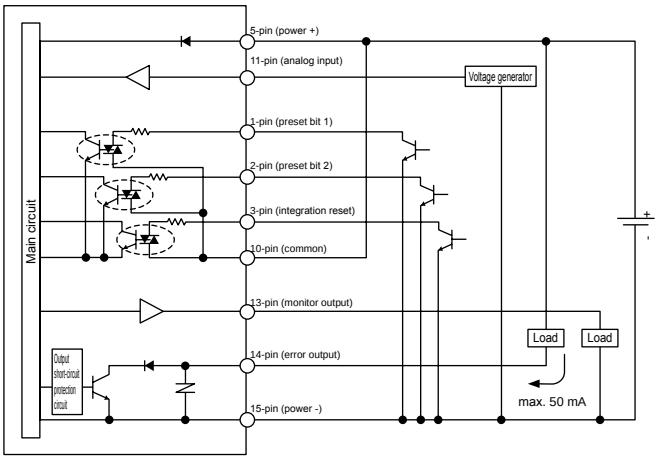
Wiring method

Example of internal circuit and load connection Analog input

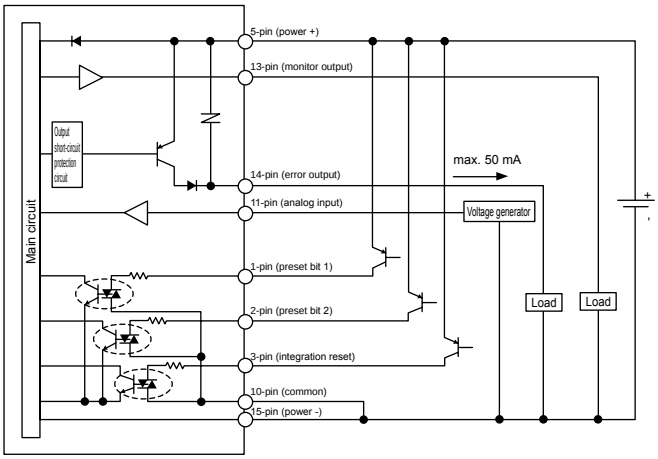
⚠ CAUTION Take care to prevent incorrect wiring.

FCM-□-□0/1/2 AN□
(Analog input, analog output + error output NPN output)



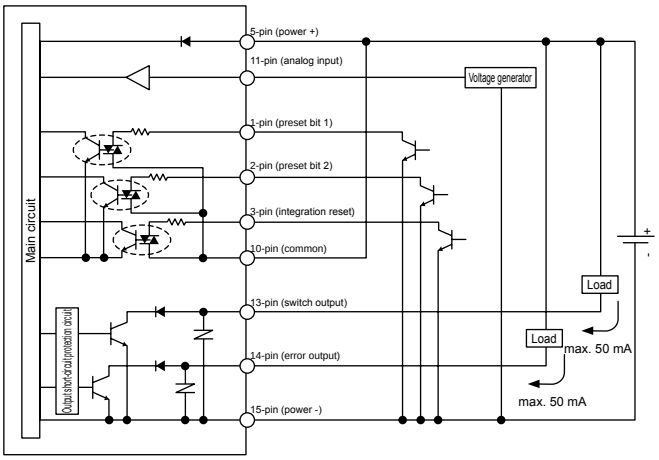
*Current consumption for pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 AP□
(Analog input, analog output + error output PNP output)



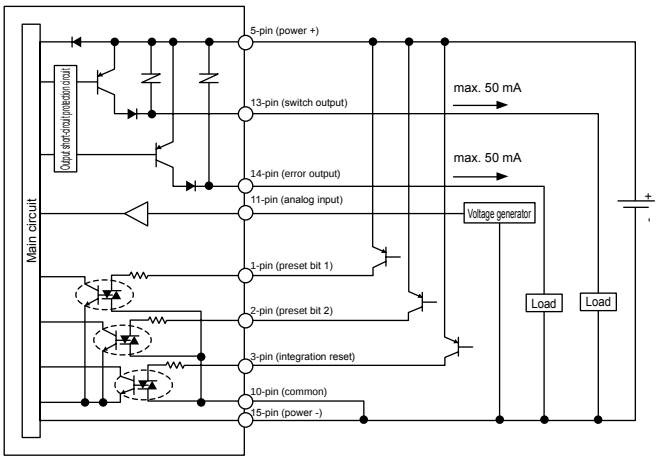
*Current consumption for pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 SN□
(Analog input, switch output + error output NPN output)



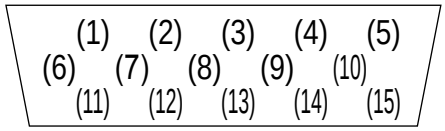
*Current consumption for pins 1 to 3 is approx. 6 mA.

FCM-□-□0/1/2 SP□
(Analog input, switch output + error output PNP output)



*Current consumption for pins 1 to 3 is approx. 6 mA.

■ Connector pin array (product body side)
[Analog input]

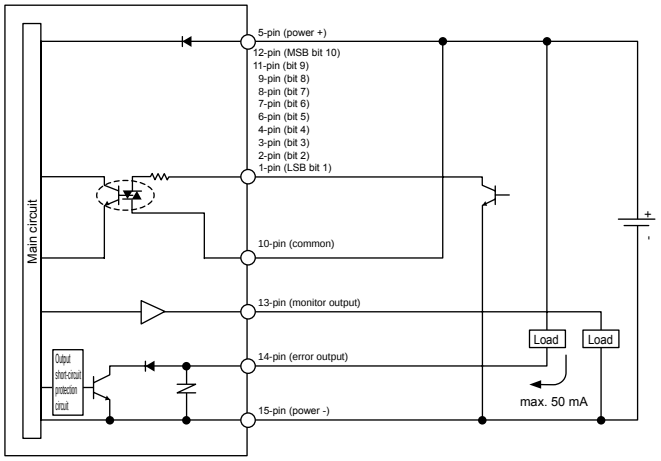


The analog input
(4), (6), (7), (8), (9) and (12) do not have pins.

Example of internal circuit and load connection Parallel input

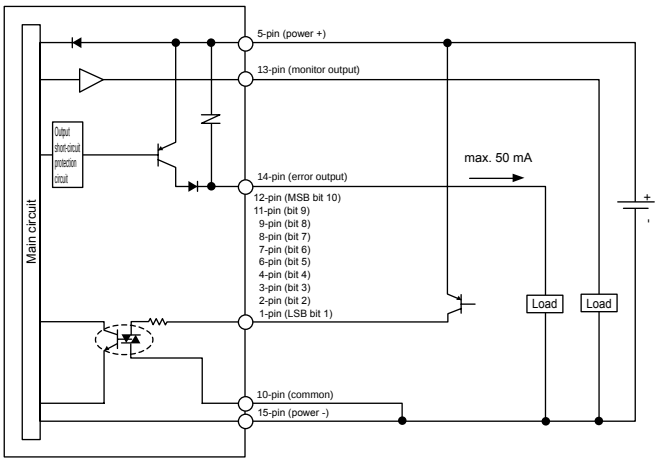
⚠ CAUTION Take care to prevent incorrect wiring.

FCM-□-□ PAN□
(Parallel input, analog output + error output NPN output)



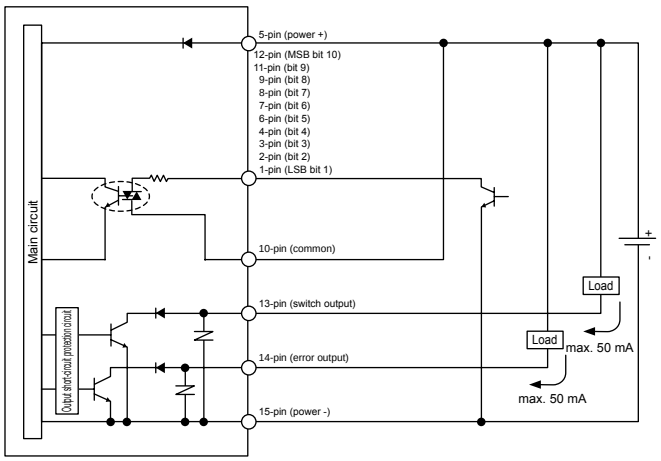
*Current consumption for pins 1 to 4, 6 to 9, 11 and 12 is approx. 6 mA.

FCM-□-□ PAP□
(Parallel input, analog output + error output PNP output)



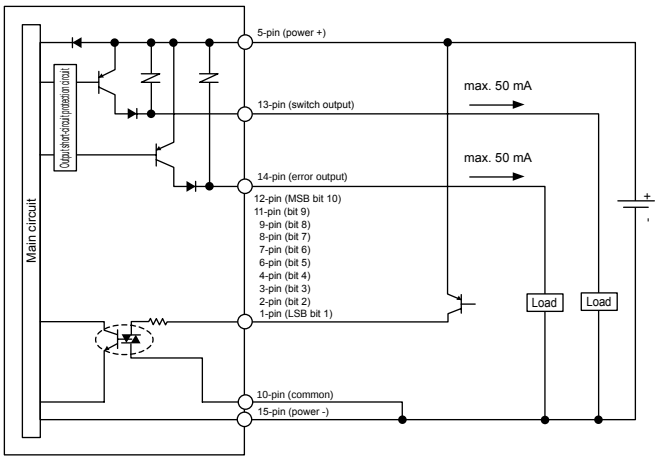
*Current consumption for pins 1 to 4, 6 to 9, 11 and 12 is approx. 6 mA.

FCM-□-□ PSN□
(Parallel input, switch output + error output NPN output)



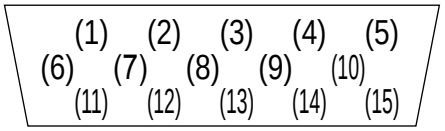
*Current consumption for pins 1 to 4, 6 to 9, 11 and 12 is approx. 6 mA.

FCM-□-□ PSP□
(Parallel input, switch output + error output PNP output)



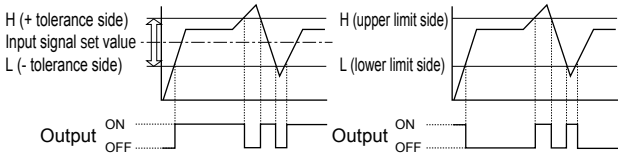
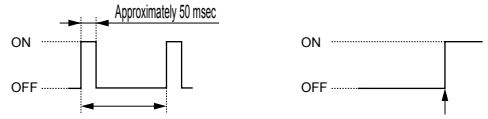
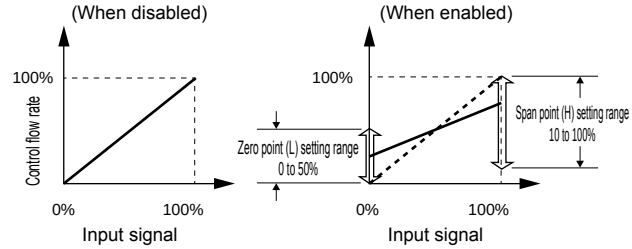
*Current consumption for pins 1 to 4, 6 to 9, 11 and 12 is approx. 6 mA.

■ Connector pin array (product body side)
[Parallel input]



Compact flow rate controller Functions of FCM Series

Functions

Function	Description	Function compatible model				Operating method
		Analog input		Parallel input		
		Analog output	Switch output	Analog output	Switch output	
Direct memory function	Target value can be entered by key. Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.	○	○	○	○	1509, 1510 1520
Preset input function	By specifying 4 arbitrary flow rates, the flow rate can be controlled with an external 2-bit input signal (signal from PLC, etc.).	○	○			1511 1520
Analog input function	Flow rate can be controlled with an analog input signal.	○	○			1513 1520
Parallel input function	Flow rate can be controlled with a parallel 10-bit (signal from PLC, etc.). Expensive input-output devices such as D/A converters are not required.			○	○	1514 1519
Integrating functions	Integrates the flow rate. As well as integrating flow display, it has the following functions. · Closes the solenoid valve when the value reaches the set integrating flow · Integrated pulse function (switch output only) *1 · Turns the switch ON when the value reaches the set integrating flow (switch output only) *1 How to reset the integrated value · Analog input: External input, button operation · Parallel input: Button operation only	○ (*1)	○	○ (*1)	○	1515 1516 1519 1521 1522
Switch output functions	The switch functions below can be selected · (1) Tolerance mode: Turns the switch ON when the value is within tolerance against the control target value (arbitrary setting) · (2) Designated range mode: Turns the switch ON when the value is outside the designated flow rate range · (3) Integrated pulse: Outputs the integrated pulse when performing integration · (4) ON at set integration or higher: Turns the switch ON when the value reaches the set integrating flow [Mode 1: Tolerance mode] [Mode 2: Designated range mode]  [Mode 3: Integrated pulse] [Mode 4: ON at set integration or higher]  Refer to pages 1515 and 1516 for pulse output rate. Set integrated value		○		○	1516 1517 1518 1521
Input signal zero/span adjustment function	Zero point or span point of input signal can be changed 	○	○			1521
Zero point adjustment	Adjusts the zero point of flow rate output	○	○	○	○	1522
Auto-power OFF	Turns the flow rate display OFF if not operated for approx. 1 minute (control does not stop with auto-power OFF function). Turns off unneeded displays to enable energy-saving operation.	○	○	○	○	1521
Error display function	Capable of displaying error state. As well as error display, it has the following functions. · Turns ON error output when an error occurs (applicable only for E01, E02, E05) · Stops control automatically when an error occurs	○	○	○	○	1508 1522
Error auto shut-off	Stops control when an error occurs, fully opens or closes valves, and turns error output ON	○	○	○	○	1522
Key lock	Disables setting change to avoid incorrect operation	○	○	○	○	1519
Reset setting	Returns the settings to default (Input signal selection, switch output, input signal zero/span adjustment, auto-power OFF, zero adjustment only)	○	○	○	○	1519

Names and functions of display/operation section

Output display (Red)

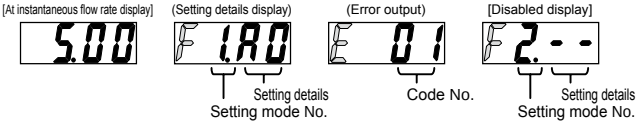
- "F" is displayed when confirming the function setting.
- "-" is turned on when switch output is ON. (switch output only)
  * Blinks when overcurrent is detected.
  * Does not blink at integrated pulse output.
- "E" lights up when error output is ON.
  * Blinks when overcurrent is detected.

* When function settings have upper/lower limits or when high-order digit or low-order digit of integrating flow display is indicated

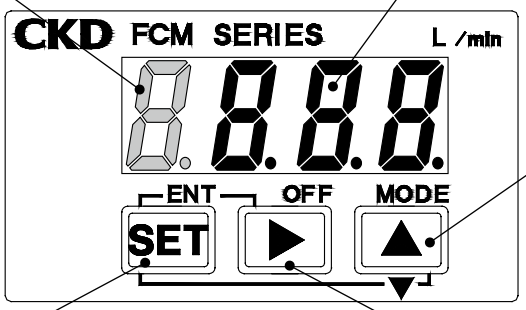
H or L is displayed.

3-digit number LED display (green)

- Displays instantaneous flow rate display and function setting details during RUN mode (instantaneous flow rate display).
  * The setting mode No. and setting details are displayed when displaying details of function settings.
- When setting each data, the values, etc., are displayed.
- Error code No. is displayed at the time of error display.



Flow rate 110% or more: Hi



UP key (MODE key)

- Used to count up values, etc.
- Used to change the setting mode.
- Used to change the settings item.

SET Key

- Used to confirm the setting mode.
- Used to confirm the setting item.
- Used to change to the integration display.

Shift key (OFF key)

- It is used to select the digits to the values, etc.
- Used to reset from forced OFF when performing forced OFF (control stop).

SET + Key (ENT key)

- Used to confirm the value.
- Used to release the key lock.
- Used to reset integration.

SET + Key (DOWN key)

- Used to count down values, etc.
- Used to set the key lock.

+ Key

- Used for initialization.

Error code table

Error display	Cause	Countermeasures	Errors subject to error auto shut-off (*1)
E.01	The power voltage is not within the rating. (Detected at 19.5 VDC or less, detection accuracy ±10% F.S.)	● Check the product's specifications, set the power voltage within the rated range, then turn the power ON again.	○
E.02	The input signal exceeded the rating range. (Detected at input 110% F.S. and over, detection accuracy ±1% F.S.)	● Check the product's input signal, set the input signal within the rated range, then turn the power ON again.	○
E.03	An error occurred during EEPROM reading or writing.	● Contact your CKD branch or dealer.	
E.04	An error occurred during memory reading or writing.	● Contact your CKD branch or dealer.	
E.05	The flow rate did not reach the setting value for approx. 5 secs. or more consecutively. (When the difference between the setting value and control value is ±20% F.S. and over, the detection accuracy is ±6% F.S.)	● After checking primary pressure, provide pressure within the rating operation differential pressure range, and then turn ON the power supply again. Or it can be reset by releasing after forced OFF (control stop) once. ● After checking for leakage from pipes, fittings, or other devices, correctly connect them, and then turn ON the power supply again. ● Contact your CKD branch or dealer.	○
E.06	Sensor output failure has occurred.	● Stop the supply of fluid to the device, set the flow rate setting to zero, and then turn ON the device power supply again. If this error is not resolved, contact your CKD branch or dealer.	○ (*2)
E.888	The switch output's overcurrent protection circuit has functioned.	● After checking whether load current exceeds the rating, correctly connect them, and then turn ON the power supply again.	

Generally, the error resets automatically; however, if it does not do so, turn OFF the power supply, check and correct the cause of the error, and then turn ON the power supply again.

*1: At shipment, the error auto shut-off was set to OFF (when an error occurs: valve fully closed). Refer to page 1522 for details.

*2: OFF regardless of the setting of error auto shut-off (when an error occurs: valve fully closed).

Controlling the flow rate

(1) When controlling the flow rate using direct memory function

Target value can be entered by key. Control flow rate can be controlled freely by operation key on the product even if there is no external input signal.
Direct memory function has two operation modes.

· Direct memory (1): Settings are applied by changing the value. (Even if the value is not confirmed, the flow rate can be varied by changing the value. This function is convenient for fine adjustment of the flow rate. Confirm the setting value after determining the flow rate.)
· Direct memory (2): Applied after the value confirmed. (When not confirming the value, the flow rate is not changed.)

[Direct memory (1) operation method]

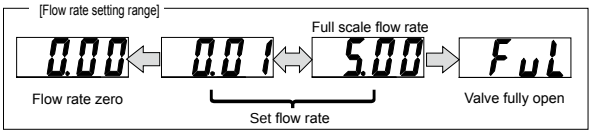
(1) Power ON Instantaneous flow rate is displayed.

(2) By pressing the ▲ key, the screen enters [F1: Input signal confirmation] screen and the present input signal setting state is displayed. The present input signal and input value are alternately displayed. (After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

(3) By holding down the SET key for approx. 2 secs., "F1.dr" starts to blink.

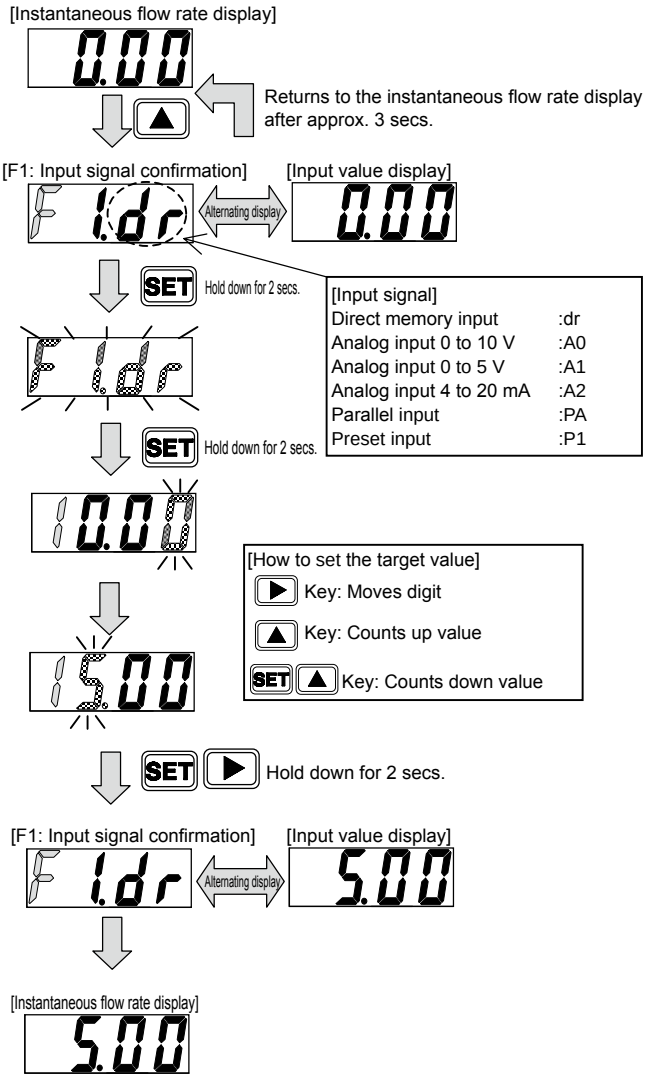
(4) By holding down the SET key for approx. 2 secs., the screen enters [Direct memory (1) setting] screen.

(5) Change the value to change the flow rate. Even if the value is not confirmed, the flow rate can be varied by changing the value.



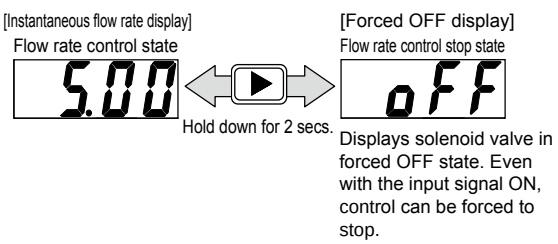
(6) By holding down the SET ▶ keys simultaneously for approx. 2 secs., the value is confirmed. Returns to [F1: Input signal confirmation] screen.

(7) Returns to the instantaneous flow rate display automatically after approx. 3 secs.



Forced OFF (flow rate zero) method

By holding down the ▶ key for approx. 2 secs. in the flow rate control state (instantaneous flow rate display), the control can be forced to stop (flow rate zero).
By holding down the ▶ key for approx. 2 secs. in the flow rate control stop state (forced OFF), the control can be returned to the flow rate control state.



Controlling the flow rate

[Direct memory (2) operation method]

(1) Power ON Instantaneous flow rate is displayed.

(2) By pressing the ▲ key once, the screen enters [F1: Input signal confirmation] screen and the present input signal setting state is displayed. The present input signal and input value are alternately displayed. (After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

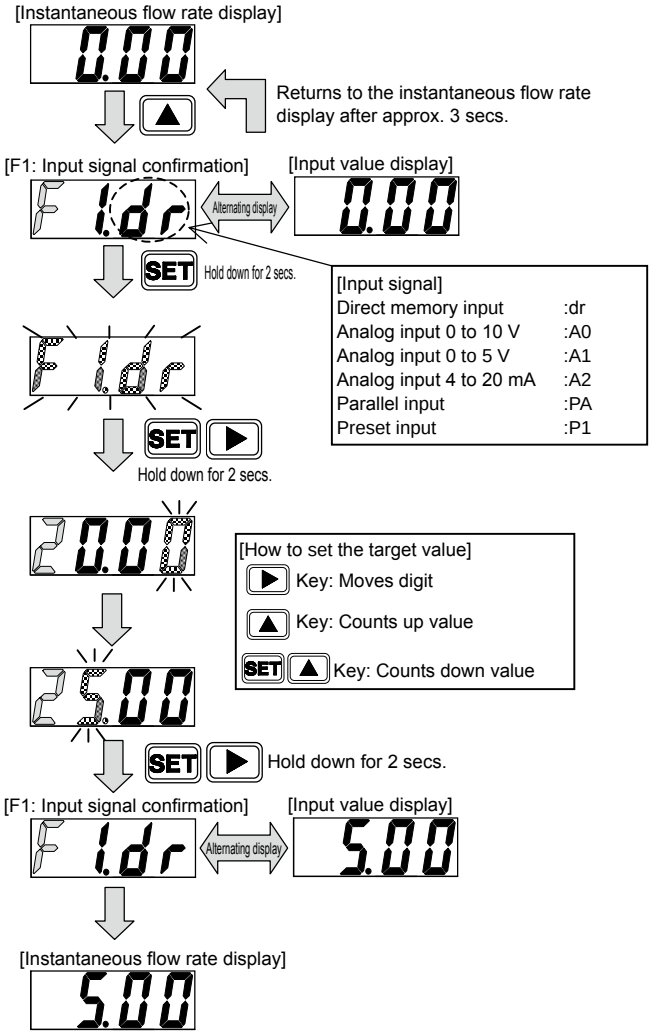
(3) By holding down the SET key for approx. 2 secs., "F1.dr" starts to blink.

(4) By holding down the SET ▶ key for approx. 2 secs., the screen enters [Direct memory (2) setting] screen.

(5) Change the value.
(When not confirming the value, the flow rate is not changed.)

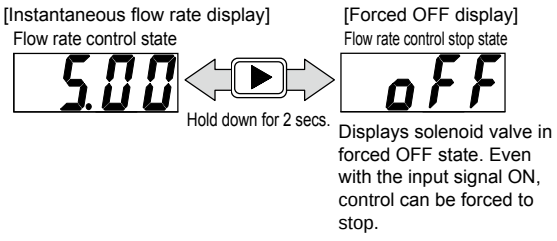
(6) By holding down the SET ▶ keys simultaneously for approx. 2 secs., the value is confirmed. Returns to [F1: Input signal confirmation] screen.

(7) Returns to the instantaneous flow rate display automatically after approx. 3 secs.



Forced OFF (flow rate zero) method

By holding down the ▶ key for approx. 2 secs. in the flow rate control state (instantaneous flow rate display), the control can be forced to stop (flow rate zero).
By holding down the ▶ key for approx. 2 secs. in the flow rate control stop state (forced OFF), the control can be returned to the flow rate control state.



CAUTION:

- The control is not stopped when direct memory setting is performed. Taking safety into account, if required, conduct it after stopping the control (forced OFF).
- The flow rate control/forced OFF state (setting value) is retained even after the power supply is turned OFF.

Controlling the flow rate

(2) When controlling the flow rate using preset input (analog input only)

By specifying 4 arbitrary flow rates, the flow rate can be controlled with an external input signal (2-bit).

Example) To control 0, 1, 2, 5 L/min using preset input, select the preset input in the input setting mode

P1: 0 L/min P2: 1 L/min

P3: 2 L/min P4: 5 L/min

for each setting. When signals are input from a PLC, etc., as indicated in the table at right, the flow rate is controlled to each preset flow rate.

D sub-socket pin No.	2	1	Preset memory number
Cable option insulator color	Orange	Brown	
Input	Bit 2	Bit 1	
Input signal	OFF	OFF	P1
	OFF	ON	P2
	ON	OFF	P3
	ON	ON	P4

[Control method using preset input signal]

(1) Power ON Instantaneous flow rate is displayed.

(2) By pressing the ▲ key once, the screen enters [F1: Input signal confirmation] screen and the present input signal setting state is displayed. The present input signal and input value are alternately displayed. (After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

(3) By holding down the SET key for approx. 2 secs., "F1.dr" starts to blink.

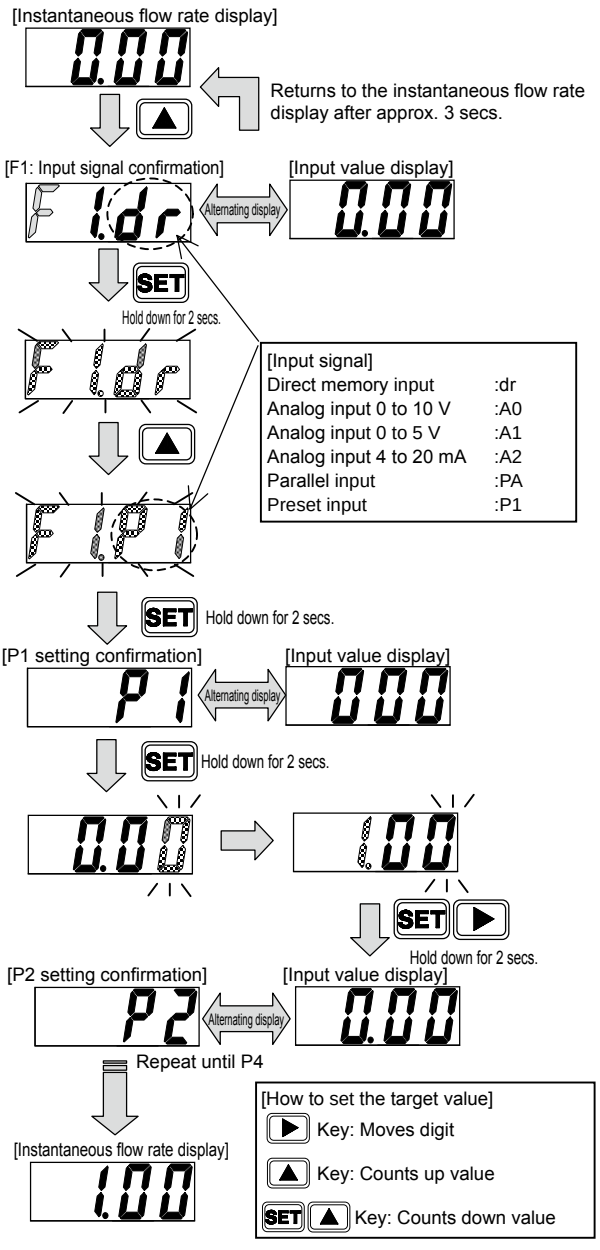
(4) By pressing the ▲ key 2 times, "F1.P1" starts to blink.

(5) By holding down the SET key for approx. 2 secs., the screen enters P1 setting confirmation screen.

(6) Hold down the SET key for approx. 2 secs. to move to the target input screen, and then enter the target value.

(7) By holding down the SET ▶ key for approx. 2 secs., the target value is stored in memory, and the screen enters P2 setting confirmation screen. Determine target values through P4 similarly.

(8) Returns to the instantaneous flow rate display automatically after approx. 3 secs. Flow rate can be controlled using the preset input.



* If switching bit 1 and bit 2 at the same time, switch within 15 ms.
As an example, note that preset memory may be wrongly set if the time difference is large, such as when switching the preset memory from P2 → P3.

Controlling the flow rate

(3) Setting change using short cut keys (only when using direct memory and preset input functions)

When using the direct memory function and the preset input function to control the flow rate, the screen can enter the setting value change screen with a single key operation.

Note: Enters the screen for changing the set value of the input signal when the shortcut key is pressed.
(Example: When controlling the flow rate with the preset input P2, the screen enters the P2 setting value change screen.)
Not applicable when controlling the flow rate using analog input or parallel input.

[Setting value change method using shortcut]

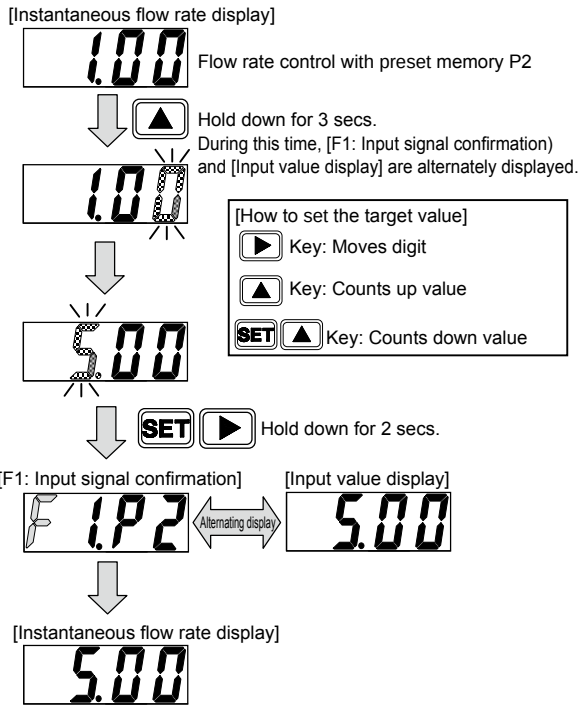
(1) Power ON Instantaneous flow rate is displayed.
(Applicable only when controlling with direct memory function or preset input function)

(2) By holding down the ▲ key for 3 secs., the screen enters the screen for changing the set value of the input signal when the ▲ key is pressed.

(3) Change the value to change the flow rate. Even if the value is not confirmed, the flow rate can be varied by changing the value.

(4) By holding down the SET ▶ keys simultaneously for approx. 2 secs., the value is confirmed. Returns to [F1: Input signal confirmation] screen.

(5) Returns to the instantaneous flow rate display automatically after approx. 3 secs.



Note: When changing settings using shortcut keys, do not switch the preset external input.
The setting value may be stored at an incorrect preset number. Because the data is not stored in memory after turning off the power supply without confirming the value, make sure to confirm the value before turning OFF the power supply.

Controlling the flow rate

(4) When controlling the flow rate using analog input (analog input only)

Flow rate can be controlled with an analog input signal.

[Control method using analog input signal]

(1) Power ON Instantaneous flow rate is displayed.

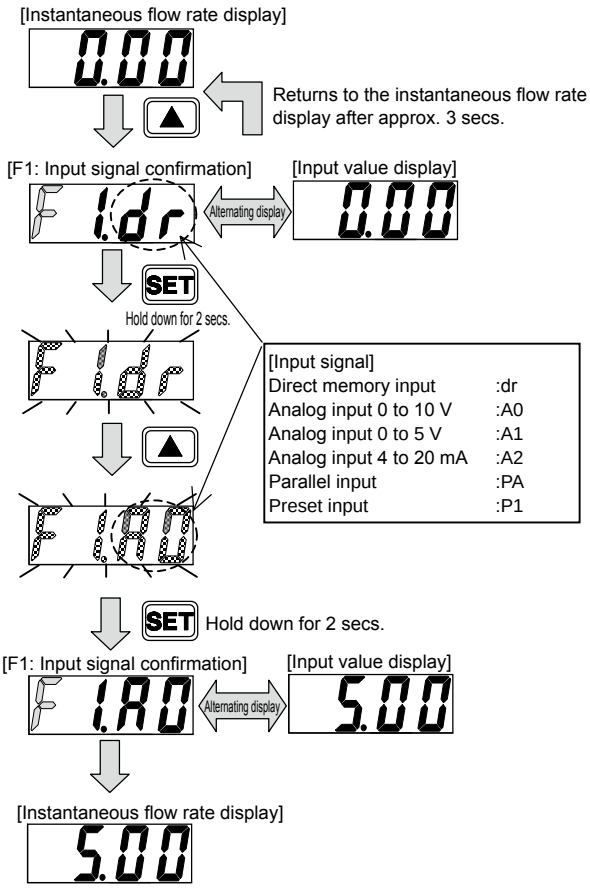
(2) By pressing the ▲ key once, the screen enters [F1: Input signal confirmation] screen and the present input signal setting state is displayed. The present input signal and input value are alternately displayed. (After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

(3) By holding down the SET key for approx. 2 secs., "F1.dr" starts to blink.

(4) By pressing the ▲ key once, "F1.A 0" starts to blink.
(Depending on the model No., the number in the □ changes.)

(5) By holding down the SET key for approx. 2 secs., the setting is confirmed.
Returns to [F1: Input signal confirmation] screen.

(6) Returns to the instantaneous flow rate display automatically after approx. 3 secs.
Flow rate can be controlled using analog input.



CAUTION: Fully open (FUL) cannot be set with the analog input.

Controlling the flow rate

(5) When controlling the flow rate using parallel input (parallel input only)

Flow rate can be controlled with a parallel 10-bit (signal from PLC, etc.). Expensive input-output devices such as D/A converters are not required.
The parallel input signal has 10 points, and when converted into a decimal, it is 0-1023. The resolution is approx. 0.1%.

Input signal = Set flow rate / Full scale flow rate x 1023

Example) When setting the flow rate to 300 mL/min with full scale flow rate of 500 mL/min

300 (mL/min) / 500 (mL/min)×1023=613.8 → 614

When 614 (decimal) is converted into binary, the result is 1001100110. 1 sets the input signal to ON, and 0 sets the input signal to OFF.
(Refer to table below)

D sub-socket pin No.	12	11	9	8	7	6	4	3	2	1
Cable option insulator color	Green (black line)	White	Red (black line)	White (black line)	Pink	Light blue	Purple	Yellow	Orange	Brown
Input	Bit 10 MSB	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1 LSB
Binary [for 614 (decimal)]	1	0	0	1	1	0	0	1	1	0
Input signal	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF

[Control method using parallel input signal]

(1) Power ON Instantaneous flow rate is displayed.

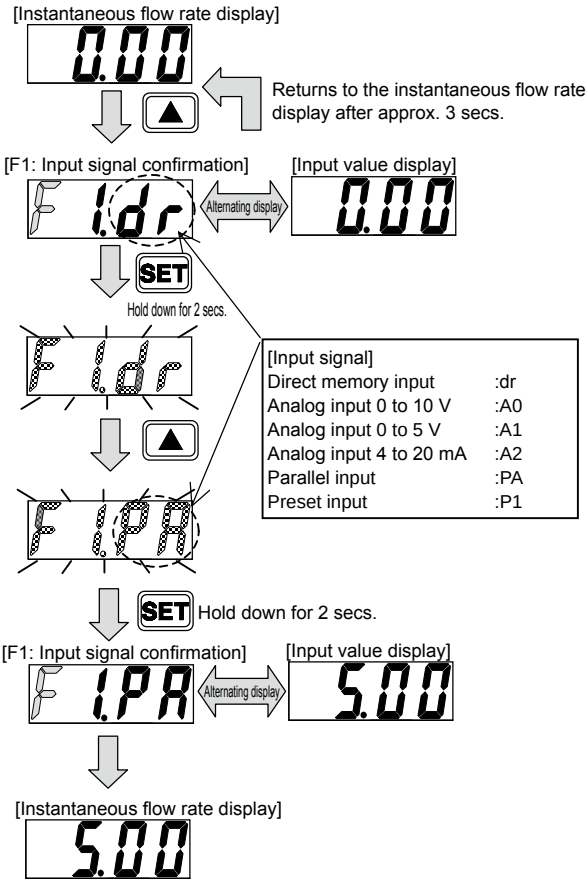
(2) By pressing the ▲ key once, the screen enters [F1: Input signal confirmation] screen and the present input signal setting state is displayed. The present input signal and input value are alternately displayed. (After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

(3) By holding down the SET key for approx. 2 secs., "F1.dr" starts to blink.

(4) By pressing the ▲ key 1 time, "F1.PA" starts to blink.

(5) By holding down the SET key for approx. 2 secs., the setting is confirmed.
Returns to [F1: Input signal confirmation] screen.

(6) Returns to the instantaneous flow rate display automatically after approx. 3 secs.
Flow rate can be controlled using parallel input.



CAUTION: Fully open (FUL) cannot be set with the parallel input.

[Reference]

If low resolution is acceptable, the number of inputs can be reduced.

Example) If resolution of approx. 2% is acceptable, operation can be performed with input of 6 points (0-63 when converted to decimal). In this case, by shorting the bits 5 to 1 in the table above together to 1 bit (LSB) and turning ON/OFF, the control can be performed with input of 6 points.

Integrating the flow rate

(1) How to display integrating flow

Displays flow rate integration. The display range is as in the table below. The integrating flow is a calculated (reference) value.

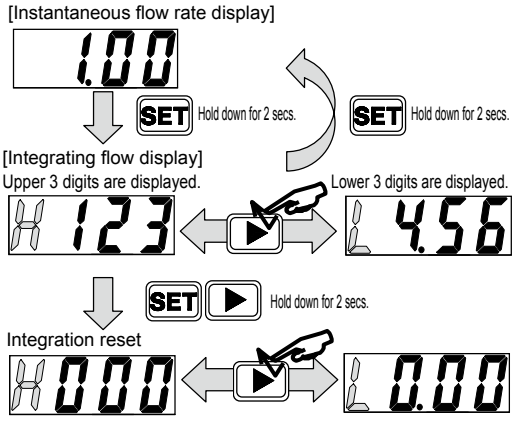
Model No. FCM-		9500 L9500	0001 L0001	0002 L0002	0005 L0005	0010 L0010	0020	0050	0100
Flow rate display	Display range	0 to 500 mL/min	0.00 to 1.00 L/min	0.00 to 2.00 L/min	0.00 to 5.00 L/min	0.0 to 10.0 L/min	0.0 to 20.0 L/min	0.0 to 50.0 L/min	0 to 100 L/min
Integrating functions	Display range	999999 mL	9999.99 L	9999.99 L	9999.99 L	99999.9 L	99999.9 L	99999.9 L	999999 L
	Display resolution	1 mL	0.01 L	0.01 L	0.01 L	0.1 L	0.1 L	0.1 L	1 L
	Pulse output rate	5 mL	0.01 L	0.02 L	0.05 L	0.1 L	0.2 L	0.5 L	1 L

[How to display integration]

(1) Instantaneous flow rate display
Integration starts from the time when the power supply is turned ON. (The integrated value is reset when the power supply is turned OFF.)

(2) By holding down the SET key for approx. 2 secs., the screen enters the integration display screen. To return to the instantaneous flow rate display, hold down SET key for approx. 2 secs. Pressing the ▶ key changes the display digit.

(3) By holding down the SET ▶ key for approx. 2 secs., the integrated value is reset. For the analog input, integrated value reset is possible from the external input (No. 3 pin). The integrated value is reset when the power supply is turned OFF.



(2) When closing the solenoid valve when the value reaches the set integrating flow

When the value reaches the set integrating flow, the solenoid valve is closed.
Ideal for filling processes with a constant flow rate, etc.

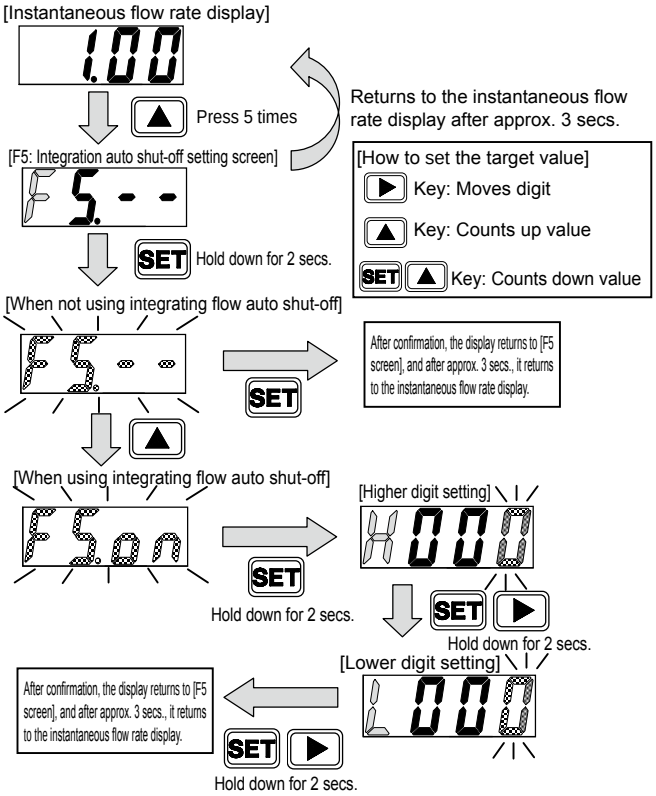
[Operating method]

(1) Instantaneous flow rate display

(2) Press the ▲ key 5 times
to enter [F5: Integration auto shut-off setting screen]. If the integration auto shut-off setting is enabled, "F5.on" and the present setting value are alternately displayed. (After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

(3) By holding down the SET key for approx. 2 secs., "F5.--" starts to blink. When not using the integration auto shut-off, by holding down SET key for approx. 2 secs., the display returns to [F5 screen], and after approx. 3 secs., it returns to the instantaneous flow rate display.

(4) When using the integration auto shut-off, press ▲ key to start "F5.on" blinking, and hold down SET key for approx. 2 secs.
After setting the higher digit, hold down SET ▶ key for approx. 2 secs.
After setting the lower digit, hold down SET ▶ key for approx. 2 secs.
The display returns to [F5 screen], and after approx. 3 secs., it returns to the instantaneous flow rate display.



* In this mode alone, the integrated value is reset when the input signal goes to zero. (enabled only after auto shut-off)
* The solenoid valve is cut off automatically and switch operation is performed when the value matches the integrating flow value.
* When the display turns "OFF" by auto shut-off, the switch output light is not turned ON. By resetting the integrated value (with button operation or external input), the display returns to the flow rate display.
* Even if the auto shut-off function is disabled at the time of auto shut-off, operation cannot be performed unless the integrated value is reset.
* The integrated value is reset at the point when the auto shut-off is turned "ON" and the value is set.

Integrating the flow rate

(3) When an integrated pulse is outputted (switch output only)

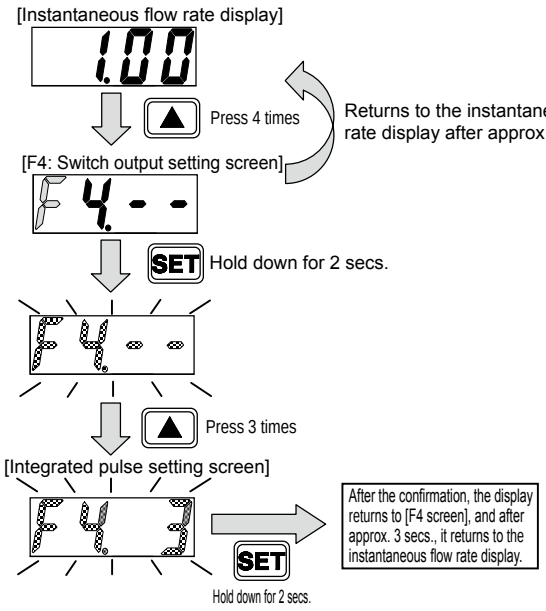
The integrated pulse is output. Refer to the table on page 1515 for pulse output rate.
Refer to the wire connection method (page 1504) and example of the internal circuit and load connection (pages 1505, 1506) for the switch output wire connection method.
[Operating method]

(1) Instantaneous flow rate display

(2) Press the ▲ key 4 times to enter [F4: Switch output setting screen]. If the switch output setting is enabled, "F4.□" and the present setting value are alternately displayed.
(After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

(3) Hold down the SET key for 2 secs. to enter the switch output setting mode.

(4) By pressing the ▲ key 3 times, "F4.3" starts to blink. By holding down the SET key for approx. 2 secs., the integrated pulse output is confirmed. The display returns to [F4 screen], and after approx. 3 secs., it returns to the instantaneous flow rate display.



(4) When switch is ON when the value reaches the set integrating flow (switch output only)

The switch output is turned ON when the value reaches the set integrating flow.
Refer to the wire connection method (page 1504) and example of the internal circuit and load connection (pages 1505, 1506) for the switch output wire connection method.
[Operating method]

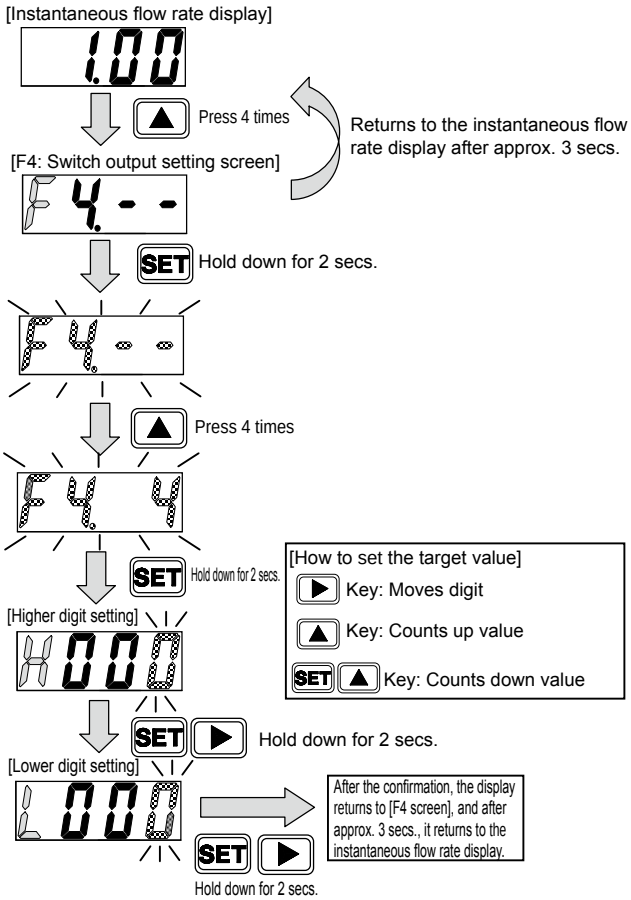
(1) Instantaneous flow rate display

(2) Press the ▲ key 4 times to enter [F4: Switch output setting screen]. If the switch output setting is enabled, "F4.□" and the present setting value are alternately displayed.
(After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

(3) Hold down the SET key for 2 secs. to enter the switch output setting mode.

(4) Press the ▲ key once to start "F4.4" blinking, and hold down SET key for approx. 2 secs. to enter the target value setting screen.
After setting the higher 3 digits of the target value, hold down SET ▶ key for approx. 2 secs.
After setting the lower 3 digits of the target value, hold down SET ▶ key for approx. 2 secs. The integrated value is reset immediately after confirmation.

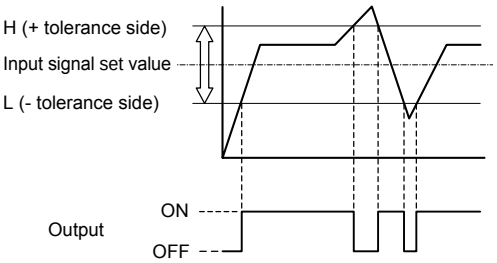
(5) The display returns to [F4 screen], and after approx. 3 secs., it returns to the instantaneous flow rate display.



Using the switch output function (switch output only)

(1) When using the tolerance mode

Turns the switch output ON when the value is within tolerance against the input signal setting value.
The tolerance value can be set on both positive and negative sides, with % F.S. (full scale).
Refer to the wire connection method (page 1504) and example of the internal circuit and load connection (pages 1505, 1506) for the switch output wire connection method.



[Operating method]

(1) Instantaneous flow rate display

(2) Press the ▲ key 4 times to enter [F4: Switch output setting screen]. If the switch output setting is enabled, "F4.□" and the present setting value are alternately displayed.
(After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

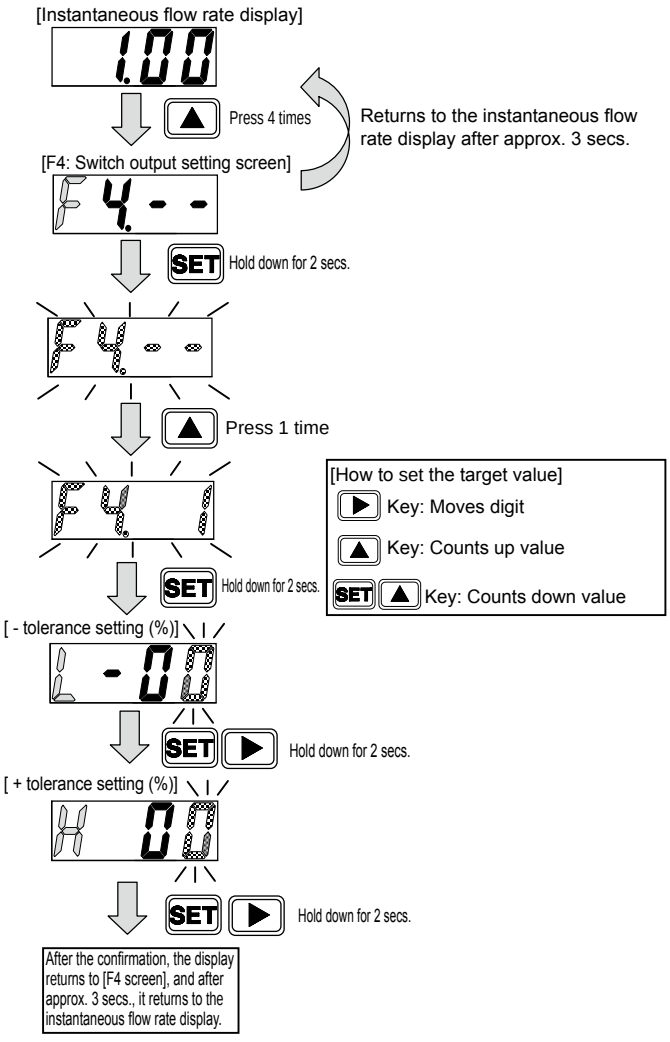
(3) Hold down the SET key for 2 secs. to enter the switch output setting mode.

(4) Press the ▲ key once to start "F4.1" blinking, and hold down SET key for approx. 2 secs. to enter the target value setting screen.

(5) After setting the tolerance value (negative side), hold down SET ▶ key for approx. 2 secs.
Negative side setting range: -50 to 0% F.S.

(6) After setting the tolerance value (positive side), hold down SET ▶ key for approx. 2 secs.
Positive side setting range: 0 to 50% F.S.

(7) The display returns to [F4 screen], and after approx. 3 secs., it returns to the instantaneous flow rate display.

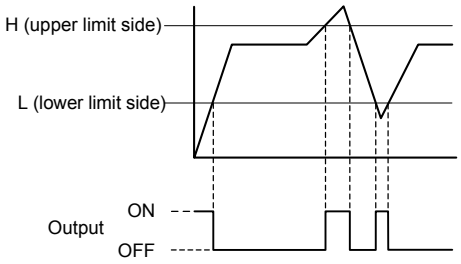


* When "FUL" is selected as the input signal set value (valve fully open), it operates with the tolerance of the set value selected before. As an example, if the input signal set value is changed from 50 L/min to "FUL" (valve fully open), the switch will be turned ON within the tolerance of 50 L/min.

Using the switch output function (switch output only)

(2) When using the designated range mode

The switch output turns ON when the value is outside the designated flow rate range. The upper/lower limits are set regardless of input signal setting value (control target value). Both upper and lower limits can be set, with % F.S. (full scale). Refer to the wire connection method (page 1504) and example of the internal circuit and load connection (pages 1505, 1506) for the switch output wire connection method.



[Operating method]

(1) Instantaneous flow rate display

(2) Press the ▲ key 4 times to enter [F4: Switch output setting screen]. If the switch output setting is enabled, "F4.□" and the present setting value are alternately displayed.
(After 3 secs. have elapsed without pressing the button, the display returns to the instantaneous flow rate display.)

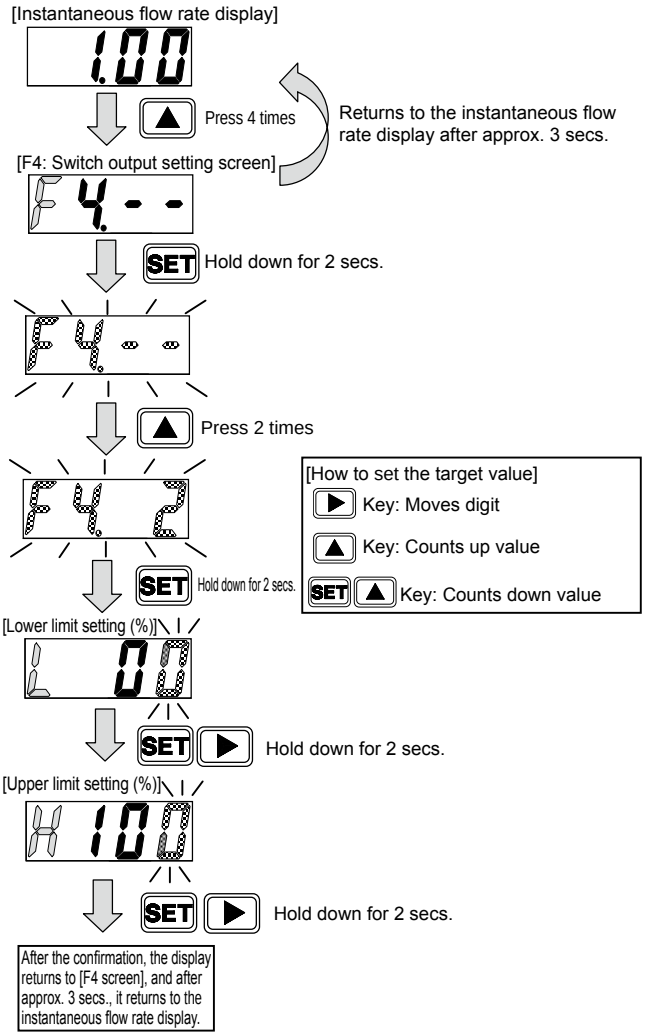
(3) Hold down the SET key for 2 secs. to enter the switch output setting mode.

(4) Press the ▲ key twice to start "F4.2" blinking, and hold down SET key for approx. 2 secs. to enter the target value setting screen.

(5) After setting the lower limit, hold down SET ▶ key for approx. 2 secs.
Lower limit setting range: 0 to 90% F.S.

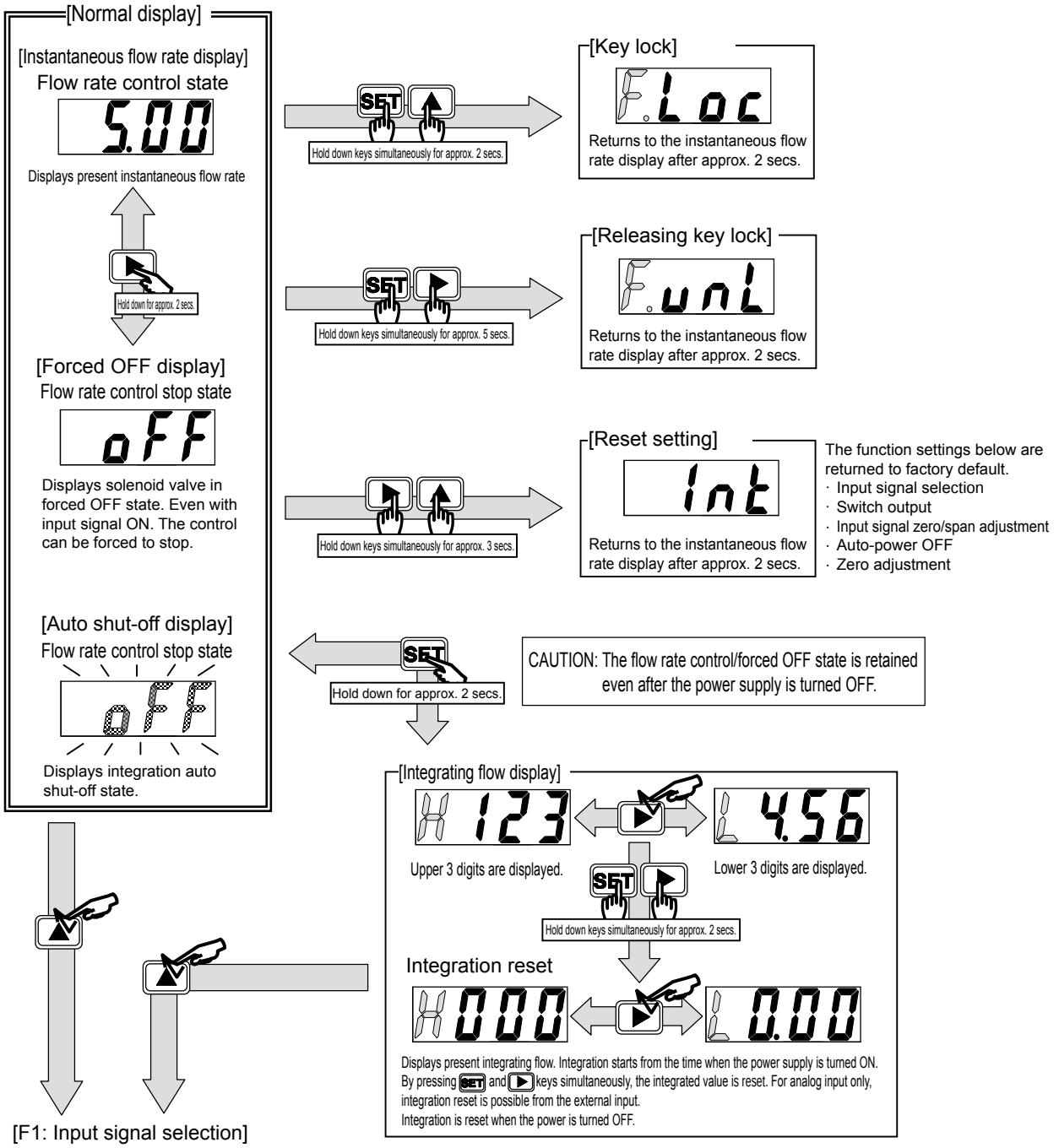
(6) After setting the upper limit, hold down SET ▶ key for approx. 2 secs.
Positive side setting range: 10 to 100% F.S.
With interval of 10% F.S. or more between the upper limit and lower limit

(7) The display returns to [F4 screen], and after approx. 3 secs., it returns to the instantaneous flow rate display.

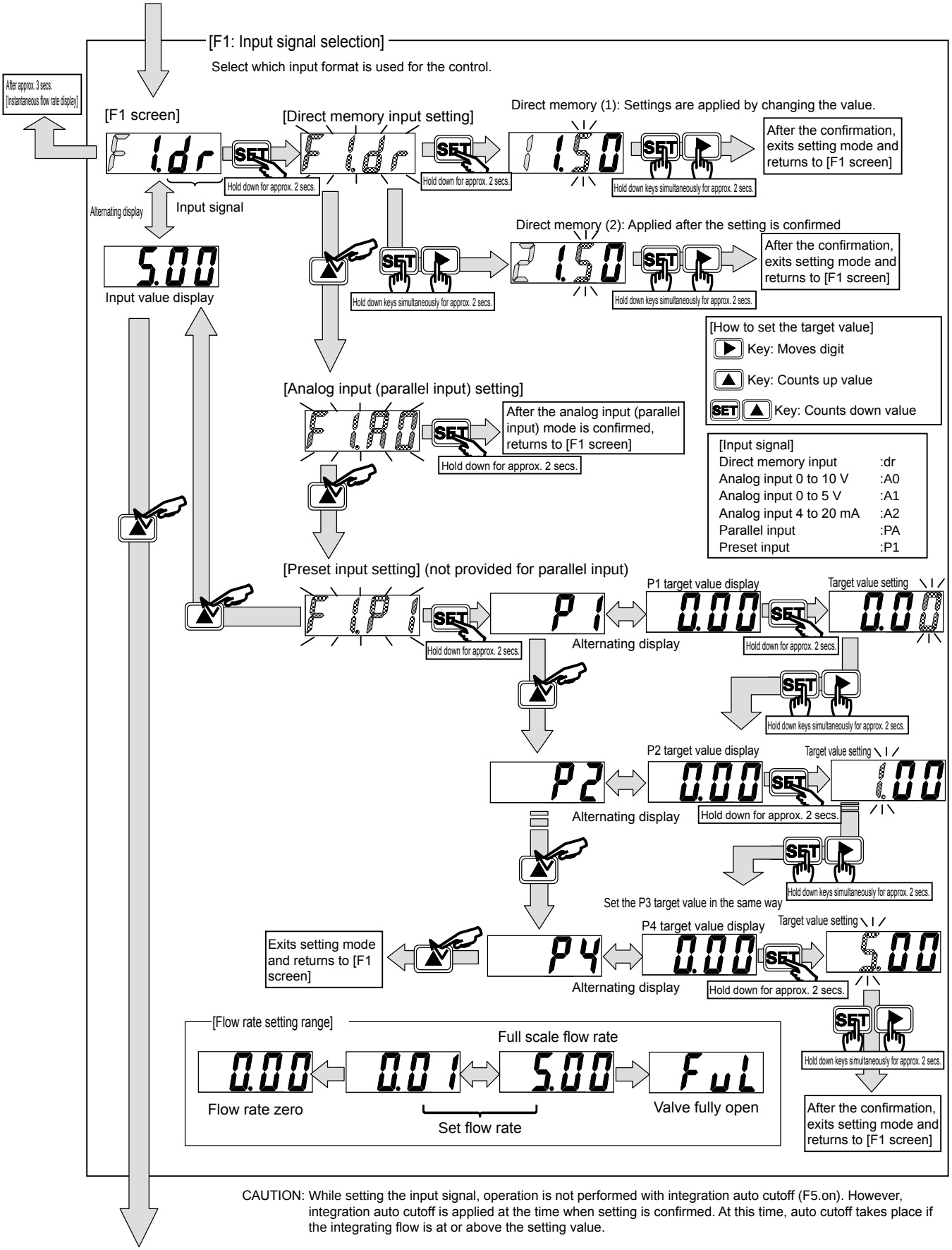


Operating methods (list)

CAUTION: · At shipment, the product is in the unlocked state. Put on key lock if required.
The key locked/unlocked state is retained after turning the power supply OFF.
· The control is not stopped during setting of F1: input signal selection and F2: input signal zero/span.
Taking safety into account, if required, conduct it after stopping the control (forced OFF).
· The flow rate control/forced OFF state is retained even after the power supply is turned OFF.



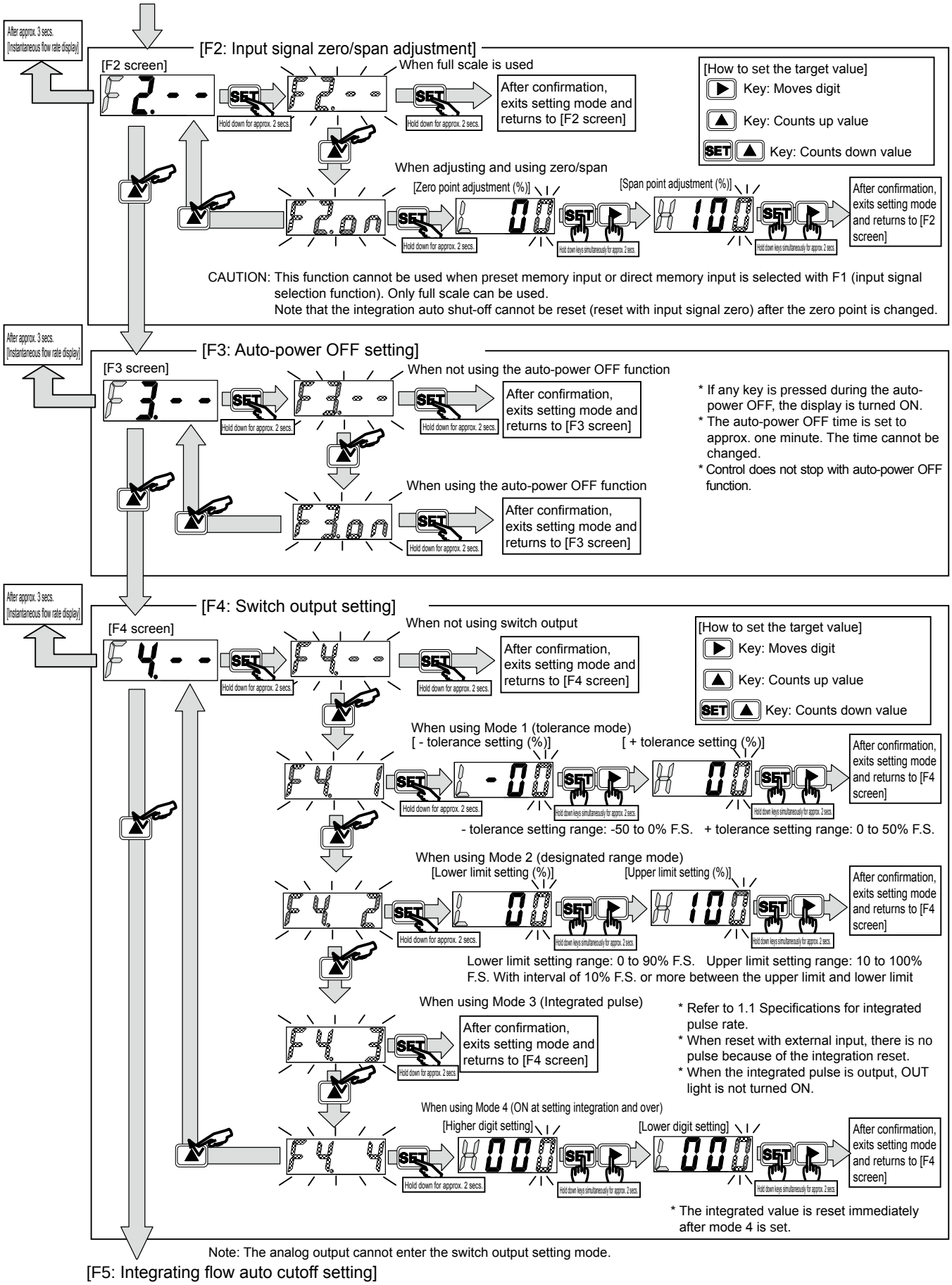
Operating methods (list)



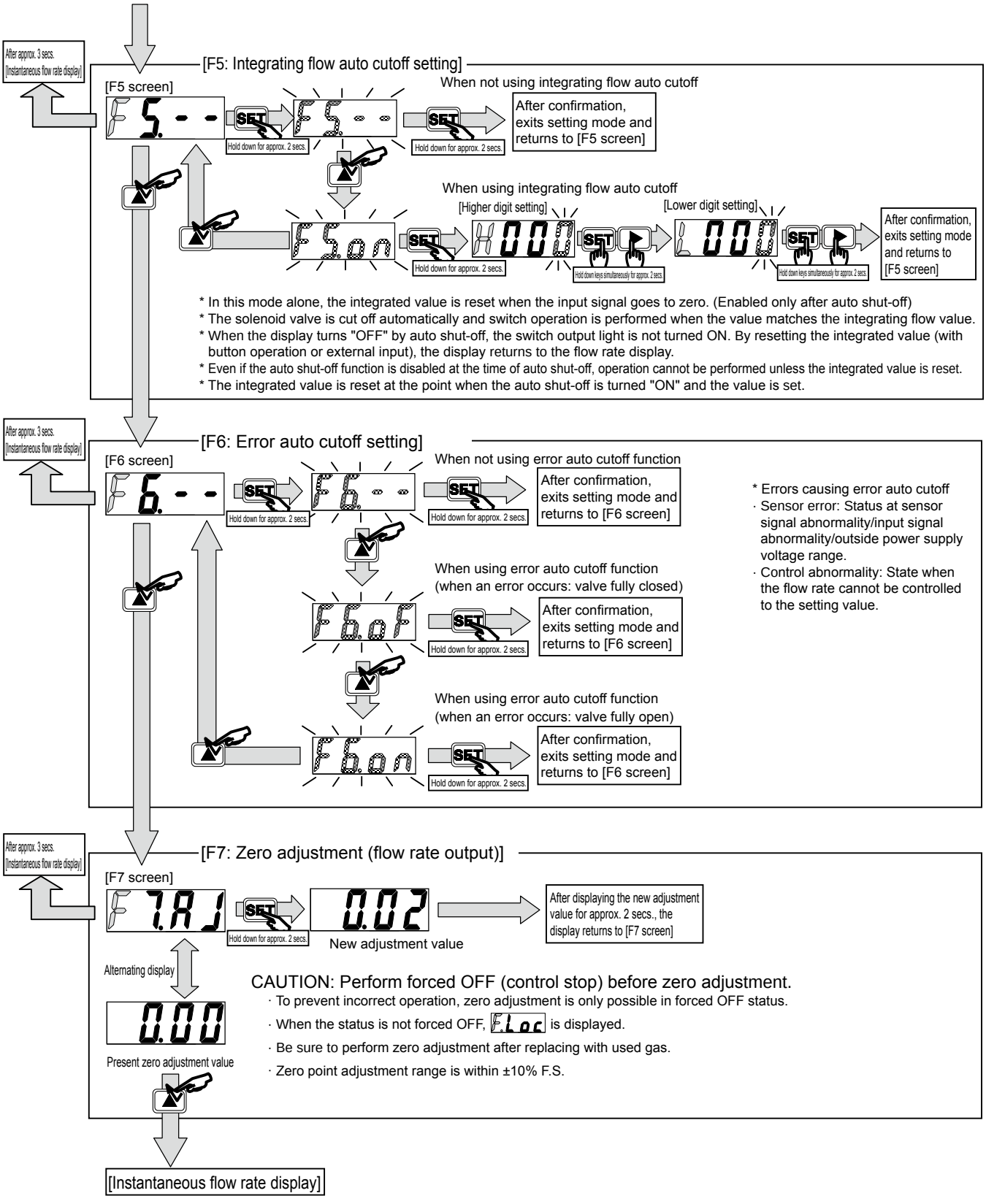
CAUTION: While setting the input signal, operation is not performed with integration auto cutoff (F5.on). However, integration auto cutoff is applied at the time when setting is confirmed. At this time, auto cutoff takes place if the integrating flow is at or above the setting value.

[F2: Input signal zero/span adjustment]

Operating methods (list)



Operating methods (list)



FCM Glossary

Applicable to compact flow rate controller FCM.

Term	Explanation
Control range	Calibration range of this product.
Accuracy	Calibration error from CKD reference device. (Conditions: Temperature 25±3˚C, power supply voltage 24±0.01 VDC, standard differential pressure, secondary side released to atmosphere)
Repeatability	Calculated from variation (D = Max. - Min.) when flow rate controls of 0% F.S. and 50% F.S. are repeated 20 times continuously in a cycle where the control is sufficiently stabilized. (Reproducibility) = ±D/2/FS control flow rate x 100[%]
Temperature characteristics	Indicates the fluctuation of the flow rate value according to changes in the ambient / fluid temperatures (reference 25°C) converted per 1°C. Calibration is performed at a temperature of 25°C.
Pressure characteristics	Indicates the fluctuation of the flow rate value according to changes in the working pressure. Calibration is performed at standard differential pressure.
Standard differential pressure	Differential pressure when this product is calibrated. (Secondary side released to atmosphere)
Operating differential pressure	Differential pressure required for normal operation of this product.
Guaranteed proof pressure	Pressure at which the product will not be damaged.
Display resolution	Min. step at which the display changes.
(Integrated) pulse output rate	Integrating flow per pulse when the integrated pulse is output.
LSB	Indicates the min. digit of parallel input.
MSB	Indicates the max. digit of parallel input.
digit	Digit. Min. value of digital display when decimal points are ignored.
AWG	Abbreviation of American Wire Gauge. Standard for cables.