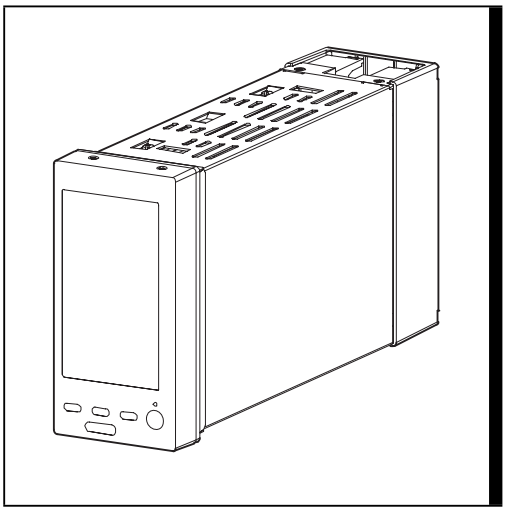
Model SC200D
MULTI-FUNCTION PID CONTROLLER

USERS MANUAL



Applicable Models

SC200D
Pulse Width Output

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Contents

1. BEFORE USE ....

Thank you for choosing M-System. Before use, please check contents of the package you received as outlined below.

If you have any problems or questions with the product, please contact M-System's Sales Office or representatives.

This product is for use in general industrial environments, therefore may not be suitable for applications which require higher level of safety (e.g. safety or accident prevention systems) or of reliability (e.g. vehicle control or combustion control systems).

For safety, installation and maintenance of this product must be conducted by qualified personnel.

PACKAGE INCLUDES:

- Multi-function PID controller .....(1)
- Resistor module .....(2)
- CJC sensor .....(2)
- Mounting bracket.....(2)
- Connector adapter ..... (1)

MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

USERS MANUAL

This manual describes detailed operations and necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

The model SC200D is referred to as 'the Controller' in this manual if not explained otherwise.

The following document will also provide helpful information when using this product:

- SC100/200 Series Function Block List (EM-6460-B)

APPLICABLE FIRMWARE VERSION

This Users Manual conforms to (SC200D) SC_LCD firmware version 1.00 or later. Refer to 6.3.1.38. VERSION when confirming the version No. of your Controller.

POINTS OF CAUTION

Conformity with EU directives

- This equipment is suitable for Pollution Degree 2, Installation Category II (transient voltage 2500V) and Measurement Category II (contact output, transient voltage 2500V). Reinforced insulation (signal input or output to power input: 300V) and basic insulation (signal input or output to contact output: 300V) are maintained. Prior to installation, check that the insulation class of this unit satisfies the system requirements.
- Altitude up to 2000 meters.
- FG (Functional Ground) shall not share with PE (Protective Earth) of other equipment. Ground the FG terminal solely for signals.
- The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE requirements. Failure to observe these requirements may invalidate the CE conformance.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures to ensure the CE conformity.
- In order to enable the operator to turn off the power input immediately, install a switch or a circuit breaker according to the relevant requirements in IEC 60947-2 and properly indicate it.
- The equipment is intended to be installed in a industrial environment defined by EN 61000-6-2, EN 61000-6-4.
- Analog signals may have some fluctuation within ±5 % during following tests:
  - EN 61000-4-3: Radiated, radio-frequency, electromagnetic field
  - EN 61000-4-6: Immunity to conducted disturbances, induced by radio frequency fields
  - EN 61000-4-8: Power frequency magnetic field

Power input

- Locate the power input rating marked on the product and confirm its operational range.
- Supplying any level of power other than specified can damage the unit or the power source.
- Power supply start-up characteristics must reach within 5 seconds to the operational voltage range of the unit.
- Power cables and signal I/O cables for the unit must be located separately.
- Power cables and signal I/O cables for the unit should not be bundled together.
- To increase noise resistance of the power input wires, twist the strands before connecting.

General Precautions

- Before you remove the unit, turn off the power supply and input signal for safety.
- Do not disassemble or modify the unit in any way. Doing so may result in a fire or an electrical shock.
- Do not block the unit's ventilation openings or use it in areas where heat accumulates.
- Additionally, do not store or use it under high-temperature conditions.
- Do not use this unit in an environment where flammable/corrosive gases are present.
- Do not store or use this unit in locations subject to direct sunlight, or where excessive dust, dirt or metal particles are present.
- This unit is a precision instrument. Do not store or use it where large shocks or excessive vibration can occur.
- Do not store or use this unit in environments subject to chemical evaporation (such as that of organic solvents), or where there are chemicals and/or acids present in the environment.
- Do not use paint thinner or organic solvents to clean this unit.
- Observe the environmental conditions when using this unit.
- Wait at least 30 seconds before turning on the power supply after it was turned off.

Environment

- Indoor use.
- This unit is designed to be mounted on a vertical panel. It is not suitable for a slanted or a horizontal panel surface.
- Environmental temperature must be within -5 to +55°C (23 to 131°F) with relative humidity within 5 to 90% RH in order to ensure adequate life span and operation.

Grounding

- Be sure to determine in advance the most stable grounding point in the environment and earth the unit's FG terminal and that of connected devices to it in order to protect the devices from dielectric breakdown.
- Grounding is also effective to eliminate noise that could cause errors in the unit's operation.

LCD panel

- The LCD panel's liquid contains an irritant. If the panel is damaged and the liquid contacts your skin, rinse immediately the contact area with running water for at least 15 minutes. If the liquid gets in your eyes, rinse immediately your eyes with running water for at least 15 minutes and consult a doctor.
- The following phenomena are LCD characteristics, and NOT a product defect:
  - LCD screen may show uneven brightness depending upon displayed images or contrast settings.
  - The LCD screen pixels may contain minute black-and-white-colored spots.
  - The color displayed on the LCD screen may appear different when seen from outside the specified viewing angle.
  - When the same image is displayed on the screen for a long time period, an afterimage may appear when the image is changed. If this happens, turn off the unit and wait for a while before restarting it.
- To prevent an afterimage:
  - Set the screensaver when you plan to display the same image for a long time period.
  - Plan to change the screen image periodically so that the same image does not remain for the long time period.
- The LCD surface is covered with a protective film at the factory shipment. Remove it once the unit is installed.

Minimizing noise interference to analog signal cables

- Noise entering through the analog signal cables may cause irregular measurement values, degradation of overall accuracy, and malfunction of the product. We recommend that you would conduct wiring to the unit with the following points of caution.
- Do not install cables close to noise sources (high frequency line, etc.).
- Do not bind the analog I/O cables together with those in which noises are present. Do not install them in the same duct.

DO NOT apply overrange input

- Do not apply voltages exceeding ±15 V across the voltage input terminals to prevent damage.
- Do not apply currents exceeding ±30 mA to the current input terminals to prevent damage.

Connector adaptor

- Connector adaptor is included in the product package when “stereo jack” is specified for “configurator interface” when ordering the product.
- Connect the adaptor to the stereo jack end of the configurator cable (model: COP-US).

Stereo jack port

- Stereo jack port is covered with a cap to prevent water/moisture in it. Take precaution so that water/moisture does not enter in it when using the configurator cable or when putting the cap on and off.
- Do not leave water/moisture inside the stereo jack port. If water/moisture is present, be sure to blow it off before using it.
- For using the port, remove the cap and insert the configurator cable connected with the adaptor.
- Be sure to put back the cap onto the port after removing the cable.

And ....

- We recommend use of an UPS to supply power backups.
- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.
- Refer to 4. INSTALLATION regarding the points of caution to be considered when installing the Controller.

2. FUNCTION DESCRIPTIONS

The model SC200D is a multi-function controller equipped with a color LCD display with touch panel. It is designed to suit with a wide variety of applications using two PID function blocks together with numerous computational functions.

FUNCTIONS & FEATURES

- For control loops with final control elements driven by electric actuators
- Color LCD with touch panel
- Five Operation views (digital display, bargraph, dual-loop bargraph, short trend and user's parameter table views)
- Enhanced screen functions for engineering (configuration, programming, tuning, realtime I/O monitoring and user's parameter table views)
- Universal input x 2 points, analog input x 4 points, discrete input x 6 points, pulse input x 5 points, high speed pulse input x 1 point
- Current output (4 – 20 mA) x 2 points, voltage output (1 – 5 V) x 2 points, relay or photo-MOSFET relay output x 5 points
- RUN contact output (relay) x 1 point
- I/O signals can be added with remote I/O modules connected via NestBus peer-to-peer communication
- Computation cycle selectable between 100 msec. and 3 sec. (control cycle selectable between 1 and 64 times of the computation cycle)
- Position input display
- One control output with two modulated pulses (to increase and to decrease)
- Two PID function blocks
- Advanced computation and sequence control functions
- Auto-tuning function
- Parameter input and changing with touch panel
- Function parameter setting, list printing and data downloading/uploading available with Loop Configuration Builder Software (model: SFEW3E)
- Short trend export (CSV), display parameter setting, saving and transfer with PC Configurator Software (model: SCCFG)
- Control and supervision by SCADA software via Modbus/TCP or RTU communication
- Selectable housing depth for ease of using existing wires in replacement
- Separable two-piece terminal block

TYPICAL APPLICATIONS

- Replacement of conventional controllers
- Panel operation for small-scale instrumentation

3. SPECIFICATIONS

3.1. MODEL NUMBERING

Code number: SC200D – **[1] [2]** – **[3] [4]**

[1] DISCRETE OUTPUT
- **1** : Relay contact
- **2** : Photo MOSFET relay

[2] MODBUS
- **1** : Modbus-RTU
- **2** : Modbus/TCP

[3] POWER INPUT
- **M2** : 100 – 240 V AC
- **R** : 24 V DC

[4] OPTIONS

Housing Depth
- **/3** : 300 mm
- **/4** : 400 mm

Language
- **blank**: Japanese
- **/E** : English

Language (Japanese or English) can be chosen by front panel setting.

Configurator interface (must be specified)
- **/1** : Stereo jack

Terminal block (must be specified)
- **/T** : Separable terminal

Other Options
- **blank**: Japanese
- **/Q** : Option other than the above (specify the specification)

3.2. RELATED PRODUCTS

The following products are required for the setting up of the device via PC (not included in the package.)

- PC Configurator Software (model: SCCFG Ver. 1.83 or later) Downloadable at M-System's web site.
- Loop Configuration Builder Software (model: SFEW3E Ver. 1.100 or later). Downloadable at M-System's web site.
- PC Configurator Cable (model: COP-US)

3.3. GENERAL SPECIFICATIONS

Construction	Panel flush mounting
Degree of protection	IP55; applicable to the front panel for single unit mounted according to the specified panel cutout
Connection	Terminal screws: M3.5 screw terminals (torque 1.0 N·m) Terminal fixing screws: M4 screw terminals (torque 1.2 N·m)
Screw terminal	Terminal screws: Nickel-plated steel (standard) or stainless Terminal fixing screws: Chrome-plated steel
Housing material	Flame-resistant resin (gray), steel
Isolation	Pv1 to Pv2 to supply output to Ai1 or Ai2 or Ai3 or Ai4 to Di1 or Di2 or Di3 or Di4 or Di5 or Pi1 or Pi2 or Pi3 or Pi4 or Pi5 to Di6 or Pi6 to Mv1 to Mv2 to Ao1 or Ao2 to Do1 to Do2 to Do3 to Do4 to Do5 to Do6 to NestBus to Modbus-RTU to Modbus/TCP to power to FG
PID control	Single loop, cascade, advanced
Proportional band (P)	1 to 1000 %
Integral time (I)	0.01 to 100 minutes
Derivative time (D)	0.01 to 10 minutes
Auto-tuning	Limit cycle method
Alarm	PV high & low, deviation, rate of change
Computation	48 functions blocks available for arithmetic operations, time functions, signal selection, limit alarm and other functions
Sequence operation	Logic sequence and step sequence (max. 1068 commands)
Computation cycle	100 msec. to 3 sec. (control cycle selectable among 1, 2, 4, 8, 16, 32 and 64 times of the computation cycle)
MV output range	-15 to +115 %
Parameter setting	With touch panel or PC (Loop Configuration Builder Software model: SFEW3E)
Self diagnostics	CPU monitoring with a watchdog timer
RUN contact	OFF in error detected by diagnostic
Short trend	Storing interval: 1, 2, 5, 10, 20, 30 sec., 1, 2, 5, 10, 30, 60 min. Capacity: 400 points (display 200 points)

3.4. DISPLAY

Display device	4.3-inch TFT LCD
Display colors	256
Resolution	480 × 272 pixels
Pixel pitch	0.198 × 0.198 mm (128 × 128 DPI)
Backlight	LED Note: The backlight can be replaced in M-System factory. The LCD must be replaced at the same time.
Screen saver standby time	1 to 99 minutes
Scaling range	-32000 to +32000
Decimal point position	10^{-1}, 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} or none
Scale divisions	2 to 10
Engineering unit indication	Max. 8 characters
Auto/Man indicator	Green/Amber LED

3.5. EXTERNAL INTERFACE

■ NestBus

Configuration	Bus type multi-drop
Standard	Conforms to TIA/EIA-485-A
Transfer rate	19.2 kbps
Protocol	NestBus (M-System's own protocol)
Max. transmission distance	1 kilometer
Transmission media	Shielded twisted-pair cable (CPEV-S φ0.9)
Terminating resistor	Incorporated
Module number	0 – F x 16 modules setting available

■ Modbus-RTU

Configuration	Half-duplex, asynchronous, no procedure
Standard	Conforms to TIA/EIA-485-A
Max. transmission distance	500 meters
Transfer rate	4800, 9600, 19.2 k, 38.4 k bps
Data bit	8
Parity bit	Odd, even, none
Max. node number	15 (except the master)
Node address	1 – 247
Transmission media	Shielded twisted-pair cable (CPEV-S φ0.9)
Terminating resistor	Incorporated

■ Modbus/TCP (Ethernet)

Physical layer standard	IEEE 802.3u
Data link layer	10BASE-T / 100BASE-TX
Transfer rate	10 / 100 Mbps, Auto Negotiation
Protocol	Modbus/TCP
Data	RTU (binary)
Connections	2
Transmission media	10BASE-T (STP cable, category 5) 100BASE-TX (STP cable, category 5e)
Max. segment length	100 meters
Port No.	502
IP address	192.168.0.1 (factory default)

3.6. SUPPLY OUTPUT

Output voltage	24 V DC ±10 % (with no load) 18 V DC min. at 20 mA
Current rating	≤ 22 mA DC
Shortcircuit protection	Current limited to approx. 30 mA

3.7. INPUT SPECIFICATIONS

■ **Pv1, Pv2**

DC CURRENT	
Current input	4 – 20 mA DC with input resistance 250 Ω (REM4)
DC VOLTAGE	
Voltage input	-10 – +10 V DC -1 – +1 V DC 0 – 10 V DC 1 – 5 V DC 0 – 1 V DC
Input resistance	≥ 1 MΩ
THERMOCOUPLE	
Thermocouple input	K, E, J, T, B, R, S, C, N, U, L, P, PR
Input resistance	≥ 30 kΩ
Burnout sensing	≤ 0.3 μA
Burnout indication	115 % of the measuring range (upscale)
Temperature range	T/C: USABLE RANGE (°C) / CONFORMANCE RANGE (°C) K (CA): -272 to +1472 / -150 to +1370 E (CRC): -272 to +1100 / -170 to +1000 J (IC): -260 to +1300 / -180 to +1200 T (CC): -272 to +500 / -170 to +400 B (RH): 24 to 1920 / 1000 to 1760 R: -100 to +1860 / 380 to 1760 S: -100 to +1860 / 400 to 1760 C (WRe 5-26): -52 to +2416 / 100 to 2315 N: -272 to +1400 / -130 to +1300 U: -252 to +700 / -200 to +600 L: -252 to +1000 / -200 to +900 P (Platinel II): -52 to +1496 / 0 to 1395 (PR): -52 to +1860 / 300 to 1760 Overrange input (out of the usable range) is handled as burnout.
RTD	
RTD input	Pt100 (JIS '97, IEC), Pt100 (JIS '89), JPt100 (JIS '89), Pt50Ω (JIS '81), Ni100
Max. lead wire resistance	100 Ω per wire
Burnout indication	115 % of the measuring range (upscale)
Sensing current	≤ 1 mA
Temperature range	RTD: USABLE RANGE (°C) / CONFORMANCE RANGE (°C) Pt 100 (JIS '97, IEC): -240 to +900 / -200 to +850 Pt 100 (JIS '89): -240 to +900 / -200 to +660 JPt 100 (JIS '89): -236 to +560 / -200 to +510 Pt 50Ω (JIS '81): -236 to +700 / -200 to +649 Ni 100: -100 to +252 / -80 to +250 Overrange input (out of the usable range) is handled as burnout.
POTENTIOMETER	
Potentiometer input	Total resistance 100 Ω to 10 kΩ
Minimum span	50 % of total resistance
Excitation	≤ 0.6 V DC

■ **Ai1, Ai2, Ai3, Ai4**

Voltage input	1 – 5 V DC
Input resistance	≥ 1 MΩ

■ **Di1, Di2, Di3, Di4, Di5 (Pi1 through Pi5 are assigned to same terminals respectively)**

Discrete input	Dry contact
Common	Negative common per 5 points
Sensing	Approx. 12 V DC / 6 mA
ON voltage/resistance	≤ 2.25 V, ≤ 1.5 kΩ
OFF voltage/resistance	≥ 11.25 V, ≥ 15 kΩ

■ **Pi1, Pi2, Pi3, Pi4, Pi5 (Di1 through Di5 are assigned to same terminals respectively)**

Pulse input	Dry contact
Maximum frequency	20 Hz
Minimum pulse width	25 msec.
Sensing	Approx. 12 V DC / 6 mA
ON voltage/resistance	≤ 2.25 V, ≤ 1.5 kΩ
OFF voltage/resistance	≥ 11.25 V, ≥ 15 kΩ

■ **Di6 (Pi6 is assigned to the same terminals)**

Discrete input	Dry contact
Common	Negative common
Sensing	Approx. 12 V DC / 12 mA
ON voltage/resistance	≤ 2 V, ≤ 1.5 kΩ
OFF voltage/resistance	≥ 11 V, ≥ 15 kΩ

■ **Pi6 (Di6 is assigned to the same terminals)**

Pulse input	Dry contact
Maximum frequency	10 kHz
Minimum pulse width	0.05 msec.
Common	Negative common
Sensing	Approx. 12 V DC / 12 mA
ON voltage/resistance	≤ 2 V, ≤ 1.5 kΩ
OFF voltage/resistance	≥ 11 V, ≥ 15 kΩ
Excitation	12 V DC ±10 %, 15 mA
Current limiting circuit	Approx. 30 mA

3.8. OUTPUT SPECIFICATIONS

■ Mv1, Mv2

Current output	4 – 20 mA DC
Load resistance	≤ 600 Ω

■ Ao1, Ao2

Voltage output	1 – 5 V DC
Load resistance	≥ 10 kΩ

■ Do1, Do2, Do3, Do4, Do5, RUN CONTACT

RELAY OUTPUT	
Relay contact	Do1, Do2, Do3, Do4, Do5, RUN contact (Do6)
Relay rating	250 V AC @1 A (cos φ = 1) 30 V DC @1 A (resistive load)
Maximum switching voltage	250 V AC or 30 V DC
Maximum switching power	250 VA or 60 W
Minimum load	5 V DC at 10 mA
Mechanical life	2×10^7 cycles
PHOTO MOSFET RELAY	
Photo MOSFET relay	Do1, Do2, Do3, Do4, Do5
Rating	200 V AC/DC @0.5 A (resistive load)
ON resistance	2.1 Ω
Maximum frequency	10 Hz at 24 V, 10 mA
ON delay time	≤ 5.0 msec.
OFF delay time	≤ 3.0 msec.

3.9. INSTALLATION

Power input	AC power	Operational voltage range 85 – 264 V AC; 50/60 Hz Control module: ≤ 25 VA at 100 V AC ≤ 40 VA at 240 V AC
	DC power	Operational voltage range 24 V DC ±10 % Ripple 10 %p-p max. Control module: ≤ 650 mA
Operational temperature range	-5 to +55°C (23 to 131°F)	
Operating humidity	5 to 90 %RH (non-condensing)	
Mounting	Panel flush mounting (high-density mounting available)	
Panel cutout	68 x 138 mm	
Panel thickness	2.3 to 20 mm (0.1 to 0.78”)	
Weight	Approx. 2.0 kg (4.41 lb) for 300 mm depth type Approx. 2.5 kg (5.51 lb) for 400 mm depth type	

3.10. PERFORMANCE

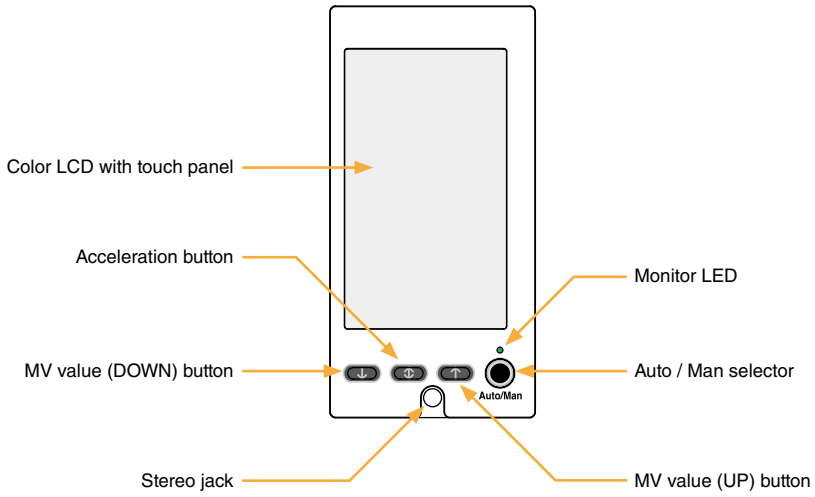
(In percentage of max. span)

Accuracy	DC input	±0.1 % ± 1 digit
	Thermocouple input	±1°C ± 1 digit ±2°C ± 1 digit for B, R, S, C, PR
	RTD input	±1°C ± 1 digit
	Potentiometer input	±0.2 % ± 1 digit
	DC output	±0.1 %
	Precision resistor (REM4)	±0.1 %
Cold junction compensation	±2°C at 25 ±10°C ambient temperature ±4°C for S, R and PR	
Temperature coefficient	±0.015 %/°C (±0.008%/ °F)	
Line voltage effect	±0.1 % over voltage range	
Calendar clock accuracy	Monthly deviation 3 minutes at 25°C ambient temperature	
RAM memory duration in power failure for hot start	10 minutes assured	
Insulation resistance	≥ 100 MΩ with 500 V DC	
Dielectric strength	Pv1 or supply output to Pv2 or Ai1 or Ai2 or Ai3 or Ai4 to Di1 or Di2 or Di3 or Di4 or Di5 or Pi1 or Pi2 or Pi3 or Pi4 or Pi5 to Di6 or Pi6 to Mv1 to Mv2 or Ao1 or Ao2 to Do1 to Do2 or Do3 or Do4 or Do5 or Do6 to NestBus to Modbus-RTU to power to FG: 1500 V AC @1 minute Modbus/TCP to FG: 500 V AC @1 minute Pv2 to Ai1 or Ai2 or Ai3 or Ai4: 500 V AC @1 minute Mv2 to Ao1 or Ao2: 500 V AC @1 minute Do2 to Do3 to Do4 to Do5 to Do6: 500 V AC @1 minute Pv1 to supply output: 500 V AC @1 minute	

3.11. STANDARDS & APPROVALS

EU conformity	EMC Directive	EMI	EN 61000-6-4
		EMS	EN 61000-6-2
	Low Voltage Directive	EN 61010-1 Measurement Category II (contact output) Installation Category II (power) Pollution degree 2 Input or output to contact output – Basic insulation (300 V) Input or output to Power – Reinforced insulation (300 V)	
	RoHS Directive		
Protection against access to the terminal blocks		Finger protection (VDE 0660-514)	

3.12. FRONT PANEL CONFIGURATION



Color LCD with touch panel

TFT color display; various display modes available with the touch panel operability.

Stereo jack

Used to communicate with PC to program and change parameters in Programming view using the Loop Configuration Builder Software (model: SFEW3E) or to program and change parameters in Configuration view using the PC Configurator Software (model: SCCFG).

MV value (DOWN) button

Decreases the MV in 40 sec. per full-scale when the control mode is set to manual. Decrements by digit in one-shot is also possible. The MV decreases in 4 seconds per full-scale when the acceleration button is pressed at once.

Decreasing pulse output is provided for the pulse width output type PID control.

Acceleration button

Accelerates MV signal's changing speed by pressing simultaneously with MV value button.

MV value (UP) button

Increases the MV in 40 sec. per full-scale when the control mode is set to manual. Increments by digit in one-shot is also possible. The MV increases in 4 seconds per full-scale when the acceleration button is pressed at once.

Increasing pulse output is provided for the pulse width output type PID control.

Auto / Man selector

Changes the control mode from auto to manual and vice versa. Manual-to-auto switching can be suppressed with the field terminal setting. (Refer to Appx 1.2. SC200D FIELD TERMINAL)

Monitor LED

Indicates control operation mode.

'Auto' mode: Green
'Man' mode: Orange
Manual loading or indication only mode (No PID): Amber

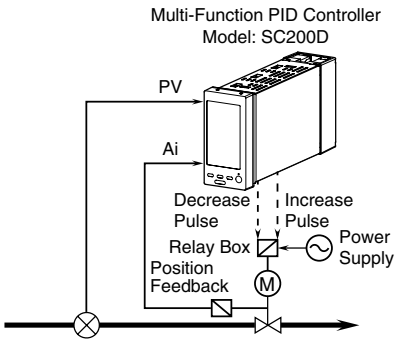
Communicating with the SFEW3E: Slow blinking
Communicating with the SCCFG: Fast blinking

When the screen shows Operation view, the lamp indicates the status of the loop specified in 'Loop display (MV/OP)' setting. (Refer to: 6.3.1.12. LOOP DISPLAY (MV/OP))

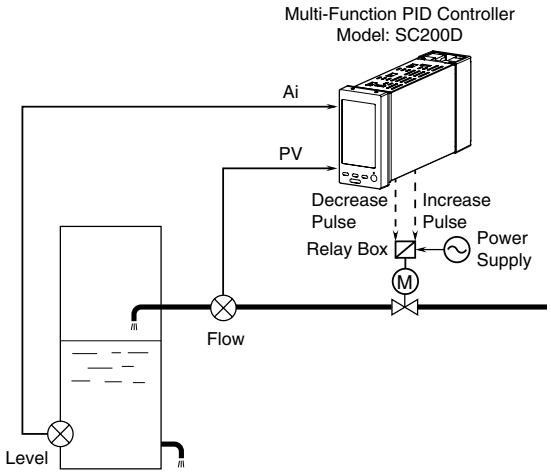
When it shows Engineering view, it indicates the status of the loop being displayed.

3.13. SYSTEM CONFIGURATION EXAMPLE

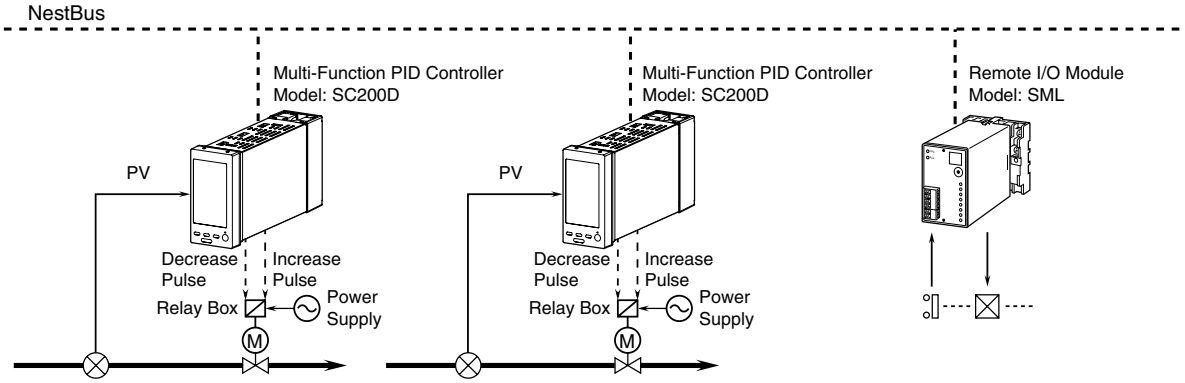
■ **SINGLE LOOP CONTROL**



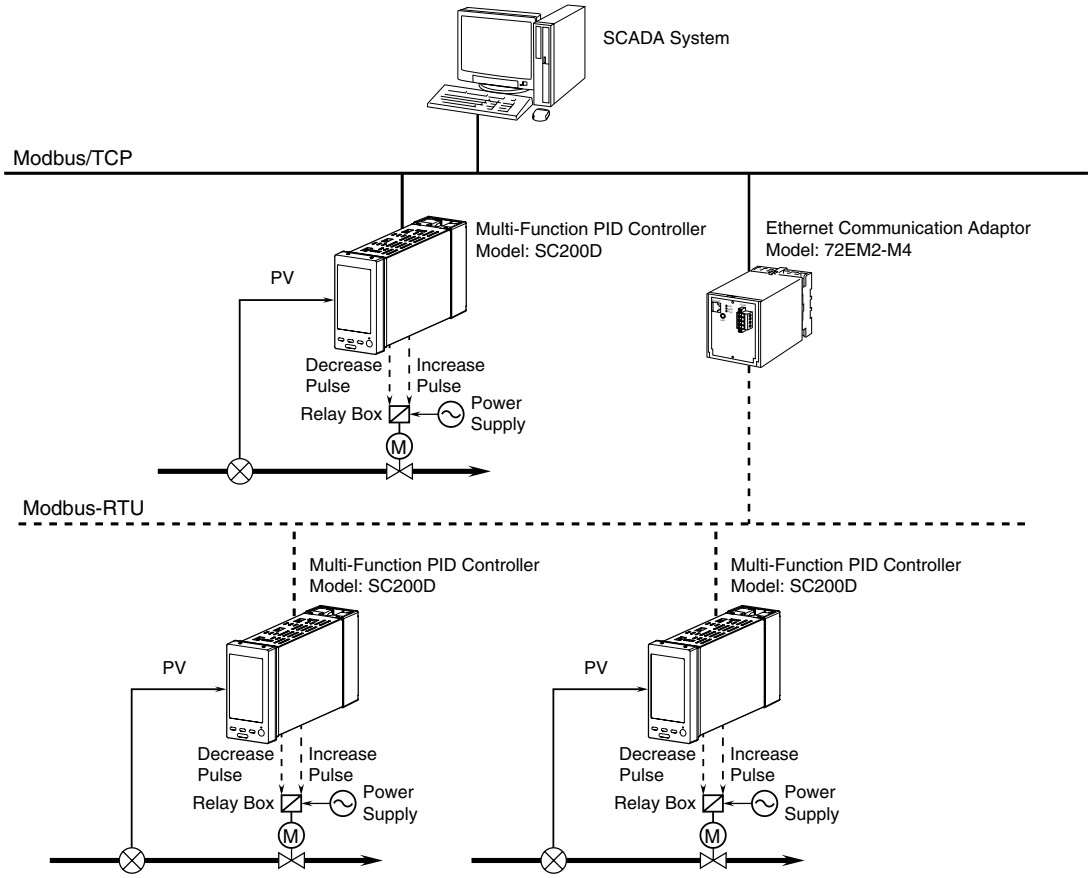
■ **CASCADE CONTROL**



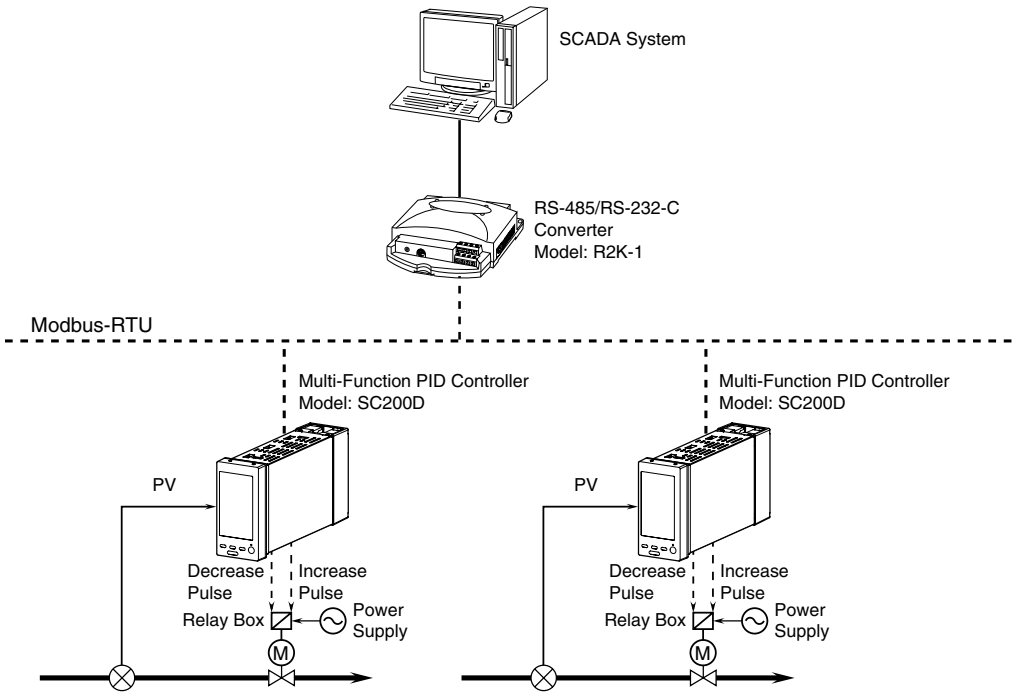
■ **I/O EXPANDED VIA NESTBUS**



■ **CONTROL / SUPERVISION VIA MODBUS/TCP**



■ CONTROL / SUPERVISION VIA MODBUS-RTU



4. INSTALLATION

4.1. GENERAL PRECAUTIONS

- IP 55 is ensured for the front panel of the unit mounted independently to a panel. Test the sealing at the mounting surface once the unit is installed.
- Set the unit on a vertical surface with its operation buttons at the lower side. Mounting in other directions may cause heat built up inside the unit and shorten its life or degrade its performance.
- Be sure to firmly tighten mounting screws and terminal screws to prevent malfunctions.
- Be sure to lock ground connector of connection cables and check condition before turning on the power supply.
- Choose an independent grounding point with 100 Ω or less resistance for transmission cable shield. Do not share with power line ground.
- In an extremely dry area, large amounts of static electricity may be built in a person. Touch a grounded metallic object and discharge any static electricity before touching the unit.
- To clean the unit, use a soft cloth wet with water or mild detergent and rub its surface lightly. Do not use volatile liquid such as alcohol or thinner, as these may damage it.
- Keep out the unit from high temperature and humidity.

4.2. ENVIRONMENT

4.2.1. SURROUNDING ENVIRONMENT

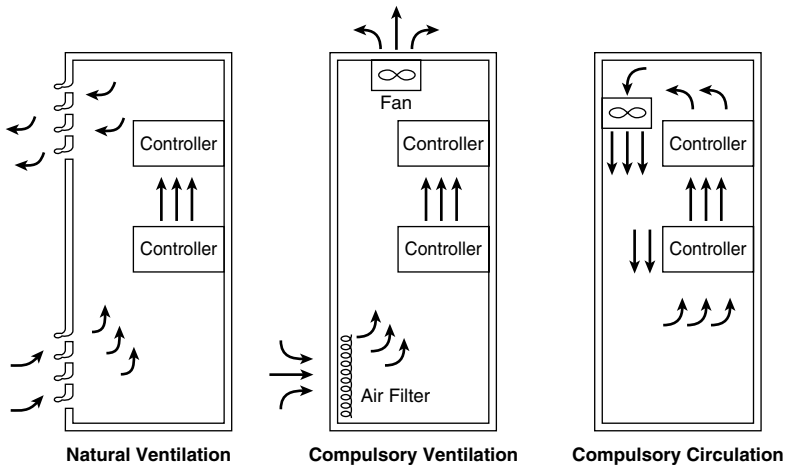
Ambient temperature	-5 – + 55 °C (23 – 131°F)
Ambient humidity	5 – 90 % RH (non-condensing)
Ambient conditions	Not allowed with presence of corrosive/flammable gas or excessive dust.

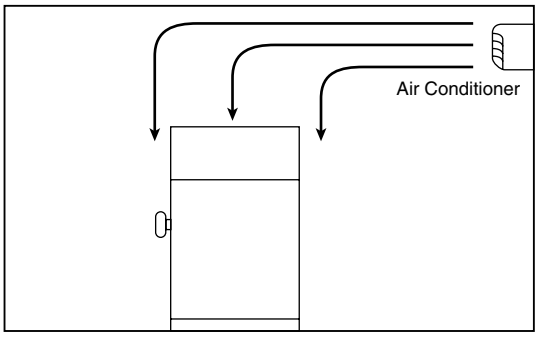
4.2.2. INSTALLATION INSIDE A CONTROL CABINET

Consider about the ease of operation, maintenance and access, and the resistance to the environment when designing a control cabinet.

Temperature

- Provide enough space for ventilation.
- Do not install thermal generating equipment such as heaters, transformers, or large capacity resistance directly next to the Controller.
- If there is fear of environmental temperature higher than 55°C (131°F), consider usage of ventilation fans or air conditioners.
- Consider also an alarm system to alert any failure of cooling devices by measuring ambient temperature, in order that such failure does not affect the system operation.
- If on the contrary there is fear of low temperature below -5°C (23°F), preheating using small heaters or lamps installed inside the panel may be considered.
- See the drawing to the right explaining typical installation configurations.





TYPICAL COOLING METHODS

Humidity

- Consider the humidity when employing air conditioners etc, as a rapid change of temperature might cause dewfall. Dewfall on the surface of printed wiring board might cause malfunction, shortcircuit or the breakdown of the equipment might be caused. When there is fear of dewfall, keep it always ON or treat preheating.

Vibration and Physical Shock

- Keep away from vibration sources or protect from physical impact. Stabilize the control cabinet with a rubber pad in order to absorb external vibrations or protect from an impact source.
- Rubber pad may be used to wrap around the impact source such as an electro-magnetic contactor installed in the panel.

Ambient atmosphere

- Isolate the control cabinet from ambient atmosphere containing dust, vapor, oil mist and/or toxic gas. Apply a sealing packing or pressurize it with clear air.

Protecting Input Signal from Noise

- Install input signal cables separately from power cables, e.g. in independent cable duct, both inside and outside the cabinet. If they must be close to each other, use shielded cables.
- Install DC input signal cables separately from AC circuits. If they must be close to each other, use shielded cables.

Protecting Output Signal from Noise

- Install output signal cables separately from power cables or other AC circuits. If they must be close to each other, use shielded cables.
- When driving an inductive load it is recommended to install surge absorbers at the closest point possible from the load.

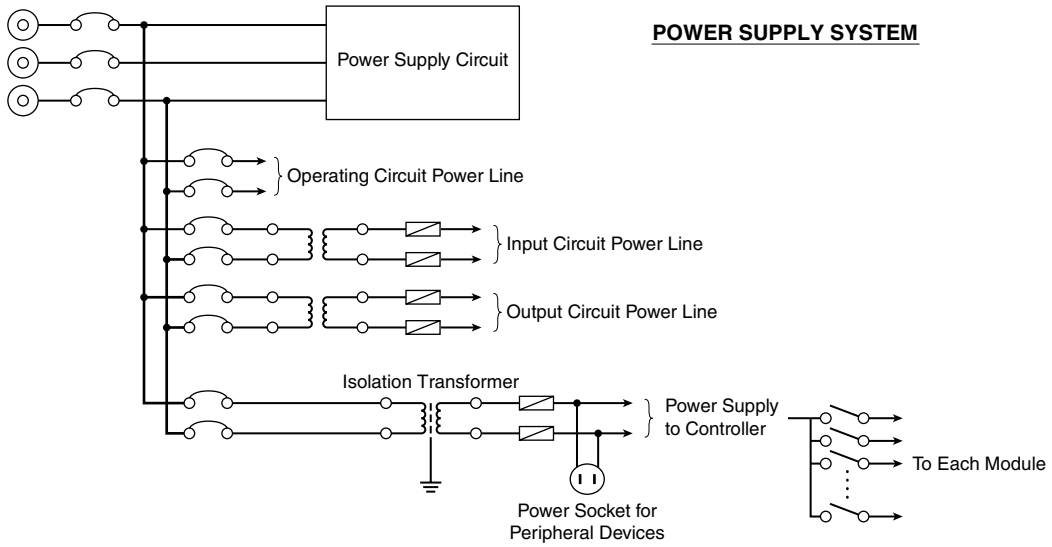
Wiring Inside the Panel

- Keep physical distance of farther than 20 cm between the Controller and power cables.
- Refer to Section 4.5. I/O SIGNAL SYSTEM for a detailed explanation of the wiring process.

4.3. POWER SYSTEM

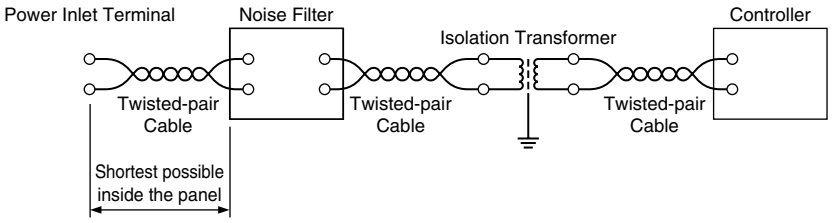
4.3.1. POWER SYSTEM WIRING

Power supply system consists of power line to the Controller, that for the motor drives and for operating circuit. Install each line separately. Provide a power socket at the end of the isolation transformer for peripheral devices connected with the Controller.



4.3.2. NOISE PRECAUTIONS

Generally a noise filter is attached to the power inlet to eliminate noise interferences to the power supply circuit. It is recommended to add an isolation transformer in case of AC power supply.

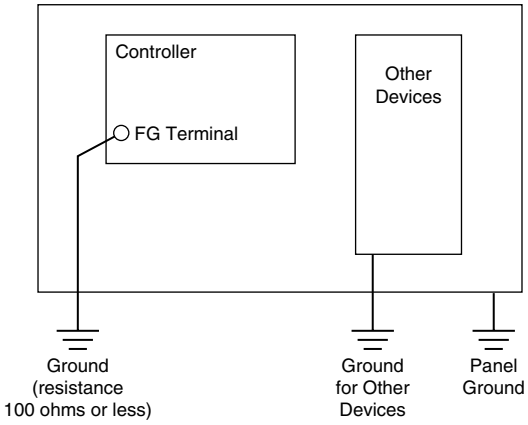


4.4. GROUNDING SYSTEM

Connect FG terminal of the Controller to an earthed panel plate inside the cabinet. If there is an interference by stray current, provide insulation between the Controller and the plate. In this case, connect the respective ground to separate points.

Use wires of adequate thickness (2 mm^2 or larger) for grounding.

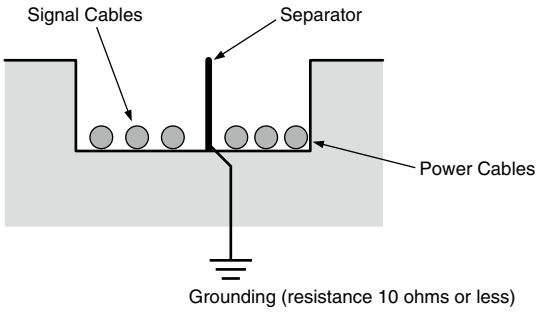
Install dedicated grounding lines for heavy duty current, low voltage power supply, operating circuit and light electrical circuit such as for the Controller.



4.5. I/O SIGNAL SYSTEM

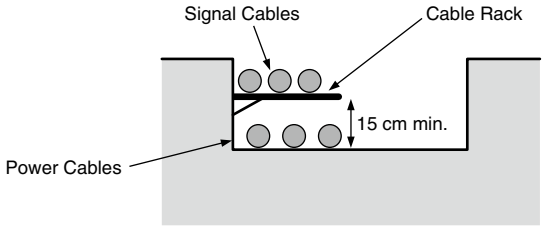
Separator Installation

Use a separator between signal cables and power supply cables installed in one pit or duct.



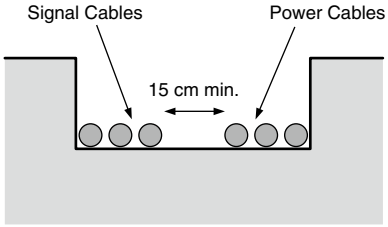
Cable Rack Installation

For using a cable rack, leave a space of 15 cm minimum from power supply cables as shown in the figure below. Separate signal cables by 60 cm or more if the current flowing to the power supply is 10 A or more.



Separation Space between Cables

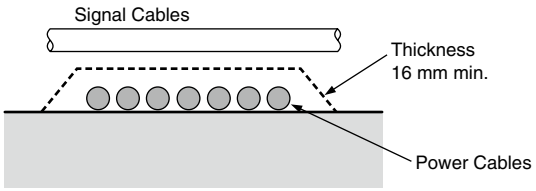
If a separator is not used, leave a space of 15 cm minimum from power supply cables as shown in the drawing below. Keep signal cables away by 60 cm or more if the current flowing to the power supply is 10 A or more.



Right-angled Cross Wiring

When the signal line is crossing over the power supply line, lay the cables at a right angle.

If the signal cables are not shielded, it is recommended to cover the power supply cables in the intersectional point with metal plate of 1.6 mm minimum thickness, as represented with dotted line in the drawing.



4.6. NESTBUS

The SC200D uses NestBus (RS-485) for peer-to-peer communication between other controllers and I/O modules. Software terminal blocks of the NestBus devices are inter-connected to expand I/Os signals and share functions without needing a master device.

Up to 16 NestBus devices are connected with twisted-pair cables in multi-drop configuration (cross wiring). An entire section of cross-wired cables is called 'segment.'

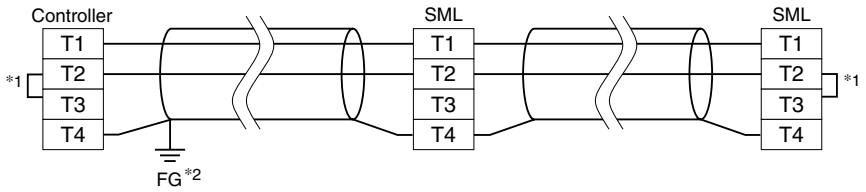
Each NestBus device is set with Card No. from 0 to F. For the SC200D, set one in GROUP 00, ITEM 51. For remote I/O modules, use the hardware DIP switch (blue rotary switch on the front). Be sure to assign each module with unique number.

4.6.1. NESTBUS CONNECTION

Use independently shielded twisted pair cables (CPEV-S φ0.9) to connect between NestBus devices. DO NOT use bound cables, in order to eliminate unexpected interference from other signal lines.

An entire segment must be inside one building, with the maximum cable length of 1 kilometer.

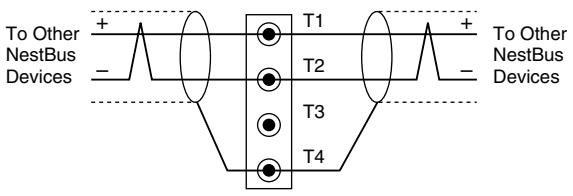
■ **NestBus**



*1. Internal terminating resistor is used when the device is at the end of a transmission line.
*2. Install shield cables to all sections and ground them at single point.

Cross Wiring

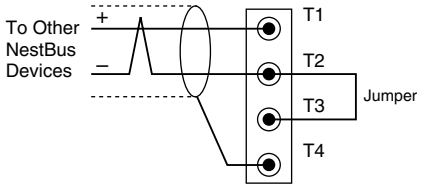
- Cross wire between each device referring to the illustration to the right.
- Be sure to connect (+) to (+) and (–) to (–).
- Connect shield terminal as designated for each device. For devices with no shield terminal, connect between the shields of each device.
- Earth the shield at single, independent ground point within the system (grounding resistance 100 Ω or less). The most appropriate point depends upon systems. There are also cases when leaving the shield ungrounded gives a better result.



Cross Wiring

Terminating Resistor

- Connect a terminating resistor at both ends of the segment.
- Terminating resistor is incorporated in each device. Close across T2 and T3 terminals to activate it. Consult each device's specifications for exact terminal assignment of the resistor.

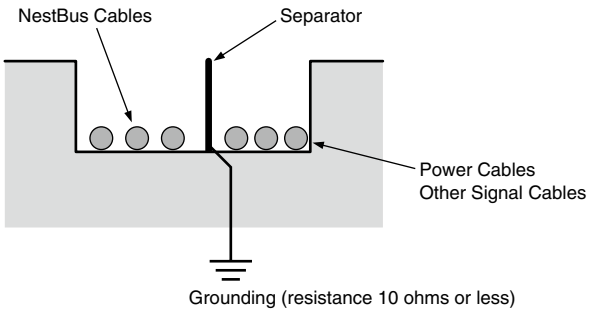


Termination Resistor

4.6.2. CABLE INSTALLATION

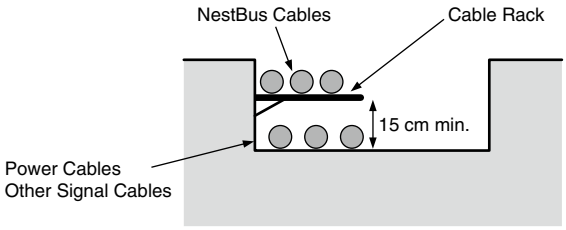
Separator Installation

Use a separator between NestBus cables and power supply/other signal cables installed in one pit or duct.



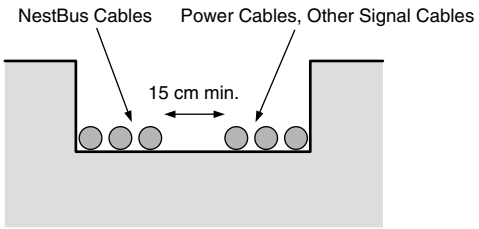
Cable Rack Installation

For using a cable rack, leave a space of 15 cm minimum from power supply/other signal cables as shown in the figure below. Separate NestBus cables by 60 cm or more if the current flowing to the power supply is 10 A or more.



Separation Space between Cables

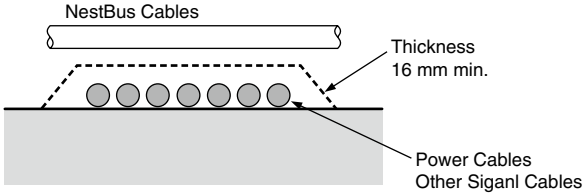
If a separator is not used, leave a space of 15 cm minimum from power supply/other signal cables as shown in the drawing below. Keep NestBus cables away by 60 cm or more if the current flowing to the power supply is 10 A or more.



Right-angled Cross Wiring

When the NestBus line is crossing over the power supply/other signal line, lay the cables at a right angle.

If the NestBus cables are not shielded, it is recommended to cover the power supply/other signal cables in the intersectional point with metal plate of 1.6 mm minimum thickness, as represented with dotted line in the drawing.



4.7. Modbus-RTU

The Modbus protocol is provided by Modicon Inc. (AEG Schneider Automation International S.A.S.), originally developed for Modicon programmable controllers. Detailed information is described in Modicon Modbus Protocol Reference Guide (PIMBUS-300 Rev. J).

The Modbus master can monitor and control the SC200D using command (query) and response transactions.

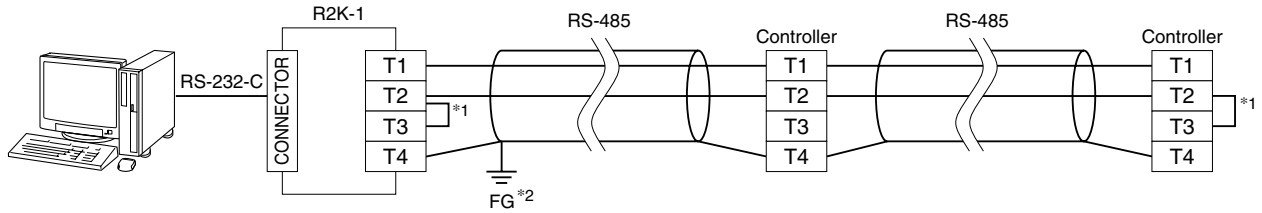
For more information about Modubs protocol, please refer to Modbus Protocol Reference Guide (EM-5650).

4.7.1. Modbus-RTU CONNECTION

Use independently shielded twisted pair cables (CPEV-S φ0.9) to connect between Modbus-RTU devices. DO NOT use bound cables, in order to eliminate unexpected interference from other signal lines.

An entire segment must be inside one building, with the maximum cable length of 500 m.

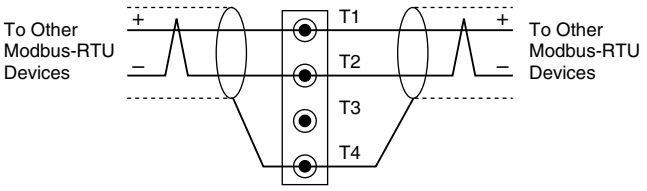
■ **Modbus-RTU**



*1. Internal terminating resistor is used when the device is at the end of a transmission line.
*2. Install shield cables to all sections and ground them at single point.

Cross Wiring

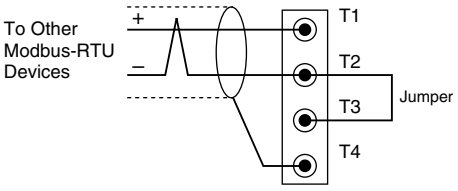
- Cross wire between each device referring to the illustration to the right.
- Be sure to connect (+) to (+) and (–) to (–).
- Connect shield terminal as designated for each device. For devices with no shield terminal, connect between the shields of each device.
- Earth the shield at single, independent ground point within the system (grounding resistance 100 Ω or less). The most appropriate point depends upon systems. There are also cases when leaving the shield ungrounded gives a better result.



Cross Wiring

Terminating Resistor

- Connect a terminating resistor at both ends of the segment.
- Terminating resistor is incorporated in each device. Close across T2 and T3 terminals to activate it. Consult each device's specifications for exact terminal assignment of the resistor.

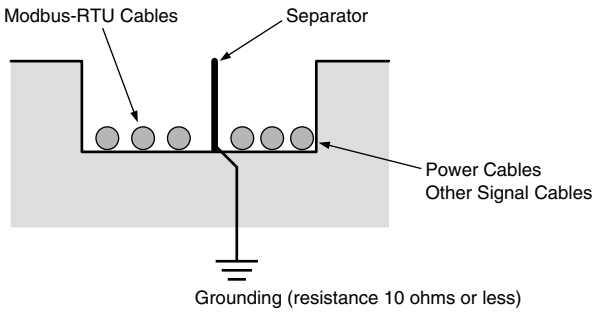


Termination Resistor

4.7.2. CABLE INSTALLATION

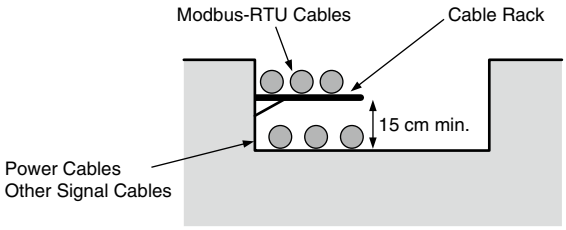
Separator Installation

Use a separator between Modbus-RTU cables and power supply/other signal cables installed in one pit or duct.



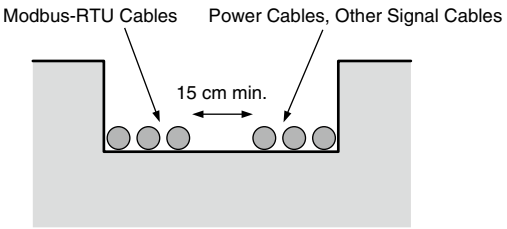
Cable Rack Installation

For using a cable rack, leave a space of 15 cm minimum from power supply/other signal cables as shown in the figure below. Separate Modbus-RTU cables by 60 cm or more if the current flowing to the power supply is 10 A or more.



Separation Space between Cables

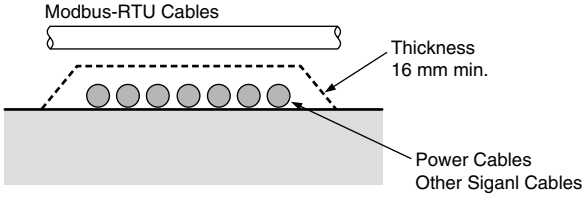
If a separator is not used, leave a space of 15 cm minimum from power supply/other signal cables as shown in the drawing below. Keep Modbus-RTU cables away by 60 cm or more if the current flowing to the power supply is 10 A or more.



Right-angled Cross Wiring

When the Modbus-RTU line is crossing over the power supply/other signal line, lay the cables at a right angle.

If the Modbus-RTU cables are not shielded, it is recommended to cover the power supply/other signal cables in the intersectional point with metal plate of 1.6 mm minimum thickness, as represented with dotted line in the drawing.



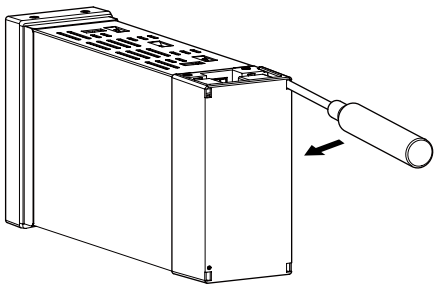
4.8. MOUNTING ON A PANEL

4.8.1. MOUNTING PROCEDURE

1) Remove both mounting brackets.
2) Detach the terminal cover and insert it first and then the unit itself into the cutout hole. (The cover is slightly wider than the unit.)
3) Put and slide the brackets back into the holes at the top and the bottom and tighten them until the unit is firmly fixed.

• How to Remove the Terminal Cover

Insert the minus tip of a screwdriver into each hole at the four corners of the cover and pull it to the direction as indicated below to separate the terminal cover.

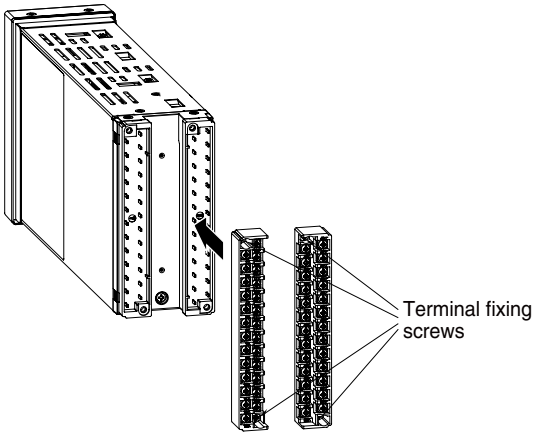


• How to Remove the Terminal Block

The terminal block is separable in two pieces. Loosen two screws on upper and lower of the terminal block to separate.

In order to attach the terminal block, tighten the terminal fixing screws evenly. (torque: 1.2 N·m)

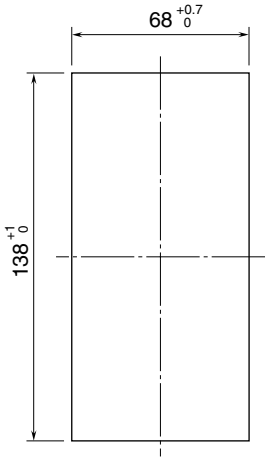
Be sure to turn off the power supply, input signal and power supply to the output relays before separating the terminal block.



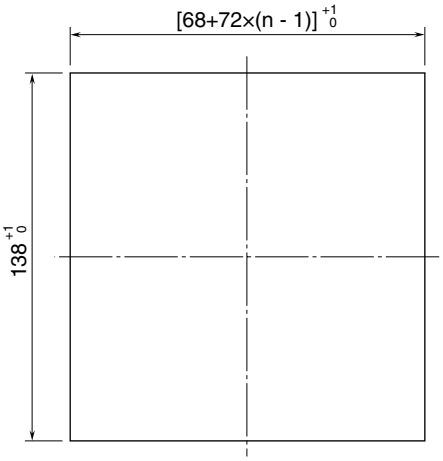
4.8.2. PANEL CUTOUT

unit: mm

• Single mounting



• Clustered mounting

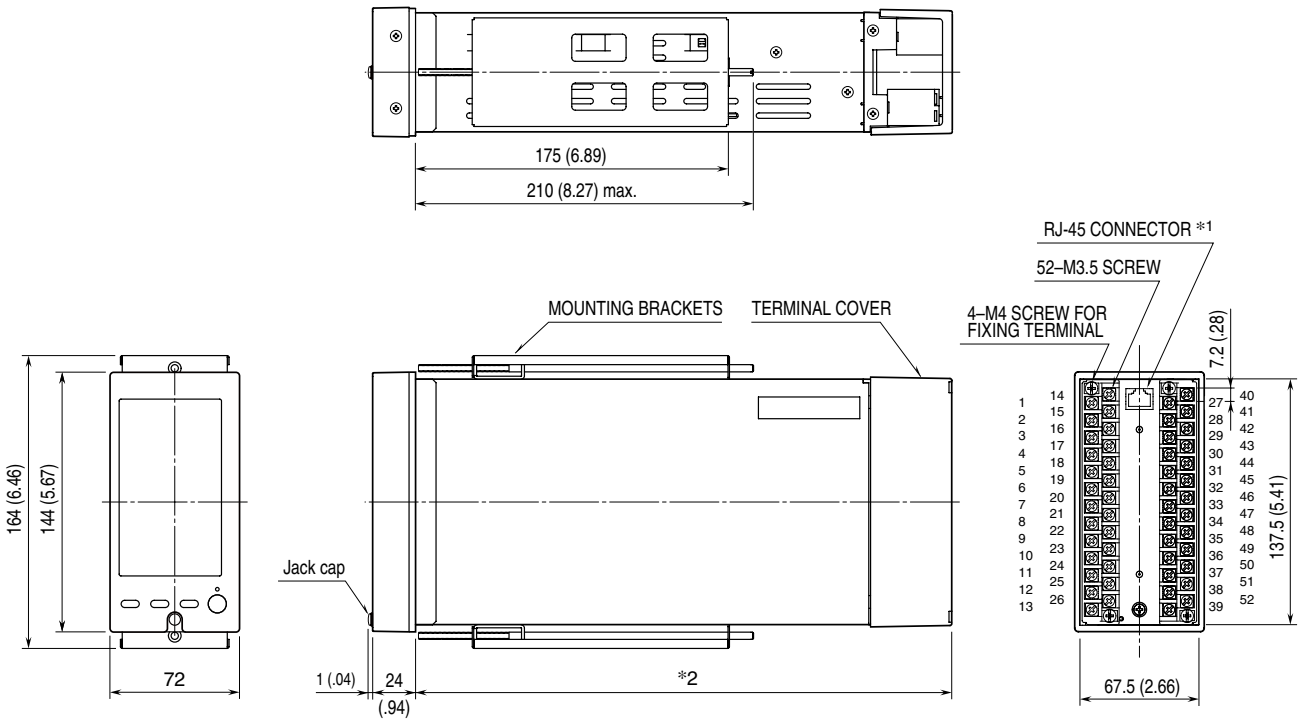


n = number of units

Panel thickness 2.3 – 20

4.8.3. EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS

unit: mm (inch)

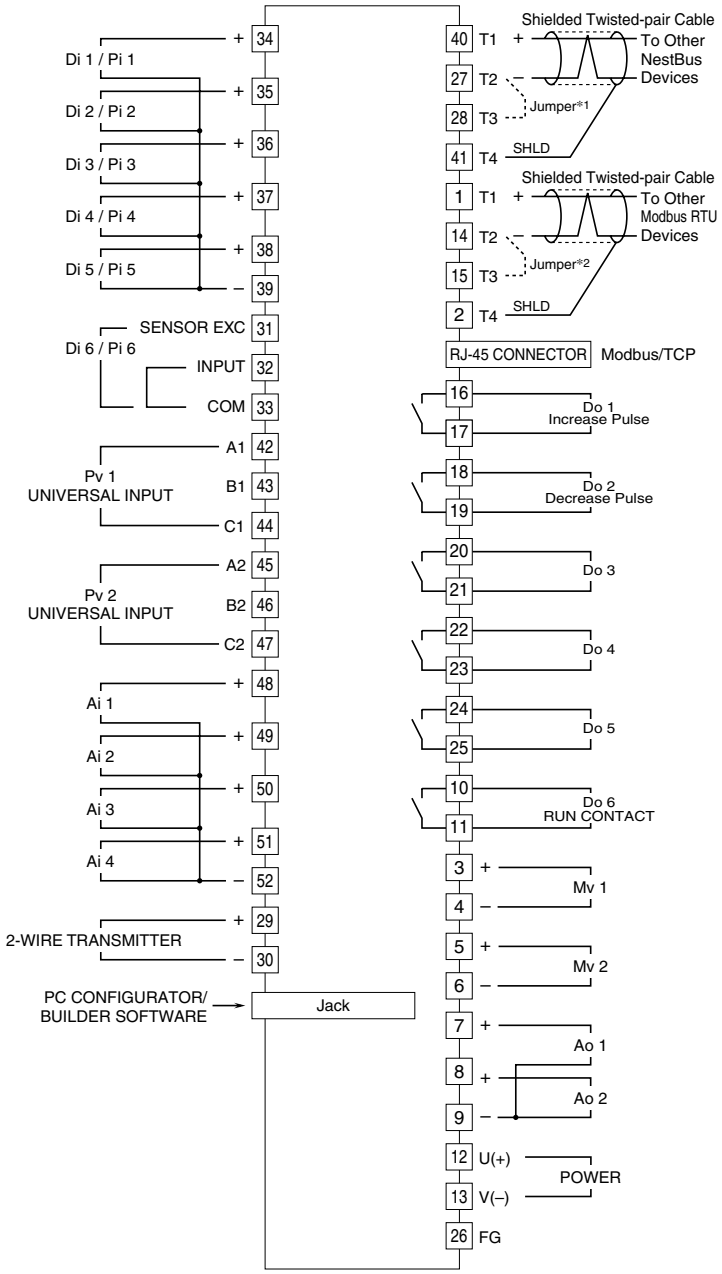


*1. For Modbus/TCP only
*2. Option /3: 300 mm (11.81")
Option /4: 400 mm (15.75")

4.9. CONNECTION DIAGRAM

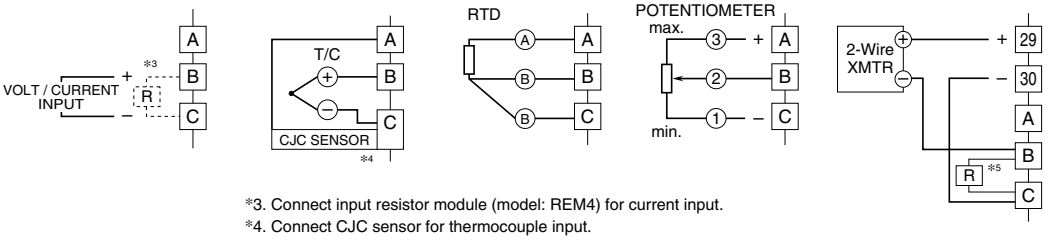
Note: In order to improve EMC performance, bond the FG terminal to ground.

Caution: FG terminal is NOT a protective conductor terminal.



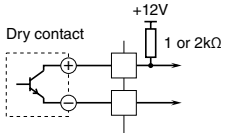
*1. Close across the terminals 27 – 28 when the unit is located at the end of a transmission line (= no cross-wiring).
*2. Close across the terminals 14 – 15 when the unit is located at the end of a transmission line (= no cross-wiring).

■ UNIVERSAL INPUT CONNECTION E.G.



*3. Connect input resistor module (model: REM4) for current input.
*4. Connect CJC sensor for thermocouple input.
*5. Connect input resistor module (model: REM4).

■ DISCRETE INPUT PULSE INPUT CONNECTION E.G.:



5. DEFAULT LOOP CONFIGURATION

5.1. GENERAL DESCRIPTIONS

The Controller is designed to suit with a wide variety of applications using two PID function blocks together with numerous computational functions.

The factory default programming enables the Controller to function as basic PID controller.

The explanation for the usage with the factory default settings is described below.

Parameters can be changed with the touch panel.

5.2. EX-FACTORY SETTING

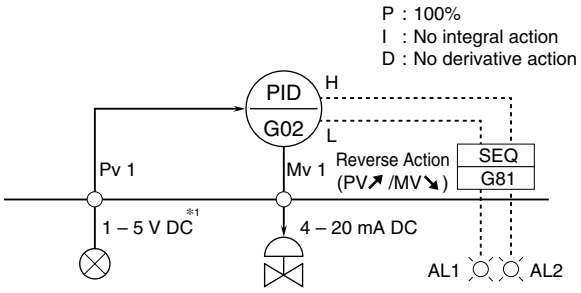
• Loop 1

Basic PID is preset.

Measured input (Pv 1) is provided to PID block. MV output from the PID block is connected to the external Mv 1 terminal. The setting method '0' (LOCAL) is set, therefore SP value can be changed only on the front panel control.

High and low alarms for Pv 1 are displayed at AL1 and AL2 lamp on the LCD.

■ LOOP 1



*1. Factory default

Note: Use the Loop Configuration Builder Software (model: SFEW3E) for loop configuration.

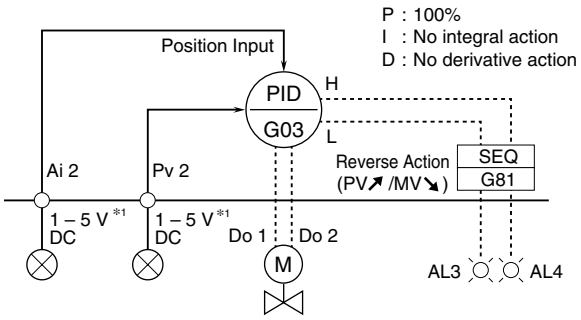
• Loop 2

Pulse width output type PID is preset.

Measured input (Pv 2) is provided to PID block. MV output from the PID block is connected to the external Do 1 and Do 2 terminals. Analog input (Ai 2) is assigned to the position input connection terminal of the PID block. The setting method '0' (LOCAL) is set, therefore SP value can be changed only on the front panel control.

High and low alarms for Pv 2 are displayed at AL3 and AL4 lamp on the LCD.

■ LOOP 2



*1. Factory default

Note: Use the Loop Configuration Builder Software (model: SFEW3E) for the loop configuration.

MAIN PARAMETER DEFAULT SETTING

GROUP	ITEM	DATA	PARAMETER
01	10	11	Field Terminal
	43	AL1	AL1 message
	44	AL2	AL2 message
	45	AL3	AL3 message
	46	AL4	AL4 message
02	10	21	Basic PID
	15	0421	G04 (SC200D) Pv 1 is assigned to Basic PID PV connection terminal.
	19	115	PV high alarm setpoint
	20	-15	PV low alarm setpoint
	29	0	Setting method (0: LOCAL)
	40	1	Control direction (reverse: MV decreases with PV increasing)
	82	10000	Upper range (in engineering unit)
	83	0	Lower range (in engineering unit)
	84	2	Decimal point position (from rightmost digit)
	86	0	MV reverse indication (direct)
03	10	21	Pulse Width Output Type PID
	15	0422	G04 (SC200D) Pv 2 is assigned to PV connection terminal of Pulse Width Output Type PID.
	19	115	PV high alarm setpoint
	20	-15	PV low alarm setpoint
	29	0	Setting method (0: LOCAL)
	40	1	Control direction (reverse: MV decreases with PV increasing)
	70	0424	G04 (SC200D) Ai 2 is assigned to position input connection terminal of Pulse Width Output Type PID.
	82	10000	Upper range (in engineering unit)
	83	0	Lower range (in engineering unit)
	84	2	Decimal point position (from rightmost digit)
	86	0	MV reverse indication (direct)
04	10	12	Extension Field Terminal 1
	25	0225	G02 (Basic PID) MV output is assigned to Mv 1 connection terminal of SC200D Field Terminal.
81	10	95	Sequential Control
	11	13 : 0000	Step command
	12	01 : 0202	G02 (Basic PID) PV low alarm is assigned to G01 (SC200D) AL1 lamp input terminal.
	13	07 : 0101	
	14	01 : 0201	G02 (Basic PID) PV high alarm is assigned to G01 (SC200D) AL2 lamp input terminal.
	15	07 : 0102	
	12	01 : 0302	G03 (Pulse Width Output Type PID) PV low alarm is assigned to G01 (SC200D) AL3 lamp input terminal.
	13	07 : 0103	
	14	01 : 0301	G03 (Pulse Width Output Type PID) PV high alarm is assigned to G01 (SC200D) AL4 lamp input terminal.
	15	07 : 0104	
	16	00 : 0000	End

Note: Refer to SC100/SC200 Function Block List.

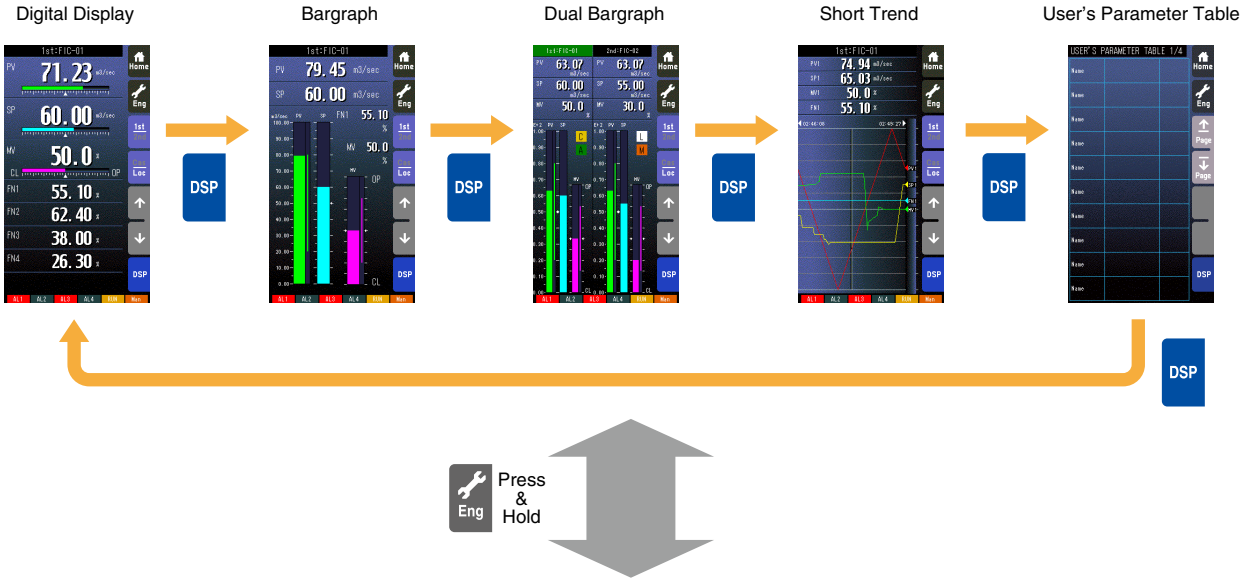
6. DISPLAY OPERATIONS

6.1. GENERAL DESCRIPTIONS

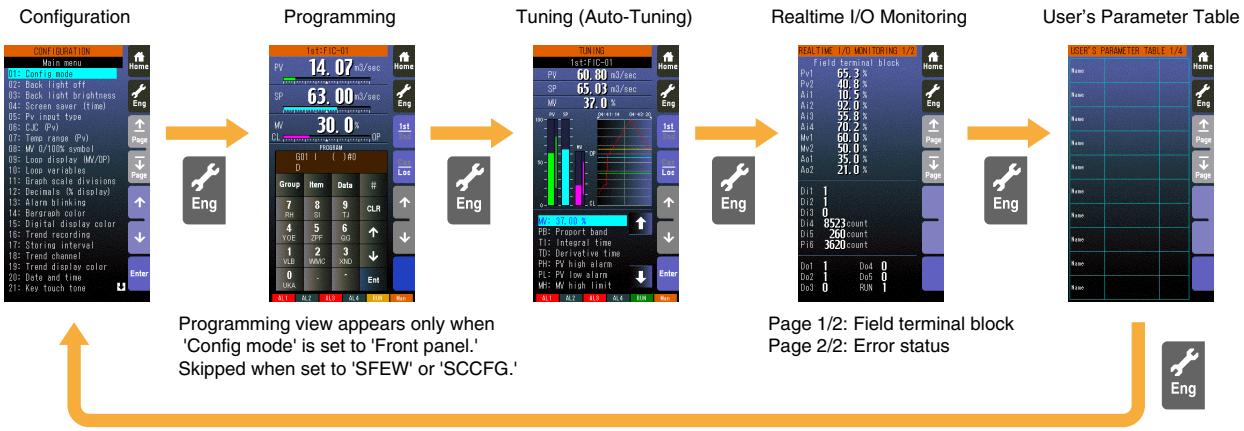
The Controller has two main screen groups, “Operation view” and “Engineering view.” Views switch with touch panel operation. Unnecessary operation views can be skipped by presetting.

In digital displays, PV and SP have 7 digits (the 5th decimal digit is rounded down when the number of decimal places is set to 5). The MV also has 7 digits. (Sign and decimal point included)

■ OPERATION VIEWS



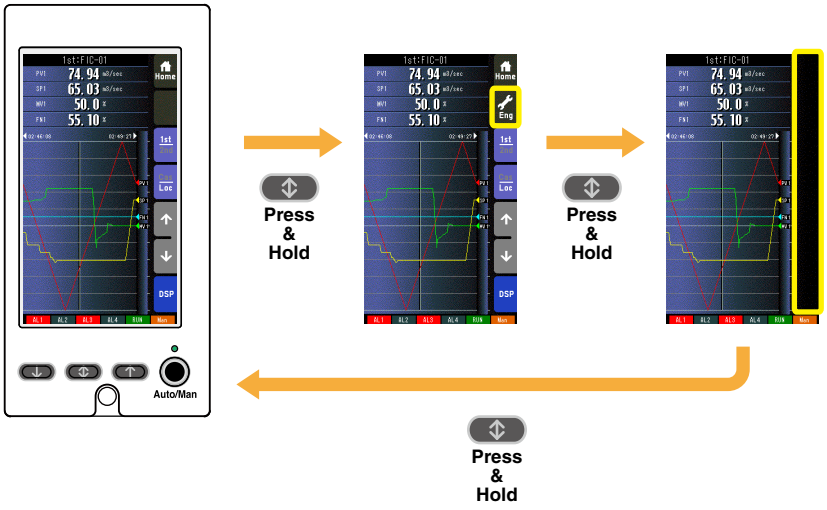
■ ENGINEERING VIEWS



Operation Buttons Lock Out

Pressing/holding the acceleration button for approx. 5 seconds activates [Eng] button on the screen. Then repeating the action at this state locks out the touch panel operation buttons. (Hardware buttons are not locked.)

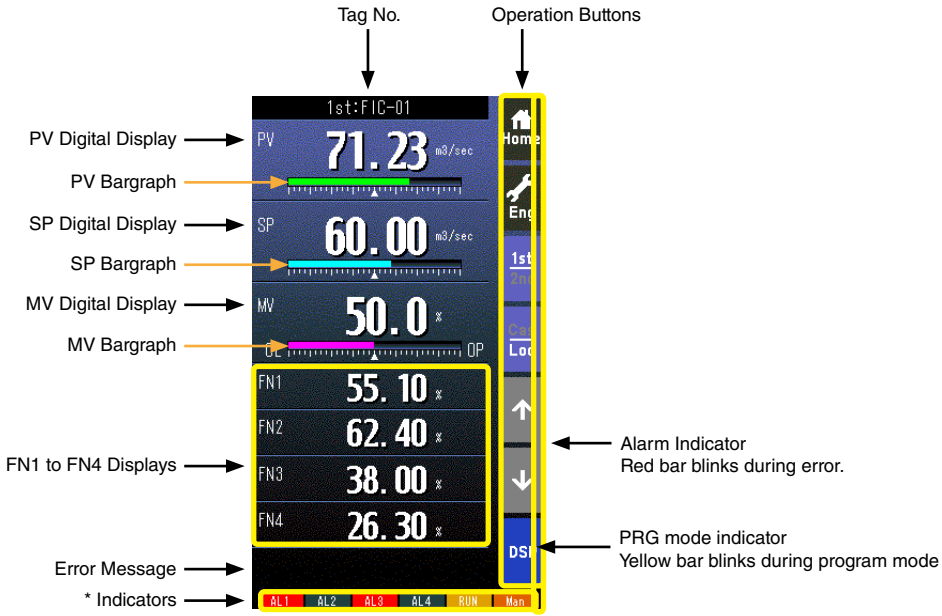
In order to release them, press/hold it again for approx. 5 seconds.



6.2. OPERATION VIEWS

6.2.1. DIGITAL DISPLAY VIEW

6.2.1.1. SCREEN COMPONENTS

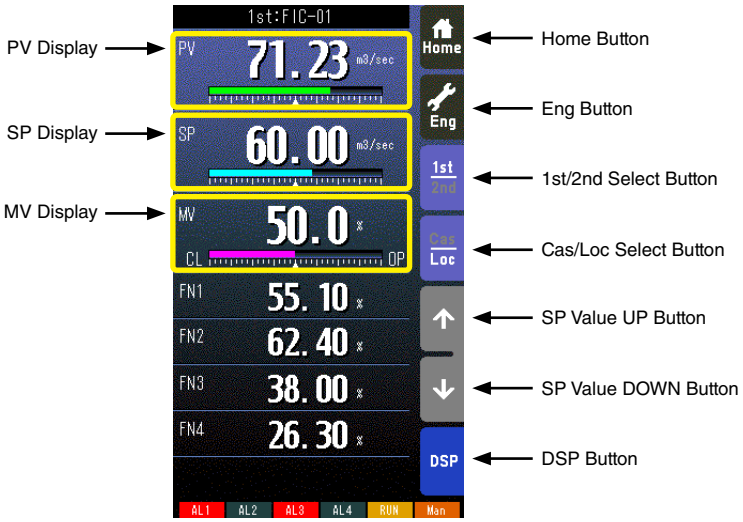


- Pressing on '1st/2nd' button switches between the primary and secondary loop.
- Bargraphs represent respective signals in percentage.
- PV and SP digital displays can be switched between engineering unit data and percentage.
- Switching is possible when 'Select unit mode' setting is set to 'Selectable.' (Refer to: 6.3.1.28. SELECT UNIT MODE)
- When error is detected, the error message is displayed on the ERROR code area.
- Refer to Appx 6. DIGITAL DISPLAY ERROR MESSAGES.
- Tag No. (FN1 to FN4) can be displayed maximum 4 characters.
- MV digital display and MV bargraph show the position input value with Pulse Width Output Type PID.

*** Indicators**

INDICATOR	EXPLANATIONS
AL1 to AL4	Background color turns red during alarm.
RUN / STOP	RUN: Green in normal conditions; Amber in an abnormality. STOP: Grey when the Controller operation is stopped; Red when the memory is failed.
Auto / Man	Auto: Green Auto indicator turns on. Man: Orange Man indicator turns on. The lamp indicates the status of the loop specified in 'Loop display (MV/OP)' setting. (Refer to: 6.3.1.12. LOOP DISPLAY (MV/OP))

6.2.1.2. DIGITAL DISPLAY OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.
Pressing/holding the button for approx. 1 second registers the view as Home view (including the 1st/2nd choice).

Eng button

Pressing/holding the button for approx. 1 second switches the view to Engineering view.
Once the view is switched, it is used to switch among the engineering views.

1st/2nd select button

Used to switch between the primary and the secondary loops. Valid only when the secondary is set.

Cas/Loc select button

Pressing/holding the button for approx. 1 second switches the control mode between cascade (Cas) and local (Loc). Valid only when 'Set mode Cas/Loc' setting under the tuning parameters is set to 'Cascade/Local.'

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value UP button *1 *2

Used to increase SP value in the speed of 40 seconds per full-scale. Touching it briefly increases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value DOWN button *1 *2

Used to decrease SP value in the speed of 40 seconds per full-scale. Touching it briefly decreases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

DSP button

Used to switch among the operation views.

PV display

Touching on the display field switches the PV value in engineering unit and in %. Valid only when 'Selectable' under 'Select unit mode' selection (Refer to: 6.3.1.28. SELECT UNIT MODE) is specified.

SP display

Touching on the display field opens a numerical pad to directly enter SP value. (Numerical pad is not available in CAS mode.)

MV display

Touching on the display field opens a numerical pad to directly enter MV value. (Numerical pad is not available in AUTO mode.)

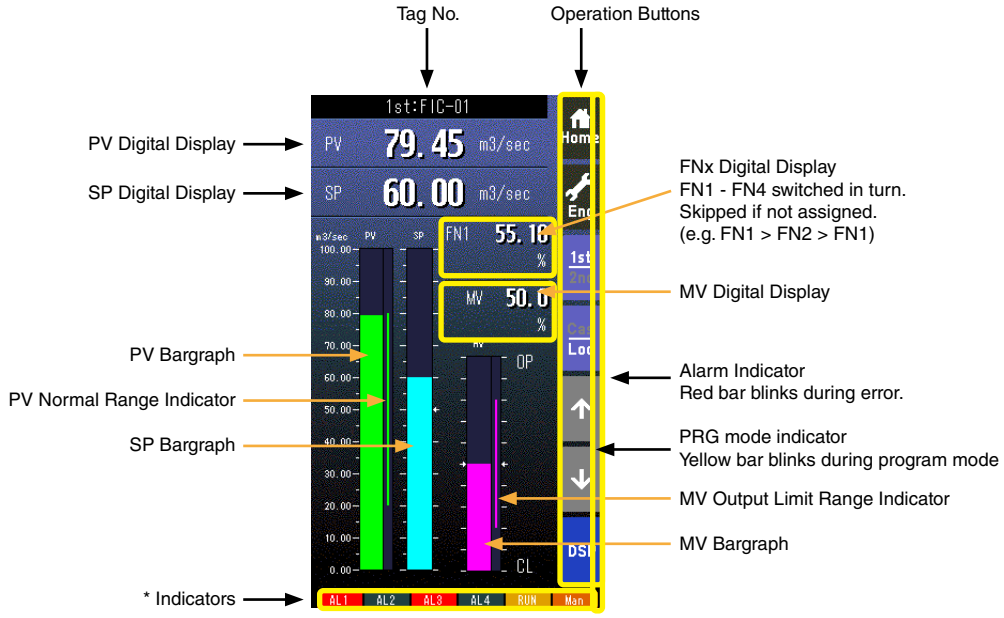
Note: Refer to Section 3.12. FRONT PANEL CONFIGURATION for MV operation details.

*1. SP buttons are locked in CAS mode.

*2. SP value changed on the display goes back to a previous value when the Config. mode (Refer to: 6.3.1.4. CONFIG MODE) is set to 'SFEW'.

6.2.2. BARGRAPH DISPLAY VIEW

6.2.2.1. SCREEN COMPONENTS

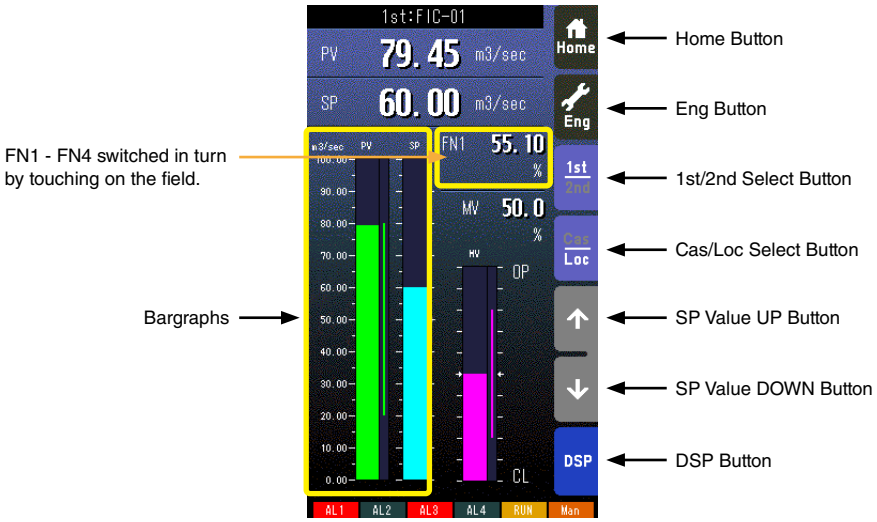


- Pressing on [1st/2nd] button switches between the primary and secondary loops.
- PV and SP values are shown in engineering unit value.
- Engineering unit and % scale can be switched with PV and SP bargraphs.
- MV digital display and MV bargraph show the position input value with Pulse Width Output Type PID.
- MV output limit range indicator shows the high and low limits of the position input with Pulse Width Output Type PID.

*** Indicators**

INDICATOR	EXPLANATIONS
AL1 to AL4	Background color turns red during alarm.
RUN / STOP	RUN: Green in normal conditions; Amber in an abnormality. STOP: Grey when the Controller operation is stopped; Red when the memory is failed.
Auto / Man	Auto: Green Auto indicator turns on. Man: Orange Man indicator turns on. The lamp indicates the status of the loop specified in 'Loop display (MV/OP)' setting. (Refer to: 6.3.1.12. LOOP DISPLAY (MV/OP))

6.2.2.2. BARGRAPH DISPLAY VIEW OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.
Pressing/holding the button for approx. 1 second registers the view as Home view (including the 1st/2nd choice).

Eng button

Pressing/holding the button for approx. 1 second switches the view to Engineering view.
Once the view is switched, it is used to switch among the engineering views.

1st/2nd select button

Used to switch between the primary and the secondary loops. Valid only when the secondary is set.

Cas/Loc select button

Pressing/holding the button for approx. 1 second switches the control mode between cascade (Cas) and local (Loc). Valid only when 'Set mode Cas/Loc' setting under the tuning parameters is set to 'Cascade/Local.'

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value UP button *1 *2

Used to increase SP value in the speed of 40 seconds per full-scale. Touching it briefly increases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value DOWN button *1 *2

Used to decrease SP value in the speed of 40 seconds per full-scale. Touching it briefly decreases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

DSP button

Used to switch among the operation views.

Bargraphs

% and engineering unit scale switched in turn by touching on the field when 'Select unit mode' is set. (Refer to: 6.3.1.28. SELECT UNIT MODE) Switching the scale on this view affects the same setting for Dual Loop Bargraph view.

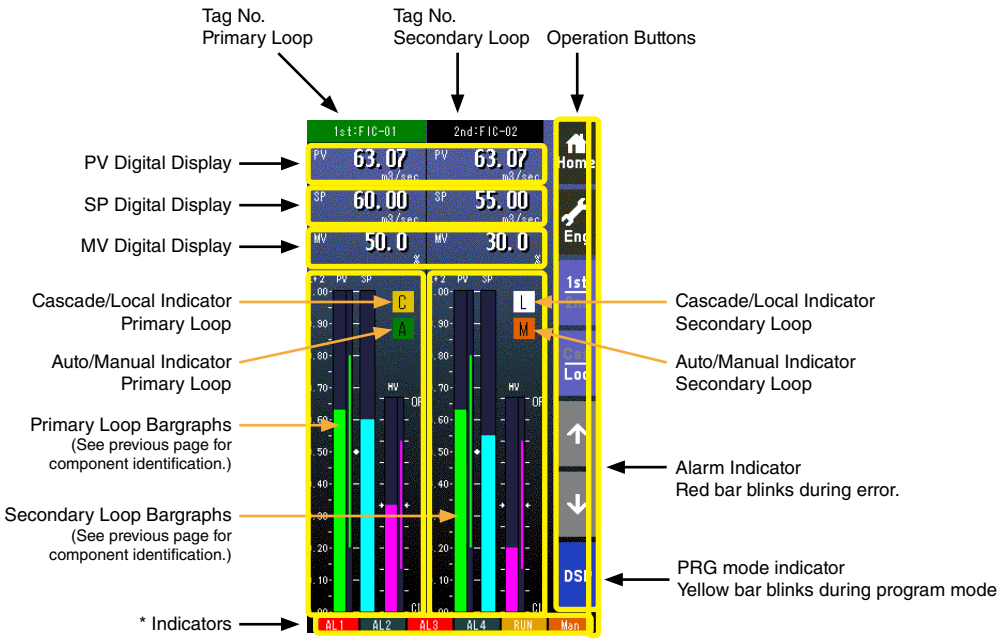
Note: Refer to Section 3.12. FRONT PANEL CONFIGURATION for MV operation details.

*1. SP buttons are locked in CAS mode.

*2. SP value changed on the display goes back to a previous value when the Config. mode (Refer to: 6.3.1.4. CONFIG MODE) is set to 'SFEW'.

6.2.3. DUAL LOOP BARGRAPH VIEW

6.2.3.1. SCREEN COMPONENTS

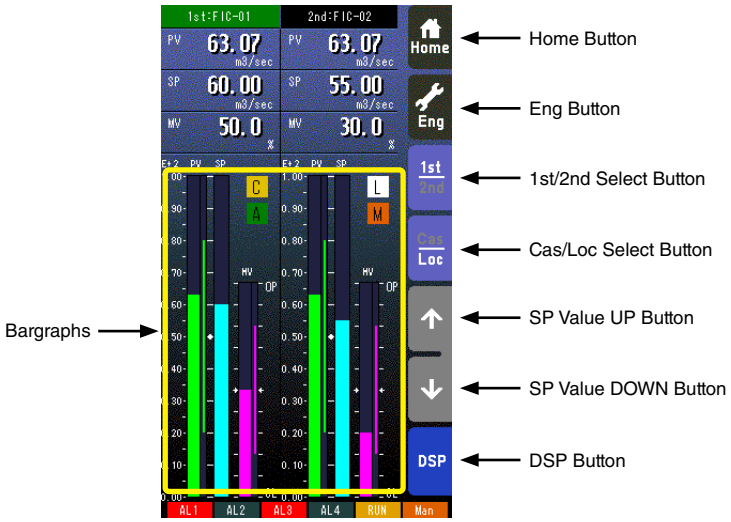


- Pressing on [1st/2nd] button switches between the primary and secondary loops.
- The secondary loop bargraph field is blank with only the background color when the secondary loop is not assigned.
- The background color of the tag field for the selected loop turns to the color specified in 'Selected loop color' setting.
- MV digital display and MV bargraph show the position input value with Pulse Width Output Type PID.
- MV output limit range indicator shows the high and low limits of the position input with Pulse Width Output Type PID.

*** Indicators**

INDICATOR	EXPLANATIONS
AL1 to AL4	Background color turns red during alarm.
RUN / STOP	RUN: Green in normal conditions; Amber in an abnormality. STOP: Grey when the Controller operation is stopped; Red when the memory is failed.
Auto / Man	Auto: Green Auto indicator turns on. Man: Orange Man indicator turns on. The lamp indicates the status of the loop specified in 'Loop display (MV/OP)' setting. (Refer to: 6.3.1.12. LOOP DISPLAY (MV/OP))

6.2.3.2. DUAL-BARGRAPH VIEW OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.
Pressing/holding the button for approx. 1 second registers the view as Home view (including the 1st/2nd choice).

Eng Button

Pressing/holding the button for approx. 1 second switches the view to Engineering view.
Once the view is switched, it is used to switch among the engineering views.

1st/2nd Select button

Used to switch between the primary and the secondary loops. Valid only when the secondary is set. The background color of the tag field for the selected loop turns green.

Cas/Loc Select button

Pressing/holding the button for approx. 1 second switches the control mode between cascade (Cas) and local (Loc). Valid only when 'Set mode Cas/Loc' setting under the tuning parameters is set to 'Cascade/Local.'

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value UP button *1 *2

Used to increase SP value in the speed of 40 seconds per full-scale. Touching it briefly increases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value DOWN button *1 *2

Used to decrease SP value in the speed of 40 seconds per full-scale. Touching it briefly decreases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

DSP button

Used to switch among the operation views.

Bargraphs

% and engineering unit scale switched in turn by touching on the field when 'Select unit mode' is set. (Refer to: 6.3.1.28. SELECT UNIT MODE) Switching the scale on this view affects the same setting for Bargraph view.

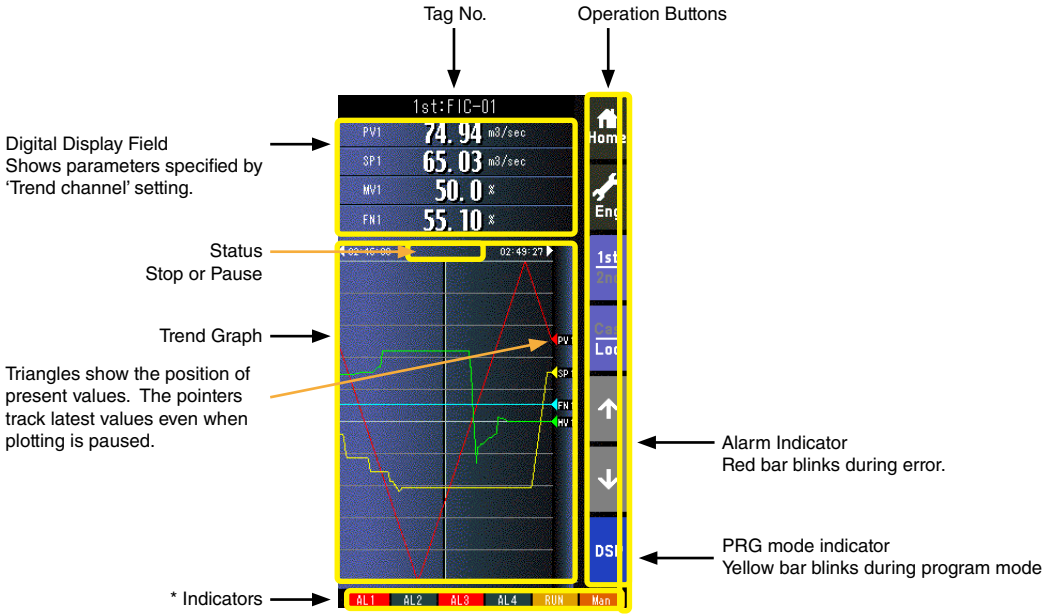
Note: Refer to Section 3.12. FRONT PANEL CONFIGURATION for MV operation details.

*1. SP buttons are locked in CAS mode.

*2. SP value changed on the display goes back to a previous value when the Config. mode (Refer to: 6.3.1.4. CONFIG MODE) is set to 'SFEW'.

6.2.4. SHORT TREND VIEW

6.2.4.1. SCREEN COMPONENTS

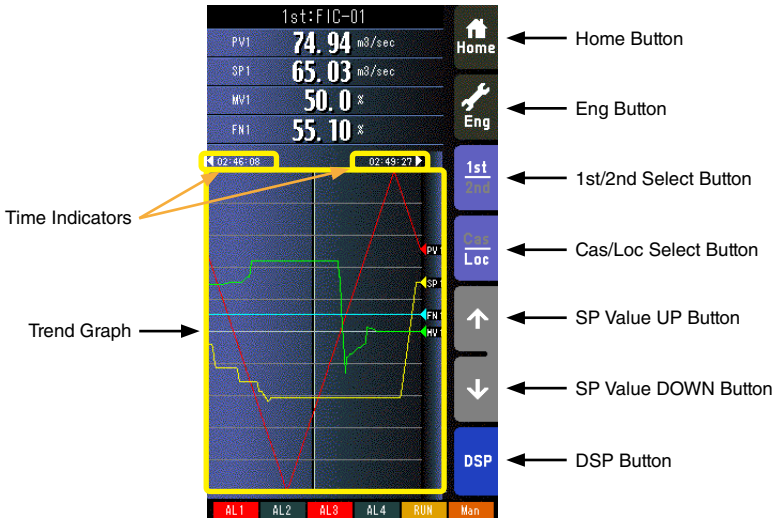


- Pressing on [1st/2nd] button switches between the primary and secondary loops.
- 200 samples are plotted on the chart.
- The graph operation is linked with that on Tuning view.
- Graph plotting is reset to restart in either of the following conditions:
  - When the power supply is turned on with 'Trend recording' set to 'Start.'
  - When 'Trend recording' setting is changed from 'Stop' to 'Start.'
  - When 'Storing interval' setting is changed.
  - When 'Trend channel' setting is changed.
  - When setting is initialized. (Refer to: 6.3.1.35. INITIALIZE)
  - When setting is changed and applied by PC configurator software (model: SCCFG).
- MV digital display (if selected) in the digital display field shows the position input value with Pulse Width Output Type PID.

*** Indicators**

INDICATOR	EXPLANATIONS
AL1 to AL4	Background color turns red during alarm.
RUN / STOP	RUN: Green in normal conditions; Amber in an abnormality. STOP: Grey when the Controller operation is stopped; Red when the memory is failed.
Auto / Man	Auto: Green Auto indicator turns on. Man: Orange Man indicator turns on. The lamp indicates the status of the loop specified in 'Loop display (MV/OP)' setting. (Refer to: 6.3.1.12. LOOP DISPLAY (MV/OP))

6.2.4.2. SHORT TREND VIEW OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.
Pressing/holding the button for approx. 1 second registers the view as Home view (including the 1st/2nd choice).

Eng Button

Pressing/holding the button for approx. 1 second switches the view to Engineering view.
Once the view is switched, it is used to switch among the engineering views.

1st/2nd select button

Used to switch between the primary and the secondary loops. Valid only when the secondary is set.

Cas/Loc select button

Pressing/holding the button for approx. 1 second switches the control mode between cascade (Cas) and local (Loc). Valid only when 'Set mode Cas/Loc' setting under the tuning parameters is set to 'Cascade/Local.'

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value UP button *1 *2

Used to increase SP value in the speed of 40 seconds per full-scale. Touching it briefly increases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value DOWN button *1 *2

Used to decrease SP value in the speed of 40 seconds per full-scale. Touching it briefly decreases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

DSP button

Used to switch among the operation views.

Trend graph

Plotting is freezed by touching on the chart. The screen shows 'Pause' while it is stopped. Plotting is restarted at the point of latest data sampling when the chart is touched again.

Time indicators

The chart can be scrolled by half the screen chart span when time indicator is touched (max. two chart spans). It moves to the directions indicated with arrows beside the time indication. Scrolling is available when the arrows are yellow.

Note: Refer to Section 3.12. FRONT PANEL CONFIGURATION for MV operation details.

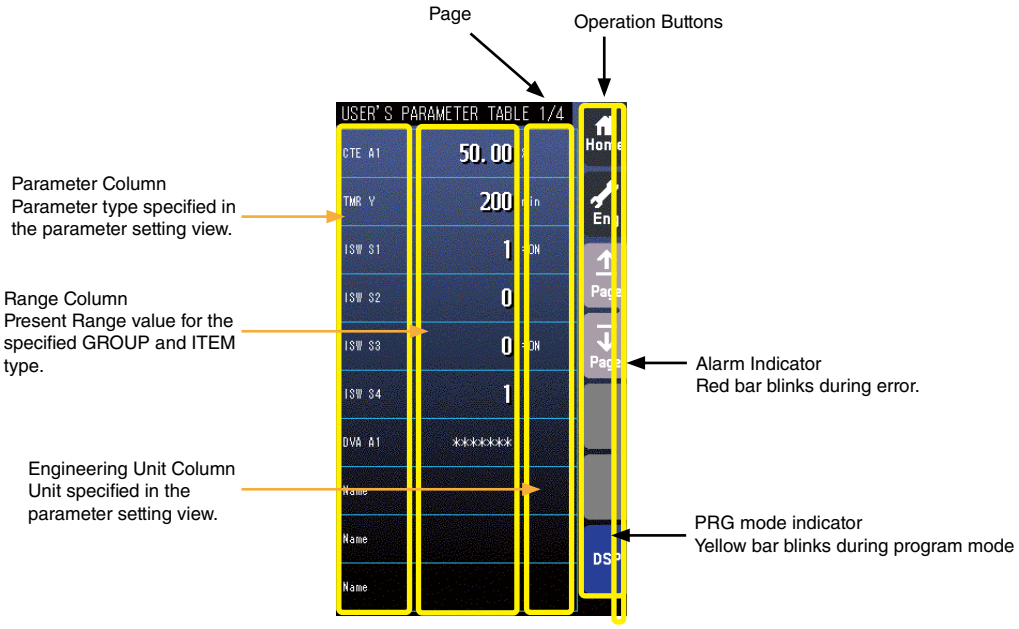
*1. SP buttons are locked in CAS mode.

*2. SP value changed on the display goes back to a previous value when the Config. mode (Refer to: 6.3.1.4. CONFIG MODE) is set to 'SFEW'.

6.2.5. USER'S PARAMETER TABLE

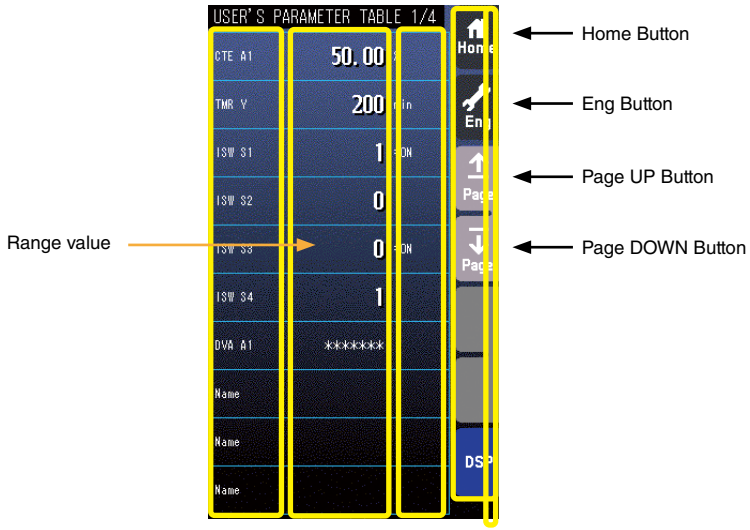
6.2.5.1. SCREEN COMPONENTS

Parameters are registered in the Parameter setting view displayed from User's parameter table in the Engineering views. Refer to 6.3.5.3. PARAMETER SETTING VIEW OPERATIONS.



- At the maximum of 40 parameters (10 per page, 4 pages in total) can be registered for the user's convenience.
- Only the parameter type identification is displayed when it is disabled in the Parameter Setting view.
- ' ******* ' is indicated in Range cell when illegal GROUP and/or ITEM No. are set for the parameter.

6.2.5.2. OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.
Pressing/holding the button for approx. 1 second registers the view as Home view (including the 1st/2nd choice).

Eng Button

Pressing/holding the button for approx. 1 second switches the view to Engineering view.
Once the view is switched, it is used to switch among the engineering views.

Page UP button

Used to go to the previous page of the main menu.

Page DOWN button

Used to go to the next page of the main menu.

Range value

Touching over a Range cell opens a numeric keypad.
The numeric keypad is not available (1) when ' ******* ' is indicated in Range cell for which illegal GROUP and/or ITEM No. are set, or (2) when the Config. mode is set to 'SFEW.'

Note

Calculation errors when converting range value to internal percentage.
When 20000 and 0 is set as Range high/low limit, setting to 9999 and converting to percentage, 49.995 % is obtained, however, internally it is processed as 49.99 %. Therefore the display shows "9998."

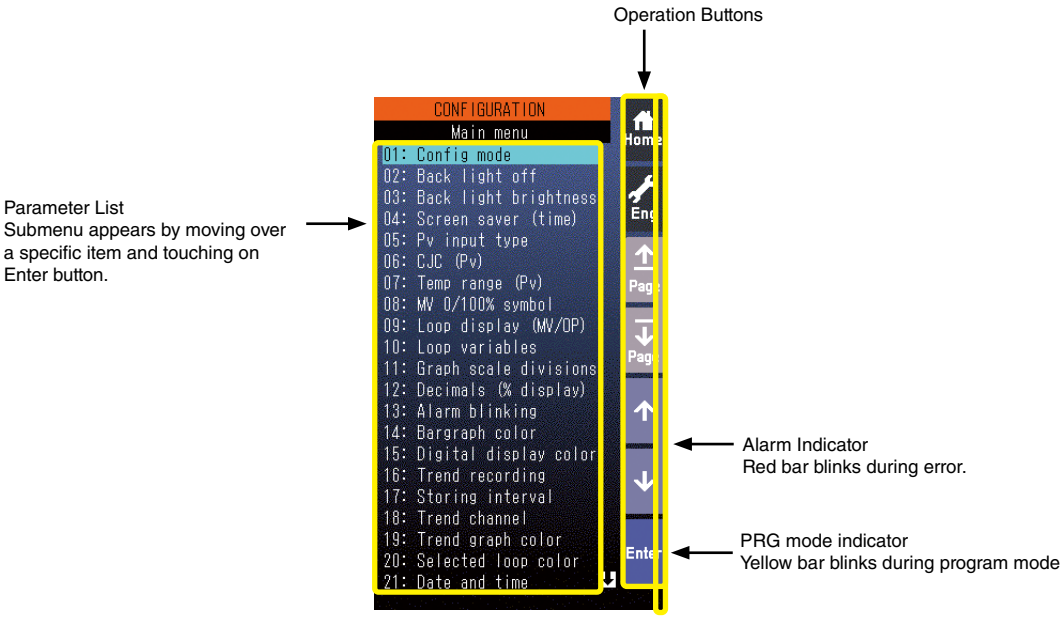
Only the acceleration button among the hardware buttons at the front is usable when the Realtime I/O Monitoring view is on screen. The MV value UP/DOWN buttons and the AUTO / MAN selector are locked.

Parameter settings are not available in the User's parameter table of Operation views. Set the parameters in the Parameter list of Engineering views.

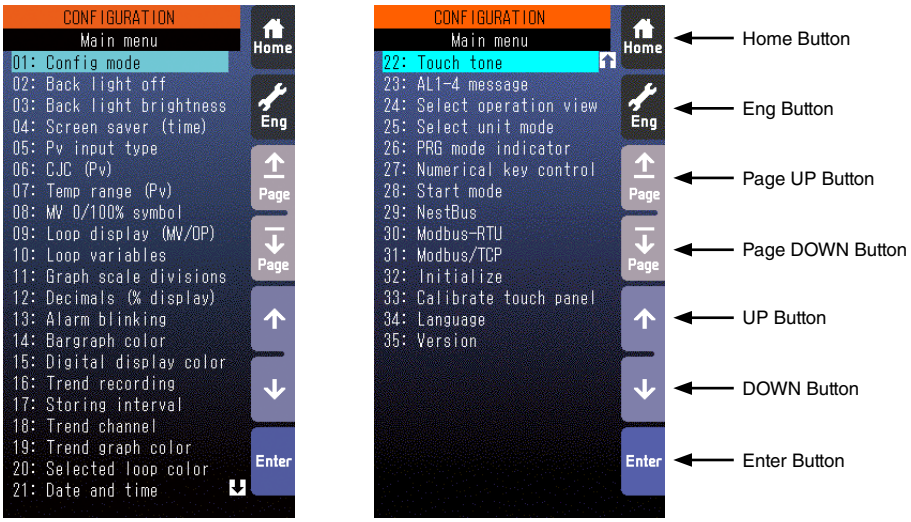
6.3. ENGINEERING VIEWS

6.3.1. CONFIGURATION VIEW

6.3.1.1. SCREEN COMPONENTS



6.3.1.2. CONFIGURATION VIEW OPERATIONS



Parameter items can be selected by directly touching over the menu list.

Home button

Used to switch the view to the one registered as Home operation view.

Eng button

Used to switch among the engineering views.

Pressing/holding the button for approx. 1 second switches the view to Operation view.

Page UP button

Used to go to the previous page of the main menu.

Page DOWN button

Used to go to the next page of the main menu.

UP button

Used to go up to next item among listed selections.

DOWN button

Used to go down to next item among listed selections.

Enter button

Used to apply the data indicated on the display.

6.3.1.3. CONFIGURATION PARAMETERS

ITEM	DATA	DEFAULT	CONTENTS	INITIALIZE: Y Locked during the SFEW comm.: R
Config mode	Front panel, SFEW, SCCFG	Front panel	Specify the means of configuring the Controller.	----
Back light off	----	----	Manual backlight control (ON by touching on the panel; shows Home view)	----
Back light brightness	1, 2, 3, 4, 5	5	Backlight brightness control	Y
Screen saver (time)	0, 1 – 99 minutes	0 (OFF)	Time before the screen turns off when not accessed. Screen saver does not turn on when: - PV high or low alarm is tripped. - AL1, AL2, AL3 or AL4 is indicated. - The device is in an abnormality. - Engineering view is on the screen.	Y
Pv input type	0 – 25	3 (1 – 5 V)	Pv 1 / Pv 2 input type 0:-10-10 V, 1: -1-1 V, 2: 0-10 V, 3: 1-5 V, 4: 0-1 V, 5: 4-20 mA, 6: K, 7: E, 8: J, 9: T, 10: B, 11: R, 12: S, 13: C, 14: N, 15: U, 16: L, 17: P, 18: PR, 19: Pt100 (JIS '97, IEC), 20: Pt100 (JIS '89), 21: JPt100 (JIS '89), 22: Pt50 (JIS '81), 23: Ni100, 24: MS, 25: DS	R
CJC (Pv)	Off, On	On	Cold junction compensation (valid only when a thermocouple type is selected with Pv input type)	R
Temp range (Pv)	-272.0 – 3000.0	0.0 – 1000.0	Upper / lower range temperature for Pv 1 / Pv 2 Selected range is applied to graph scale 0% and 100%. Function block data is converted into 0-100%.	R
MV-0/100% symbol	O, C, OP, CL, HI, LO, 100, 0, Max., Min., None	100%: OP 0%: CL	Mv 1 / Mv 2 graph scale 0% and 100% symbols	Y
Loop display (MV/OP)	1, 2	LP1: 1 LP2: 2	Mv signal assigned to the primary loop view. Mv signal assigned to the secondary loop view	Y
Loop variables	1, 2	1 (PV/SP/MV)	Variables assignment (order) for bargraphs 1: PV / SP / MV, 2: SV / PV / OP (SV=SP, OP=MV)	Y
Graph scale divisions	2 – 10	10	Number of divisions applied to graphs on Bargraph view	Y
Decimals (% display)	1, 2	1	Number of decimal places applied to % indication (PV1, PV2, SP1, SP2, MV1, MV2)	Y
Alarm blinking	Disable, Enable	Enable	Digital displays can be set to blink during PV and/or MV alarms.	Y
Bargraph color	18 colors (color chart)*1	Norm: 5 Hi: 1 Lo: 4	PV1 bargraph color (normal range, high alarm range, low alarm range)	Y
		Norm: 5 Hi: 1 Lo: 4	PV2 bargraph color (normal range, high alarm range, low alarm range)	
		Norm: 13 Hi: 12 Lo: 14	MV1 bargraph color (normal range, high alarm range, low alarm range)	
		Norm: 13 Hi: 12 Lo: 14	MV2 bargraph color (normal range, high alarm range, low alarm range)	
		8	SP1 bargraph color	
		8	SP2 bargraph color	
Digital display color	18 colors (color chart)*1	16	Digital display color (PV1, PV2, MV1, MV2, SP1, SP2, FN1, FN2, FN3, FN4) (High/Low alarm colors specified for bargraphs are applied.)	Y
Trend recording	Start, Stop	Start	Trend recording operation control	Y
Storing interval	1 sec thr. 60 min	10 sec	Short trend storing interval *2 (1, 2, 5, 10, 20, 30 sec, 1, 2, 5, 10, 30, 60 min)	Y
Trend channel	0 – 10	LP1 CH1: 1 LP1 CH2: 3 LP1 CH3: 5 LP1 CH4: 0 LP2 CH1: 2 LP2 CH2: 4 LP2 CH3: 6 LP2 CH4: 0	Short trend channel assignment (CH1 thr. CH4) 0: None, 1: PV1, 2: PV2, 3: SP1, 4: SP2, 5: MV1, 6: MV2, 7: FN1, 8: FN2, 9: FN3, 10: FN4	Y

ITEM	DATA	DEFAULT	CONTENTS	INITIALIZE: Y Locked during the SFEW comm.: R
Trend graph color	18 colors (color chart)*1	CH1: 1 CH2: 4 CH3: 5 CH4: 8	Short trend graph color (CH1 thr. CH4)	Y
Selected loop color	18 colors (color chart)*1	7	Background color of the tag field for the selected loop	Y
Date and time	----	----	Present date and time	----
Touch tone	Disable, Enable	Enable	Sound at the touch of buttons	Y
AL1-4 message	Max. 4 characters	AL1, AL2, AL3, AL4	Messages indicated on the alarm indicator lamps	R
Select operation view	Disable, Enable	Enable	Views to be indicated or skipped (digital, bargraph, dual-loop bargraph, short trend)	Y
Select unit mode	Selectable, Eng unit, %	Selectable	Scale setting for PV indicators (digital and bargraph)	R
PRG mode indicator	OFF, ON	ON	Yellow bar blinks during program mode.	Y
Numerical key control	Disable, Enable	Enable	Numerical key control for SP1, MV1, SP2, MV2.	Y
Start mode	Cold start, Hot start	Hot start	Control operation options at the startup (See the appendix of this manual for default values for cold start)	R
NestBus	0 – F	0	Card No.	R
Modbus-RTU	1 – 247	1	Node No.	Y
	4800, 9600, 19200, 38400	38400	Transfer rate	Y
	8 (fixed)	8	Data bit (fixed value, reference only)	Y
	None, Even, Odd	Odd	Parity	Y
Modbus/TCP	0.0.0.0 ... 255.255.255.255	192.168.0.1	IP address	Y
	0.0.0.0 ... 255.255.255.255	255.255.255.0	Subnet mask	Y
	502 (fixed)	502	Port No. (fixed value, reference only)	Y
	0 – 3000	180	Linger time	Y
	00-10-9C-xx-xx-xx	----	Mac address (reference only)	----
Initialize	----	----	Resetting to factory default setting (applicable to items indicated with Y in the rightmost column)	----
Calibrate touch panel	----	----	Fine calibration of touch panel positioning	----
Language	Japanese, English	As specified when ordering	Display language	----
Version	----	----	Version No. indication (control, indication, I01, I02)	----

*1. Color chart

*2. Storing interval and timing

INTERVAL	TIMING	INTERVAL	TIMING
1 sec.	Every sec.	1 min.	Every min. 0 sec.
2 sec.	Even number of sec.	2 min.	Even number of min. 0 sec.
5 sec.	0, 5, 10, ... 55 sec.	5 min.	0, 5, ... 55 min. 0 sec.
10 sec.	0, 10, 20 ... 50 sec.	10 min.	0, 10, ... 50 min. 0 sec.
20 sec.	0, 20, 40 sec.	30 min.	0, 30 min. 0 sec.
30 sec.	0, 30 sec.	60 min.	Every hour, 0 min. 0 sec.

6.3.1.4. CONFIG MODE

Following methods are available for configuring the Controller.

- Via the front panel control on Programming view (Engineering views)
- SFEW3E Loop Configuration Builder software
- SCCFG PC Configurator software

When using infrared communication, be sure to set only one Controller module to SFEW or SCCFG communication mode at once so that other modules do not interfere when more than two modules are mounted close to each other. During the SFEW communication mode, the front monitor LED slowly blinks and the Programming view is locked (not displayed) among Engineering views. When the Controller is set to the SCCFG mode, the monitor LED rapidly blinks.

6.3.1.5. BACK LIGHT OFF

Screen backlight is forcibly turned off irrespective of alarm status of the moment. It is automatically turned on again when an alarm caused by new event is triggered or the screen is touched.

When the backlight is set to on, the Controller shows first Operation view registered as Home without the 'Eng' button.

6.3.1.6. BACK LIGHT BRIGHTNESS

Backlight brightness can be set from level 1 (darkest) to 5 (brightest) in 5 steps. Its life span is for approx. 50000 hours in 25°C (time before the brightness is reduced by half with brightness setting 5). Longer life is expected by reducing brightness level.

Characters/images on the screen may not clearly be legible in a bright environment such as under direct sunlight, even at the highest brightness setting. Place a sun shield over the front panel in such case.

6.3.1.7. SCREEN SAVER (time)

Screen saver can be set either to off, or on between 1 and 99 minutes. When the screen saver is on, backlight is turned off.

Pressing any one of the front push buttons reactivates the backlight without applying its originally assigned function.

The module goes back to normal status in case of an alarm.

Screen saver does not turn on when:

- PV high or low alarm is tripped.
- AL1, AL2, AL3 or AL4 is indicated.
- The device is in an abnormality.
- Engineering view is on the screen.

6.3.1.8. PV INPUT TYPE

Choose an input type for universal input Pv1 and Pv2. Hardware wiring configuration may vary depending on the type. Refer to: 4.9. CONNECTION DIAGRAM.

6.3.1.9. COLD JUNCTION COMPENSATION (Pv)

Enable or disable cold junction compensation for T/C input.

When the function is enabled, the Controller measures absolute temperature to cancel errors by room temperature.

6.3.1.10. TEMPERATURE RANGE (Pv)

The Controller handles analog data in percentage between -15 and 115%. With temperature input (T/C or RTD), it converts a specific temperature range into the percentage. Temperature unit: °C.

6.3.1.11. MV 0/100% SYMBOL

MV bargraph can be accompanied with symbols indicating 0% and 100% status respectively. Choose among: O, C, OP, CL, HI, LO, 100, 0, Max, Min or no indication.

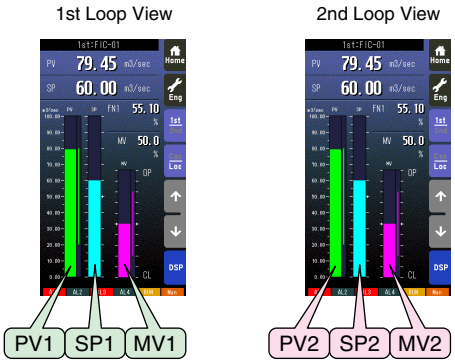
6.3.1.12. LOOP DISPLAY (MV/OP)

One module of the SC can control two loops and has Operation views for each loop. Basically each view shows parameters for one specific loop, but MV bargraph could be from the other loop. By choosing MV2 on the primary (1st) loop view, you can confirm the secondary loop operation at once.

MV control by the front push buttons and Auto/Man switching and indication by the front push buttons and LEDs are applicable to the selected MV signal.

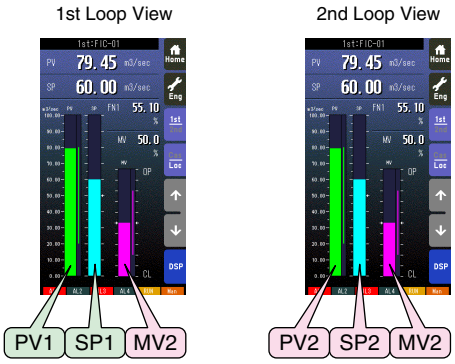
THE SETTING IS VALID ONLY FOR OPERATION VIEWS.

[Example 1] Primary (1st) loop MV = 1, Secondary (2nd) loop MV = 2 (default setting)



	1st loop view	2nd loop view
MV control	MV1	MV2
Auto/Man switching/indication	1st loop	2nd loop

[Example 2] Primary (1st) loop MV = 2, Secondary (2nd) loop MV = 2



	1st loop view	2nd loop view
MV control	MV2	MV2
Auto/Man switching/indication	2nd loop	2nd loop

By setting different colors for MV1 and MV2 bargraphs, indicated MV may be visually identifiable. Refer to: 6.3.1.17. BARGRAPH COLOR.

6.3.1.13. LOOP VARIABLES

Loop variable identification/position can be either PV - SP - MV or SV - PV - OP. SP replaces SV and MV replaces OP in the function blocks programming.

6.3.1.14. GRAPH SCALE DIVISIONS

Choose among 2 through 10 divisions for bargraph scales.

6.3.1.15. DECIMALS (% display)

Choose 1 or 2 decimal places for % displays.

6.3.1.16. ALARM BLINKING

Digital displays can be set to blink during PV and/or MV alarms.

6.3.1.17. BARGRAPH COLOR

Colors are selectable for: normal range, high alarm and low alarm for PV and MV bargraphs; normal range for SP bargraph.

When a high/low alarm for PV or MV is tripped, the relevant digital display also turns to the specified color.

Refer to 6.3.1.3. CONFIGURATION PARAMETERS for color selections.

6.3.1.18. DIGITAL DISPLAY COLOR

Colors are selectable for PV, SP, MV and FN digital displays. When a high/low alarm for PV or MV is tripped, the relevant digital display turns to the color specified for alarms for the bargraphs. It blinks when alarm blinking is enabled.

Refer to Section 6.3.1.3. CONFIGURATION PARAMETERS for color selections.

6.3.1.19. TREND RECORDING

Used to start or stop trend recording.

6.3.1.20. STORING INTERVAL

Choose among 1 sec, 2 sec, 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 2 min, 5 min, 10 min, 30 min and 60 min. Refer to Section 6.3.1.3. CONFIGURATION PARAMETERS for exact storing timing for each selection.

6.3.1.21. TREND CHANNEL

Trending for at the maximum of 4 variables (channels) per loop can be plotted on the screen and stored. Choose variables for each loop.

6.3.1.22. TREND GRAPH COLOR

Choose colors for each trend graph.

Refer to Section 6.3.1.3. CONFIGURATION PARAMETERS for color selections.

6.3.1.23. SELECTED LOOP COLOR

Choose a specific background color of the tag field for the selected loop on Dual Bargraph view.

Refer to Section 6.3.1.3. CONFIGURATION PARAMETERS for color selections.

6.3.1.24. DATE AND TIME

Time is indicated on Trend and Tuning views.

A real time clock (backup with capacitor, not with battery) is equipped in the module but time setting will be lost if the module is without power supply for an extended time period. Resetting may be required.

6.3.1.25. TOUCH TONE

Enable or disable touch tone for the front push buttons and touch panel buttons.

6.3.1.26. AL1-4 MESSAGE

A specific message can be indicated at alarm on the alarm indicators at the bottom of the screen. Max. 4 characters.

6.3.1.27. SELECT OPERATION VIEW

Operation views to be skipped when moving from one view to another can be specified. The one registered as Home cannot be disabled.

6.3.1.28. SELECT UNIT MODE

PV value display in Digital Display view and Bargraph view can be switched between engineering unit indication and % indication, or fixed at either selection.

6.3.1.29. PRG MODE INDICATOR

Choose blinking or not blinking of yellow bar during program mode (Item 01 of Group for Function block list is not 0.)

6.3.1.30. NUMERICAL KEY CONTROL

Choose disable/enable of numerical key control for SP and MV in the Digital Display.

6.3.1.31. START MODE

Choose hot start or cold start at the startup. With hot start setting, the module starts from the status at the moment of shut-down. With cold start setting, it initializes all parameters before starting.

Refer to Appx 2. COLD START PARAMETERS.

6.3.1.32. NESTBUS

Set NestBus Card No. of the SC200D. The Controller automatically restarts when the Card No. is changed.

6.3.1.33. MODBUS-RTU

Modbus-RTU setting is available for Model: SC200D-x1-x. Restart the Controller to apply a new setting.

- Node No.
- Transfer rate
- Data bit: Fixed at 8. For reference purpose only.
- Parity: Specify the parity bit. Stop bit is set to '2' with the parity set to 'None,' set to '1' with 'Even' or 'Odd' setting.

Refer to Appx 5. MODBUS FUNCTIONS for supported functions and register assignments.

6.3.1.34. MODBUS/TCP

Modbus/TCP setting is available for Model: SC200D-x2-x. Restart the Controller to apply a new setting.

- IP address
- Subnet mask
- Port No.: Fixed at 502. For reference purpose only.
- Linger time: Communication is severed when no activity is detected for the time period.
- Mac address: No setting

Refer to Appx 5. MODBUS FUNCTIONS for supported functions and register assignments.

Note

(1) IP address, Subnet mark: Set 0 or a space for higher digits when only one or two among three digits are set (e.g. 12 = ' 12' or '012')

(2) Default gateway: The Controller responds only to its master's queries (commands), which contains the master's address, therefore no default gateway setting is needed.

6.3.1.35. INITIALIZE

Initialize display setting to the factory default. Applicable parameters are indicated with X at the rightmost column of the table in Section 6.3.1.3. CONFIGURATION PARAMETERS.

6.3.1.36. CALIBRATE TOUCH PANEL

Fine calibration for the touch panel. The screen is calibrated at the factory but may need fine re-adjustment after an extended time period when touched point and target point reacting to the touch are misaligned.

6.3.1.37. LANGUAGE

Choose the display language. The language setting is not changed when the initialization (Refer to: 6.3.1.35. INITIALIZE) is performed.

6.3.1.38. VERSION

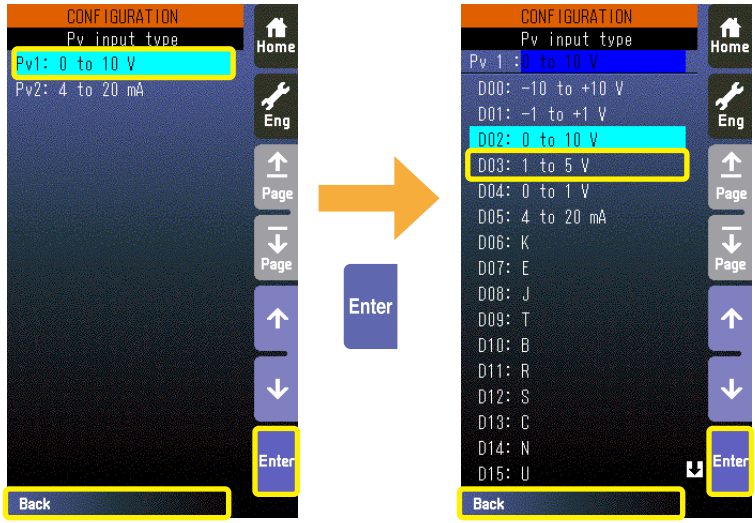
The Controller functions are divided by blocks and shared by multiple CPU. Firmware version No. of each CPU are indicated.

6.3.1.39. SETTING EXAMPLES

■ **Choosing from multiple selections** (e.g. changing Pv1 input type from 0-10 V to 1-5 V)

1) Choose “PV input type” in Configuration view menu and touch [Enter].
2) Choose PV input (Pv1 in this example) you want to change, and touch [Enter].
3) Choose input type (D03: 1 to 5 V in this example) you want to set, and touch [Enter].

Note: Touch [Back] at the bottom to go back to previous view.



■ **Choosing colors** (e.g. changing Pv1 normal range bargraph color from green to blue)

1) Choose “Bargraph color” in Configuration view menu and touch [Enter].
2) Choose signal type (“PV1” in this example) you want to change, and touch [Enter].
3) Touch color indicator (green section to the right of “Norm” in this example) you want to change, and touch [Enter].
4) Color chart appears on the screen. Touch new color (blue) and touch [Enter].

Note: Touch [Back] at the bottom to go back to previous view.

■ **Entering alphanumeric characters** (e.g. changing AL1 message)

1) Choose "AL1-4 message" in Configuration view menu and touch [Enter].
2) Choose AL message (AL1 in this example) you want to change, and touch [Enter].
3) Enter characters you want to set, and touch [Enter].

   Use [➜] [🡐] to shift the cursor position.

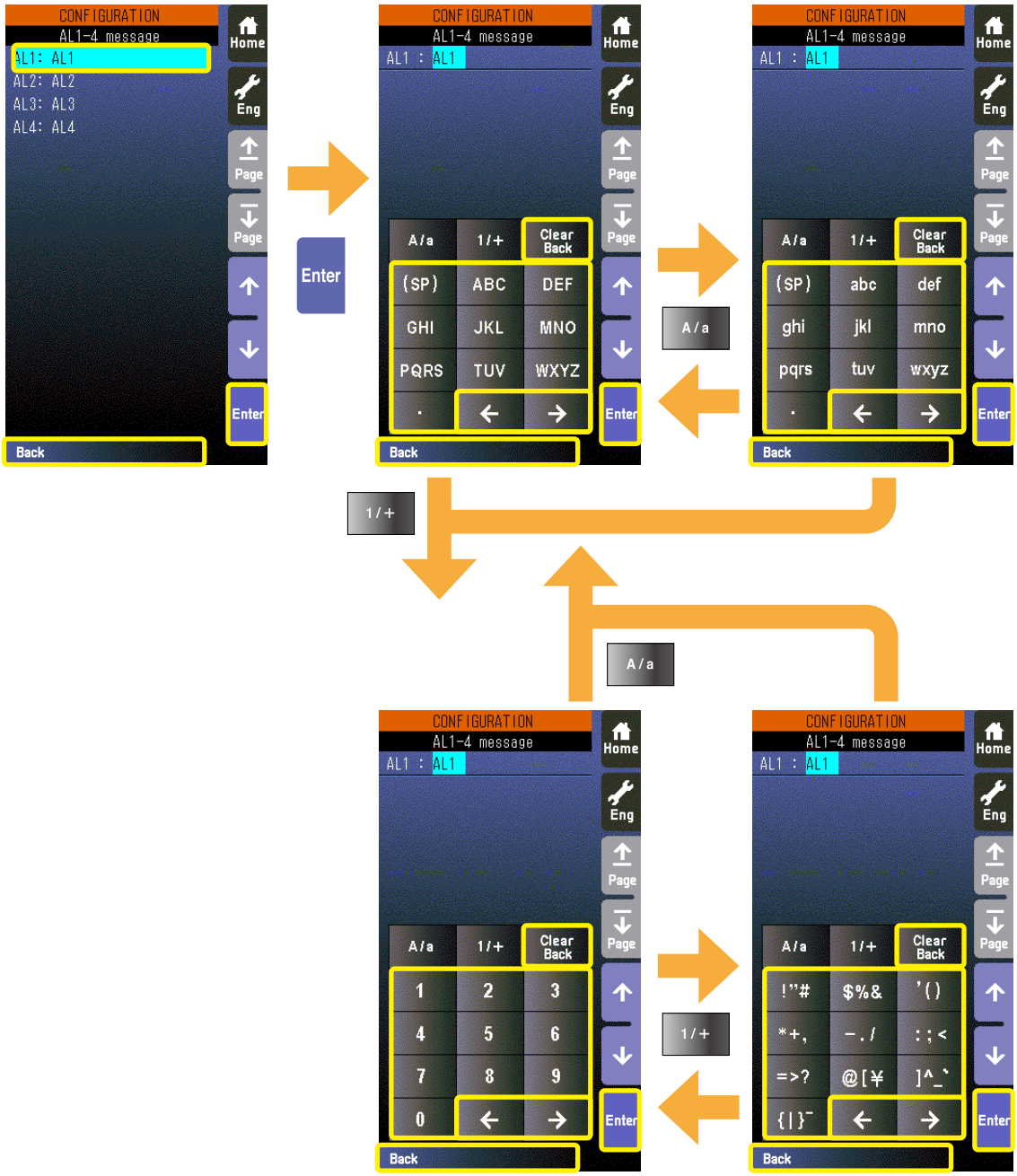
   [Clear Back] deletes the character and its space at the position of the cursor.

   [A/a] switches between capitals and small letters.

   [1/+] switches between numeric and special characters.

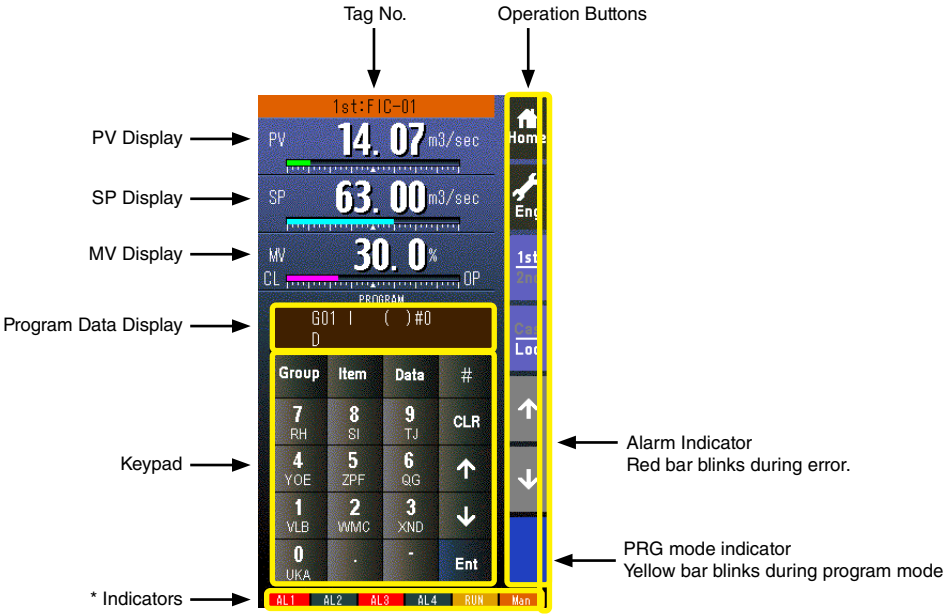
   Touching one key each time switches between the characters indicated on the key (e.g. A > B > C > A).

Note: Touch [Back] at the bottom to go back to previous view.



6.3.2. PROGRAMMING VIEW

6.3.2.1. SCREEN COMPONENTS

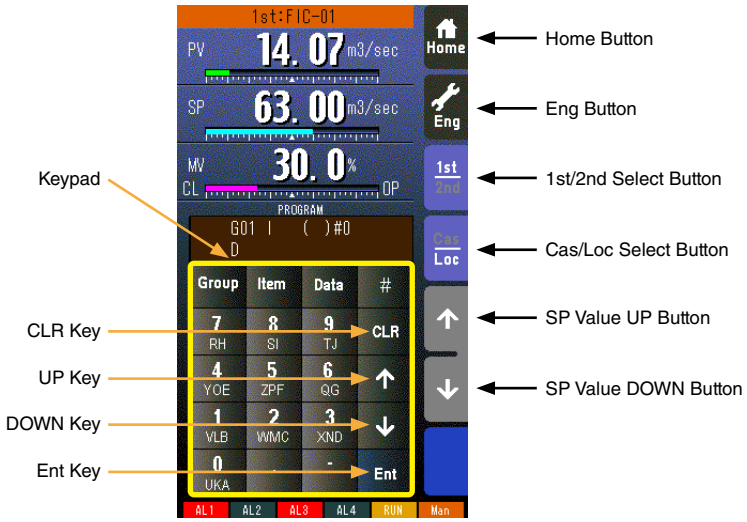


• MV digital display and MV bargraph show the position input value with Pulse Width Output Type PID.

*** Indicators**

INDICATOR	EXPLANATIONS
AL1 to AL4	Background color turns red during alarm.
RUN / STOP	RUN: Green in normal conditions; Amber in an abnormality. STOP: Grey when the Controller operation is stopped; Red when the memory is failed.
Auto / Man	Auto: Green Auto indicator turns on. Man: Orange Man indicator turns on. The lamp indicates the status of the loop being on the screen.

6.3.2.2. PROGRAMMING VIEW OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.

Eng button

Used to switch among the engineering views.

Pressing/holding the button for approx. 1 second switches the view to Operation view.

1st/2nd select button

Used to switch between the primary and the secondary loops. Valid only when the secondary is set.

Cas/Loc select button

Pressing/holding the button for approx. 1 second switches the control mode between cascade (Cas) and local (Loc). Valid only when 'Set mode Cas/Loc' setting under the tuning parameters is set to 'Cascade/Local.'

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value UP button *1

Used to increase SP value in the speed of 40 seconds per full-scale. Touching it briefly increases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value DOWN button *1

Used to decrease SP value in the speed of 40 seconds per full-scale. Touching it briefly decreases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

CLR key

Used to clear the program data display.

UP key

Used to go to the previous ITEM number.

DOWN key

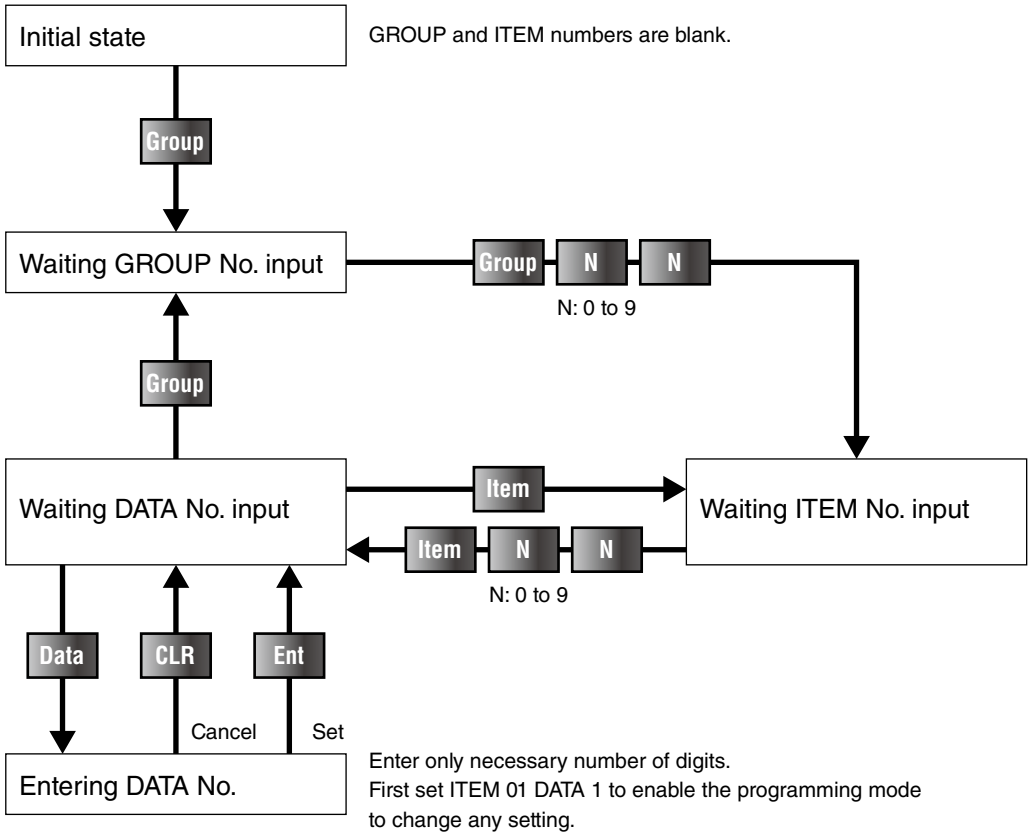
Used to go to the next ITEM number.

Ent key

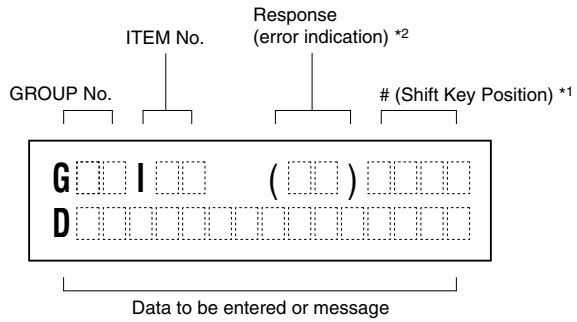
Used to apply the data on the display.

*1. SP buttons are locked in CAS mode.

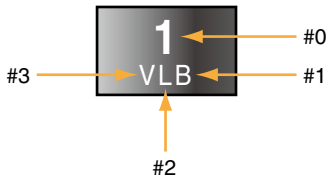
■ OPERATION FLOWCHART



■ PROGRAM DATA FIELD & KEYPAD



[Example]

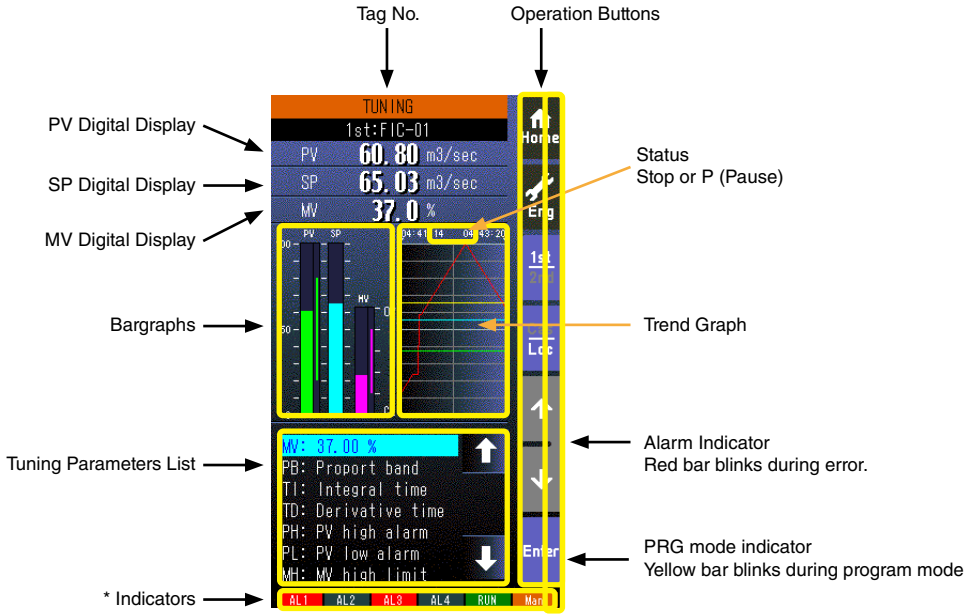


*1. [#] key is used to enter alphabets.
Shift key position indication switches in order of #1, #2, #3, #0 … every time the key is pressed.
Level #0 is for entering numeric, and levels #1 to #3 indicate the position of alphabets (below the numeric) from the right to left.

*2. Response message after format check
OK : OK
NG : No good
ER : Communication error
OE : Operation procedure error
DE : Data syntax error
VE : Non-registered input unit table (not initialized)
WE : Input unit table writing error

6.3.3. TUNING (AUTO-TUNING) VIEW

6.3.3.1. SCREEN COMPONENTS

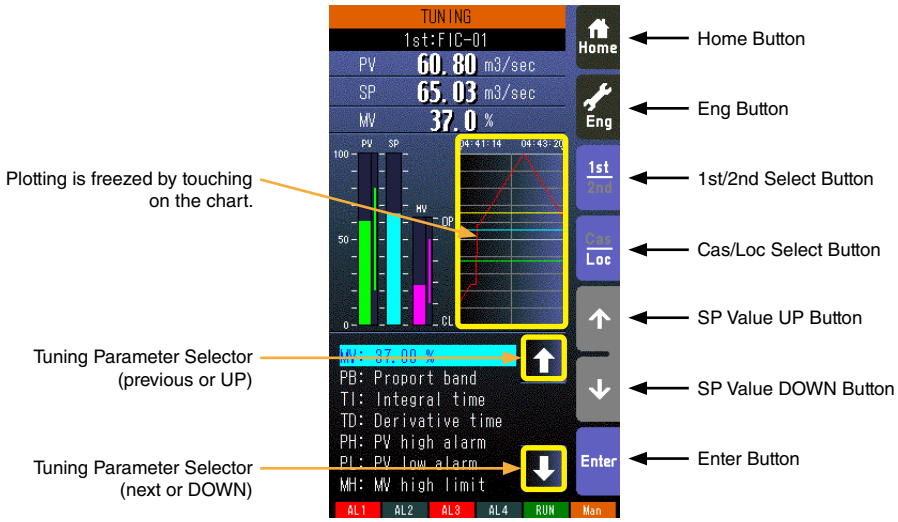


- 100 sample data is plotted on the trend graph.
- The trend graph is reset (cleared) and restarted when:
  - When the power supply is turned on with 'Trend recording' set to 'Start.'
  - When 'Trend recording' setting is changed from 'Stop' to 'Start.'
  - When 'Storing interval' setting is changed.
  - When 'Trend channel' setting is changed.
  - When setting is initialized. (Refer to: 6.3.1.35. INITIALIZE)
  - When setting is changed and applied by PC configurator software (model: SCCFG).
- MV digital display and MV bargraph show the position input value with Pulse Width Output Type PID.

*** Indicators**

INDICATOR	EXPLANATIONS
AL1 to AL4	Background color turns red during alarm.
RUN / STOP	RUN: Green in normal conditions; Amber in an abnormality. STOP: Grey when the Controller operation is stopped; Red when the memory is failed.
Auto / Man	Auto: Green Auto indicator turns on. Man: Orange Man indicator turns on. The lamp indicates the status of the loop being on the screen.

6.3.3.2. TUNING VIEW OPERATIONS



- This view is available when the relevant control loop uses basic PID or advanced PID control.
- Specific tuning parameters can be selected not only by UP/DOWN buttons but also by directly touching them.

Home button

Used to switch the view to the one registered as Home operating view.

Eng button

Used to switch among the engineering views.

Pressing/holding the button for approx. 1 second switches the view to Operating view.

1st/2nd selector

Used to switch between the primary and the secondary loops. Valid only when the secondary is set.

Cas/Loc selector

Pressing/holding the button for approx. 1 second switches the control mode between cascade (Cas) and local (Loc). Valid only when 'Set mode Cas/Loc' setting under the tuning parameters is set to 'Cascade/Local.'

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value UP button *1 *2

Used to increase SP value in the speed on 40 seconds per full-scale. Touching it briefly increases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

SP value DOWN button *1 *2

Used to decrease SP value in the speed on 40 seconds per full-scale. Touching it briefly decreases the value digit by digit.

The button operation can be locked by SC field terminal setting. Refer to Appx 1.2. SC200D FIELD TERMINAL.

Enter button

Used select and go to parameter setting of the selector parameter.

Tuning parameter selector (previous or UP)

Used to move up the cursor to choose tuning parameters.

Tuning parameter selector (next or DOWN)

Used to move down the cursor to choose tuning parameters.

*1. SP buttons are locked in CAS mode.

*2. SP value changed on the display goes back to a previous value when the Config. mode (Refer to: 6.3.1.4. CONFIG MODE) is set to 'SFEW'.

6.3.3.3. TUNING PARAMETERS

ABBR	SELECTABLE RANGE	CONTENTS	Basic PID	Advanced PID	MV Control	Ratio Setting	Indicator	Pulse Width Output Type PID
SP	-15.00 to 115.00%	Setpoint value (Local mode)	X	X	----	X ±32.000	----	X
MV	±115.00%	Manipulated value (Man mode)	X	X	X	X	----	X
PB	0 to 1000%	Proportional band	X	X	----	----	----	X
TI	0.00 to 100.00 min.	Integral time (0: No integral)	X	X	----	----	----	X
TD	0.00 to 10.00 min.	Derivative time (0: No derivative)	X	X	----	----	----	X
PH	-15.00 to 115.00%	PV alarm high limit	X	X	----	X	X	X
PL	-15.00 to 115.00%	PV alarm low limit	X	X	----	X	X	X
MH	±115.00%	MV high limit	X	X	----	----	----	X
ML	±115.00%	MV low limit	X	X	----	----	----	X
DL	0.00 to 115.00%	Deviation alarm setpoint	X	X	----	----	----	X
SM	Local, Cascade/Local	Setting mode	X	X	----	X	----	X
DR	Direct, Reverse	Control direction	X	X	----	----	----	X
DM	PV derivative, Deviation deriv	Derivative type	X	X	----	----	----	X
MD	Direct, Reverse	MV control direction display	X	X	X	X	----	----
TG	10 characters	Tag No. (Tag name)	X	X	X	X	X	X
MH	±32000	Upper range in engineering unit	X	X	----	X	X	X
ML	±32000	Lower range in engineering unit	X	X	----	X	X	X
DP	0, 1, 2, 3, 4, 5	Decimal point position (number of decimal places)	X	X	----	X	X	X
TU	8 characters	Unit	X	X	----	X	X	X
AT		To Auto-tuning view	X	X	----	----	----	----

Note 1. SM: Ai signal can be used as SP when Cascade/Local mode is selected.
Note 2. All parameters except AT are locked during the SFEW communication mode.
Note 3. For more details, refer to SC100/200 Series Function Block List.
Note 4. Read 'Position input high alarm setpoint' for 'MV high limit', 'Position input low alarm setpoint for 'MV low limit' with Pulse Width Output Type PID.

6.3.3.4. AUTO-TUNING PARAMETERS

ABBR	SELECTABLE RANGE	CONTENTS	REMARKS
SP	-15.00 to 115.00%	Setpoint value	Local mode only.
CV	-15.00 to 115.00%	Tuning point	Default value: 50%
P1	-15.00 to 115.00%	PV high limit	Auto-tuning is cancelled when PV is over the high limit or below the low limit.
P2	-15.00 to 115.00%	PV low limit	
M1	±115.00%	MV high limit	MV changes in steps within MV high/low limits.
M2	±115.00%	MV low limit	
MI	±115.00%	Fixed MV at error	MV is fixed at this value at error.
TO	1 to 3200 minutes	Time out period	
CM	Setpoint change, Process change	Optimization	
CA	PID, PI	Control action	
TU		To Tuning view	
AT		Start auto-tuning	

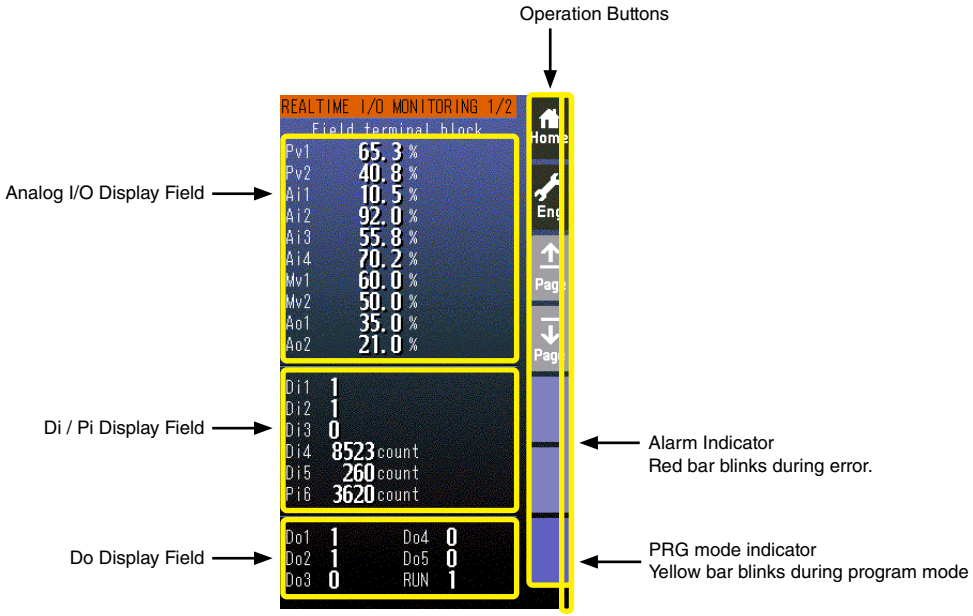
Note 1. SP or AT is locked during the SFEW communication mode.
Note 2. Refer to Section 9. AUTO-TUNING for detailed explanations on each parameter.

Note
Rounding of fractions for engineering unit is rounding down.
Example) When engineering unit range is 0.00 to 30.00 kg and input value is 49.96 %, 14.988 is obtained by converting to engineering unit. 14.98 is displayed by rounding down.

6.3.4. REALTIME I/O MONITORING VIEW

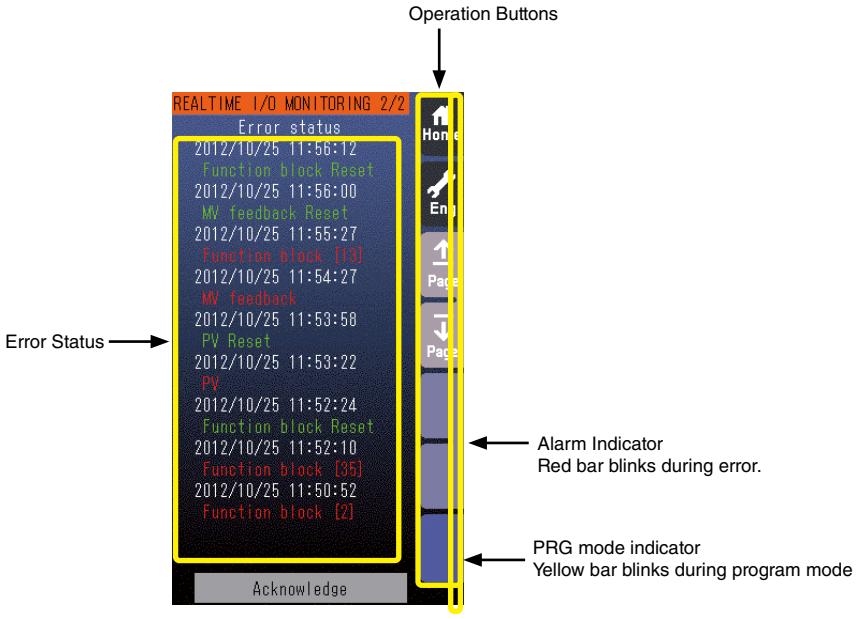
6.3.4.1. SCREEN COMPONENTS

Page 1/2: Field Terminal Block

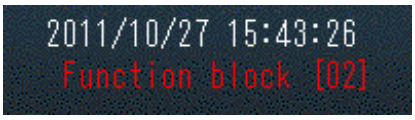


- Analog I/O values are represented in % of the field terminal block range.
- DiX and PiX display items depend upon the user's terminal assignments.
- Di / Do status is given as 1 or 0.
- Pi displays indicate accumulated counts between 0 and 9999 (unit: count).

Page 2/2: Error Status



- Error status fields contain the error type in red and the date it occurred (YYYY/MM/DD HH/MM/SS). (See the example below.)
- For abnormal function block and corruption of EEPROM database, also group number is displayed.



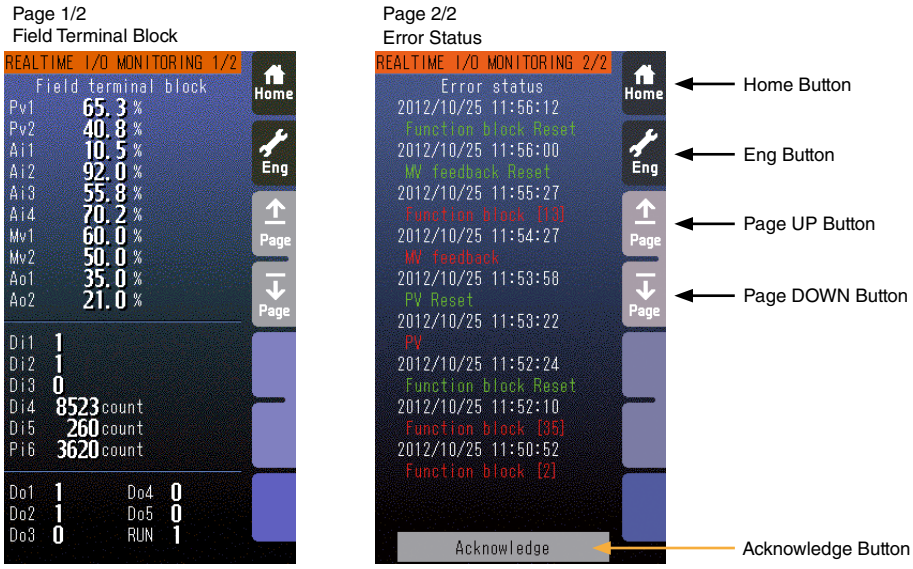
- When error is recovered, the date it is recovered (YYYY/MM/DD) and a message in green are displayed.

- At the maximum of 10 error statuses are displayed. When they exceed 10, oldest one is deleted. Error type is given as in the table below.

ERROR No.	MESSAGE
1	EEPROM database
2	PV
3	MV feedback
4	Function block
5	Control overload
6	Modbus communication

- Error status is detected when the power supply is reset.
- Refer also to Appx 6. DIGITAL DISPLAY ERROR MESSAGES.

6.3.4.2. REALTIME I/O MONITORING VIEW OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.

Eng button

Used to switch among the engineering views.

Pressing/holding the button for approx. 1 second switches the view to Operation view.

Page UP button

Used to go to the previous page.

Page DOWN button

Used to go to the next page.

Acknowledge button

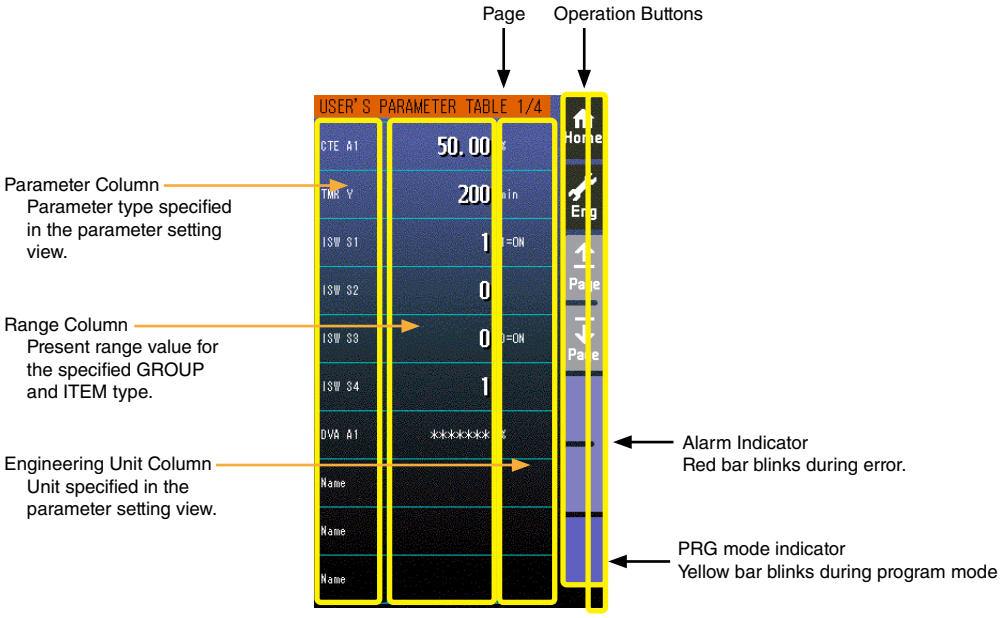
Pressing/holding the button for approx. 1 second deletes recovered error status.

Note

Only the acceleration button among the hardware buttons at the front is usable when the Realtime I/O Monitoring view is on screen. The MV value UP/DOWN buttons and the AUTO / MAN selector are locked.

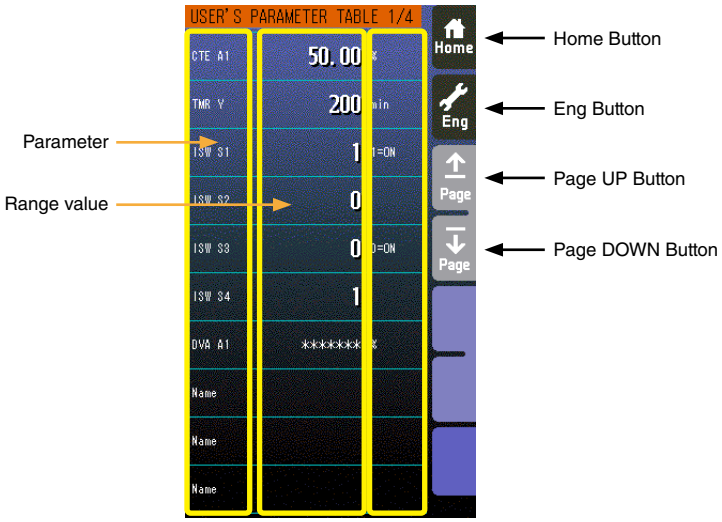
6.3.5. USER'S PARAMETER TABLE VIEW

6.3.5.1. SCREEN COMPONENTS



- At the maximum of 40 parameters (10 per page, 4 pages in total) can be registered for the user's convenience.
- Parameters are registered in the Parameter Setting View.
- Only the parameter type identification is displayed when it is disabled in the Parameter Setting view.
- ' ******* ' is indicated in Range cell when illegal GROUP and/or ITEM No. are set for the parameter.

6.3.5.2. USER'S PARAMETER TABLE VIEW OPERATIONS



Home button

Used to switch the view to the one registered as Home operation view.

Eng button

Used to switch among the engineering views.

Pressing/holding the button for approx. 1 second switches the view to Operation view.

Page UP button

Used to go to the previous page.

Page DOWN button

Used to go to the next page.

Parameter

Touching over a parameter cell switches the view to the Parameter Setting View for the row.

Range value

Touching over a Range cell opens a numeric keypad.

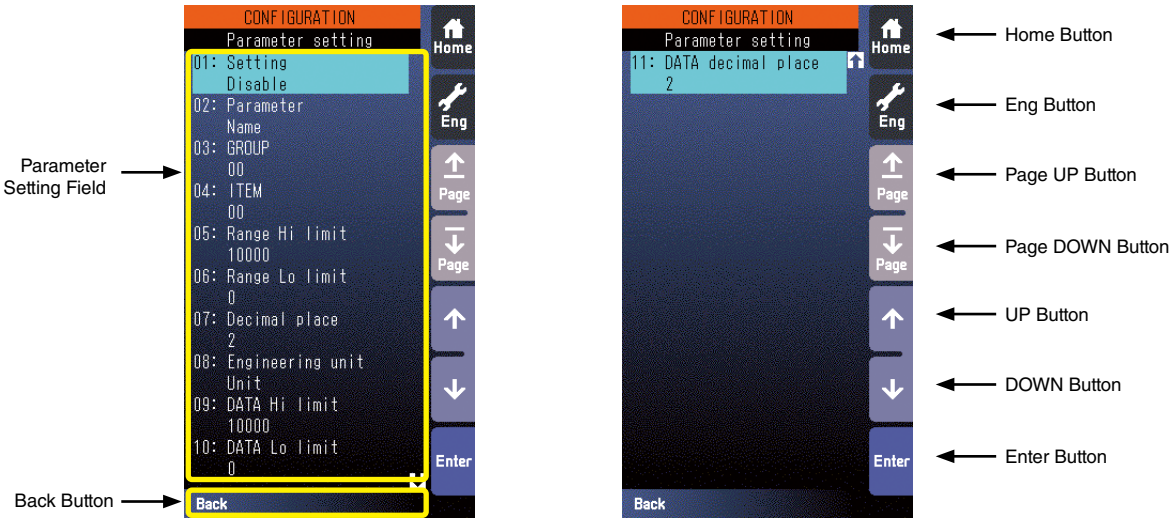
The numeric keypad is not available (1) when ' ******* ' is indicated in Range cell for which illegal GROUP and/or ITEM No. are set, or (2) when the Config. mode is set to 'SFEW.'

Note

Calculation errors when converting range value to internal percentage.
When 20000 and 0 is set as Range high/low limit, setting to 9999 and converting to percentage, 49.995 % is obtained, however, internally it is processed as 49.99 %. Therefore the display shows "9998."

Only the acceleration button among the hardware buttons at the front is usable when the Realtime I/O Monitoring view is on screen. The MV value UP/DOWN buttons and the AUTO / MAN selector are locked.

6.3.5.3. PARAMETER SETTING VIEW OPERATIONS



Home button
Used to switch the view to the one registered as Home operation view.
Pressing/holding the button for approx. 1 second registers the view as Home view (including the 1st/2nd choice).

Eng Button
Pressing/holding the button for approx. 1 second switches the view to Engineering view.
Once the view is switched, it is used to switch among the engineering views.

Page UP button
Locked

Page DOWN button
Locked

UP button
Used to go up to next item in the parameter setting field.

DOWN button
Used to go down to next item in the parameter setting field.

Enter button
Used to select an item to change its value.

Back button
Used to go back to User's Parameter Table view.

Parameter Setting Field
Shows Parameter setting items. Refer to 6.3.5.4. SETTING ITEMS for detail.

6.3.5.4. SETTING ITEMS

ITEMS marked with ◆ in the SC100/200 Series Function Block List are available for changes. All parameters are reset to the default values by the initialization in the Configuration view.

SETTING ITEM	DATA INPUT	DEFAULT	CONTENTS
Setting	Enable / Disable	Disable	Enable / Disable the parameter in the User's Parameter Table view.
Parameter	Max. 10 characters	Name	Parameter identification
GROUP *1	0 to 99	0	GROUP No. in the Function Block List
ITEM *1	0 to 99	0	ITEM No. in the Function Block List
Range Hi limit	±32000	10000	Range's upper range value
Range Lo limit	±32000	0	Range's lower range value
Decimal place	0 to 5	2	Range's decimal point position
Engineering unit	Max. 8 characters	Unit	Range's engineering unit
DATA Hi limit	±32000	10000	DATA's upper range value
DATA Lo limit	±32000	0	DATA's lower range value
DATA decimal place	0 to 5	2	DATA's decimal point position

*1. ' ******* ' is indicated in DATA cell when illegal GROUP and/or ITEM No. are set for the parameter.

6.3.5.5. SETTING EXAMPLES

■ Parameters with fractions

• Setting Ao 1 parameter (ITEM 11) for '8-point Parameter Generator' block (Model No. 86).

• 0.0 kg : 0.00 %, 20.0 kg : 100.00 %

Function Block List

GROUP [30]

ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
◆★11	▲	±115.00%	21: NNN.NN	Ao 1 Parameter

Parameter Setting

SETTING ITEM	DATA INPUT
Setting	Enable
Parameter	CTE A1
GROUP	30
ITEM	11
Range Hi limit	200
Range Lo limit	0
Decimal place	1
Engineering unit	kg
DATA Hi limit	10000
DATA Lo limit	0
DATA decimal place	2

■ Parameters in 0/1 (contact status) format

• Setting S1 internal switch (ITEM 11) for 'Internal Switch' block (Model No. 93).

Function Block List

GROUP [32]

ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
◆★11	▲	0, 1	01: N	S1 Internal switch

Parameter Setting

SETTING ITEM	DATA INPUT
Setting	Enable
Parameter	ISW S1
GROUP	32
ITEM	11
Range Hi limit	1
Range Lo limit	0
Decimal place	0
Engineering unit	1=ON
DATA Hi limit	1
DATA Lo limit	0
DATA decimal place	0

In the above example, DATA engineering unit field is used for a note.

7. FUNCTION BLOCK SETTING

The Controller functions are programmable combining various function blocks.

Although most basic functions of PID control are already set at the factory, the Controller can provide advanced functions by configuring internal function blocks with Loop Configuration Builder software (model: SFEW3E).

Function blocks are common to all devices in M-System's MsysNet system.

7.1. GENERAL DESCRIPTION

• Only One Software for All Devices

Every module in the MsysNet system utilizes one common software, except for the Field Terminal specifically used for each of them. If you learn how to configure one module, you will understand all others.

• No Computer Language: Software Function Blocks

The MsysNet system does not use any specialized computer language, but the "Software Function Blocks". It incorporates programming concepts for PID controllers, computation modules or PLCs which are familiar to users.

• User-Friendly Parameter Setting Software

Loop Configuration Builder software for the SC100/200 Series (model: SFEW3E) is available. With the builder software, you can build configuration files, copy them, save them, and print them.

7.2. FIELD INPUT SETTING

In this section, configuration items related to external connection of the Controller are explained.

7.2.1. PROCESS & ANALOG INPUT SETTING

For process input (Pv 1, Pv 2), choose among 26 input types. Be aware that the terminal connection differs depending upon input types. The factory default setting is "3: 1 to 5 V".

GROUP [04] EXTENSION TERMINAL 1 "▲" marked data modifiable in PROGRAM mode.

ITEM	MDFY	DATA INPUT	DEFAULT SETTING	CONTENTS
36	▲	MM	TP1: 3	Pv 1 input type [MM: input type No.] 12: S 19: Pt100 (JIS '97, IEC) 0: -10-10 V 6: K 13: C 20: Pt100 (JIS '89) 1: -1-1 V 7: E 14: N 21: JPt100 (JIS '89) 2: 0-10 V 8: J 15: U 22: Pt50 (JIS '81) 3: 1-5 V 9: T 16: L 23: Ni100 4: 0-1 V 10: B 17: P 24: MS 5: 4-20 mA 11: R 18: PR 25: DS (Set ITEM37...39 for Pv 1 input type 6...23)
37	▲	-272.0 – 3000.0	HT1: 1000	Pv 1 upper range temperature
38	▲	-272.0 – 3000.0	LT1: .0	Pv 1 lower range temperature
39	▲	0, 1	CJ1: 1	Pv 1 cold junction compensation (0: Without, 1: With)
40	▲	MM	TP2: 3	Pv 2 input type [MM: input type No.] 12: S 19: Pt100 (JIS '97, IEC) 0: -10-10 V 6: K 13: C 20: Pt100 (JIS '89) 1: -1-1 V 7: E 14: N 21: JPt100 (JIS '89) 2: 0-10 V 8: J 15: U 22: Pt50 (JIS '81) 3: 1-5 V 9: T 16: L 23: Ni100 4: 0-1 V 10: B 17: P 24: MS 5: 4-20 mA 11: R 18: PR 25: DS (Set ITEM41...43 for Pv 1 input type 6...23)
41	▲	-272.0 – 3000.0	HT2: 1000	Pv 2 upper range temperature
42	▲	-272.0 – 3000.0	LT2: .0	Pv 2 lower range temperature
43	▲	0, 1	CJ2: 1	Pv 2 cold junction compensation (0: Without, 1: With)

7.2.2. DISCRETE & PULSE INPUT SETTING

Discrete inputs (Di) and pulse inputs (Pi) share the same terminal. Channels set to '0' function as discrete input; those set to '1' function as pulse input. The factory default setting is '00000,' all channels are assigned as discrete input.

GROUP [05] EXTENSION TERMINAL 2 "▲" marked data modifiable in PROGRAM mode.

ITEM	MDFY	DATA INPUT	DEFAULT SETTING	CONTENTS
31	▲	NNNNN	PD:00000	Di/Pi selection (0 = Di, 1 = Pi) N N N N N Di 1 / Pi 1 Di 2 / Pi 2 Di 3 / Pi 3 Di 4 / Pi 4 Di 5 / Pi 5
52	▲	N	PD6: 1	Di/Pi selection (0 = Di, 1 = Pi)

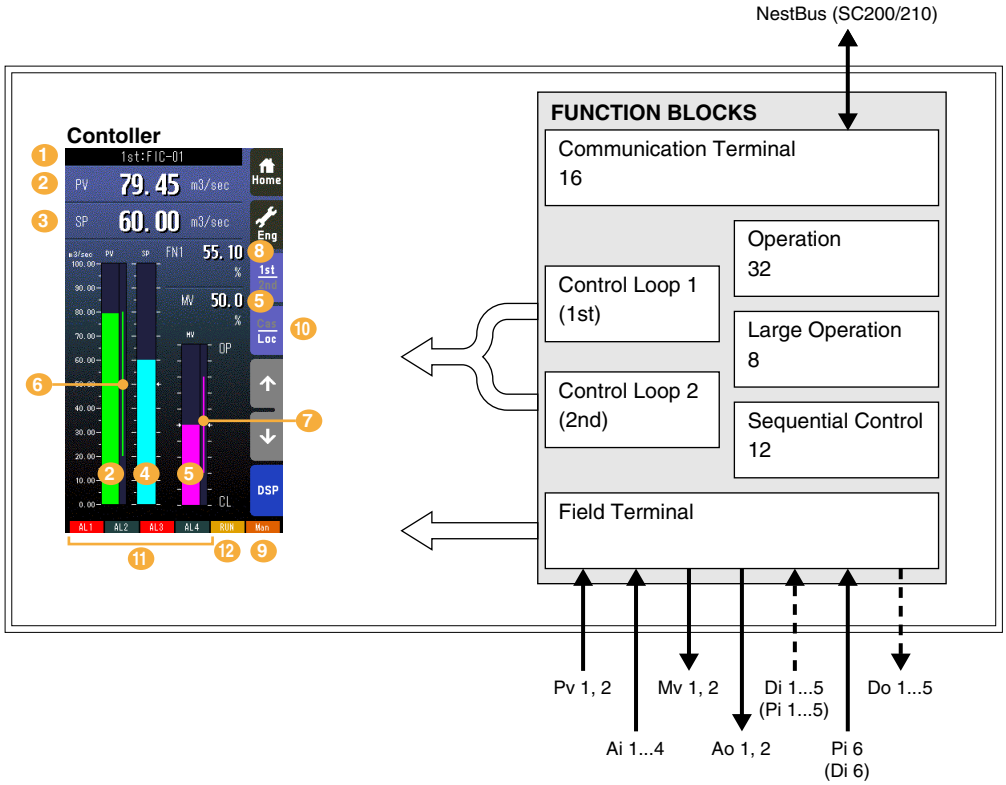
Caution !

When a channel is set to pulse input, ladder sequences employing the channel as discrete input do not function.

7.3. FUNCTION BLOCKS IN RELATION WITH SCREEN CONFIGURATION

The figure below shows an image explaining relations of the Controller display screen with function blocks and external I/Os.

- Operating status of two function blocks assigned to Control Blocks are monitored on the screen.
- Six types of Control Block are available: Basic PID, Advanced PID, Manual Loader, Ratio Setter and Indicator and Pulse Widh Output Type PID.
- The Gr No. for the Control Block assigned to the primary (1st) loop is set in GROUP 01, ITEM 11.
- Displayed items differ depending upon the types of Control Block. The table below shows display items for each type of Control Block.
- RUN and other indicators automatically show present conditions.
- Users can set any characters to AL1 through AL4 indicators and control their ON and OFF functions.



Note: The Gr No. for the Control Block assigned to the primary (1st) loop is set in GROUP 01, ITEM 11. Reset the Controller whenever ITEM 11 has been changed.

DISPLAY CONTENTS DEPENDING ON CONTROL BLOCK TYPES

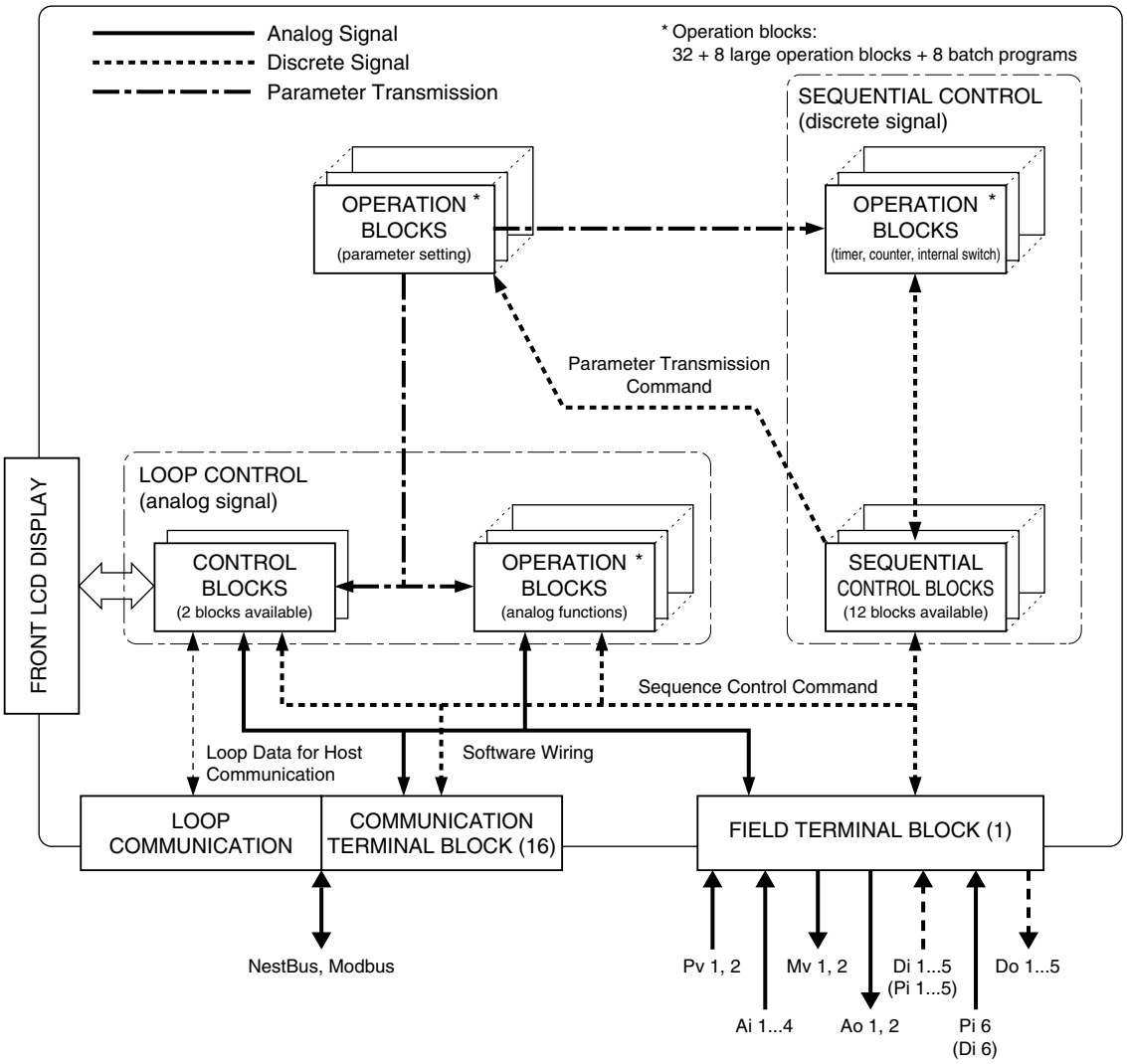
NO.	DISPLAY ITEM	BASIC PID	ADVANCED PID	MANUAL LOADER	RATIO SETTER	INDICATOR	PULSE WIDTH OUTPUT TYPE PID
1	Tag. No.	X	X	X	X	X	X
2	PV Display	X	X	----	X	X	X
3	SP Display	X	X	----	X	----	X
4	SP Bar Display	X	X	----	----	----	X
5	MV Display	X	X	X	X	----	X
6	PV Normal Range	X	X	----	X	X	X
7	MV Output Limit Range	X	X	----	----	----	X
8	FN Display	X	X	X	X	X	X
9	Auto/Man	X	X	----	X	----	X
10	Cas/Loc	X	X	----	X	----	X
11	AL1 – AL4 Indicator	X	X	X	X	X	X
12	RUN Indicator	X	X	X	X	X	X
Note 1. Read 'Position Input' for 'MV Display', 'Position Input High/Low Limit' for 'MV Output Limit Range' with Pulse Width Output Type PID.							

7.4. RELATIONS BETWEEN FUNCTION BLOCKS

• Close connection between PID control and sequential control

• I/O point expansion via software terminal blocks

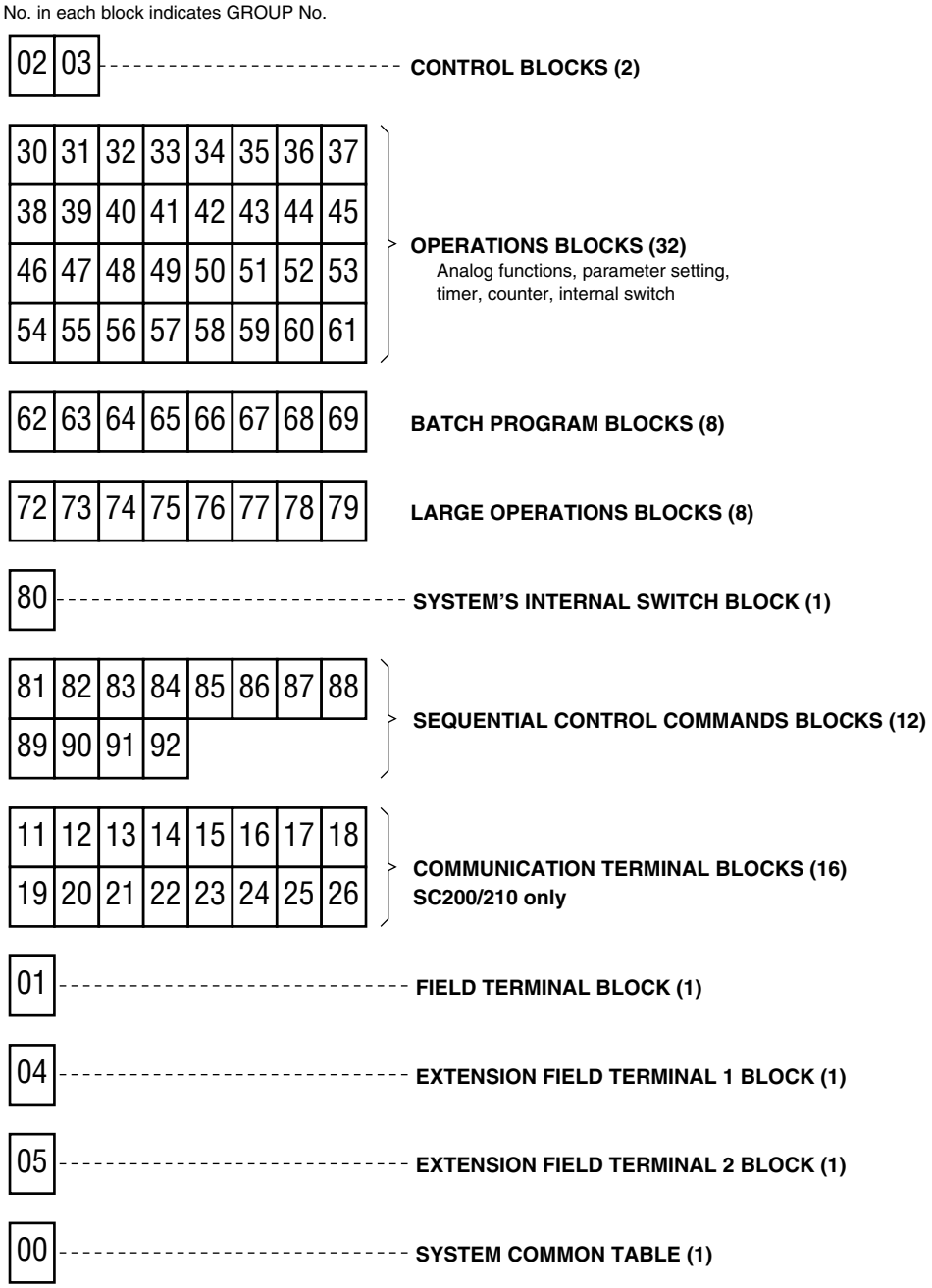
• Automatic parameters and setpoints change via “Parameter Setter” block



7.5. FUNCTION BLOCK ALLOCATIONS

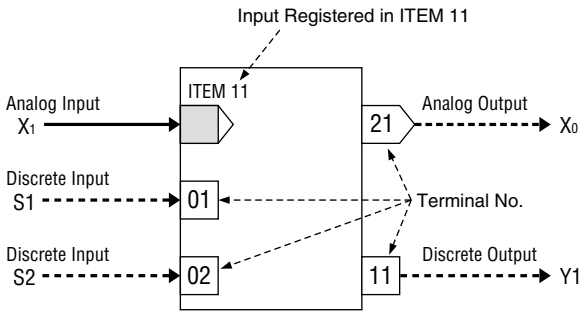
Capability of one module of the Controller, number and type of function blocks and their allocations, would be well explained if you imagine an instrument panel.

- Number of instruments mountable in one instrument panel is as shown in the figure below. A Group No. means allocation No. in the panel.
- You choose a Group No. and program a Function Block model in ITEM 10. Then all other available ITEMs will be shown according to the function model.
- For the Field Terminal block, users cannot change the model setting.



7.6. CONNECTING BETWEEN FUNCTION BLOCKS

7.6.1. EXAMPLE OF CONNECTION TERMINALS REPRESENTATION IN A FUNCTION BLOCK



7.6.2. CONNECTING ANALOG SIGNALS

- Input signal: Group No. and Terminal No. of the signal you need to input (GGNN) is described in a designated ITEM of the target function block.
- Output signal: Output terminal No. is determined for each function block type.

[Example]

If Basic PID block needs to input PV signal from Field Terminal block, the terminal No. of PV signal is represented as 0421 (04: Group No., 21: Terminal No.). Then you write 0421 in ITEM 15 in the PID block.

7.6.3. CONNECTING DISCRETE SIGNALS

Discrete I/O terminals are available in function blocks. You can process these I/O signals via relay logic programs in Sequential Control Program block or via Contact Distributor block.

Relay Logic Program

- Discrete input: Discrete input terminal No. is allocated to a coil in relay logic program. It can be input also as discrete signal of the relay logic.
- Discrete output: Discrete output terminal No. pre-determined for each function block type is input as discrete signal of the relay logic.

Contact Distributor

A discrete contact input is connected to a discrete contact output just like analog signals. Combination of terminals for discrete input and output is registered in the Contact Distributor block.

7.6.4. PARAMETER SETTER

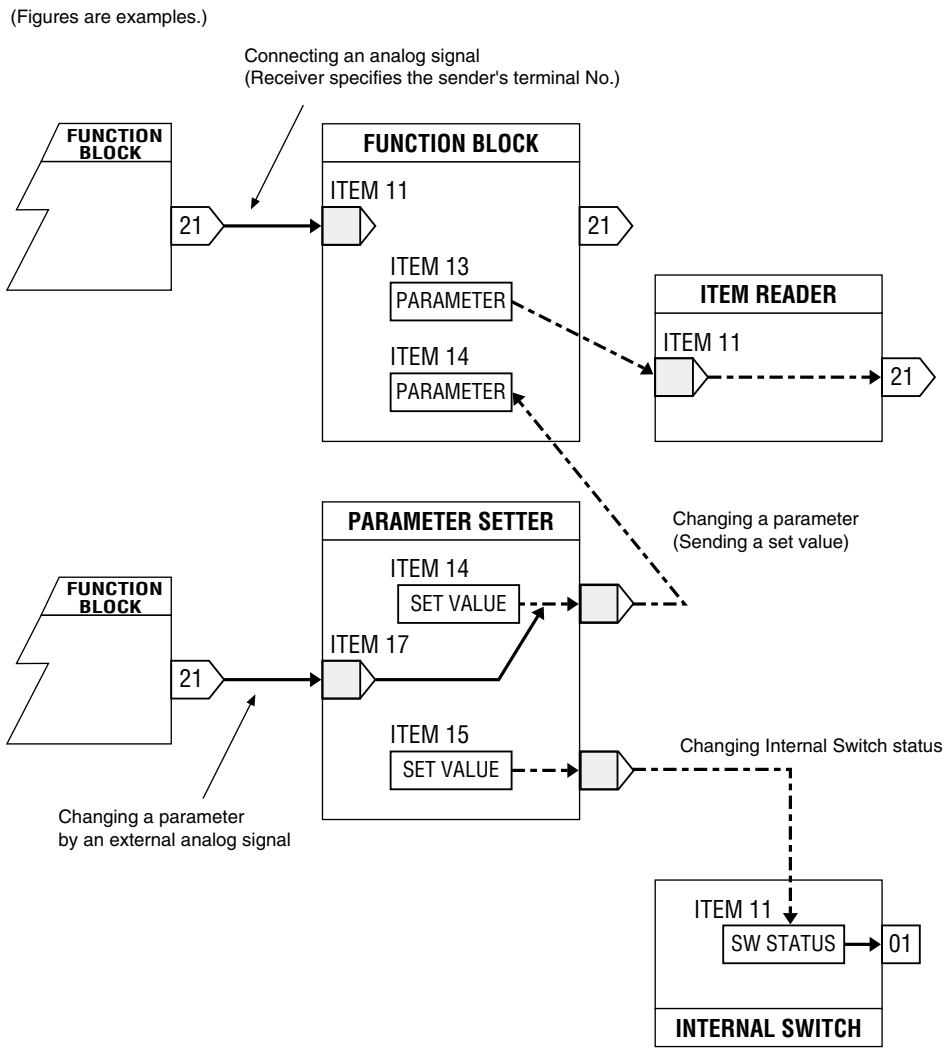
Various parameters and their output connection terminals (location of the parameter) are preset in Parameter Setter function block and sent when necessary via a trigger signal from Sequential Control Program block.

WARNING !

Parameters in the Parameter Setter block are rewritable up to 100 000 times. For example, if parameters are updated every hour, the memory will reach its usable limit in approx. 11 years.

7.6.5. ITEM READER

Parameters are converted into analog signals via this ITEM Reader block.



7.7. SOFTWARE COMMUNICATION BY COMMUNICATION TERMINALS

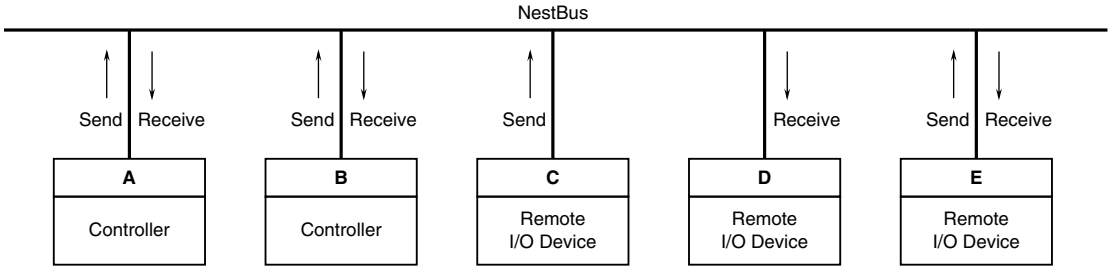
Communication Terminal blocks are used for sending/receiving analog signals and discrete signals between Controllers and remote I/Os.

Sending and Receiving Principles

Token passing protocol is used in this system. A token (right to transmit) goes around nodes (devices connected to the network). Each device, in its turn, broadcasts transmission data to the network. Other devices listen to them and take in necessary data.

There are four (4) communication terminal blocks as following:

- Di Receive Terminal: Discrete input, 32 points
- Do Send Terminal: Discrete output, 32 points
- Ai Receive Terminal: Analog input, 2 points
- Ao Send Terminal: Analog output, 2 points

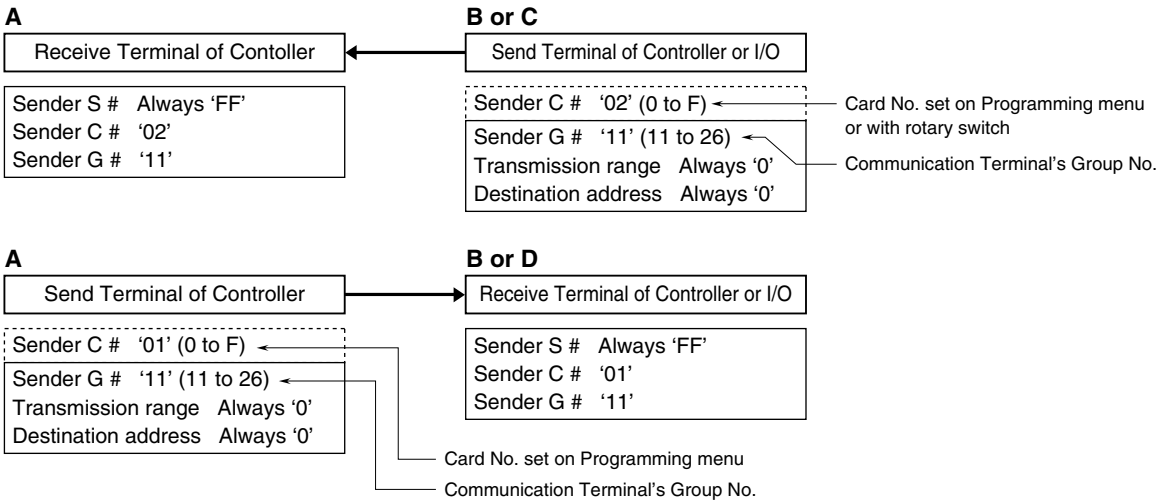


For transmitting data from the device A to the device B in the example shown above, first set necessary data in Send Terminal of the device A and broadcasts them to the network. Then set in Receive Terminal of the device B with the sender address specifying the device A, and take in the data from the network.

Transmission data are broadcasted to the network together with their sender address. If another device requires to receive one of these data, set in its Receive terminal with the required sender address.

Address Setting Example

The following is an example of actual setting to transmit between the Controller A and B (or remote I/O C or D) mentioned in the above figure. In the figure below, boxes in solid line indicate data set in ITEMs of Communication Terminal blocks. Those in broken line indicates those set by other means such like Programming menu on the Controller or DIP switches of remote I/O device.



8. COMMUNICATING WITH THE SFEW3E PROGRAM

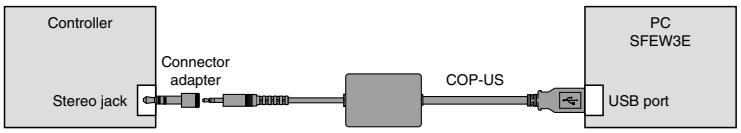
8.1. GENERAL DESCRIPTION

The Loop Configuration Builder Software (model: SFEW3E) is used to upload and download the function block data. Refer to the Users Manual for the SFEW3E for detailed descriptions.

8.2. CONNECTING THE CONTROLLER TO PC

Connect the Controller to PC in order to communicate with the SFEW3E.

1) Install the SFEW3E program and driver for PC Configurator cable (model: COP-US) to the PC and connect the COP-US to its USB port.
2) Start up the SFEW3E and set the COM port number assigned to the USB in the initial setting.
3) Connect the COP-US to the connector adaptor and after this, to the Controller's jack port.
4) Go to Engineering View and choose Configuration > 01 : Config mode > 02 : SFEW. The front monitoring LED starts blinking slowly to indicate the ready state. Refer to Section 6.3.1.4. CONFIG MODE to operate the Controller.



9. AUTO-TUNING

The PID controller provides accurate control characteristics only by adequately combining proportional band (P), integral time (I) and derivative time (D) and tuning each parameter to most appropriate values.

The P, I and D parameters can be set on the tuning view of the Controller. In addition, it has the auto-tuning mode enabling the user to determine approximate parameters automatically by simple panel operations.

9.1. GENERAL DESCRIPTIONS

The SC Controller uses the limit cycle oscillation for auto-tuning. The control output (MV) is given with a cyclic oscillation (two cycles) at the reference tuning point (CV) where the PV behavior is observed. The most appropriate PID parameters are then computed from measured values of the amplitude and frequency of the established output limit cycle waveform.

During this procedure, MV must be given with sudden changes, therefore this method is not recommended to a system that does not tolerate such disturbance for valve operations. Furthermore, it is not suitable for use in a control system with fast response time or that with an extremely long cycle time.

In general, the limit cycle method is recommended when the ratio L/T of dead time (L) divided by time constant (T) ranges between 0.15 and 0.6, while the control characteristics worsen with values greater than 1, reach its controllable limit with 2, when it is no longer suitable for PID control.

Be aware that the process may react in an unexpected way during auto-tuning procedure. Naturally the parameters obtained in this method may not be the most appropriate. Manual adjustments are recommended to tune them finely.

Refer to Section 6.3.3. TUNING (AUTO-TUNING) VIEW to operate the Controller for the following auto-tuning procedure.

9.2. AUTO-TUNING OPERATIONS

With all auto-tuning parameters set, choose 'AT : Run Auto-tuning.' If the selected reference tuning point (CV) value is greater than the setpoint (SP), a message for caution appears on the screen to warn a possible damage to the control system.

Control output (MV) is changed in a step between 100% and 0%. PV amplitude (Kcp) and frequency (Tcp) are measured to calculate appropriate PID parameters. When MV high limit (MH) is set to a value lower than 100% and/or low limit (ML) to one higher than 0%, MH and/or ML values are used for oscillation. Fix MV at 0% when the control action (DR) is set to '1 : Reverse (MV decreases with increasing PV);' or at 100% when it is set to '0 : Direct,' and wait until PV is stable enough before starting auto-tuning procedure.

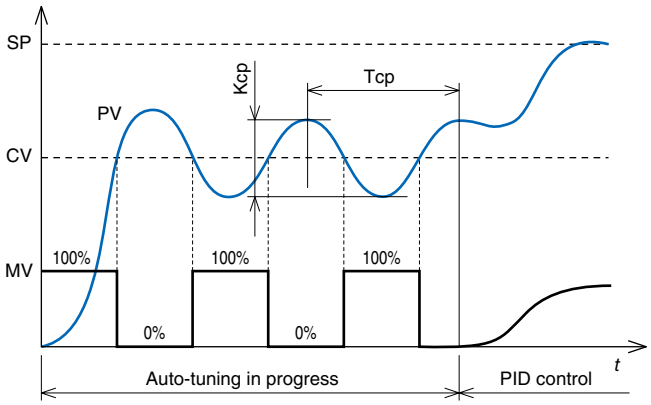
The following example of the Controller operation is applied to reverse control action.

1) Blue AUTO indicator starts blinking. MV is switched to 100% and then to 0% when PV crosses across CV.
2) MV is then again switched to 100% when PV crosses across CV the second time. These cycles are repeated for twice.
3) Amplitude (Kcp) and frequency (Tcp) of the reacting PV waveform as in the figure to the right are measured.
4) P, I and D parameters are obtained from the following formulae using Kcp and Tcp values. The a, b and c values depend upon optimization and control action settings.

   Proportional gain: K = a Kcp
   (Proportional band : PB = 100% / K)

   Integral time: TI = b Tcp

   Derivative time: TD = c Tcp
5) Store the calculated parameters and go back to normal PID control mode. Green AUTO indicator is turned on.



The above figure shows operation with reverse control action.
MV cycles are inverted with direct action.
Wait to start the procedure until PV is stabilized.

When the auto-tuning procedure is completed abnormally as explained in the following, 'MI : Fixed MV' at error value is applied as MV.

- When PV goes over PV high limit or below PV low limit.
- When the procedure does not complete before preset time out (TO) is elapsed.
- When 'AT : Stop Auto-tuning' is selected (a message for caution appears on the screen).

9.3. OPTIMIZATION & CONTROL ACTION

OPTIMIZATION	DESCRIPTION
Process change	(= Constant-value control) PID parameters are calculated so to suit PV signal change (disturbance). Choose this option for single loop control and for primary loop control in a cascade control loop.
Setpoint change	(= Follow-up control) PID parameters are calculated so to suit SP signal change. Choose this option for secondary loop control in a cascade control loop.

OPERATION MODE	DESCRIPTION
PID	P, I and D parameters
PI	P and I parameters

9.4. MANUAL ADJUSTMENT OF PID PARAMETERS FOR FINE TUNING

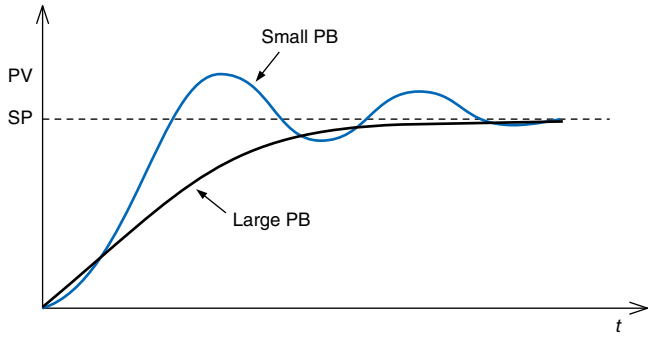
Parameters obtained by auto-tuning may not be the most appropriate. Run an actual control operation with them and confirm their adequacy. When further manual adjustments are needed, refer to the following instructions.

Proportional Band (PB)

Set a larger PB when the system allows more time to track SP but less overshooting.

Set a smaller PB when the system allows more overshooting but less time to stabilize, or when it needs to recover more quickly from a disturbance.

Be aware that the output signal may start hunting if you choose too small a proportional band.

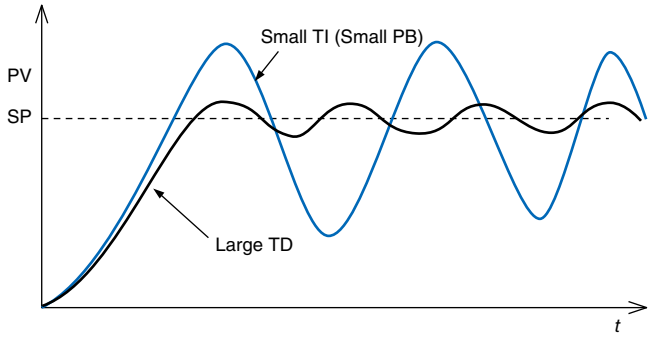


Integral Time (TI)

Repeating overshooting/undershooting or hunting of long cycles suggests the integral action may be too intensive. Set a larger TI or a larger PB to minimize hunting.

Derivative Time (TD)

Hunting of short cycles suggests too fast a response time of the control system and the derivative action may be too intensive. Set a smaller TD in such cases.



10. COMMUNICATING WITH THE SCCFG PROGRAM

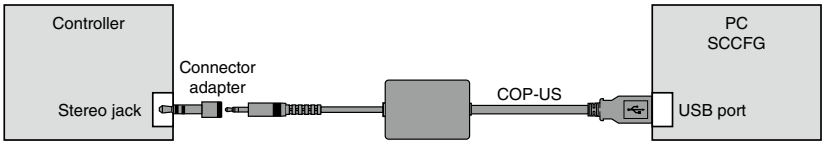
10.1. GENERAL DESCRIPTION

The PC Configurator Software (model: SCCFG) is used to save and transfer setting parameters.

Refer to the Users Manual for the SCCFG for detailed descriptions.

10.2. CONNECTING THE CONTROLLER TO PC

1) Install the SCCFG program and driver for PC Configurator cable (model: COP-US) to the PC and connect the COP-US to its USB port.
2) Set the COM port number assigned to the USB for use with the SCCFG.
3) Connect the COP-US to the connector adaptor and after this, to the Controller's jack port.
4) Go to Engineering View and choose Configuration > 01 : Config mode > 03 : SCCFG. The front monitoring LED starts blinking rapidly to indicate the ready state. Refer to Section 6.3.1.4. CONFIG MODE to operate the Controller.



10.3. SAVING SHORT TREND DATA

Short trend data stored in the Controller can be exported in a CSV file. Exported data range depends upon the trend recording status:

START: Max. 400 samples backward from the most recent sample
STOP: Max. 400 samples backward from the moment of STOP command.
PAUSE: Max. 400 samples backward from the moment of PAUSE command.

Refer to the Users Manual for the SCCFG for the CSV file format.

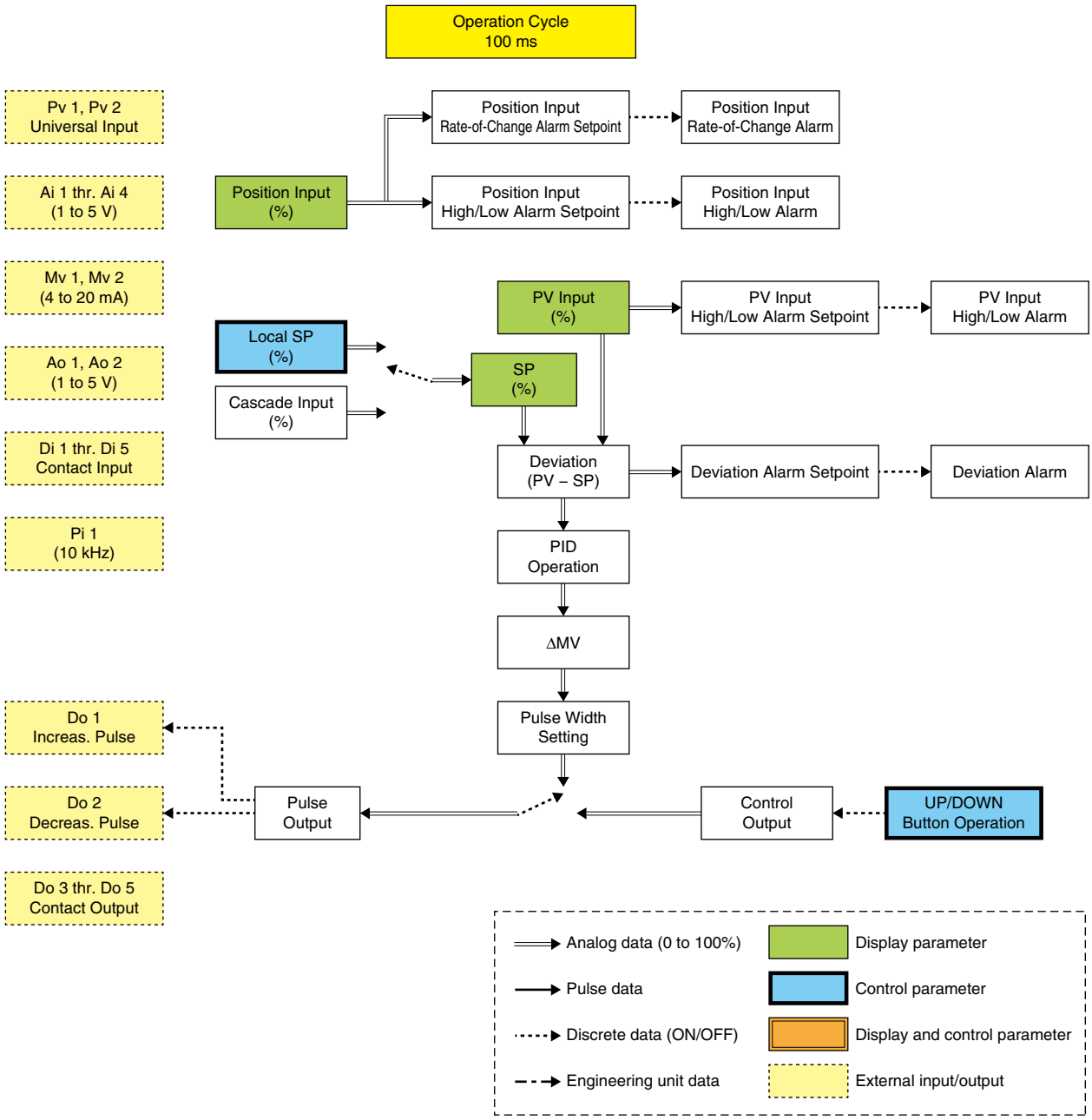
10.4. TRANSFERRING SETTING PARAMETERS

Setting parameters (those marked with 'Y' in the rightmost column of '6.3.1.3. CONFIGURATION PARAMETERS' table plus all items in '6.3.5.4. SETTING ITEMS' table) can be uploaded and saved in a PC file. Setting files can be downloaded to the Controller device. They can be copied to multiple devices in turn.

Transferred parameters become valid only after the power supply to the Controller is reset.

11. PULSE WIDTH OUTPUT TYPE PID

11.1. FUNCTION DIAGRAM



11.2. PULSE WIDTH OUTPUT TYPE PID OPERATION AND SETTING

Use GROUP 03 to register the pulse width output type PID control. Refer to Appx 1.5. PULSE WIDTH OUTPUT TYPE PID for details of ITEMS.

11.2.1. POSITION INPUT

- Position input: Shows the position input value.
- Position input high/low alarm setpoint: Used to set the high and low alarm setpoints for the position input.
- Position input high/low alarm: Turns to '1' when the position input is out of the alarm setpoint range, otherwise remains '0'.
- Position input rate-of-change alarm setpoint: Used to set the rate-of-change (per control cycle) alarm setpoint for the position input.
- Position input rate-of-change alarm: Turns to '1' when the position input is out of the alarm setpoint range, otherwise remains '0'.

Setting ITEM

ITEM 72: Position input high alarm setpoint
ITEM 73: Position input low alarm setpoint
ITEM 75: Position input rate-of-change alarm setpoint

Data

ITEM 71: Position input
ITEM 77: Position input high alarm
ITEM 78: Position input low alarm
ITEM 79: Position input rate-of-change alarm

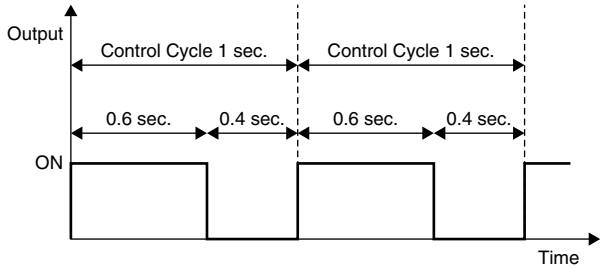
11.2.2. PULSE WIDTH OUTPUT

11.2.2.1. AUOTMATIC OPERATION MODE

- Full stroke time (sec): Time duration for the control output travels from 0% to 100%.
- Minimum pulse width (sec): Minimum ON pulse width
- ΔMV: MV deviation per control cycle (%)
- Output pulse: Provided in the interval of control cycles. Do 1 (increas. pulse) is output when ΔMV is positive, Do 2 (decreas. pulse) is output when ΔMV is negative. Increas. pulse output status turns to '1' while the increasing pulses are output, decreas. pulse output status turns to '1' when the decreasing pulses are output. ON pulse width equals [ΔMV*Full Stroke Time / 100] (sec).

Note 1: Control cycle must be greater than ON pulse width.
Note 2: No pulse output when the minimum pulse width is wider than ON pulse width.

[Setting Example]
Control cycle: 1 second Full stroke time: 60 seconds Minimum pulse width: 0.02 second
At ΔMV = 1%, ON pulse width = 1*60/100 = 0.6 second.
Pulses modulated with ON = 0.6 sec. and OFF = 0.4 sec. every second are provided as output.



The output turns off within the control cycle when ΔMV is 0.03% or less (minimum pulse width > ON width).
The output turns on within the control cycle when ΔMV is 1.67% or more (control cycle < ON width).

Setting ITEM

ITEM 53: Full stroke time
ITEM 54: Minimum pulse width

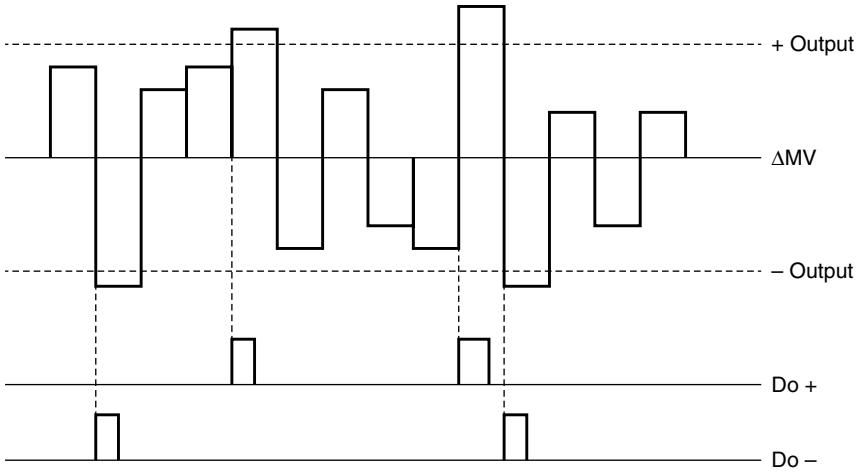
Data

ITEM 65: ΔMV
ITEM 67: Increas. pulse output status
ITEM 68: Decreas. pulse output status

[Output Operation for Less-than-minimum Pulse Width]

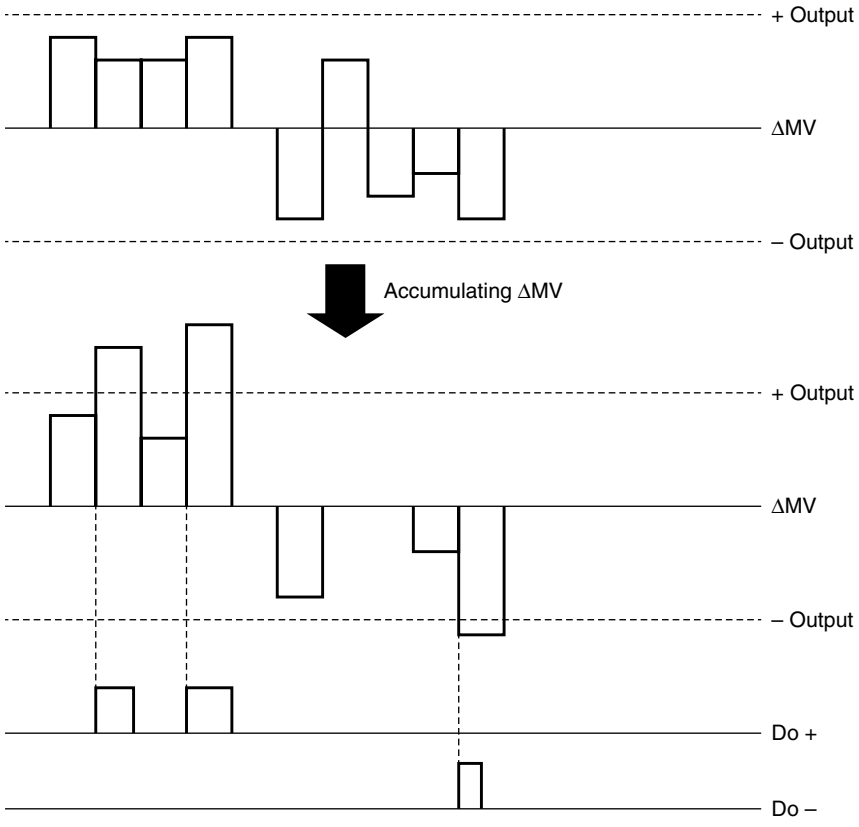
• Drop-off

The output turns on when the ON pulse width calculated every control cycle using ΔMV and the full stroke time exceeds the minimum pulse width setting.



• Accumulate

The output turns on when the accumulated ON pulse width calculated using accumulated ΔMV exceeds the minimum pulse width setting.



Setting ITEM

ITEM 55: Output operation for less-than-minimum pulse width

11.2.2.2. MANUAL OPERATION

The pulse output is provided by operating MV UP/DOWN buttons on the front panel when the operating mode is set to 'Manual' (ITEM 59: 0).

Appx 1. FUNCTION BLOCKS PARTICULAR TO SC200D

Appx 1.1. SYSTEM COMMON TABLE

BLOCK NAME

System Common Table

GROUP [00] ★: Setting data

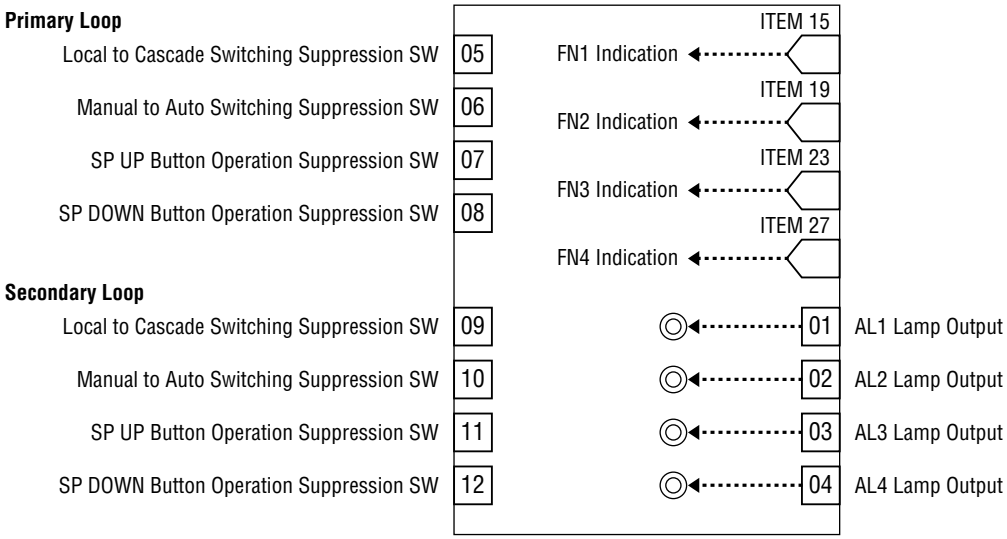
	ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
	01	●	(always modifiable)		■ MAINTENANCE SWITCH (lock command) Switching Group 00 maintenance switch affects all other groups.
			0	MT: 0	MONITOR mode: data monitoring only
			1	MT: 1	PROGRAM mode: "▲" marked data modifiable
			S	MT: S	SIMULATION mode: "❄" marked data modifiable
	02	IND			■ CONTROL STATUS INDICATION
				RUN	Running
				STOP	Stopped
	03	▲			■ OPERATION COMMAND
			0	STOP	Stop
			1	HOT START	Hot start
			2	COLD START	Cold start
	06	IND			■ Nest Bus TRANSMISSION STATUS INDICATION
				RUN	Transmitting
				STOP	Stopped
★	08	▲			■ Nest Bus TRANSMISSION MODE
			0	0	Send/Receive mode C#: 00 to 0F
			1	1	Receive only mode C#: 10 to 1E (C# upper digit is automatically set to '1'.)
★	11	▲	50 to 3000	NNNN	■ COMPUTATION CYCLE (msec) Selectable in every 10 milliseconds
	12	IND		NNN%	■ CONTROL LOAD RATE INDICATION (%)
	13	●	0	NNN%	■ MAX. CONTROL LOAD RATE INDICATION (%) Reset when "0" is entered.
					■ SYSTEM STATUS INDICATION (error indication)
	21	IND			• EEPROM Data Base Failed
				ALLRIGHT	All blocks proved normal
				GROUP NN	Abnormal block No. indication (NN: GROUP No.)
	23	IND			• MV Feedback Abnormality (Mv 1 OR Mv 2) deviation alarm status of MV check input and MV output in the field terminal block indicated
				MV NORMAL	MV feedback proved normal
				MV ABNORMAL	MV feedback proved abnormal
	24	IND			• Block Abnormality (GROUP No. indicated)
				ALLRIGHT	All blocks proved normal
				GROUP NN	Abnormal block No. indication (NN: GROUP No.)
	25	IND			• Control Overload
				LOAD: RIGHT	Appropriate control load
				LOAD: OVER	Control overload
	26	IND			• Supervisory communication error
				COM: NN	Number of communication error events (NN)
	30	IND			• Supervisory communication error
				COM: PER: NN	Number of parity error events (NN)

	ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
	31	IND			• Supervisory communication error
				COM: FER: NN	Number of framing error events (NN)
	32	IND			• Supervisory communication error
				COM: OER: NN	Number of overrun error events (NN)
	33	IND			• Supervisory communication error
				COM: SER: NN	Number of sum check error events (NN)
	35	IND			• Abnormal FB No. hold
				ALLRIGHT	All blocks proved normal
				GROUP NN	Abnormal block No. indication (NN: GROUP No.)
	36	IND			• Abnormality contents hold
				ER: NN	Abnormal block contents (NN)
	40	●			■ COMPUTATION CYCLE SWITCHING FLAG
			0, 1	0	Normal
				1	Computation cycle switched
					Reset when "0" is entered. Once reset, "LOAD: RIGHT" is set in ITEM 25.
★	51	▲	0 – F	CD : 0	■ CARD NO. REGISTRATION (Remark 1)
★	60	▲			■ RUN CONTACT ERROR RESET MODE
			0, 1	0	Automatic reset
				1	Manual reset
★	61	●			■ RUN CONTACT ERROR RESET FLAG
			0, 1	0	Normal
				1	Reset
					Valid when ITEM 60 is set to "Manual".
	95	▲	1	BLOCK RELEASE	■ DELETE MODEL NO. COMMAND
				(initial display *)	Group 00, 01, 04, 05, 06 or 80 are not deleted.
★	96	IND	71	FIELD: 71	■ FIELD TERMINAL MODEL IDENTIFICATION
★	97	▲		SC200D	■ HARDWARE MODEL NO. INDICATION (max. 8 characters, for use in the supervisory system)
	99	IND		DCSSC N.NN	■ ROM VERSION INDICATION

Remark 1: The controller is automatically reset when the card No. is changed.

Appx 1.2. SC200D FIELD TERMINAL

ABBR	FIELD TERMINAL	ABBR
F83	SC200D Field Terminal	F83



GROUP [01] ★: Setting data

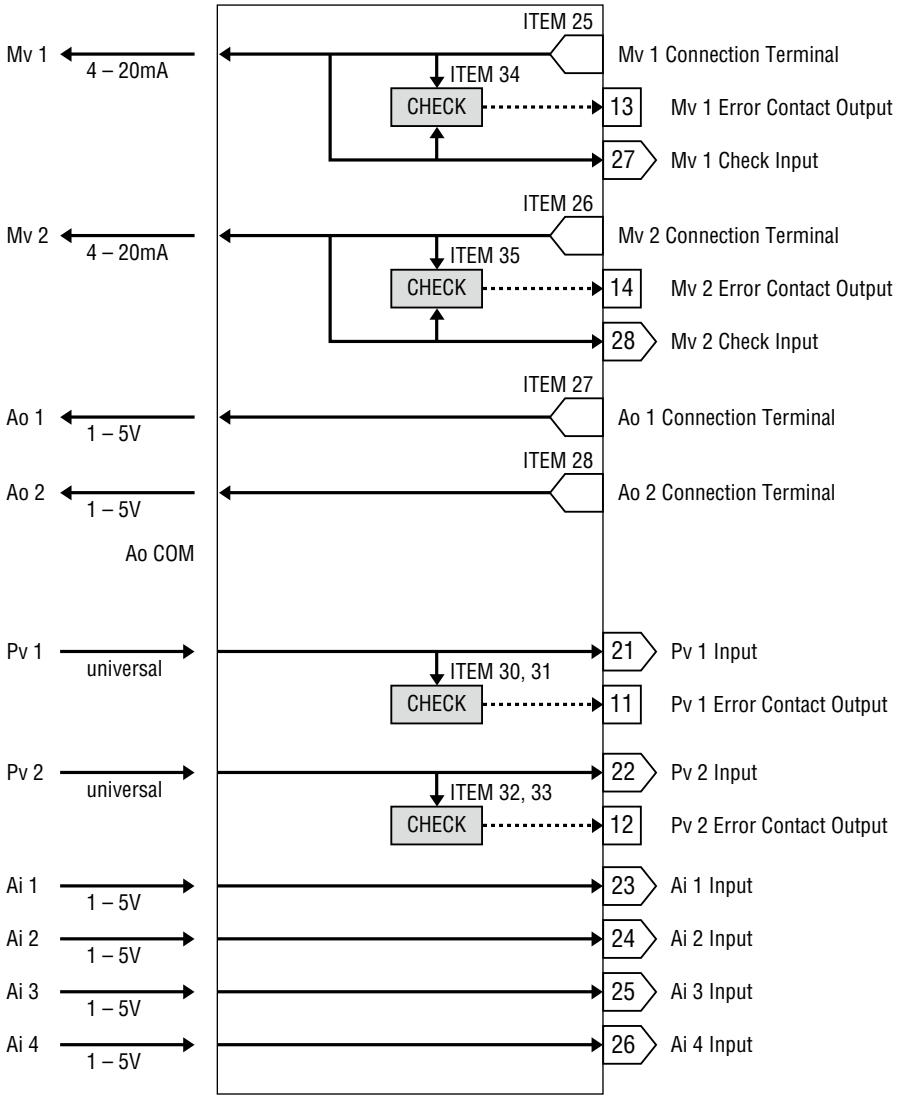
ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
01	●	(always modifiable)		■ MAINTENANCE SWITCH (lock command)
				Same mode for Extension Field Terminal 1 through 4
		0	MT: 0	MONITOR mode: data monitoring only
		1	MT: 1	PROGRAM mode: "▲" marked data modifiable
		S	MT: S	SIMULATION mode: "❄" marked data modifiable
02	IND	No input	ER: NN	Error indication (00: normal, 01 – 90: error) Extension Field Terminal 1 and 2 included
10	**IND**	**11**	**MD: 11**	**FIELD TERMINAL (model)**
INDICATION				
★ 11	▲	2, 3	GR: 2	Primary loop Group No. (valid after reset)
★ 12	▲	0, 1	M1: N	Primary MV operational range (0: ±115%, 1: -15 – +115%)
★ 13	▲	0, 1	M2: N	Secondary MV operational range (0: ±115%, 1: -15 – +115%)
★ 15	▲	GGNN	1F: 3121	FN1 connection terminal for indication GG: Group No. NN: terminal No.
★ 16	▲	±32000	1H: 1500	FN1 upper range (in engineering unit)
★ 17	▲	±32000	1L: 0	FN1 lower range (in engineering unit)
★ 18	▲	0, 1, 2, 3, 4, 5	1D: 1	FN1 decimal point position (from rightmost digit)
★ 19	▲	GGNN	2F: GGNN	FN2 connection terminal for indication GG: Group No. NN: terminal No.
★ 20	▲	±32000	2H: NNNNN	FN2 upper range (in engineering unit)
★ 21	▲	±32000	2L: NNNNN	FN2 lower range (in engineering unit)
★ 22	▲	0, 1, 2, 3, 4, 5	2D: N	FN2 decimal point position (from rightmost digit)
★ 23	▲	GGNN	3F: GGNN	FN3 connection terminal for indication GG: Group No. NN: terminal No.
★ 24	▲	±32000	3H: NNNNN	FN3 upper range (in engineering unit)
★ 25	▲	±32000	3L: NNNNN	FN3 lower range (in engineering unit)
★ 26	▲	0, 1, 2, 3, 4, 5	3D: N	FN3 decimal point position (from rightmost digit)

ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
★ 27	▲	GGNN	4F: GGNN	FN4 connection terminal for indication GG: Group No. NN: terminal No.
★ 28	▲	±32000	4H: NNNNN	FN4 upper range (in engineering unit)
★ 29	▲	±32000	4L: NNNNN	FN4 lower range (in engineering unit)
★ 30	▲	0, 1, 2, 3, 4, 5	4D: N	FN4 decimal point position (from rightmost digit)
★ 31	▲	alphanumeric	T1: XXX...X	FN1 tag name (max. 10 characters)
★ 32	▲	alphanumeric	T2: XXX...X	FN2 tag name (max. 10 characters)
★ 33	▲	alphanumeric	T3: XXX...X	FN3 tag name (max. 10 characters)
★ 34	▲	alphanumeric	T4: XXX...X	FN4 tag name (max. 10 characters)
★ 35	▲	alphanumeric	U1: XXX...X	FN1 engineering unit (max. 8 characters)
★ 36	▲	alphanumeric	U2: XXX...X	FN2 engineering unit (max. 8 characters)
★ 37	▲	alphanumeric	U3: XXX...X	FN3 engineering unit (max. 8 characters)
★ 38	▲	alphanumeric	U4: XXX...X	FN4 engineering unit (max. 8 characters)
39	▲ ❄	0, 1	01: N	AL1 lamp output
40	▲ ❄	0, 1	02: N	AL2 lamp output
41	▲ ❄	0, 1	03: N	AL3 lamp output
42	▲ ❄	0, 1	04: N	AL4 lamp output
★ 43	▲	alphanumeric	L1: XXXX	AL1 comment (max. 4 characters)
★ 44	▲	alphanumeric	L2: XXXX	AL2 comment (max. 4 characters)
★ 45	▲	alphanumeric	L3: XXXX	AL3 comment (max. 4 characters)
★ 46	▲	alphanumeric	L4: XXXX	AL4 comment (max. 4 characters)
CONTROL (Remark 1)				
Primary Loop				
51	▲ ❄	0, 1	05: N	Local to Cascade switching suppress. SW (0: permit, 1: prohibit)
52	▲ ❄	0, 1	06: N	Manual to Auto switching suppress. SW (0: permit, 1: prohibit)
53	▲ ❄	0, 1	07: N	SP UP button operation suppress. SW (0: permit, 1: prohibit)
54	▲ ❄	0, 1	08: N	SP DOWN button operation suppress. SW (0: permit, 1: prohibit)
Secondary Loop				
55	▲ ❄	0, 1	09: N	Local to Cascade switching suppress. SW (0: permit, 1: prohibit)
56	▲ ❄	0, 1	10: N	Manual to Auto switching suppress. SW (0: permit, 1: prohibit)
57	▲ ❄	0, 1	11: N	SP UP button operation suppress. SW (0: permit, 1: prohibit)
58	▲ ❄	0, 1	12: N	SP DOWN button operation suppress. SW (0: permit, 1: prohibit)

Remark 1: Control by a host device connected via Modbus prevails the local setting.

Appx 1.3. SC200D EXTENSION FIELD TERMINAL 1

ABBR	FIELD TERMINAL	ABBR
F83	SC200D Extension Field Terminal 1	F83



ITEM 02 has no error indication. It is indicated in GROUP 01 (Field Terminal).

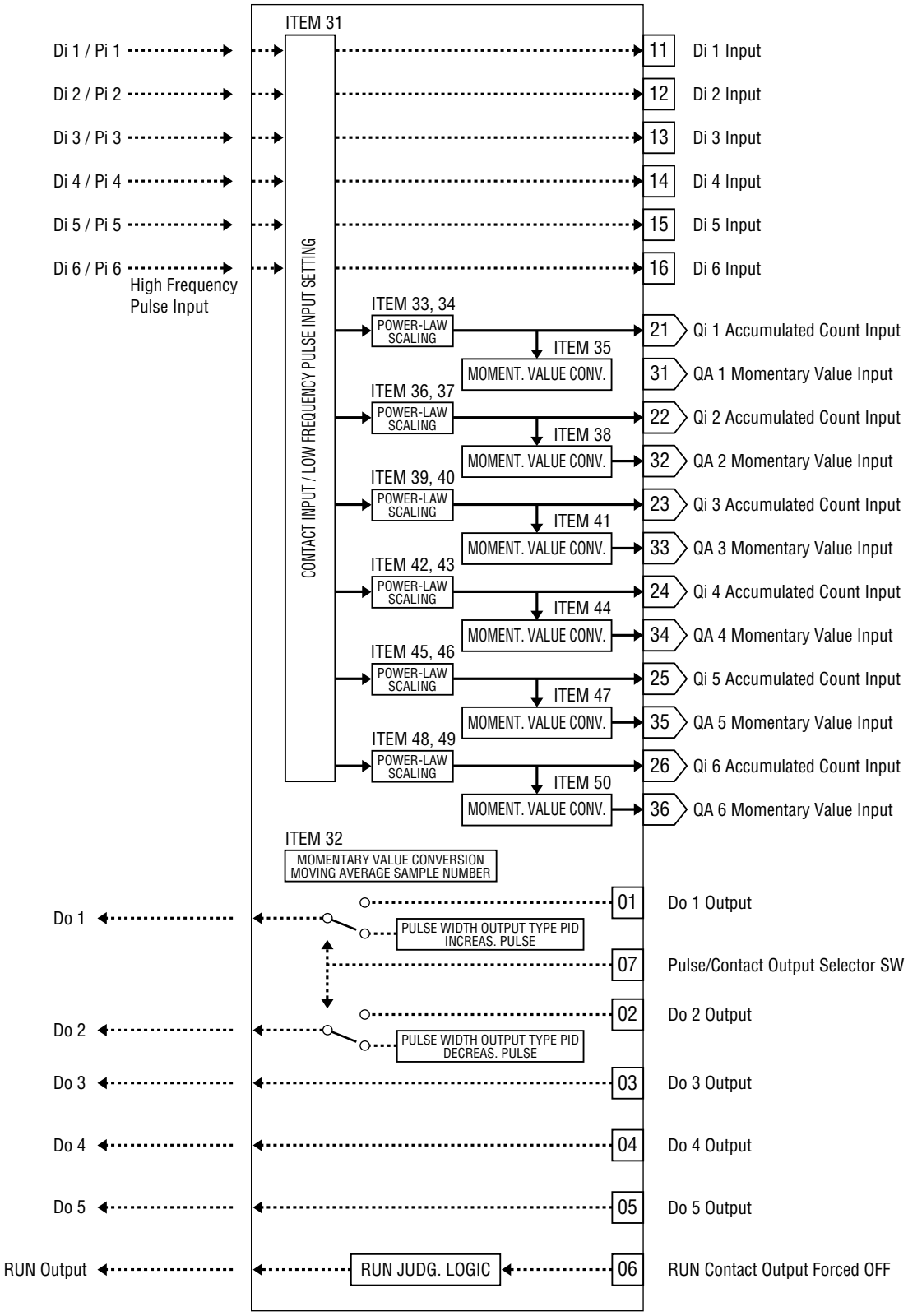
GROUP [04] ★: Setting data

	ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
	01	●	(always modifiable)		■ MAINTENANCE SWITCH (lock command)
					Same mode for Extension Field Terminal 1 and 2
			0	MT: 0	MONITOR mode: data monitoring only
			1	MT: 1	PROGRAM mode: "▲" marked data modifiable
			S	MT: S	SIMULATION mode: "❄" marked data modifiable
	10	**IND**	**12**	**MD: 12**	**EXTENSION FIELD TERMINAL 1 (model)**
	ANALOG INPUT INDICATION				
	11	▲ ❄	-15.00 – 115.00 %	21: NNN.NN	Pv 1 input
	12	▲ ❄	-15.00 – 115.00 %	22: NNN.NN	Pv 2 input
	13	▲ ❄	-15.00 – 115.00 %	23: NNN.NN	Ai 1 input
	14	▲ ❄	-15.00 – 115.00 %	24: NNN.NN	Ai 2 input
	15	▲ ❄	-15.00 – 115.00 %	25: NNN.NN	Ai 3 input
	16	▲ ❄	-15.00 – 115.00 %	26: NNN.NN	Ai 4 input
	17	▲ ❄	-15.00 – 115.00 %	27: NNN.NN	Mv 1 check input
	18	▲ ❄	-15.00 – 115.00 %	28: NNN.NN	Mv 2 check input
	19	▲ ❄	±320.00 Unit	29: NNN.NN	Pv 1 input engineering unit
	20	▲ ❄	±320.00 Unit	30: NNN.NN	Pv 2 input engineering unit
	ANALOG OUTPUT INDICATION				
	21	▲	-15.00 – 115.00 %	MV1: NNN.NN	Mv 1 output
	22	▲	-15.00 – 115.00 %	MV2: NNN.NN	Mv 2 output
	23	▲	-15.00 – 115.00 %	AO1: NNN.NN	Ao 1 output
	24	▲	-15.00 – 115.00 %	AO2: NNN.NN	Ao 2 output
	ANALOG OUTPUT CONNECTION TERMINAL				
★	25	▲	GGNN	M1#: 0225	Mv 1 connection terminal (error if not connected) GG: Group No. NN : terminal No.
★	26	▲	GGNN	M2#: 0225	Mv 2 connection terminal (error if not connected) GG: Group No. NN : terminal No.
★	27	▲	GGNN	A1#: 0225	Ao 1 connection terminal (error if not connected) GG: Group No. NN : terminal No.
★	28	▲	GGNN	A2#: 0225	Ao 2 connection terminal (error if not connected) GG: Group No. NN : terminal No.
	PV / MV SETTING				
★	30	▲	-15.00 – 115.00 %	PH1: NNN.NN	Pv 1 high alarm setpoint (for error judgment)
★	31	▲	-15.00 – 115.00 %	PL1: NNN.NN	Pv 1 low alarm setpoint (for error judgment)
★	32	▲	-15.00 – 115.00 %	PH2: NNN.NN	Pv 2 high alarm setpoint (for error judgment)
★	33	▲	-15.00 – 115.00 %	PL2: NNN.NN	Pv 2 low alarm setpoint (for error judgment)
★	34	▲	0.00 – 115.00 %	ML1: NNN.NN	Mv 1 deviation alarm setpoint (for error judgment)
★	35	▲	0.00 – 115.00 %	ML2: NNN.NN	Mv 2 deviation alarm setpoint (for error judgment)
★	36	▲	MM	TP1: MM	Pv 1 input type [MM: input type No.] Refer to Section 7.2.1. PROCESS & ANALOG INPUT SETTING. (Set ITEM 37...39 for Pv 1 input type 6...23)
★	37	▲	-272.0 – 3000.0	HT1: NNNN.N	Pv 1 upper range temperature
★	38	▲	-272.0 – 3000.0	LT1: NNNN.N	Pv 1 lower range temperature
★	39	▲	0, 1	CJ1: N	Pv 1 cold junction compensation (0: Without, 1: With)
★	40	▲	MM	TP1: MM	Pv 2 input type [MM: input type No.] Refer to Section 7.2.1. PROCESS & ANALOG INPUT SETTING. (Set ITEM 41...43 for Pv 2 input type 6...23)
★	41	▲	-272.0 – 3000.0	HT2: NNNN.N	Pv 2 upper range temperature
★	42	▲	-272.0 – 3000.0	LT2: NNNN.N	Pv 2 lower range temperature
★	43	▲	0, 1	CJ2: N	Pv 2 cold junction compensation (0: Without, 1: With)

	ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
	44	▲ ❄	0, 1	11: N	Pv 1 error contact output
	45	▲ ❄	0, 1	12: N	Pv 2 error contact output
	46	▲ ❄	0, 1	13: N	Mv 1 error contact output
	47	▲ ❄	0, 1	14: N	Mv 2 error contact output
ANALOG I/O ZERO/SPAN ADJUSTMENTS					
★	50	▲	±115.00 %	PZ1: 0.00	Pv 1 zero adjustment (zero bias)
★	51	▲	±3.2000	PS1: 1.0000	Pv 1 span adjustment (gain)
★	52	▲	±115.00 %	PZ2: 0.00	Pv 2 zero adjustment (zero bias)
★	53	▲	±3.2000	PS2: 1.0000	Pv 2 span adjustment (gain)
★	54	▲	±115.00 %	MZ1: 0.00	Mv 1 zero adjustment (zero bias)
★	55	▲	±3.2000	MS1: 1.0000	Mv 1 span adjustment (gain)
★	56	▲	±115.00 %	MZ2: 0.00	Mv 2 zero adjustment (zero bias)
★	57	▲	±3.2000	MS2: 1.0000	Mv 2 span adjustment (gain)
★	58	▲	±115.00 %	IZ1: 0.00	Ai 1 zero adjustment (zero bias)
★	59	▲	±3.2000	IS1: 1.0000	Ai 1 span adjustment (gain)
★	60	▲	±115.00 %	IZ2: 0.00	Ai 2 zero adjustment (zero bias)
★	61	▲	±3.2000	IS2: 1.0000	Ai 2 span adjustment (gain)
★	62	▲	±115.00 %	IZ3: 0.00	Ai 3 zero adjustment (zero bias)
★	63	▲	±3.2000	IS3: 1.0000	Ai 3 span adjustment (gain)
★	64	▲	±115.00 %	IZ4: 0.00	Ai 4 zero adjustment (zero bias)
★	65	▲	±3.2000	IS4: 1.0000	Ai 4 span adjustment (gain)
★	66	▲	±115.00 %	CZ1: 0.00	Mv 1 check input zero adjustment (zero bias)
★	67	▲	±3.2000	CS1: 1.0000	Mv 1 check input span adjustment (gain)
★	68	▲	±115.00 %	CZ2: 0.00	Mv 2 check input zero adjustment (zero bias)
★	69	▲	±3.2000	CS2: 1.0000	Mv 2 check input span adjustment (gain)
★	70	▲	±115.00 %	OZ1: 0.00	Ao 1 zero adjustment (zero bias)
★	71	▲	±3.2000	OS1: 1.0000	Ao 1 span adjustment (gain)
★	72	▲	±115.00 %	OZ2: 0.00	Ao 2 zero adjustment (zero bias)
★	73	▲	±3.2000	OS2: 1.0000	Ao 2 span adjustment (gain)

Appx 1.4. SC200D EXTENSION FIELD TERMINAL 2

ABBR	FIELD TERMINAL	ABBR
F83	SC200D Extension Field Terminal 2	F83



ITEM 02 has no error indication. It is indicated in GROUP 01 (Field Terminal).

GROUP [05] ★: Setting data

ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
01	●	(always modifiable)		■ MAINTENANCE SWITCH (lock command)
				Same mode for Extension Field Terminal 1 and 2
		0	MT: 0	MONITOR mode: data monitoring only
		1	MT: 1	PROGRAM mode: "▲" marked data modifiable
		S	MT: S	SIMULATION mode: "❄" marked data modifiable
10	**IND**	**13**	**MD: 13**	**EXTENSION FIELD TERMINAL 2 (model)**
DISCRETE INPUT INDICATION				
11	▲ ❄	0, 1 or NNNN	11: N or	Di 1 input indication or
			21: NNNN	Qi 1 accumulated count indication
12	▲ ❄	0, 1 or NNNN	12: N or	Di 2 input indication or
			22: NNNN	Qi 2 accumulated count indication
13	▲ ❄	0, 1 or NNNN	13: N or	Di 3 input indication or
			23: NNNN	Qi 3 accumulated count indication
14	▲ ❄	0, 1 or NNNN	14: N or	Di 4 input indication or
			24: NNNN	Qi 4 accumulated count indication
15	▲ ❄	0, 1 or NNNN	15: N or	Di 5 input indication or
			25: NNNN	Qi 5 accumulated count indication
16	▲ ❄	0, 1 or NNNN	16: N or	Di 6 input indication or
			26: NNNN	Qi 6 accumulated count indication
17	▲ ❄	-15.00 – 115.00 %	31: NNN.NN	QA 1 momentary value indication
18	▲ ❄	-15.00 – 115.00 %	32: NNN.NN	QA 2 momentary value indication
19	▲ ❄	-15.00 – 115.00 %	33: NNN.NN	QA 3 momentary value indication
20	▲ ❄	-15.00 – 115.00 %	34: NNN.NN	QA 4 momentary value indication
21	▲ ❄	-15.00 – 115.00 %	35: NNN.NN	QA 5 momentary value indication
22	▲ ❄	-15.00 – 115.00 %	36: NNN.NN	QA 6 momentary value indication
DISCRETE OUTPUT INDICATION				
23	▲ ❄	0, 1	01: N	Do 1 output indication
24	▲ ❄	0, 1	02: N	Do 2 output indication
25	▲ ❄	0, 1	03: N	Do 3 output indication
26	▲ ❄	0, 1	04: N	Do 4 output indication
27	▲ ❄	0, 1	05: N	Do 5 output indication
28	▲ ❄	0, 1	06: N	RUN contact output forced OFF (1: OFF)
PULSE INPUT SETTING				
★ 31	▲		PD: NNNNN	Di/Pi selection (0 = Di, 1 = Pi) (10^0 : Di 1, 10^1 : Di 2, 10^2 : Di 3, 10^3 : Di 4) (Remark 1)
★ 32	▲	1-16	KR: NN	Pi moving average sample number for momentary value conversion
★ 33	▲	1, 0, -1, -2, -3	D1: -1	Qi 1 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
★ 34	▲	0.0000 – 6.4000	S1: N.NNNN	Qi 1 scaling factor
★ 35	▲	0.00 – 10000.00	K1: NNNNN.NN	QA 1 momentary value conversion factor (number of pulses per second at 100% momentary value input)
★ 36	▲	1, 0, -1, -2, -3	D2: -1	Qi 2 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
★ 37	▲	0.0000 – 6.4000	S2: N.NNNN	Qi 2 scaling factor
★ 38	▲	0.00 – 10000.00	K2: NNNNN.NN	QA 2 momentary value conversion factor (number of pulses per second at 100% momentary value input)
★ 39	▲	1, 0, -1, -2, -3	D3: -1	Qi 3 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
★ 40	▲	0.0000 – 6.4000	S3: N.NNNN	Qi 3 scaling factor
★ 41	▲	0.00 – 10000.00	K3: NNNNN.NN	QA 3 momentary value conversion factor (number of pulses per second at 100% momentary value input)

ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
★ 42	▲	1, 0, -1, -2, -3	D4: -1	Qi 4 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
★ 43	▲	0.0000 – 6.4000	S4: N.NNNN	Qi 4 scaling factor
★ 44	▲	0.00 – 10000.00	K4: NNNNN.NN	QA 4 momentary value conversion factor (number of pulses per second at 100% momentary value input)
★ 45	▲	1, 0, -1, -2, -3	D5: -1	Qi 5 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
★ 46	▲	0.0000 – 6.4000	S5: N.NNNN	Qi 5 scaling factor
★ 47	▲	0.00 – 10000.00	K5: NNNNN.NN	QA 5 momentary value conversion factor (number of pulses per second at 100% momentary value input)
★ 48	▲	1, 0, -1, -2, -3	D6: -1	Qi 6 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
★ 49	▲	0.0000 – 6.4000	S6: N.NNNN	Qi 6 scaling factor
★ 50	▲	0.00 – 10000.00	K6: NNNNN.NN	QA 6 momentary value conversion factor (number of pulses per second at 100% momentary value input)
DISCRETE OUTPUT SETTING				
★ 51	▲	0, 1	DM: N	Abnormality contact output mode (0: Normal, 1: All contact outputs OFF at RUN contact OFF)
HIGH SPEED PULSE SETTING				
★ 52	▲	0, 1	PD6: N	Di/Pi selection (0: Di 6, 1: Pi 6)
PULSE WIDTH OUTPUT/DO SETTING				
★ 53	▲ ❄	0, 1	07: N	Pulse width output/Do selection (0: Pulse width output, 1: Do)

Remark 1: ITEM 31: Di/Pi selection

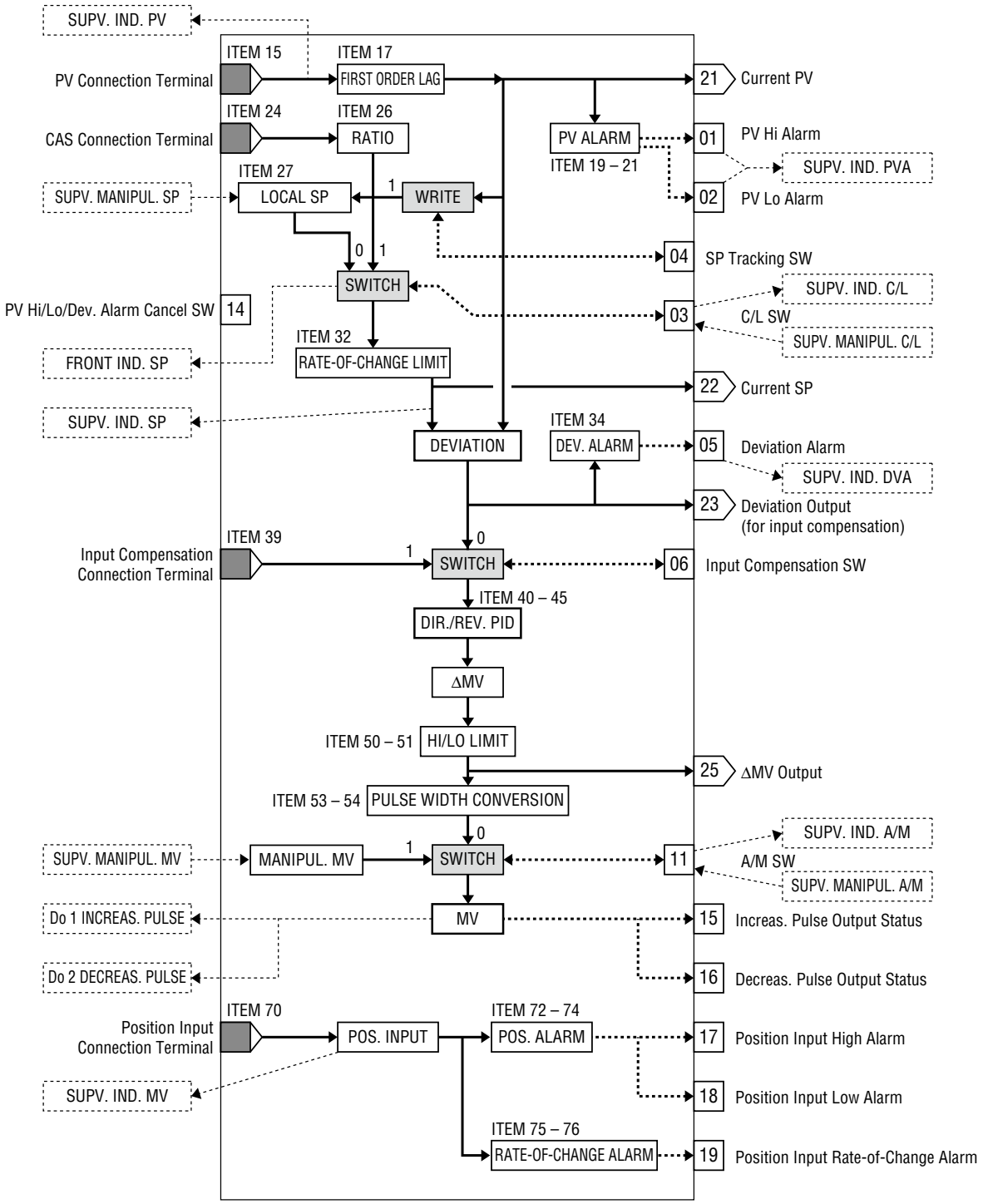
Pulse outputs become undefined when 'Di' is selected; while discrete outputs become undefined when 'Pi' is selected.

Appx 1.5. PULSE WIDTH OUTPUT TYPE PID

The pulse width output type PID can be assigned only to GROUP 03.

MODEL NO.	BLOCK NAME	MODEL NO.
27	Pulse Width Output Type PID	27

ABBR: SCA



GROUP [03] ◆: Automatically changeable parameters ★: Setting data

ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
01	●	(always modifiable)		■ MAINTENANCE SWITCH (lock command)
		0	MT: 0	MONITOR mode: data monitoring only
		1	MT: 1	PROGRAM mode: "▲" marked data modifiable
02	IND	No input	ER: NN	Error indication (00: normal, 01 – 90: error)
★ **10**	▲	**27**	**MD: 27**	**PULSE WIDTH OUTPUT TYPE PID (model)** '-' to clear.
PROCESS VALUE (PV)				
★ 15	▲	GGNN	P#: 0121	PV connection terminal (error if not connected) GG: Group No. NN: terminal No.
16	▲	-15.00 – 115.00 %	PV: NNN.NN	PV %
◆★17	▲	0.0 – 100.0 s	PT: NNN.N	PV first order lag time constant (0.0: without)
18	▲	-15.00 – 115.00 %	21: NNN.NN	Current PV %
◆★19	●	-15.00 – 115.00 %	PH: NNN.NN	PV high alarm setpoint
◆★20	●	-15.00 – 115.00 %	PL: NNN.NN	PV low alarm setpoint
◆★21	●	0.00 – 115.00 %	HS: NNN.NN	Hysteresis (deadband)
22	▲	0, 1	01: N	PV high alarm
23	▲	0, 1	02: N	PV low alarm
SETPOINT VALUE (SP)				
★ 24	▲	GGNN	C#: 0225	CAS connection terminal
25	▲	-15.00 – 115.00 %	SP: NNN.NN	CAS %
◆★26	●	±32.000	RT: NN.NNN	Ratio setting (signal % ratio)
◆★27	●	-15.00 – 115.00 %	SP: NNN.NN	Local SP %
★ 29	▲	0, 1	SM: N	Setting mode (0: local, 1: cascade/local)
◆ 30	●	0, 1	03: N	C/L SW (0: local, 1: cascade)
31	●	0, 1	04: N	SP tracking SW (0: OFF, 1: ON)
★ 32	●	0.00 – 115.00 %/s	SR: NNN.NN	SP rate-of-change limit (0.00: without)
33	▲	-15.00 – 115.00 %	22: NNN.NN	Current SP %
DEVIATION				
◆★34	●	0.00 – 115.00 %	DL: NNN.NN	Deviation alarm setpoint (hysteresis (deadband) in ITEM 21)
35	▲	0, 1	05: N	Deviation alarm
36	▲	±115.00 %	23: NNN.NN	Deviation output %
★ 37	▲	0, 1	06: N	Input compensation SW (0: without, 1: with)
★ 38	▲	0, 1, 2, 3	IM: N	Input compensation method (0: without, 1: addition, 2: subtraction, 3: substitution)
★ 39	▲	GGNN	I#: 0221	Input compensation connection terminal
CONTROL				
★ 40	▲	0, 1	DR: N	Control direction (0: direct, 1: reverse [MV decreases with PV increase])
★ 41	▲	0, 1	DM: N	Derivative method (0: PV derivative, 1: deviation derivative)
◆★42	●	1 – 1000 %	PB: NNNN	Proportional band
◆★43	●	0.00 – 100.00 min.	TI: NNN.NN	Integral time (0.00: no integral action)
◆★44	●	0.00 – 10.00 min.	TD: NN.NN	Derivative time (0.00: no derivative action)
★ 45	▲	1, 2, 4, 8, 16, 32, 64	CP: NN	Control cycle (multiple of basic control cycle)

ITEM	MDFY	DATA INPUT	DISPLAY (e.g.)	CONTENTS
CONTROL OUTPUT (MV)				
◆★50	●	±115.00 %	MH: NNN.NN	Δ MV Output high limit
◆★51	●	±115.00 %	ML: NNN.NN	Δ MV Output low limit
◆★53	●	0.0 – 900.0 s	FS: NNN.N	Full stroke time (sec)
◆★54	●	0.02 – 60.00 s	PM: NN.NN	Minimum pulse width (sec)
★ 55	▲	0, 1	S0: N	Output operation for less-than-minimum pulse width (0: drop off, 1: accumulate)
59	●	0, 1	11: N	A/M SW (0: manual, 1: auto)
63	▲	0, 1	14: N	PV alarm, deviation alarm function stop command (Remark 1)
65	▲	±115.00 %	25: NNN.NN	ΔMV %
★ 66	▲	0, 1	MS1: N	Smooth tracking output with local SP change (0: without, 1: with)
67	▲	0, 1	15: N	Increas. pulse output status (0: without, 1: output)
68	▲	0, 1	16: N	Decreas. pulse output status (0: without, 1: output)
POSITION INPUT				
★ 70	▲	GGNN	M#: 0423	Position input connection terminal GG: Group No. NN: terminal No.
71	▲	-15.00 – 115.00 %	MVA: NNN.NN	Position input %
◆★72	●	-15.00 – 115.00 %	MH: NNN.NN	Position input high alarm setpoint
◆★73	●	-15.00 – 115.00 %	ML: NNN.NN	Position input low alarm setpoint
◆★74	●	0.00 – 115.00 %	HS: NNN.NN	Hysteresis (deadband)
◆★75	●	0.00 – 115.00 %/s	MR: NNN.NN	Position input rate-of-change alarm setpoint
◆★76	●	0.00 – 115.00 %	HS: NNN.NN	Hysteresis (deadband)
77	▲	0, 1	17: N	Position input high alarm
78	▲	0, 1	18: N	Position input low alarm
79	▲	0, 1	19: N	Position input rate-of-change alarm
SUPERVISORY INDICATION USE				
★ 80	▲	alphanumeric	TG: XXX X	Tag name (10 characters max.)
★ 81	▲	alphanumeric	TC: XXXX X	Tag comment (16 characters max.)
★ 82	▲	±32000	MH: 15000	Upper range (in engineering unit)
★ 83	▲	±32000	ML: 0	Lower range (in engineering unit)
★ 84	▲	0, 1, 2, 3, 4, 5	DP: 1	Decimal point position (from rightmost digit)
★ 85	▲	alphanumeric	TU: XXX X	Engineering unit (8 characters max.)

Remark 1: With this switch set to '1', PV high/low alarm and deviation alarm functions are cancelled.

Appx 2. COLD START PARAMETERS

GROUP 01: FIELD TERMINAL

GROUP	ITEM	DATA	PARAMETER
01	39	0	AL1 lamp output
	40	0	AL2 lamp output
	41	0	AL3 lamp output
	42	0	AL4 lamp output

GROUP 04: EXTENSION FIELD TERMINAL 1

GROUP	ITEM	DATA	PARAMETER
04	11	0	Pv 1 input
	12	0	Pv 2 input
	13	0	Ai 1 input
	14	0	Ai 2 input
	15	0	Ai 3 input
	16	0	Ai 4 input
	17	0	Mv 1 check input
	18	0	Mv 2 check input
	21	0	Mv 1 output
	22	0	Mv 2 output
	23	0	Ao 1 output
	24	0	Ao 2 output
	44	0	Pv 1 error contact output
	45	0	Pv 2 error contact output
	46	0	Mv 1 error contact output
	47	0	Mv 2 error contact output

GROUP 05: EXTENSION FIELD TERMINAL 2

GROUP	ITEM	DATA	PARAMETER
05	11	0	Di 1 input indication or Qi 1 accumulated count indication
	12	0	Di 2 input indication or Qi 2 accumulated count indication
	13	0	Di 3 input indication or Qi 3 accumulated count indication
	14	0	Di 4 input indication or Qi 4 accumulated count indication
	15	0	Di 5 input indication or Qi 5 accumulated count indication
	16	0	Di 6 input indication or Qi 6 accumulated count indication
	17	0	QA 1 momentary value indication
	18	0	QA 2 momentary value indication
	19	0	QA 3 momentary value indication
	20	0	QA 4 momentary value indication
	21	0	QA 5 momentary value indication
	22	0	QA 6 momentary value indication
	23	0	Do 1 output indication
	24	0	Do 2 output indication
	25	0	Do 3 output indication
	26	0	Do 4 output indication
	27	0	Do 5 output indication
	53	0	Pulse width output/Do selection

GROUP 02: PID CONTROLLER

GROUP	ITEM	DATA	PARAMETER
02	16	0	PV %
	18	0	Current PV %
	22	0	PV high alarm
	23	0	PV low alarm
	25	0	CAS %
	30	0	Cas/Loc SW
	31	0	SP tracking SW
	33	0	Current SP %
	35	0	Deviation alarm
	36	0	Deviation output %
	52	0	Preset value SW
	55	0	Output hold SW
	57	0	External feedback %
	58	0	External feedback SW
	59	0	Auto/Man SW
	60	0	MV %
	61	0	MV high limit reached
	62	0	MV low limit reached

GROUP 03: PULSE WIDTH OUTPUT TYPE PID

GROUP	ITEM	DATA	PARAMETER
03	16	0	PV %
	18	0	Current PV %
	22	0	PV high alarm
	23	0	PV low alarm
	25	0	CAS %
	30	0	Cas/Loc SW
	31	0	SP tracking SW
	33	0	Current SP %
	35	0	Deviation alarm
	36	0	Deviation output %
	52	0	Preset value SW
	55	0	Output hold SW
	57	0	External feedback %
	58	0	External feedback SW
	59	0	Auto/Man SW
	60	0	MV %
	61	0	MV high limit reached
	62	0	MV low limit reached
	67	0	Increas. pulse output status
	68	0	Decreas. pulse output status
	77	0	Position input high alarm
	78	0	Position input low alarm
	79	0	Position input rate-of-change alarm

Appx 3. FUNCTION BLOCK PARAMETERS DEFAULT SETTING

(Initial values provided when ITEM 10 is set)

GROUP 01: FIELD TERMINAL

GROUP	ITEM	ABBR	DATA	PARAMETER
01	11	GR	2	Primary loop Group No. (valid after reset)
	12	M1	0	Primary MV operational range (0: ±115%, 1: -15 – +115%)
	13	M2	0	Secondary MV operational range (0: ±115%, 1: -15 – +115%)
	15	1F	0000	FN1 connection terminal for indication (GG: Group No., NN: terminal No.)
	16	1H	10000	FN1 upper range (in engineering unit)
	17	1L	0	FN1 lower range (in engineering unit)
	18	1D	2	FN1 decimal point position (from rightmost digit)
	19	2F	0000	FN2 connection terminal for indication (GG: Group No., NN: terminal No.)
	20	2H	10000	FN2 upper range (in engineering unit)
	21	2L	0	FN2 lower range (in engineering unit)
	22	2D	2	FN2 decimal point position (from rightmost digit)
	23	3F	0000	FN3 connection terminal for indication (GG: Group No., NN: terminal No.)
	24	3H	10000	FN3 upper range (in engineering unit)
	25	3L	0	FN3 lower range (in engineering unit)
	26	3D	2	FN3 decimal point position (from rightmost digit)
	27	4F	0000	FN4 connection terminal for indication (GG: Group No., NN: terminal No.)
	28	4H	10000	FN4 upper range (in engineering unit)
	29	4L	0	FN4 lower range (in engineering unit)
	30	4D	2	FN4 decimal point position (from rightmost digit)
	31	T1	Tag No.	FN1 tag name (max. 10 characters)
	32	T2	Tag No.	FN2 tag name (max. 10 characters)
	33	T3	Tag No.	FN3 tag name (max. 10 characters)
	34	T4	Tag No.	FN4 tag name (max. 10 characters)
	35	U1	Unit	FN1 engineering unit (max. 8 characters)
	36	U2	Unit	FN2 engineering unit (max. 8 characters)
	37	U3	Unit	FN3 engineering unit (max. 8 characters)
	38	U4	Unit	FN4 engineering unit (max. 8 characters)
	43	L1	AL1	AL1 comment (max. 4 characters)
	44	L2	AL2	AL2 comment (max. 4 characters)
	45	L3	AL3	AL3 comment (max. 4 characters)
	46	L4	AL4	AL4 comment (max. 4 characters)

GROUP 04: EXTENSION FIELD TERMINAL 1

GROUP	ITEM	ABBR	DATA	PARAMETER
04	25	M1#	0099	Mv 1 connection terminal (error if not connected) (GG: Group No., NN: terminal No.)
	26	M2#	0099	Mv 2 connection terminal (error if not connected) (GG: Group No., NN: terminal No.)
	27	A1#	0099	Ao 1 connection terminal (error if not connected) (GG: Group No., NN: terminal No.)
	28	A2#	0099	Ao 2 connection terminal (error if not connected) (GG: Group No., NN: terminal No.)
	30	PH1	115.00	Pv 1 high alarm setpoint (for error judgment)
	31	PL1	-15.00	Pv 1 low alarm setpoint (for error judgment)
	32	PH2	115.00	Pv 2 high alarm setpoint (for error judgment)
	33	PL2	-15.00	Pv 2 low alarm setpoint (for error judgment)
	34	ML1	115.00	Mv 1 deviation alarm setpoint (for error judgment)
	35	ML2	115.00	Mv 2 deviation alarm setpoint (for error judgment)
	36	TP1	3	Pv 1 input type
	37	HT1	1000.0	Pv 1 upper range temperature
	38	LT1	0.0	Pv 1 lower range temperature
	39	CJ1	1	Pv 1 cold junction compensation (0: without, 1: with)
	40	TP2	3	Pv 2 input type
	41	HT2	1000.0	Pv 2 upper range temperature
	42	LT2	0.0	Pv 2 lower range temperature
	43	CJ2	1	Pv 2 cold junction compensation (0: without, 1: with)
	50	PZ1	0.00	Pv 1 zero adjustment (zero bias)
	51	PS1	1.0000	Pv 1 span adjustment (gain)
	52	PZ2	0.00	Pv 2 zero adjustment (zero bias)
	53	PS2	1.0000	Pv 2 span adjustment (gain)
	54	MZ1	0.00	Mv 1 zero adjustment (zero bias)
	55	MS1	1.0000	Mv 1 span adjustment (gain)
	56	MZ2	0.00	Mv 2 zero adjustment (zero bias)
	57	MS2	1.0000	Mv 2 span adjustment (gain)
	58	IZ1	0.00	Ai 1 zero adjustment (zero bias)
	59	IS1	1.0000	Ai 1 span adjustment (gain)
	60	IZ2	0.00	Ai 2 zero adjustment (zero bias)
	61	IS2	1.0000	Ai 2 span adjustment (gain)
	62	IZ3	0.00	Ai 3 zero adjustment (zero bias)
	63	IS3	1.0000	Ai 3 span adjustment (gain)
	64	IZ4	0.00	Ai 4 zero adjustment (zero bias)
	65	IS4	1.0000	Ai 4 span adjustment (gain)
	66	CZ1	0.00	Mv 1 check input zero adjustment (zero bias)
	67	CS1	1.0000	Mv 1 check input span adjustment (gain)
	68	CZ2	0.00	Mv 2 check input zero adjustment (zero bias)
	69	CS2	1.0000	Mv 2 check input span adjustment (gain)
	70	OZ1	0.00	Ao 1 zero adjustment (zero bias)
	71	OS1	1.0000	Ao 1 span adjustment (gain)
	72	OZ2	0.00	Ao 2 zero adjustment (zero bias)
	73	OS2	1.0000	Ao 2 span adjustment (gain)

GROUP 05: EXTENSION FIELD TERMINAL 2

GROUP	ITEM	ABBR	DATA	PARAMETER
05	31	PD	00000	Di/Pi selection (0 = Di, 1 = Pi) (10^0 : Di1, 10^1 : Di2, 10^2 : Di3, 10^3 : Di4, 10^4 : Di5)
	32	KR	1	Pi moving average sample number for momentary value conversion
	33	D1	0	Qi 1 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
	34	S1	1.0000	Qi 1 scaling factor
	35	K1	1000.00	QA 1 momentary value conversion factor (number of pulses per second at 100% momentary value output)
	36	D2	0	Qi 2 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
	37	S2	1.0000	Qi 2 scaling factor
	38	K2	1000.00	QA 2 momentary value conversion factor (number of pulses per second at 100% momentary value output)
	39	D3	0	Qi 3 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
	40	S3	1.0000	Qi 3 scaling factor
	41	K3	1000.00	QA 3 momentary value conversion factor (number of pulses per second at 100% momentary value output)
	42	D4	0	Qi 4 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
	43	S4	1.0000	Qi 4 scaling factor
	44	K4	1000.00	QA 4 momentary value conversion factor (number of pulses per second at 100% momentary value output)
	45	D5	0	Qi 5 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
	46	S5	1.0000	Qi 5 scaling factor
	47	K5	1000.00	QA 5 momentary value conversion factor (number of pulses per second at 100% momentary value output)
	48	D6	0	Qi 6 power-law scaling (10's power 1: x 10, 0: x 1, -1: x 0.1, -2: x 0.01, -3: x 0.001)
	49	S6	1.0000	Qi 6 scaling factor
	50	K6	1000.00	QA 6 momentary value conversion factor (number of pulses per second at 100% momentary value output)
	51	DM	0	Error detected by diagnostic (0: Normal conditions, 1: All discrete outputs OFF with RUN contact OFF
	52	PD6	1	PD6: Select Discrete / Pulse input 0 = Di, 1 = Pi

GROUP 02: PID CONTROLLER

GROUP	ITEM	ABBR	Basic PID DATA	Adv. PID DATA	MV Man. DATA	Ratio Setter DATA	Indicator DATA	PARAMETER
02	15	P#	0000	0000	----	0000	0000	PV connection terminal
	17	PT	----	.0	----	----	----	PV first order lag time constant
	19	PH	115.00	115.00	----	115.00	115.00	PV high alarm setpoint
	20	PL	-15.00	-15.00	----	-15.00	-15.00	PV low alarm setpoint
	21	HS	1.00	1.00	----	1.00	1.00	Hysteresis (deadband)
	24	C#	0000	0000	----	0000	----	CAS connection terminal
	26	RT	----	1.000	----	----	----	Ratio setting (signal % ratio)
	27	SP	.00	.00	----	1.000	----	Local SP %
	29	SM	0	0	----	0	----	Setting method (0: local)
	30	03	0	0	----	0	----	Cas/Loc SW (0: local)
	32	SR	----	.00	----	----	----	SP rate-of-change limit (0: without)
	34	DL	115.00	115.00	----	----	----	Deviation alarm setpoint
	37	06	----	0	----	----	----	Input compensation SW (0: without)
	38	IM	----	0	----	----	----	Input compensation method (0: without)
	39	I#	----	0000	----	----	----	Input compensation connection terminal
	40	DR	0	0	----	.00	----	Control action (0: direct [MV increases with PV increase])
	41	DM	0	0	----	.00	----	Derivative method (0: PV derivative)
	42	PB	100	100	----	----	----	Proportional band
	43	TI	.00	.00	----	----	----	Integral time (0: no integral action)
	44	TD	.00	.00	----	----	----	Derivative time (0: no derivative action)
	45	CP	1	1	----	----	----	Control cycle (multiple of basic control cycle)
	47	07	----	0	----	----	----	Output compensation SW (0: without)
	48	OM	----	0	----	----	----	Output compensation method (0: without)
	49	0#	----	0000	----	----	----	Output compensation connection terminal
	50	MH	115.00	115.00	----	----	----	Output high limit
	51	ML	-115.00	-115.00	----	----	----	Output low limit
	53	MI	.00	.00	----	----	----	Preset value
	54	MR	----	.00	----	----	----	Output rate-of-change limit (0: without)
	56	M#	----	0000	----	----	----	External feedback connection terminal
	59	11	0	0	----	0	----	Auto/Man SW (0: manual)
	60	MV	.00	.00	.00	.00	----	Supervisory indication / manipulated MV %
	64	RS	50.00	50.00	----	----	----	Manual reset
	66	MS	0	0	----	----	----	Smooth tracking output with local SP change (0: without)
	80	TG	Tag No.	Tag No.	Tag No.	Tag No.	Tag No.	Tag name
	81	TC	Tag Comment	Tag Comment	Tag Comment	Tag Comment	Tag Comment	Tag comment
	82	MH	10000	10000	----	10000	10000	Upper range
	83	ML	0	0	----	0	0	Lower range
	84	DP	2	2	----	2	2	Decimal point position (from rightmost digit)
	85	TU	Unit	Unit	----	Unit	Unit	Engineering unit
	86	MD	0	0	0	0	----	MV reverse indication (0: direct)

GROUP 03: PULSE WIDTH OUTPUT TYPE PID

GROUP	ITEM	ABBR	DATA	PARAMETER
03	15	P#	0000	PV connection terminal
	17	PT	.0	PV first order lag time constant
	19	PH	115.00	PV high alarm setpoint
	20	PL	-15.00	PV low alarm setpoint
	21	HS	1.00	Hysteresis (deadband)
	24	C#	0000	CAS connection terminal
	26	RT	1.000	Ratio setting (signal % ratio)
	27	SP	.00	Local SP %
	29	SM	0	Setting method (0: local)
	30	03	0	Cas/Loc SW (0: local)
	32	SR	.00	SP rate-of-change limit (0: without)
	34	DL	115.00	Deviation alarm setpoint
	37	06	0	Input compensation SW (0: without)
	38	IM	0	Input compensation method (0: without)
	39	I#	0000	Input compensation connection terminal
	40	DR	0	Control action (0: direct [MV increases with PV increase])
	41	DM	0	Derivative method (0: PV derivative)
	42	PB	100	Proportional band
	43	TI	.00	Integral time (0: no integral action)
	44	TD	.00	Derivative time (0: no derivative action)
	45	CP	1	Control cycle (multiple of basic control cycle)
	47	07	0	Output compensation SW (0: without)
	48	OM	0	Output compensation method (0: without)
	49	0#	0000	Output compensation connection terminal
	50	MH	115.00	Δ MV Output high limit
	51	ML	-115.00	Δ MV Output low limit
	53	FS	300.0	Full stroke time
	54	PM	.02	Minimum pulse width
	55	S0	0	Output operation for less-than-minimum pulse width
	59	11	0	Auto/Man SW (0: manual)
	66	MS	0	Smooth tracking output with local SP change (0: without)
	72	MH	115.00	Position input high alarm setpoint
	73	ML	-115.00	Position input low alarm setpoint
	74	HS	1.00	Hysteresis (deadband)
	75	MR	.00	Position input rate-of-change alarm setpoint
	76	HS	1.00	Hysteresis (deadband)
	80	TG	Tag No.	Tag name
	81	TC	Tag Comment	Tag comment
	82	MH	10000	Upper range
	83	ML	0	Lower range
	84	DP	2	Decimal point position (from rightmost digit)
	85	TU	Unit	Engineering unit

Appx 4. ERROR CODES

■ FINDING GROUP NO. IN ERROR

When an error occurs, first confirm the error code and corresponding abnormality in GROUP 00: System Common Table as shown below. Group No. in which the error is occurring presently is indicated in ITEM 24. Those in the past are indicated in ITEM 35.

GROUP 00: SYSTEM COMMON TABLE

ITEM	MDFY	DATA INPUT	DISPLAY	CONTENTS
12	IND		NNN%	■ CONTROL LOAD RATE INDICATION (%)
13	●	0	NNN%	■ MAX. CONTROL LOAD RATE INDICATION (%) Reset when "0" is entered.
				■ SYSTEM STATUS INDICATION (error indication)
21	IND			• EEPROM Data Base Failed
			ALLRIGHT	All blocks proved normal
			GROUP NN	Abnormal block No. indication (NN: GROUP No.)
22	IND			• PV Abnormality (OR output with Pv1/Pv2) (PV input H/L alarm status in the field terminal block indicated)
			PV NORMAL	PV proved normal
			PV ABNORMAL	PV proved abnormal
23	IND			• MV Feedback Abnormality (OR output with Mv1/Mv2) (deviation alarm status of MV check input and MV output in the field terminal block indicated)
			MV NORMAL	MV feedback proved normal
			MV ABNORMAL	MV feedback proved abnormal
24	IND			• Block Abnormality (GROUP No. indicated)
			ALLRIGHT	All blocks proved normal
			GROUP NN	Abnormal block No. indication (NN: GROUP No.)
25	IND			• Control Overload
			LOAD: RIGHT	Appropriate control load
			LOAD: OVER	Control overload "LOAD: OVER" is reset to "LOAD: RIGHT" when "0" is set in GROUP 00 / ITEM 40 (CONTROL CYCLE SWITCHING FLAG).
35	IND		ALLRIGHT	• Abnormal FB No. hold All blocks proved normal
			GROUP NN	Abnormal block No. indication (NN: GROUP No.)
36	IND			• Abnormality contents hold
			ER:NN	Abnormal block contents (NN)
95	▲	1	BLOCK RELEASE (initial display *)	■ DELETE MODEL NO. COMMAND Group 00, 01, 04, 05 or 80 are not deleted.

● = Always modifiable ▲ = Modifiable in PROGRAM mode

■ FUNCTION BLOCK ERROR CODES

Once Group No. in which an error is occurring presently, you can access error information in ITEM 02 of the identified GROUP.

ERROR ID	CONTENTS
ER : 00	Normal
ER : 01	Connection terminal 1 undefined
ER : 02	Connection terminal 2 undefined
ER : 03	Connection terminal 3 undefined
ER : 04	Connection terminal 4 undefined
ER : 05	Connection terminal 5 undefined
ER : 06	Connection terminal 6 undefined
ER : 07	Connection terminal 7 undefined
ER : 08	Connection terminal 8 undefined
ER : 09	Connection terminal 9 undefined
ER : 10	Computation error: Divided by '0'
ER : 11	Computation error: Result out of range *1
ER : 20	Communication terminal: Not received
ER : 21	Communication terminal: Connected external device error
ER : 22	Connected internal device error
ER : 70	Illegal block combination
ER : 80	Sequence error: Illegal command
ER : 81	Sequence error: Undefined connection terminal
ER : 87	Sequence error: Non-registered step
ER : 88	Sequence error: Register overflow
ER : 89	Sequence error: One-shot overflow
ER : 90	EEPROM data failed *2

*1. 32767 < Computation Result < -32768

*2. Red RUN lamp turns on and error message is indicated when the EEPROM database is destroyed. When this happens, process either of the following:
(1) In PROGRAM mode, write '1' in GROUP 00 / ITEM 95 to execute BLOCK RELEASE.
(2) Connect the Loop Builder Software (model: SFEW3E).
Execute EEPROM Clear and download a new loop configuration.

Appx 5. MODBUS FUNCTIONS

Appx 5.1. SUPPORTED FUNCTIONS

DATA & CONTROL FUNCTIONS

CODE	FUNCTION	DESCRIPTION
01	Read Coil Status	Digital output from the slave
03	Read Holding Registers	General purpose register within the slave
05	Force Single Coil	Digital output from the slave
06	Preset Single Register	General purpose register within the slave
15	Force Multiple Coils	Digital output from the slave
16	Preset Multiple Registers	General purpose register within the slave

Appx 5.2. ADDRESS REGISTERS ASSIGNMENTS

R: Read, R/W: Read and Write

CAUTION

(1) DO NOT write while the configuration mode is set to the SFEW. Write only during the front panel config. mode or the SCCFG mode.

(2) After writing, wait for at least 1 sec. + computation cycle before reading. Otherwise, written values may not be properly reflected.

LOOP 1

REGISTER	PARAMETER	R/W	DESCRIPTION
40001	PV	R	Process value (-15.00 to 115.00%, Data range -1500 to 11500)
40002	SP	R/W	Setpoint (-15.00 to 115.00%, Data range -1500 to 11500) (±32.000, Data range ±32000 for Ratio Setting)
40003	MV	R/W	Manipulated value (±115.00%, Data range ±11500)
40004	PB	R/W	Proportional band (0 to 1000%, Data range 0 to 1000)
40005	TI	R/W	Integral time (0.00 to 100.00 minutes, Data range 0 to 10000)
40006	TD	R/W	Derivative time (0.00 to 10.00 minutes, Data range 0 to 1000)
40007	PH	R/W	PV high alarm setpoint (-15.00 to 115.00%, Data range -1500 to 11500)
40008	PL	R/W	PV low alarm setpoint (-15.00 to 115.00%, Data range -1500 to 11500)
40009	DL	R/W	Deviation alarm setpoint (0.00 to 115.00%, Data range 0 to 11500)
40010	MH	R/W	MV high limit (±115.00%, Data range ±11500) or Position input high alarm setpoint (0.00 to 115.00%, Data range 0 to 11500) *1
40011	ML	R/W	MV low limit (±115.00%, Data range ±11500) or Position input low alarm setpoint (0.00 to 115.00%, Data range 0 to 11500) *1
40012	RH	R/W	Range high limit (±32000, Data range ±32000)
40013	RL	R/W	Range low limit (±32000, Data range ±32000)
40014	DP	R/W	Decimal point position (0 to 5, Data range 0 to 5)
1	C/L	R/W	Cascade / Local (0: Local, 1: Cascade)
2	A/M	R/W	Auto / Manual (0: Manual, 1: Auto)
3	PHA	R	PV high alarm (0: Normal, 1: Alarm)
4	PLA	R	PV low alarm (0: Normal, 1: Alarm)
5	----	----	Reserved (DO NOT WRITE)
6	MD	R/W	MV reverse indication (0: Direct, 1: Reverse)
7	POH	R	Position input high alarm (0: Normal, 1: Alarm) *1
8	PHL	R	Position input low alarm (0: Normal, 1: Alarm) *1
9	PRA	R	Position input rate-of-change alarm (0: Normal, 1: Alarm) *1
10	PU	R	Increas. pulse output status (0: Without, 1: Output) *1
11	PD	R	Decreas. pulse output status (0: Without, 1: Output) *1

*1. Applicable for the pulse width output type PID.

LOOP 2

REGISTER	PARAMETER	R/W	DESCRIPTION
40101	PV	R	Process value (-15.00 to 115.00%, Data range -1500 to 11500)
40102	SP	R/W	Set point (-15.00 to 115.00%, Data range -1500 to 11500) (±32.000, Data range ±32000 for Ratio Setting)
40103	MV	R/W	Manipulated value (±115.00%, Data range ±11500)
40104	PB	R/W	Proportional band (0 to 1000%, Data range 0 to 1000)
40105	TI	R/W	Integral time (0.00 to 100.00 minutes, Data range 0 to 10000)
40106	TD	R/W	Derivative time (0.00 to 10.00 minutes, Data range 0 to 1000)
40107	PH	R/W	PV high alarm setpoint (-15.00 to 115.00%, Data range -1500 to 11500)
40108	PL	R/W	PV low alarm setpoint (-15.00 to 115.00%, Data range -1500 to 11500)
40109	DL	R/W	Deviation alarm setpoint (0.00 to 115.00%, Data range 0 to 11500)
40110	MH	R/W	MV high limit (±115.00%, Data range ±11500) or Position input high alarm setpoint (0.00 to 115.00%, Data range 0 to 11500) *1
40111	ML	R/W	MV low limit (±115.00%, Data range ±11500) or Position input low alarm setpoint (0.00 to 115.00%, Data range 0 to 11500) *1
40112	RH	R/W	Range high limit (±32000, Data range ±32000)
40113	RL	R/W	Range low limit (±32000, Data range ±32000)
40114	DP	R/W	Decimal point position (0 to 5, Data range 0 to 5)
101	C/L	R/W	Cascade / Local (0: Local, 1: Cascade)
102	A/M	R/W	Auto / Manual (0: Manual, 1: Auto)
103	PHA	R	PV high alarm (0: Normal, 1: Alarm)
104	PLA	R	PV low alarm (0: Normal, 1: Alarm)
105	----	----	Reserved (DO NOT WRITE)
106	MD	R/W	MV reverse indication (0: Direct, 1: Reverse)
107	POH	R	Position input high alarm (0: Normal, 1: Alarm) *1
108	PHL	R	Position input low alarm (0: Normal, 1: Alarm) *1
109	PRA	R	Position input rate-of-change alarm (0: Normal, 1: Alarm) *1
110	PU	R	Increas. pulse output status (0: Without, 1: Output) *1
111	PD	R	Decreas. pulse output status (0: Without, 1: Output) *1

*1. Applicable for the pulse width output type PID.

COMMUNICATION TERMINAL (ANALOG)

REGISTER	PARAMETER	R/W	DESCRIPTION
40301	Gr11 A1	R/(W)	Group 11, Analog terminal 1 (-15.00 to 115.00%, Data range -1500 to 11500)
40302	Gr11 A2	R/(W)	Group 11, Analog terminal 2 (-15.00 to 115.00%, Data range -1500 to 11500)
:	:	:	:
40331	Gr26 A1	R/(W)	Group 26, Analog terminal 1 (-15.00 to 115.00%, Data range -1500 to 11500)
40332	Gr26 A2	R/(W)	Group 26, Analog terminal 2 (-15.00 to 115.00%, Data range -1500 to 11500)

Read only for AO Send Terminal.
Read/Write for AI Receive Terminal (Set ITEM 11 to FE)

COMMUNICATION TERMINAL (DISCRETE)

REGISTER	PARAMETER	R/W	DESCRIPTION
301	Gr11 D1	R/(W)	Group 11, Discrete terminal 1
:	:	:	:
332	Gr11 D32	R/(W)	Group 11, Discrete terminal 32
:	:	:	:
781	Gr26 D1	R/(W)	Group 26, Discrete terminal 1
:	:	:	:
812	Gr26 D32	R/(W)	Group 26, Discrete terminal 32

Read only for DO Send Terminal.
Read/Write for DI Receive Terminal (Set ITEM 11 to FE)

Either of AO Send, AI Receive, DO Send, DI Receive Terminal can be assigned to each Group.

FIELD TERMINAL

REGISTER	PARAMETER	R/W	DESCRIPTION
40901	PV1	R	PV1 input (-15.00 to 115.00%, Data range -1500 to 11500)
40902	PV2	R	PV2 input (-15.00 to 115.00%, Data range -1500 to 11500)
40903	AI1	R	AI1 input (-15.00 to 115.00%, Data range -1500 to 11500)
40904	AI2	R	AI2 input (-15.00 to 115.00%, Data range -1500 to 11500)
40905	AI3	R	AI3 input (-15.00 to 115.00%, Data range -1500 to 11500)
40906	AI4	R	AI4 input (-15.00 to 115.00%, Data range -1500 to 11500)
40907	MV1	R	MV1 output (-15.00 to 115.00%, Data range -1500 to 11500)
40908	MV2	R	MV2 output (-15.00 to 115.00%, Data range -1500 to 11500)
40909	AO1	R	AO1 output (-15.00 to 115.00%, Data range -1500 to 11500)
40910	AO2	R	AO2 output (-15.00 to 115.00%, Data range -1500 to 11500)
40911	PI1	R	PI1 input (0 to 9999, Data range 0 to 9999)
40912	PI2	R	PI2 input (0 to 9999, Data range 0 to 9999)
40913	PI3	R	PI3 input (0 to 9999, Data range 0 to 9999)
40914	PI4	R	PI4 input (0 to 9999, Data range 0 to 9999)
40915	PI5	R	PI5 input (0 to 9999, Data range 0 to 9999)
40916	PI6	R	PI6 input (0 to 9999, Data range 0 to 9999)
40917	FN1	R	FN1 indication (-15.00 to 115.00%, Data range -1500 to 11500)
40918	FN2	R	FN2 indication (-15.00 to 115.00%, Data range -1500 to 11500)
40919	FN3	R	FN3 indication (-15.00 to 115.00%, Data range -1500 to 11500)
40920	FN4	R	FN4 indication (-15.00 to 115.00%, Data range -1500 to 11500)
901	DI1	R	DI1 input
902	DI2	R	DI2 input
903	DI3	R	DI3 input
904	DI4	R	DI4 input
905	DI5	R	DI5 input
906	DO1	R	DO1 output
907	DO2	R	DO2 output
908	DO3	R	DO3 output
909	DO4	R	DO4 output
910	DO5	R	DO5 output
911	RUN	R	RUN contact (0: Error, 1: Normal)
912	AL1	R	AL1 lamp
913	AL2	R	AL2 lamp
914	AL3	R	AL3 lamp
915	AL4	R	AL4 lamp
916	DI6	R	DI6 input

Read only for output data. Use Communication Terminal to write.

SYSTEM

REGISTER	PARAMETER	R/W	DESCRIPTION	EQUIVALENT TO
1001	MAINTE	R	Maintenance status (0 in the monitor mode at GR 02 and GR 03 ITEM 01, 1 in others)	----
1002	RUN	R	Control status (0: Run, 1: Stop)	GR 00 ITEM 02
1003	EEPERR	R	EEPROM data base failed (0: Normal, 1: Error)	GR 00 ITEM 21
1004	PVERR	R	PV abnormality (0: Normal, 1: Error)	GR 00 ITEM 22
1005	MVAERR	R	MV feedback abnormality (0: Normal, 1: Error)	GR 00 ITEM 23
1006	MODERR	R	Function block abnormality (0: Normal, 1: Error)	GR 00 ITEM 24
1007	OVERLOAD	R	Control overload (0: Normal, 1: Overload)	GR 00 ITEM 25
41001	EEPGRP	R	EEPROM error group (with EEPRR = 1)	----
41002	MODGRP	R	Function block error group (with MODERR = 1)	----

NOTE

When more than one error has occurred among EEPERR, PVERR, MVAERR, MODERR and OVERLOAD, the most critical error is set with "1." Priority is given as: EEPERR > PVERR > MVAERR > MODERR > OVERLOAD.
For example, MODERR is set with "1" when both MODERR and OVERLOAD are in error. Then OVERLOAD turns to "1" after MODERR error is cancelled.

USER'S PARAMETER TABLE

REGISTER	PARAMETER	R/W	DESCRIPTION
41101	PR01	R/W	DATA 01 (±32000, Data range ±32000)
41102	PR02	R/W	DATA 02 (±32000, Data range ±32000)
41103	PR03	R/W	DATA 03 (±32000, Data range ±32000)
41104	PR04	R/W	DATA 04 (±32000, Data range ±32000)
41105	PR05	R/W	DATA 05 (±32000, Data range ±32000)
41106	PR06	R/W	DATA 06 (±32000, Data range ±32000)
41107	PR07	R/W	DATA 07 (±32000, Data range ±32000)
41108	PR08	R/W	DATA 08 (±32000, Data range ±32000)
41109	PR09	R/W	DATA 09 (±32000, Data range ±32000)
41110	PR10	R/W	DATA 10 (±32000, Data range ±32000)
41111	PR11	R/W	DATA 11 (±32000, Data range ±32000)
41112	PR12	R/W	DATA 12 (±32000, Data range ±32000)
41113	PR13	R/W	DATA 13 (±32000, Data range ±32000)
41114	PR14	R/W	DATA 14 (±32000, Data range ±32000)
41115	PR15	R/W	DATA 15 (±32000, Data range ±32000)
41116	PR16	R/W	DATA 16 (±32000, Data range ±32000)
41117	PR17	R/W	DATA 17 (±32000, Data range ±32000)
41118	PR18	R/W	DATA 18 (±32000, Data range ±32000)
41119	PR19	R/W	DATA 19 (±32000, Data range ±32000)
41120	PR20	R/W	DATA 20 (±32000, Data range ±32000)
41121	PR21	R/W	DATA 21 (±32000, Data range ±32000)
41122	PR22	R/W	DATA 22 (±32000, Data range ±32000)
41123	PR23	R/W	DATA 23 (±32000, Data range ±32000)
41124	PR24	R/W	DATA 24 (±32000, Data range ±32000)
41125	PR25	R/W	DATA 25 (±32000, Data range ±32000)
41126	PR26	R/W	DATA 26 (±32000, Data range ±32000)
41127	PR27	R/W	DATA 27 (±32000, Data range ±32000)
41128	PR28	R/W	DATA 28 (±32000, Data range ±32000)
41129	PR29	R/W	DATA 29 (±32000, Data range ±32000)
41130	PR30	R/W	DATA 30 (±32000, Data range ±32000)
41131	PR31	R/W	DATA 31 (±32000, Data range ±32000)
41132	PR32	R/W	DATA 32 (±32000, Data range ±32000)
41133	PR33	R/W	DATA 33 (±32000, Data range ±32000)
41134	PR34	R/W	DATA 34 (±32000, Data range ±32000)
41135	PR35	R/W	DATA 35 (±32000, Data range ±32000)
41136	PR36	R/W	DATA 36 (±32000, Data range ±32000)
41137	PR37	R/W	DATA 37 (±32000, Data range ±32000)
41138	PR38	R/W	DATA 38 (±32000, Data range ±32000)
41139	PR39	R/W	DATA 39 (±32000, Data range ±32000)
41140	PR40	R/W	DATA 40 (±32000, Data range ±32000)

Appx 5.3. EXCEPTION CODES

EXCEPTION CODES

CODE	EXCEPTION	DESCRIPTION
01	Illegal Function	Function code is not allowable for the slave.
02	Illegal Data Address	Address is not allowable within the slave.
03	Illegal Data Value	Data is not valid for the function.

Appx 6. DIGITAL DISPLAY ERROR MESSAGES

When more than one error has occurred at once, the most critical error is indicated.

MESSAGE	DESCRIPTION	PRIORITY
ERROR: EEPROM database	Equivalent to GROUP 00 ITEM 21	HIGH ↕ LOW
ERROR: PV	Equivalent to GROUP 00 ITEM 22	
ERROR: MV feedback	Equivalent to GROUP 00 ITEM 23	
ERROR: Function block	Equivalent to GROUP 00 ITEM 24	
ERROR: Control overload	Equivalent to GROUP 00 ITEM 25	
ERROR: Modbus communication	Modbus communication module error	

RUN CONTACT, RUN INDICATOR AND ERROR DISPLAY

FUNCTION	ERROR MESSAGE	RUN CONTACT	RUN INDICATOR	REFER TO
EEPROM database destroyed	ERROR: EEPROM database	OFF	Red	*1
PV error	ERROR: PV	ON	Green	*2
MV feedback error	ERROR: MV feedback	ON	Green	*3
Function block error	ERROR: Function block	ON	Amber	*4
Control overload	ERROR: Control overload	ON	Green	*5
NestBus communication error	ERROR: Function block	OFF	Amber	*6
Comm. error between control and I/O	ERROR: Function block	OFF	Amber	*7
Comm. error between LCD and extension	ERROR: Modbus communication	ON	Green	
Comm. error between control and LCD	–	OFF	Last display color	*8
Control status error	–	ON	RUN/STOP	*9
RUN contact forced OFF	–	OFF	Green	*10

*1: Function Block List Group [00], Item 21 “GROUP NN” (NN = group number)

*2: Function Block List Group [00], Item 22 “PV ABNORMAL”

*3: Function Block List Group [00], Item 23 “MV ABNORMAL”

*4: Function Block List Group [00], Item 24 “GROUP NN” (NN = group number)

*5: Function Block List Group [00], Item 25 “LOAD: OVER”

*6: Function Block List “Di receive terminal” and “Ai receive terminal” reception time-out (error number 21)

*7: Function Block List reception time-out to a “field terminal” (error number 22).

*8: “Communication error” dialogue appears.

*9: Function Block List Group [00], Item 02

*10: Function Block List Group [05], Item 28 set to 1.