14	_trL 1 SEt3 to _trL6 SEt8	Set a lower limit for transmission scaling of OUT 1 to OUT 6	Setting range: Lower limit to the upper limit in the SV limit range	Multi-input 0.0 4-wire type -100.0

4.4.7 Transmission setting mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□9 □□□□	Select transmission setting	Setting concerning transmission	
2	_trn□ SEt9	Set a transmission output function	Output connection channel 1__: Connect it to 1CH 2__: Connect it to 2CH (if it is available) Select a type of transmission control _0_: Forward action _1_: Reverse action Transmission functions __1: PV (measurements) output __2: SV (settings) output __3: MV (operation amount) output (main output) __4: MV (operation amount) output (auxiliary output)	101
3	_trH□ SEt9	Set an upper limit for transmission scaling	Setting range: Lower limit to the upper limit in the SV limit range	Multi-input 1200.0 4-wire type 500.0
4	_trL□ SEt9	Set a lower limit for transmission scaling	Setting range: Lower limit to the upper limit in the SV limit range	Multi-input 0.0 4-wire type -100.0

4.4.8 Setting mode for DI 1 to 4

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□A □□□□ to SEt□d □□□□	Select DI 1 to DI 4	Setting concerning DI 1 to 4	
2	_d 1F□ SEtA to _d4F□ SEtd	Set a DI 1 to DI 4 function	Select a target channel 1_: Acts on CH 1 2_: Acts on CH 2 3_: Acts on CH 1 and 2 Select a DI function (active) _1: SV or SV 2 _2: (in the _Md state) or READY _3: (in the _Md state) or manual _4: Reverse action or forward action _5: Release AT or start AT _6: Reverse action SV or forward action SV 2 _7: Reset or timer start _8: Stop logging or start logging _9: Disable or enable bank switchover • The target channel selections in SV 2 switchover are 1_ and 2_ only. • The method of switchover varies according to the number of DIs to be assigned to bank switchover. (See 4.1 "The operation state.") • Up to 3 DIs can be assigned to bank switchover. • The target channel in bank switchover will be irrelevant. • Of two DIs, the one having the smaller number comes first.	11
3	_d 1P□ SEtA to _d4P□ SEtd	Set a polarity for DI 1 to D14	0: Closed active 1: Open active	0
4	_Su2 SEtA to _Su5 SEtd	Set DI 1 SV 2 to DI 4 SV 5	Setting range: SLL 1 to SLH1 (CH1) SLL2 to SLH2 (CH2) Setting unit: °C (thermocouple and resistance bulb) digit (current and voltage inputs) --- % for CH 2 only (potentiometer)	0.0

4.4.9 Setting mode for communications 1 and 2

Communications 1 is for RS232C and RS485. Communications 2 is for infrared communications.

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□E □□□□ to SEt□F □□□□	Select communications 1 and 2	Setting concerning communications 1 and 2	
2	PrT 1 SEtE to PrT2 SEtF	Set a protocol for communications 1 and 2	Setting a communications protocol 0: TOHO model 100 protocol 1: MODBUS (RTU) 2: MODBUS (ASCII)	0
3	CoM 1 SEtE to CoM2 SEtF	Set a parameter for communications 1 and 2	BCC check n___: Disable b___: Enable Data length selection _7__: 7-bit _8__: 8-bit Parity check __n_: Disable __o_: Odd number __E_: Even number Stop bit length ___1: 1-bit ___2: 2-bit When an ASCII code is selected for MODBUS 7n2/7o 1/7E 1 When an RTU code is selected for MODBUS 8n2/8o 1/8E 1 * BCC check will be disabled.	b8n2
4	bPS 1 SEtE to bPS2 SEtF	Set a speed for communications 1 and 2	4.8 : 4800bps 9.6 : 9600bps 19.2 : 19200bps 38.4 : 38400bps	9.6
5	Adr 2 SEtE to Adr 2 SEtF	Set an address for communications 1 and 2	Setting range: 1 to 99 stations The range will be between 1 and 247 stations when MODBUS is selected.	1
6	AbtE 1 SEtE to AbtE2 SEtF	Set a response delay for communications 1 and 2	Setting range: 0 to 250ms	0
7	Mod 1 SEtE to Mod2 SEtF	Set a mode switchover for communications 1 and 2	rO: Enable communication R rW: Enable communication RW Selecting MODBUS disables the mode switchover.	rW

4.4.10 Timer setting mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□G □□□□	Select the timer	Setting concerning the timer	
2	_tMF□ SEtG	Set a timer function	1: Auto-start 2: Manual start 3: Event start 4: SV start (OFF delay only) Setting a value for the ON delay timer to be mentioned below will activate it as an ON delay timer. Setting a repetition frequency activates the timer as a repetition timer. At that time, repetition will not be activated unless an ON or OFF delay timer is set.	1
3	_HrU□ SEtG	Set a timer unit	1: Hours and minutes 2: Minutes and seconds	1
4	_tSu□ SEtG	Set a start tolerance for the timer SV	Thermocouple input Setting range: 0 to 999 or 0.0 to 999.9 Setting unit: °C Resistance bulb input Setting range: 0 to 999 or 0.0 to 999.9 or 0.00 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: 0 to 99999 The decimal place can be set to a desired position. Setting unit: digit --- CH2 only Potentiometer input Setting range: 0.0 to 999.9 Setting unit: %	0.0

* If the timer is used, set a connection channel with P45 _CnE or P50 E 1F.

	Character PV screen Auxiliary screen	Designation	Description	Initial value
5	ondtM SEtC	Set a time for the ON delay timer	Setting range: 0.00 to 99.59 (hours and minutes) 0.00 to 59.59 (minutes and seconds) Setting unit: Hours and minutes or minutes and seconds This is inactive in the case of the SV start.	0.00
6	oFdtM SEtC	Set a time for the OFF delay timer	Setting range: 0.00 to 99.59 (hours and minutes) 0.00 to 59.59 (minutes and seconds) Setting unit: Hours and minutes or minutes and seconds	0.00
7	_tCnt SEtC	Set a repetition frequency	Setting range: 0 to 99 Setting unit: Times (set it to 0 for a limitless number of times)	1
8	_tI A□ SEtC	Timer residual time monitor	Residual time monitor While on this screen, press the ENT key once to start the timer.	

4.4.11 Logging setting mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□H □□□□	Select logging	Setting concerning logging	
2	_Int□ SEtH	Set a logging interval	Setting range: 1 to 9999 Setting unit: second	10
3	_Int□ SEtH	Set logging start/stop	The SV display is "no,SdC" when no SD card is in. Inserting an SD card changes the SV display as shown below. Unformatted: no,FMt Write-protected: LoCP SD card full: FULL If normally writable: The system displays the residual amount of SD card (in KB or MB units). Use the ENT key to start/stop logging. During logging, the SV display and SD card lamp blink.	Depending on the status of the SD card.
4	_YEAr SEtH	Set a calendar	Lit: Current year Blinking: Time being set DP (speed) blinking: Time unset Holding down the ENT key for a long time changes a specific setting.	
5	_ dAY SEtH	Set a month and day	Lit: Current month and day Blinking: Time being set DP (speed) blinking: Time unset Holding down the ENT key for a long time changes a specific setting. To switch over the month or day, hold down the key for a long time and then hold it down for a long time again.	
6	_tIME SEtH	Set a time	Lit: Current time Blinking: Time being set DP (speed) blinking: Time unset The time can be changed with the same step as _ dAY.	

4.4.12 CT setting mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□L □□□□	Select a CT	Setting concerning CTs	
2 3	_C1 1□ SEtL to _C1 2□ SEtL	Set a target from CT1 and CT2	0: Monitor only 1: Output 1 2: Output 2 3: Output 3 4: Output 4 5: Output 5 6: Output 6 1 to 6 is only displayed when the specific output is set to the main or auxiliary output. Setting CT 1 and CT 2 to the same output results in 3-phase detection.	0

4.4.13 Setting mode for CH 1 polygonal line approximation

Polygonal line approximation is for outputting PAA0 when inputting PAb0.

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□n □□□□	Select CH 1 polygonal line approximation	Setting concerning polygonal line approximation for CH 1	
2 to 17	_PAA0 SEtn to _PAAF SEtn	Set an input for polygonal line approximation 0 to F	Thermocouple input Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C Resistance bulb input Setting range: -199 to 999 or -199.9 to 999.9 or -199.99 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -19999 to 99999 The decimal place can be set to a desired position. Setting unit: digit The setting is limited so that polygonal line approximation n ≦ polygonal line approximation n + 1. --- CH2 only Potentiometer input Setting range: -199.9 to 999.9 Setting unit: %	_PAA0 is 0.0 _PAA1 to F is 1200.0
18 to 33	_PAb0 SEtn to _PAbF SEtn	Set an output for polygonal line approximation 0 to F	Thermocouple input Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C Resistance bulb input Setting range: -199 to 999 or -199.9 to 999.9 or -199.99 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -19999 to 99999 The decimal place can be set to a desired position. Setting unit: digit The setting is limited so that polygonal line approximation n ≦ polygonal line approximation n + 1. --- CH2 only Potentiometer input Setting range: -199.9 to 999.9 Setting unit: %	_PAB0 is 0.0 _PAB1 to F is 1200.0

4.4.14 Setting mode for CH 2 polygonal line approximation

Polygonal line approximation is for outputting PAA0 when inputting PAb0.

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□n □□□□	Select CH 2 polygonal line approximation	Setting concerning polygonal line approximation for CH 2 This is not displayed when CH 2 is unavailable.	
2 to 17	_PAA0 SEtn to _PAAF SEtn	Set an input for polygonal line approximation 0 to F	Thermocouple input Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C Resistance bulb input Setting range: -199 to 999 or -199.9 to 999.9 or -199.99 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -19999 to 99999 The decimal place can be set to a desired position. Setting unit: digit The setting is limited so that polygonal line approximation n ≦ polygonal line approximation n + 1. --- CH2 only Potentiometer input Setting range: -199.9 to 999.9 Setting unit: %	_PAA0 is 0.0 _PAA1 to F is 1200.0
18 to 33	_PAb0 SEtn to _PAbF SEtn	Set an output for polygonal line approximation 0 to F	Thermocouple input Setting range: -199 to 999 or -199.9 to 999.9 Setting unit: °C Resistance bulb input Setting range: -199 to 999 or -199.9 to 999.9 or -199.99 to 999.99 (when the input type is 14, 16, or 18) Setting unit: °C Current and voltage inputs Setting range: -19999 to 99999 The decimal place can be set to a desired position. Setting unit: digit The setting is limited so that polygonal line approximation n ≦ polygonal line approximation n + 1. --- CH2 only Potentiometer input Setting range: -199.9 to 999.9 Setting unit: %	_PAB0 is 0.0 _PAB1 to F is 1200.0

4.4.15 Setting mode for logging contents

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□o □□□□	Select logging contents	Setting concerning logging contents	
2 to 10	_LG 1 SEto to _LoG9 SEto	First to ninth setting for logging	This sets information to be recorded in a log.	oFF

4.4.16 Key setting mode

	Character PV screen Auxiliary screen	Designation	Description	Initial value
1	SEt□P □□□□	Select key setting	Setting concerning key setting	
2 3 4	_FU 1□ SEtP to _FU3□ SEtP	Set the FUNC 1 to 3 key	0: No function 1: Starts and stops AT 2: RUN/READY 3: Starts and resets the timer 4: Releases event holding 5: Secret (See 4.6 "Secret function.") 6: Forcible control output ON 7: Power OFF 8: Starts and stops logging 9: Switchover key for priority screens Setting the system to FUNC 1 will switch the system over with the priority screen for SEt1 .	0
5	_A-M□ SEtP	Set an A/M key	0: Enable 1: Disable	1
6	_Ent□ SEtP	Set the ENT key	0: The setting can be finalized without pressing the ENT key. 1: The setting is finalized by pressing the ENT key.	0
7	_oPEr SEtP	Set the operation mode display	This sets the first screen to be displayed on the operation mode screen after the system is turned on. 0: Displays the PV, SV, and auxiliary screen. 1: Displays the priority screen. (This displays the priority screen having the smallest number when priority screens are set.)	0
8	_SUbd SEtP	Set an auxiliary screen display	This sets the first auxiliary screen to be displayed after the system is turned on or when it goes back to the operation mode screen.	0

	PV display	SV display	CH display
0: CH	CH1 PV	CH1 SV	CH 1
1: MV 1 of CH 1 (main output)	CH1 PV	CH1 SV	CH1 MV1
2: MV 2 of CH 1 (auxiliary output)	CH1 PV	CH1 SV	CH1 MV2
3: MV 1 of CH 2 (main output) *1	CH2 PV	CH2 SV	CH2 MV1
4: MV 2 of CH 2 (auxiliary output)*1	CH2 PV	CH2 SV	CH2 MV2
5: Bank display	CH1 PV	CH1 SV	bP 1

*1 Only when CH 2 is available

9	_Ini □ SEtP	Initial setting	Holding down the ENT key for at least 2 seconds will switch the setting value back its initial state (the factory-configured parameters). During initialization, the SV screen displays Ini t.	
10	_LoC□ SEtP	Set a key lock	0: OFF 1: Locks all 2: Locks the operation mode 3: Locks everything other than the operation mode.	0

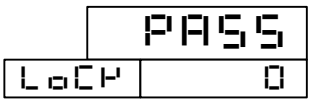
4.5 Blind setting mode

Power ON
↓
Initial screen display (about 4 seconds)
↓
Operation mode
↓ MODE key 10 seconds
bAnK0 Screen display blinking
↓ Press the ENT key once.
↓ Press the MODE key once.
Blind setting mode

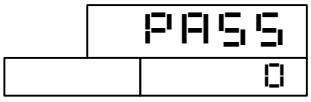
To terminate the blind setting mode, press the MODE key for 10 seconds.

4.6 Secret function

Specify "Secret" in the FUNC key setting and press the FUNC key to switch to the screen for entering a PIN number.



If the auxiliary screen displays "LOCK" at that time, the secret function is active.
Even if the secret function is active, the 0 is displayed immediately after the system switches to another screen.



Enter a PIN number between 1 and 9999 and press ENT to activate the secret function.
Press ENT again to inactivate the secret function.

If the secret function is active, the parameter screen becomes inaccessible.

Pressing the MODE key in the secret screen will switch the system to the operation mode.

5. History

Revision A, January 8, 2004, by Ishihara and Sato

An operation flow was added.

1) Cover: The model TTM-509 (tentative) was changed to "TTM-509.
2) P7: The ▲ and ▼ in ⑦ and ⑧, which had been in the wrong order, were corrected.
3) P9: A transition that occurs when the FUNC key is pressed in a priority screen was added.
4) P10: The color of the I in the initial screen was changed from "orange" to "green."
5) P11 to 12: A description was added for a case when banks were switched over with a DI.
6) P13: (4) "SV start" was added.
7) P16: In the description of the setting mode, "the ENT key … for a specific category" was changed to "the MODE key... for a specific category."
8) P17: In the bank setting mode, the screen was renamed. The SET2 display of CH was switched to the auxiliary screen.
9) P19: _bU□ 1 was changed to _□bU 1.
10) P19 to P24: Item 1, which was entirely designed for "Select the setting mode screen" was changed to specific names such as "Select priority screen 0 setting."
11) P28: The characters for D?F, D?P, SV? were changed.
12) P29, 30: The parameters in the flow included an abnormal parameter. It was corrected.
13) P38: A display setting for the operation mode was added. The initial value was corrected.
14) P39: The bank setting mode and item 2 (auxiliary screen) were given a channel display.
15) P40: Screens that cannot be set with a priority screen were described. A screen for the polygonal line approximation mode.
16) P41: The "4 to 20mA" was deleted from the input types. The aim was to give an external resistance to 1 to 5V.
17) P41: Input type: 14, 15, 18, … Pt100, etc. -120.00 to 120.00 was added. The other input type numbers were moved.
18) P42: The PV filter setting of CH 1 and that of CH 2 were made identical.
19) P42: Set a decimal place: Resistance bulb input: The 0.00 display was given an additional notation when the input type was 14 only.
20) P42, 43, 46, 48, 49, 51, 56, 59, and 60: A notation was added only when the input type was 14.
21) P42: Set a PV filter: 0.00 was corrected to 0.0.
22) P43: "0.0 turns off the display of the deviations" was added.
23) P44: Precautions on resolution in analog input was added.
24) P50: "Set an OUT? function" had not included the initial value from o3F to o6F. It was then added.
25) P51: "Set a delay timer for event output 1" had not included the initial value. It was then added.
26) P52: The name of _E 16 had been wrong. It was then corrected. Its description was corrected too. "Heater abnormality" was added.
27) P52, 53: Transmission function: _3: "MV (operation amount) output" was added.
28) P54: "The target channel selections" in the SV2 function was set to 1_ and 2_ only.
    Bank switchover was added to _9 in "Set a DI function."
    The characters D?F, D?P, and SV? were changed.
29) P55: The ASCII mode was added to the protocol for MODBUS.
    In "Set a communications parameter," the specifications in the MODBUS enclosure were changed.
    "The communications delay is inactive with MODBUS was deleted.
    In "Set a speed for communications 1" was deleted.

30) P55: Communications speed: "Infrared communications cannot select 4,800bps" was deleted.
31) P57: The auxiliary screen was changed to SETH.
32) P61: The designation LOG9, which had been "First setting for logging," was corrected to "Ninth."
33) P62: "Set the operation mode display" was added.

Revision B, May 20, 2004, Ishihara

34) The method of setting cascade and remote control were changed. The system was changed from setting by input type to setting by control type.
35) P51: The setting range for event output sensitivity was changed from "-19999 to 99999" to "0 to 99999."
36) P49: The setting range of the dead band was changed from "-10000 to 10000" to "-19999 to 19999."
37) P44, 52, and 53: The need of the difference of 50 digits for SLL/SLH, CASL/CASH, REL/REH, and TRL?/TRH?/TRL/TRH (for transmission only) was eliminated.
38) P52 and 53: The "Set the transmission output" includes MV transmission but not the setting of the main output and auxiliary output. They were then added.
39) P53: The setting of 1 CH and 2 CH were added to "Set a transmission output function."
40) P56: The method of setting a timer function was changed. Provision was made so that setting a time would activate the timer instead of determining an ON/OFF delay with the timer function.
41) P19 and P43: There had been two buzzer settings. One of them was removed.
42) P63: The way a blind enters and other details were added.
43) P50: An OUT setting was determined in the case of a potentiometer (position proportional control).
44) P36: Final line: "▲=r in the case of CH 1 polygonal approximation" was changed to "▲=r in the case of CH 2 polygonal line approximation."
45) P47: The setting ranges for "Set the main control operation amount change limiter to rise, to fall, " "Set the auxiliary control operation amount change limiter to rise, to fall" were changed to "0 to 110.0" to "0 to 120.0." "Limitless at 0.0" was deleted. The initial value was set to 100.0.
46) P48: The description of the potentiometers for "Set a main output sensitivity," "Set an auxiliary output sensitivity," "Position the OFF point of the main output," and "Position the OFF point of the auxiliary output" was deleted.
47) P49: In the case of a potentiometer, the dead band setting was changed to the differential gap (sensitivity) of the potentiometer.
48) P54: In a DI, "Start AT and start the timer" was changed to "Input a level."
49) P54: In RUN/RDY and Auto/Manual with DI input, the non-active state was changed from "fixed" (such as RUN) to a _Md state.
50) P45: The "timer connection channel" setting was added to "Set a control type." This enables the time to be finished in CH 1 and CH 2 at the same time.
51) P56: tMn was deleted.
52) P50: "_9: Connect it to the timer" was added to "Set a function for event outputs 1 to 6."
53) P13 and 14: A change was made so that a control state when the system was turned on would be determined by a startup setting state. It was made the same as the repetition timer.
54) P13: The description in 4.2.1 was changed.
55) P42, 43, 46, 51, 56, 59, and 60: The upper limit of the setting range of the potentiometer was changed from 199.9 to 999.9. The aim was to prevent limitation due to input switchover or something similar.

Revision C, July 7, 2004, Ishihara

56) P63: The method of entering and quitting the blind setting mode was changed.
57) P17: The method of returning from the bank setting mode to the operation mode was changed.
58) P57: The timer start was changed to ENT on the timer residual time monitor.
59) P57: The item of "Set logging start/stop" was entirely rewritten.
60) P57: A screen was added for setting the year, month, and day.
61) P32: A flow was added for the year, month, and day.
62) P63: A description was added for the secret function.
63) P13: Startup conditions were changed for 4.2.2. "Setting a timer function, (3) Event start."
64) P19, 20, 22, 23, 24, and 25: A change was made so that a move can be made across channel settings with the CH key.
65) P31: The "Set a timer output destination" screen was deleted.
66) Corrigenda (mainly initial values corrected): P19 _dEu 1,_dEu2,_bU/P23: Bottom of E _AH 11→AH 12,_oU 11,_od 11,_oU 12,_od 12/P24 _oU2 1,_od2 1,_oU22,_od22/P31 _HrA/P38 _1 n1
67) P50: A setting was added that changes the display color when an event occurs.

Revision D, August 4, 2004, by Ishihara

68) P50: The part 0_ in the description of E1F was corrected to _0_.
69) P50: A O1F description was added. It was indicated that O5F and O6F were without transmission.
70) P52: A function for "Display color switchover" was added to E1B as well.
71) P57: The method of setting the year, month, day, and time was added.

Revision E: August 26, 2004, by Ishihara

72) P62: "Initialize with the FUNC 1 key of _1 n1 " was changed to "Initialize with the ENT key."
73) P62: A table was added to _SUbd.
74) P63: Provision was made so that the secret screen would be accessible from any screen instead of "The secret screen is only accessible from the operation screen."
75) P63: An addition was made: "Pressing the MODE key in the secret screen will switch the system to the operation mode."