• DI Assignment

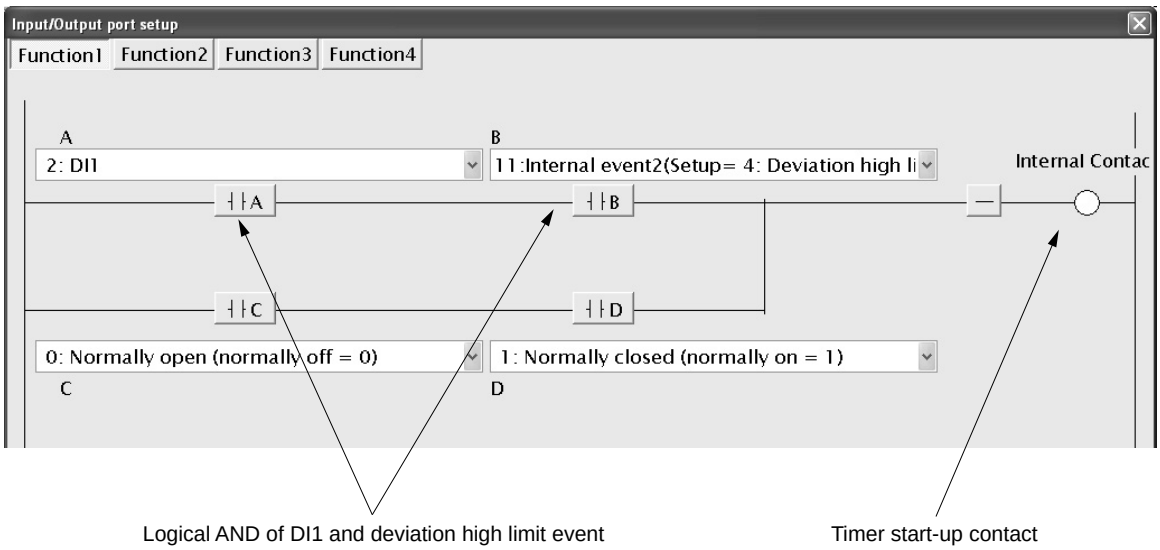
DI Assignment	Display	Internal Contact 1	Internal Contact 2
Operation type	DIx.1	17: Timer stop/start	7: RUN/READY
Input bit function	DIx.2	1: Function 1 (A and B) or (C and D)	1: Function 1 (A and B) or (C and D)
Input assignment A	DIx.3	2: DI1	2: DI1
Input assignment B	DIx.4	11: Internal Event 2 (Setting = 4: Deviation high limit)	10: Internal Event 1 (Setting = 32: Timer (Status))
Input assignment C	DIx.5	0: Normally opened. (Normally Off = 0)	0: Normally opened. (Normally Off = 0)
Input assignment D	DIx.6	0: Normally opened. (Normally Off = 0)	0: Normally opened. (Normally Off = 0)
Polarity A	DIx.7	0: Direct	0: Direct
Polarity B	DIx.7	0: Direct	1: Reverse
Polarity C	DIx.7	0: Direct	0: Direct
Polarity D	DIx.7	0: Direct	0: Direct
Polarity	DIx.8	0: Direct	1: Reverse
Event channel definitions	DIx.9	1	----

Note. The internal DI No. is indicated at the mark of "x" shown in the display column.

◆ Setting points

The timer startup conditions are set to logical AND of DI1 and temperature attainment (Internal Event 2: Deviation high limit).
The mode (RUN/READY) selection is used as conditions for logical AND of the A contact of DI1 and the B contact of the timer. However, since the mode is the READY mode when the contact is ON, it is reversed in the final stage of internal contact 2.

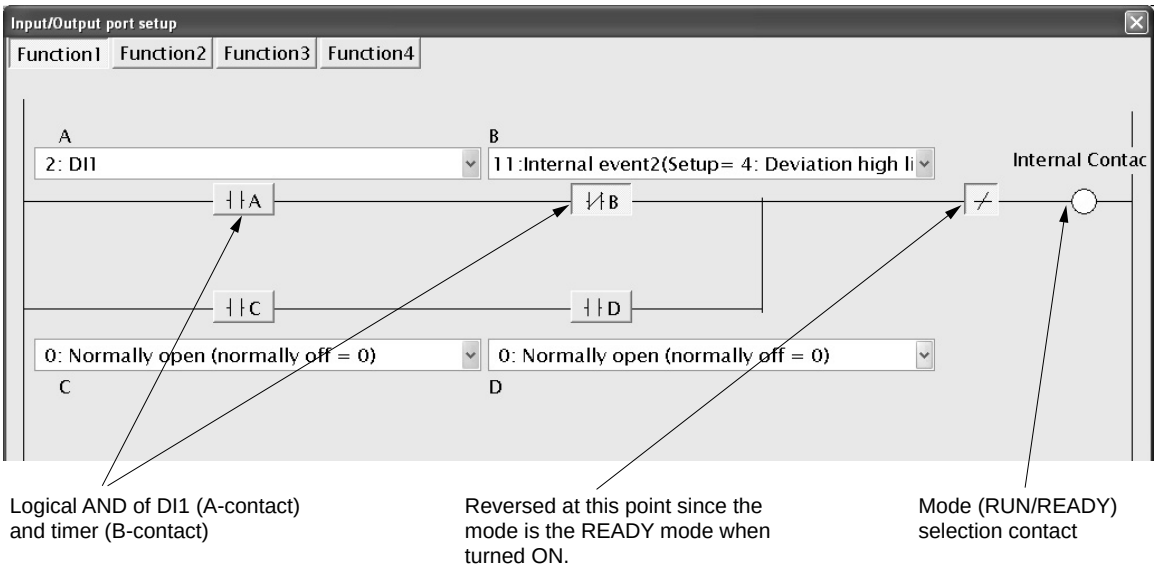
DI Assignment (Internal Contact 1): Input/Output port setup



Logical AND of DI1 and deviation high limit event

Timer start-up contact

DI Assignment (Internal Contact 2): Input/Output port setup

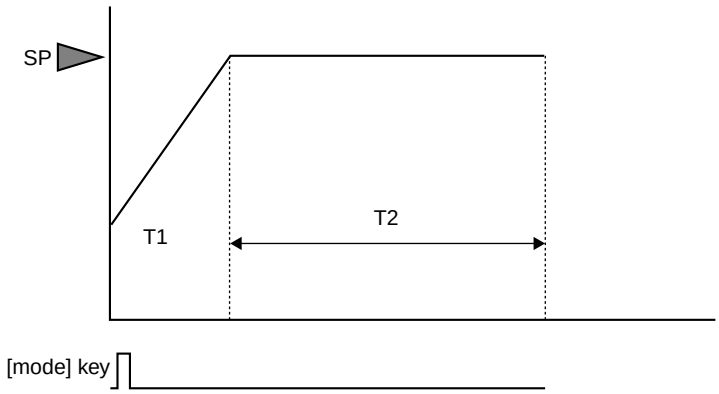


Logical AND of DI1 (A-contact) and timer (B-contact)

Reversed at this point since the mode is the READY mode when turned ON.

Mode (RUN/READY) selection contact

● Example 3 Simple pattern



◆ Explanation

When the [mode] key is pressed, the mode is changed to the RUN mode and the PV is started.

The SP value moves up (or down) along with the ramp-up (or ramp-down) set value.

When the SP value reaches the final SP value and the PV value enters the constant range, the counting is started. After the T2 time has elapsed, the mode is changed to the READY mode.

◆ Setting example

• Event

Event	Display	Internal Event 1	Internal Event 2
Operation type	Ex.C1	9: Deviation high/low limit (Final SP reference)	32: Timer (Status)
Direct/reverse	Ex.C2	1: Reversed.	----
Standby	Ex.C2	0: No standby	----
EVENT state at READY	Ex.C2	1: EVENT state at READY is forcibly turned OFF.	0: EVENT state at READY is continued.
Alarm OR	Ex.C3	0: None	0: None
Special OFF setup	Ex.C3	0: As usual.	----
Delay time unit	Ex.C3	0: 0.1s	0: 0.1s
Event main setting (low limit)	Ex	3	----
Event sub setting (high limit)	Ex.SB	3	----
Hysteresis	Ex.HY	9999	----
ON delay	Ex.ON	2	15
OFF delay	Ex.OF	0	0

Note. The internal event No. is indicated at the mark of "x" shown in the display column.

• DI Assignment

DI Assignment	Display	Internal Contact 1	Internal Contact 2
Operation type	DIx.1	7: RUN/READY	17: Timer stop/start
Input bit function	DIx.2	1: Function 1 (A and B) or (C and D)	1: Function 1 (A and B) or (C and D)
Input assignment A	DIx.3	18: COM DI 1	10: Internal Event 1 (Setting = 9: Deviation high/low limit (Final SP reference)
Input assignment B	DIx.4	11: Internal Event 2 (Setting = 32: Timer (Status))	26: During SP ramp
Input assignment C	DIx.5	0: Normally opened. (Normally Off = 0)	18: COM DI 1
Input assignment D	DIx.6	0: Normally opened. (Normally Off = 0)	11: Internal Event 2 (Setting = 32: Timer (Status))
Polarity A	DIx.7	0: Direct	0: Direct
Polarity B	DIx.7	1: Reverse	1: Reverse
Polarity C	DIx.7	0: Direct	0: Direct
Polarity D	DIx.7	0: Direct	0: Direct
Polarity	DIx.8	1: Reverse	0: Direct
Event channel definitions	DIx.9	----	2

Note. The internal DI No. is indicated at the mark of "x" shown in the display column.

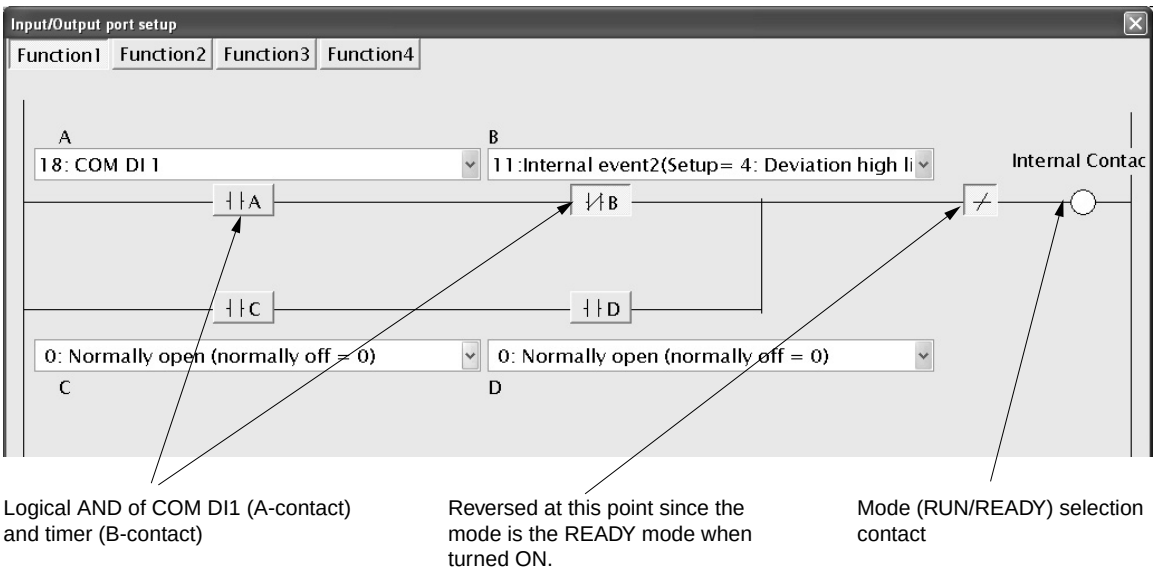
◆ Others

C72 [mode key function]: 7 (COM DI1 selection)
SP ramp-up/ramp-down: Desired value

◆ Setting points

The internal EV1 is substituted for the guarantee soak.
Therefore, “9999” is set to the hysteresis of Event 1 so that Event 1 is not turned OFF after it has been turned ON even though the PV fluctuates.

DI Assignment (Internal Contact 1): Input/Output port setup

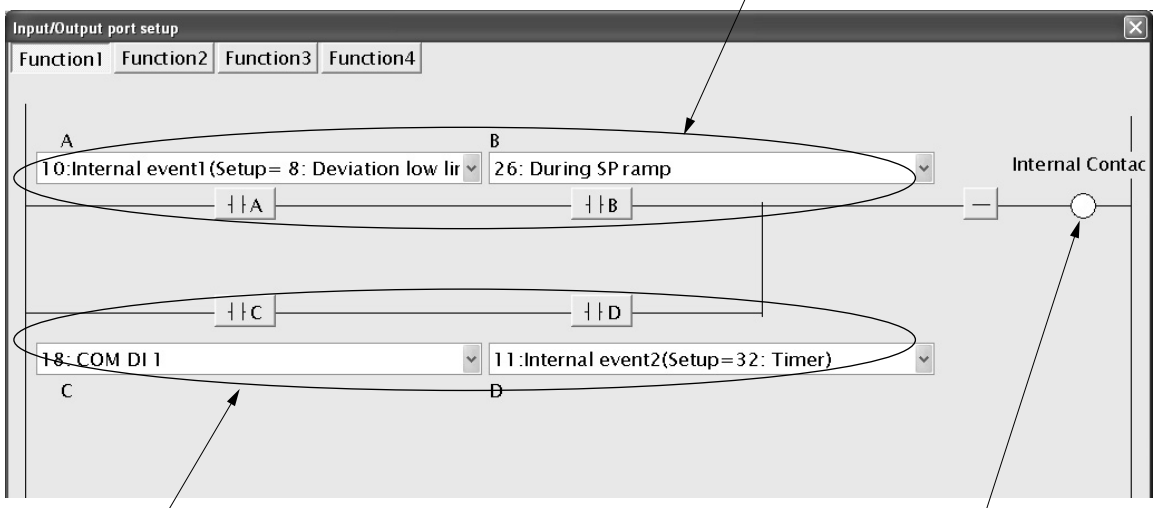


Logical AND of COM DI1 (A-contact) and timer (B-contact)

Reversed at this point since the mode is the READY mode when turned ON.

Mode (RUN/READY) selection contact

Conditions for guarantee soak (ramp is completed and operation enters within the deviation of the final SP.)



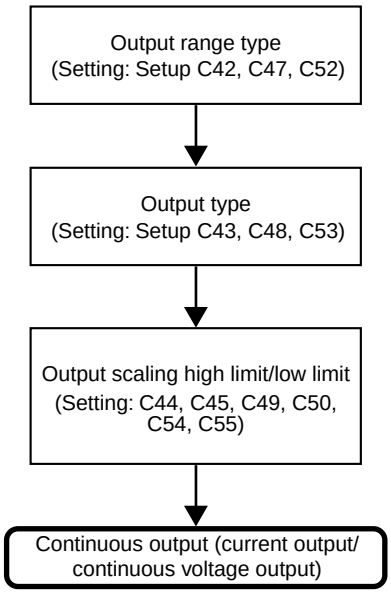
The timer start is self-retained at time-up so that the timer is not restarted due to change in PV.

Timer start-up contact

DI Assignment (Internal Contact 2): Input/Output port setup

5 - 11 Continuous Output

The following shows the functional block diagram of the continuous output:



■ Output range

The output range of the current output and continuous voltage output can be set.

Item (Bank)	Display	Contents	Initial value	User level
Control output 1 range (Setup bank)	C42	Current output 1: 4 to 20mA 2: 0 to 20mA	1	Simple, Standard, High function
Control output 2 range (Setup bank)	C47		1	
Auxiliary output range (Setup bank)	C52	Continuous voltage output 1: 1 to 5V 2: 0 to 5V 3: 0 to 10V	1	

• When the object control output is the current output or continuous voltage output, the display and setting can be configured.

■ Output type

The output type of the current output and continuous voltage output can be set.

Item (Bank)	Display	Contents	Initial value	User level
Control output 1 type (Setup bank)	C43	0: Manipulated variable (MV) 1: Heat MV (for heat/cool control) 2: Cool MV (for heat/cool control) 3: PV 4: PV before ratio, bias, and filter 5: SP 6: Deviation 7: CT1 current value 8: CT2 current value 9: MFB (including estimated MFB)	0	Simple, Standard, High function
Control output 2 type (Setup bank)	C48		3	
Auxiliary output type (Setup bank)	C53		3	

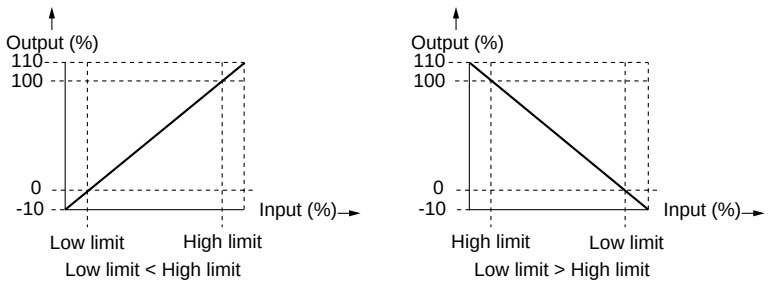
• When the object control output is the current output or continuous voltage output, the display and setting can be configured.

■ Output scaling low limit/high limit

The output scaling low limit and high limit of the current output and continuous voltage output can be set.

Item (Bank)	Display	Contents	Initial value	User level
Control output 1 scaling low limit (Setup bank)	C 44	-1999 to +9999 The decimal point position may vary so that it meets the output type.	0.0	Simple, Standard, High function
Control output 1 scaling high limit (Setup bank)	C 45		100.0	
Control output 2 scaling low limit (Setup bank)	C 49		0	
Control output 2 scaling high limit (Setup bank)	C 50		1000	
Auxiliary output scaling low limit (Setup bank)	C 54		0	
Auxiliary output scaling high limit (Setup bank)	C 55		1000	

- When the object control output is the current output or continuous voltage output, the display and setting can be configured.
- The following figures show the relationship between the numeric value and output of the output type using the output scaling low limit/high limit settings:



However, the output is 0 to 110% in a range of 0 to 20mA.

5 - 12 Current Transformer (CT) Input

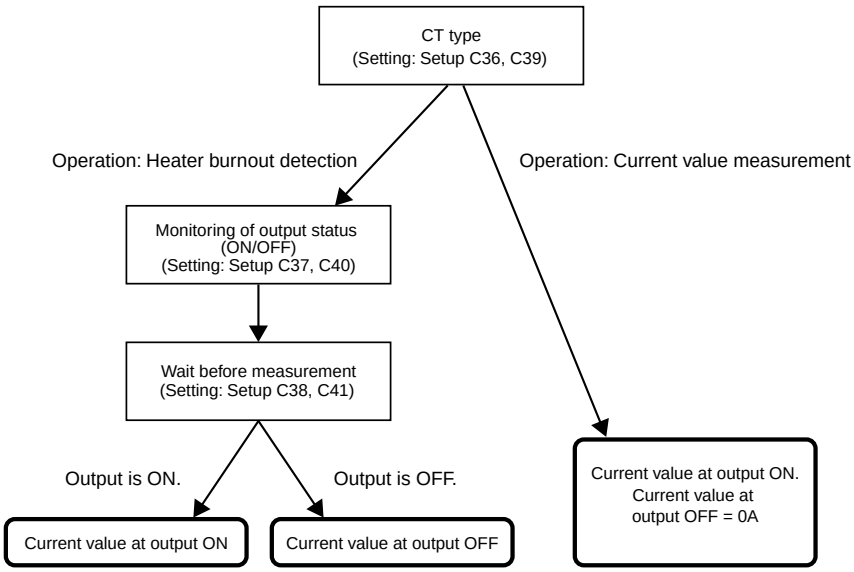
For CT input, two kinds of current values are provided.

• Current value at output ON: This current value is used for the heater burnout/over-current event. This current value is displayed as CT current value.

• Current value at output OFF: This current value is used for the heater short-circuit event. This current value cannot be displayed.

When [CT type] is set at "heater burnout detection" (C36 = 0 or C39 = 0), the following operation is performed:
The current value at output ON becomes the CT current value measured when the output specified in [CT output] is turned ON.
The current value at output OFF becomes the CT current value measured when the output specified in [CT output] is turned OFF.
When [CT type] is set at "current value measurement" (C36 = 1 or C39 = 1), the following operation is performed:
The current value at output ON becomes the measured CT current value regardless of the output ON/OFF status.
The current value at output OFF is fixed at "0.0A".

The following shows the functional block diagram of the current transformer (CT) input:



Handling Precautions

• The current value at output ON is used when the operation type of the Internal Event is set at [heater burnout/over-current].
The current value at output OFF is used when the operation type of the Internal Event is set at [heater short-circuit].

• If a change in current value is 2.5A or less, the CT input suppresses this change through the filter process.
This prevents the heater burnout event from malfunctioning due to fluctuation of the current value by variations in heater power voltage.
If the heater current is 2.5A or less, the filter process is activated when this unit is powered ON or the heater is powered ON. Therefore, it takes 3 to 5s that the heater current becomes equivalent to the actual current value.
When setting the heater burnout event is set at such low current level, an ON delay of 3 to 5s is set so that the event is not turned ON accidentally.

■ CT type

A desired operation type can be set for each of CT input 1 or CT input 2.

Item (Bank)	Display	Contents	Initial value	User level
CT1 operation type (Setup bank)	C 36	0: Heater burnout detection 1: Current value measurement	0	Simple, Standard, High function
CT2 operation type (Setup bank)	C 39		0	

- When the optional model has two CT input points, the display and setting can be made.
- When the CT type is set at “current value measurement”, the current value at output ON is updated regardless of the output ON/OFF status and the current value at output OFF is fixed at “0.0A”.

■ CT output

When the CT type is set at “heater burnout detection”, the output of the output ON/OFF monitor object can be set.

Item (Bank)	Display	Contents	Initial value	User level
CT1 output (Setup bank)	C 37	0: Control output 1 1: Control output 2 2: Event output 1 3: Event output 2 4: Event output 3	0	Simple, Standard, High function
CT2 output (Setup bank)	C 40		0	

- When the optional model has two CT input points and the CT type is set at “heater burnout detection”, the display and setting can be made.

■ CT measurement wait time

When the CT type is set at “heater burnout detection”, a period of time between changing of the output ON/OFF and starting of the current value measurement can be set.

Item (Bank)	Display	Contents	Initial value	User level
CT1 measurement wait time (Setup bank)	C 38	30 to 300ms	30ms	Simple, Standard, High function
CT2 measurement wait time (Setup bank)	C 41		30ms	

- When the optional model has two CT input points and the CT type is set at “heater burnout detection”, the display and setting can be made.
- When the measurement wait time has elapsed after the ON/OFF status of the output to be monitored has been changed, the measurement of the current value is started. When 100ms have elapsed after that, the measurement of the current value is completed.

5 - 13 Console Display and Key Operation

It is possible to make the setting so that the console display and key operation are customized.

■ Key operation type

Two kinds of general key operation flows are provided, standard key operation type and special key operation type. A desired key operation type can be selected. (For details about two kinds of key operation types,
☞ refer to 2-2, Key Operation (on page 2-2).)

Item (Bank)	Display	Contents	Initial value	User level
Key operation type (Setup bank)	C 71	0: Standard type 1: Special type	0	High function

■ [mode] key function

The selection operation when the [mode] key is kept pressed for 1s or longer in the operation display mode can be set.

Item (Bank)	Display	Contents	Initial value	User level
[mode] key function (Setup bank)	C 72	0: Invalid 1: AUTO/MANUAL selection 2: RUN/READY selection 3: AT Stop/Start 4: LSP group selection 5: Release all DO latches 6: LSP/RSP selection 7: Communication DI1 selection 8: Invalid	0	Simple, Standard, High function

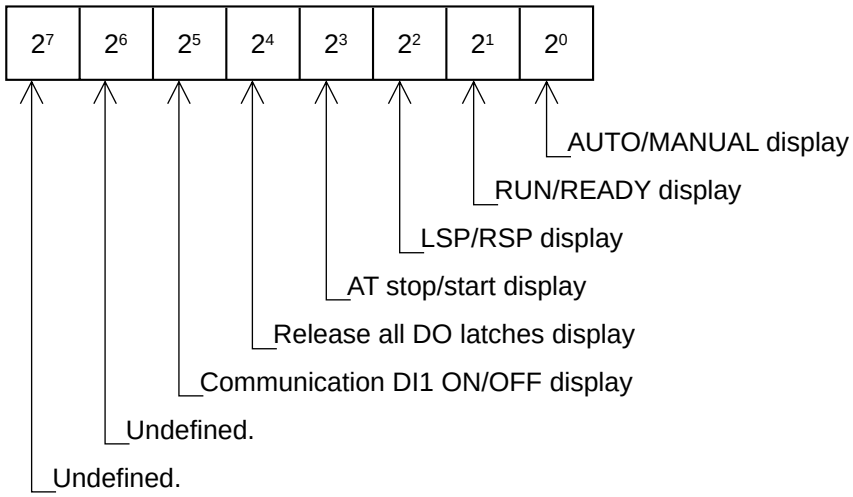
! Handling Precautions

- When [CtrL: Control method] is set at “0” (ON/OFF control), the AUTO/MANUAL selection becomes invalid.
- When [CtrL: Control method] is set at “0” (ON/OFF control) or if the PV high limit/low limit alarm occurs, the AT stop/start selection becomes invalid.
- When [C30: LSP system group] is set at “1”, the LSP group selection becomes invalid.

■ MODE display setup

The mode related setup items of the parameter setting and mode bank to be displayed can be set.

Item (Bank)	Display	Contents	Initial value	User level
MODE display setup (Setup bank)	C 73	Whether or not the mode bank setup is displayed is determined by the sum of the following weights: Bit 0: AUTO/MANUAL display Disabled: 0, Enabled: +1 Bit 1: RUN/READY display Disabled: 0, Enabled: +2 Bit 2: LSP/RSP display Disabled: 0, Enabled: +4 Bit 3: AT stop/start display Disabled: 0, Enabled: +8 Bit 4: Release all DO latches display Disabled: 0, Enabled: +16 Bit 5: Communication DI1 ON/OFF display Disabled: 0, Enabled: +32 Other invalid settings, 0, +64, +128	255	Standard, High function



• When using the Smart Loader Package SLP-C35, not only the numeric value, but also the bit input can be used to set [C73: MODE display setup].

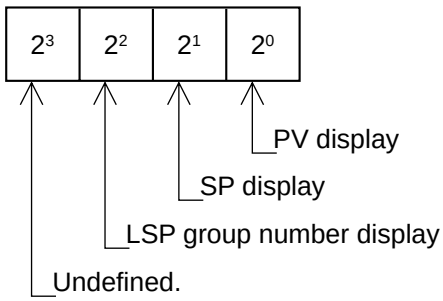
Handling Precautions

- Even though the AUTO/MANUAL display is set at [Displayed], the AUTO/MANUAL is not displayed when [CtrL: Control method] is set at “0” (ON/OFF control).
- Even though the AT stop/start display is set at [Displayed], the AT stop/start is not displayed when [CtrL: Control method] is set at “0” (ON/OFF control).
- Even though the LSP/RSP display is set at [Enabled], the LSP/RSP is not displayed if the model does not provide the RSP input.

■ PV/SP display setup

The PV/SV value related items to be displayed in the operation display mode can be set.

Item (Bank)	Display	Contents	Initial value	User level
PV/SP display setup (Setup bank)	C 74	Whether or not the PV/SP value related items are displayed in the operation display mode is determined by the sum of the following weights: Bit 0: PV display Disabled: 0, Enabled: +1 Bit 1: SP display Disabled: 0, Enabled: +2 Bit 2: LSP group number display Disabled: 0, Enabled: +4 Other invalid settings, 0, +8	15	Standard, High function



• When using the Smart Loader Package SLP-C35, not only the numeric value, but also the bit input can be used to set [C74: PV/SP display setup].

Handling Precautions

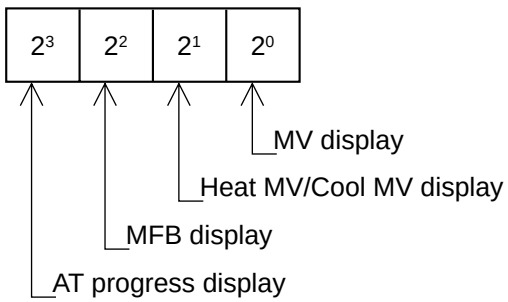
• Even though the LSP group number display is set at [Enabled], the LSP group number is not displayed when [C30: LSP system group] is set at “1”.

■ MV display setup

The MV related items to be displayed in the operation display mode can be set.

• When using the Smart Loader Package SLP-C35, not only the numeric value,

Item (Bank)	Display	Contents	Initial value	User level
MV display setup (Setup bank)	C 75	Whether or not the MV value related items are displayed in the operation display mode is determined by the sum of the following weights: Bit 0: MV display Disabled: 0, Enabled: +1 Bit 1: Heat MV/cool MV display Disabled: 0, Enabled: +2 Bit 2: MFB display Disabled: 0, Enabled: +4 Bit 3: AT progress display Disabled: 0, Enabled: +8	15	Standard, High function



but also the bit input can be used to set [C75: MV display setup].

Handling Precautions

- Even though the heat MV/cool MV display is set at [Enabled], the heat MV/cool MV is not displayed when [Heat/Cool control: C26] is set at “0” (Disabled).
- Even though the AT progress display is set at [Enabled], the AT progress is not displayed while the AT is stopping.
- Even though the MFB display is set at [Enabled], the MFB is not displayed if the model does not provide the position proportional output.

■ EV display setup

The main setting and sub-setting of Internal Events 1 to 3 to be displayed in the operation display mode can be set.

Item (Bank)	Display	Contents	Initial value	User level
EV display setup (Setup bank)	C 76	0: Internal Event set value is not displayed in the operation display mode. 1: Set value of Internal Event 1 is displayed in the operation display mode. 2: Set values of Internal Events 1 to 2 are displayed in the operation display mode. 3: Set values of Internal Events 1 to 3 are displayed in the operation display mode.	0	Standard, High function

[!] Handling Precautions

- Even though the Internal Event set value is set at [Enabled], the Internal Event set values are not displayed when the main setting and sub-setting are not necessary according to the operation type of Internal Event.
- The main setting and sub-setting of Internal Events 4 to 8 cannot be displayed in the operation display mode.

■ Timer remaining time display setup

The ON delay/OFF delay remaining time of Internal Events 1 to 3 to be displayed in the operation display mode can be set.

Item (Bank)	Display	Contents	Initial value	User level
Timer remaining time display setup (Setup bank)	C 77	0: ON/OFF delay remaining time of Internal Event is not displayed in the operation display mode. 1: ON/OFF delay remaining time of Internal Event 1 is displayed in the operation display mode. 2: ON/OFF delay remaining time of Internal Events 1 to 2 are displayed in the operation display mode. 3: ON/OFF delay remaining time of Internal Events 1 to 3 are displayed in the operation display mode.	0	Standard, High function

[!] Handling Precautions

- Even though the Internal Event timer remaining time is set at [Enabled], the timer remaining time is not displayed when the timer remaining time display is not necessary according to the operation type of Internal Event.
- The timer remaining time of Internal Events 4 to 8 cannot be displayed in the operation display mode.

■ CT display setup

The CT current value to be displayed in the operation display mode can be set.

Item (Bank)	Display	Contents	Initial value	User level
CT display setup (Setup bank)	C 78	0: CT current value is not displayed in the operation display mode. 1: CT1 current value is displayed in the operation display mode. 2: CT1 to 2 current values are displayed in the operation display mode.	0	Standard, High function

• When the optional model has two CT input points, the display and setting can be made.

■ User level

The user level of the console display can be set.
As a larger value is set, the number of possible displays/settings is increased.

Item (Bank)	Display	Contents	Initial value	User level
User level (Setup bank)	C 79	0: Simple configuration 1: Standard configuration 2: High function configuration	0	Simple, Standard, High function

■ Communication monitoring display

The function of the decimal point LED at the right end digit of the lower display (lower 4-digit display) can be set.

Item (Bank)	Display	Contents	Initial value	User level
Communication monitoring display (Setup bank)	C 80	0: Disabled 1: Flashing while data is being sent through RS-485 communication. 2: Flashing while data is being received through RS-485 communication. 3: Logical OR of all DI statuses 4: Flashing in READY mode	0	High function

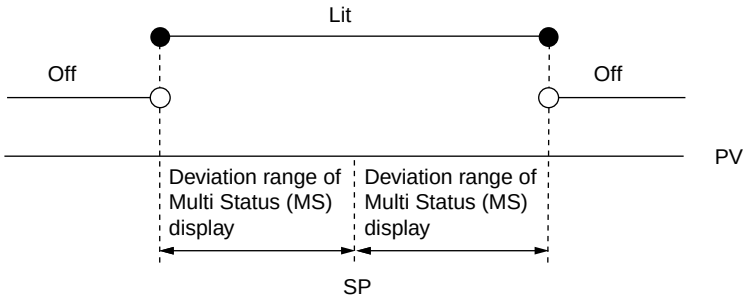
■ Multi Status (MS) display

The lighting conditions for the Multi Status (MS) display located at the center of the console and three groups of the lighting statuses can be set with the priority put.

Item (Bank)	Display	Contents	Initial value	User level
Multi Status (MS) display, Condition (top priority) (Setup bank)	C 81	0: Normally open (Normally OFF=0) 1: Normally close (Normally ON=1) 2 to 9: Internal event 1 to 8 10 to 13: Undefined. 14: MV1 (ON/OFF, Time proportional 1, Heat-side, OPEN-side output) 15: MV2 (Time proportional 2, Cool-side, CLOSE-side output) 16 to 17: Undefined. 18 to 21: DI1 to DI4 22 to 25: Undefined. 26 to 30: Internal contact 1 to 5 31 to 33: Undefined. 34 to 37: Communication DI1 to DI4 38: MANUAL 39: READY 40: RSP 41: AT 42: During ramp 43: Undefined. 44: Alarm 45: PV alarm 46: Undefined. 47: [mode] key pressing status 48: Event output 1 terminal status 49: Control output 1 terminal status	39	High function
Multi Status (MS) display, Status (top priority) (Setup bank)	C 82	0: Lit. 1: Slow flashing 2: Flashing twice 3: Fast flashing 4: Left to right 5: Right to left 6: Reciprocating between left and right 7: Deviation OK 8: Deviation graph 9: MV graph 10: Heat-side MV graph (For heat/cool control) 11: Cool-side MV graph (For heat/cool control) 12: MFB graph (including MFB being estimated) 13: DI monitor 14: Internal contact monitor 15: Internal event monitor	1	
Multi Status (MS) display, Condition (second priority) (Setup bank)	C 83	Same as Multi Status (MS) display, Condition (top priority).	44	High function
Multi Status (MS) display, Status (second priority) (Setup bank)	C 84	Same as Multi Status (MS) display, Status (top priority).	6	
Multi Status (MS) display, Condition (third priority) (Setup bank)	C 85	Same as Multi Status (MS) display, Condition (top priority).	1	High function
Multi Status (MS) display, Status (third priority) (Setup bank)	C 86	Same as Multi Status (MS) display, Status (top priority).	9	
Multi Status (MS) display, Deviation range (Setup bank)	C 87	0 to 9999U	5U	High function

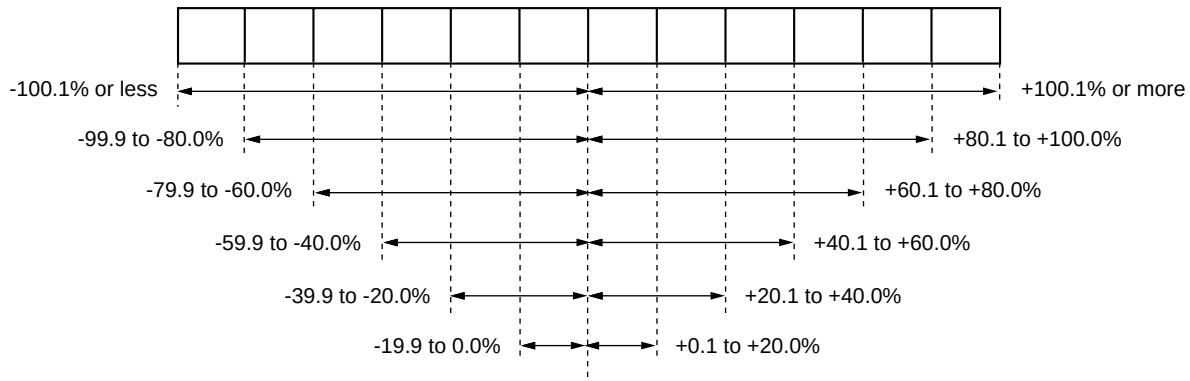
- The lighting conditions are satisfied when the status set as conditions is ON (example: Internal event 1) or the status set as conditions is met (example: MANUAL). Therefore, if the lighting conditions are set at "0", the conditions are always not satisfied. If the lighting conditions are set at "1", the conditions are always satisfied.
- When the lighting conditions having the top priority are satisfied, the operation enters the lighting status having the top priority.
- When the lighting conditions having the top priority are not satisfied and the lighting conditions having the second priority are satisfied, the operation enters the lighting status having the second priority.
- When the lighting conditions having the top and second priorities are not satisfied and the lighting conditions having the third priority are satisfied, the operation enters the lighting status having the third priority.
- When the lighting conditions having the top to third priorities are not satisfied, the Multi Status (MS) display becomes off.

- When the lighting status is set at "7" (deviation OK), the Multi Status (MS) display is lit or off as shown in the following Figure:
  If the deviation range of the Multi Status (MS) display is set at "0U", the Multi Status (MS) display is lit only when the PV display value equals SP (PV=SP).



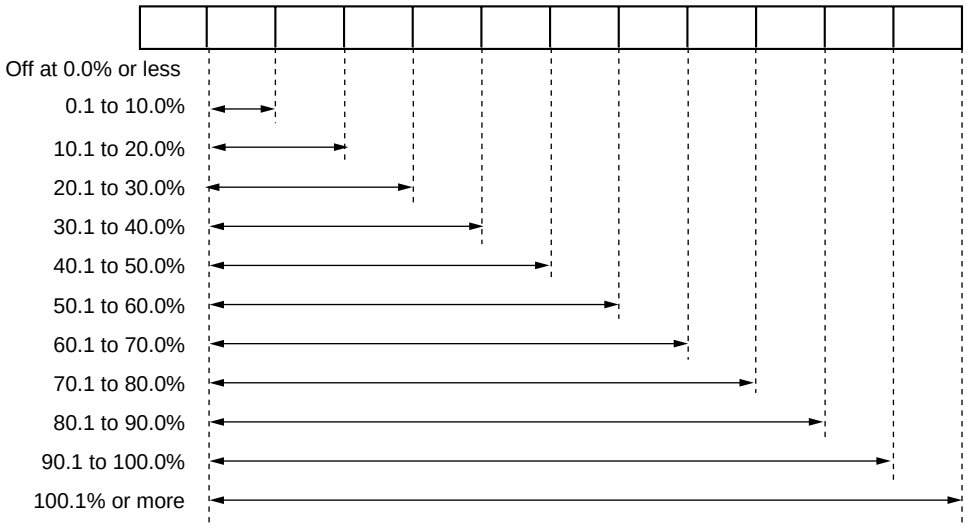
Deviation OK lit/off

- When the lighting status is set at "8" (deviation graph), the Multi Status (MS) display is lit as shown in the following Figure:
  The deviation range of the Multi Status (MS) display is set to "1U" or more. If this range is set at "0U", the Multi Status (MS) display becomes off.



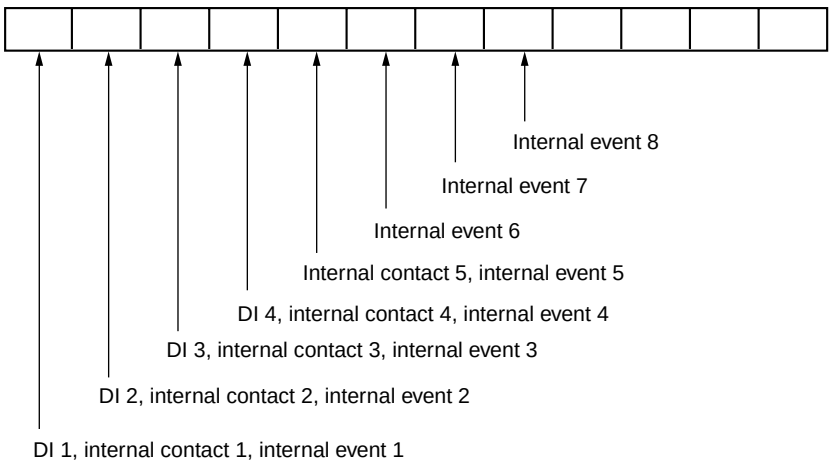
Lighting range of deviation graph (Ratio of deviation (PV-SP) to Multi Status (MS) display deviation range)

• When the lighting status is set at “9” (MV graph), “10” (Heat-side MV graph), “11” (Cool-side MV graph), or “12” (MFB graph), the Multi Status (MS) display is lit as shown in the following Figure:



Lighting range of MV graph (This explanation also applies to the heat MV, cool MV, and MFB.)

• When the lighting status is set at “13” (DI monitor), “14” (Internal contact monitor), or “15” (Internal event monitor), the Multi Status (MS) display is lit as shown in the following Figure:



Lighting of DI, internal contact, and internal event

■ User Function

Up to eight settings selected from various settings can be added to the operation display.

Item (Bank)	Display	Contents	Initial value	User level
User Function 1 (User Function bank)	UF-1	Each setting is set on the upper display. The following shows the setting exceptions: – – – – : Not registered. P – _ : Proportional band of currently used PID group I – _ : Integral time of currently used PID group d – _ : Derivative time of currently used PID group rE – _ : Manual reset of currently used PID group oL – _ : Output low limit of currently used PID oH – _ : Output high limit of currently used PID group P – _C : Proportional band for cool side of currently used PID group I – _C : Integration time for cool side of currently used PID group d – _C : Derivative time for cool side of currently used PID group oL.– _C : Output low limit for cool side of currently used PID group oH.– _C : Output high limit for cool side of currently used PID group It is possible to register only the settings, which can be displayed. (Example: Manual reset of the PID constant can be registered when the I (Integral time) is set at “0”.)	----	Standard, High function
User Function 2 (User Function bank)	UF-2		----	
User Function 3 (User Function bank)	UF-3		----	
User Function 4 (User Function bank)	UF-4		----	
User Function 5 (User Function bank)	UF-5		----	
User Function 6 (User Function bank)	UF-6		----	
User Function 7 (User Function bank)	UF-7		----	
User Function 8 (User Function bank)	UF-8		----	

• When using the Smart Loader Package SLP-C35, [User Function] can be registered even though the conditions for instrument status are set as display disabled.

Handling Precautions

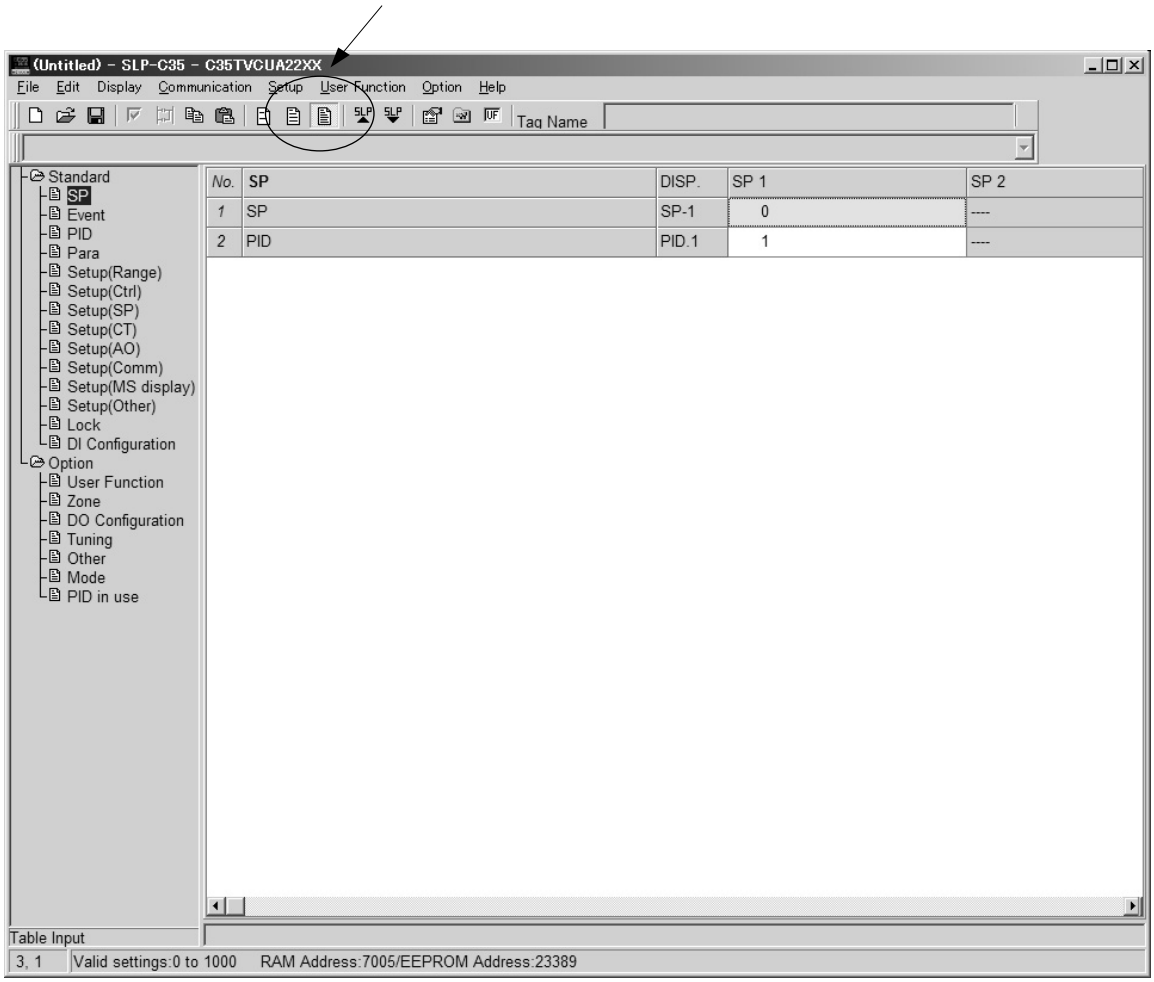
The settings registered in the User Function are not displayed in the operation display mode when the display is set disabled.

● User Function setting procedures

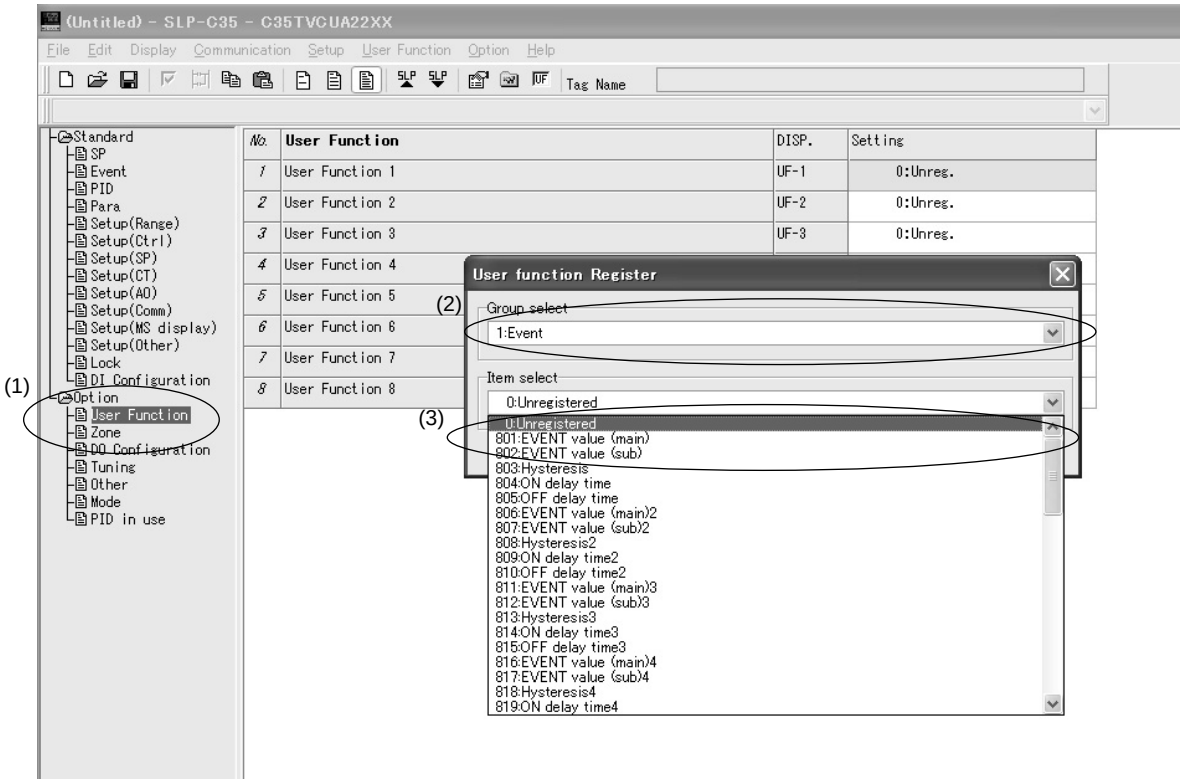
This section describes an example of setting with the Smart Loader Package SLP-C35.
When registering the user function, up to eight parameters can be registered to the [para] key.
When frequently used functions are registered, this ensures convenient operation.
In this example, the main setting of event 1 is registered into UF1.

1. To register a user function from the user function item:

   When using this function, first set the user level to “Standard configuration” or “High function configuration”.



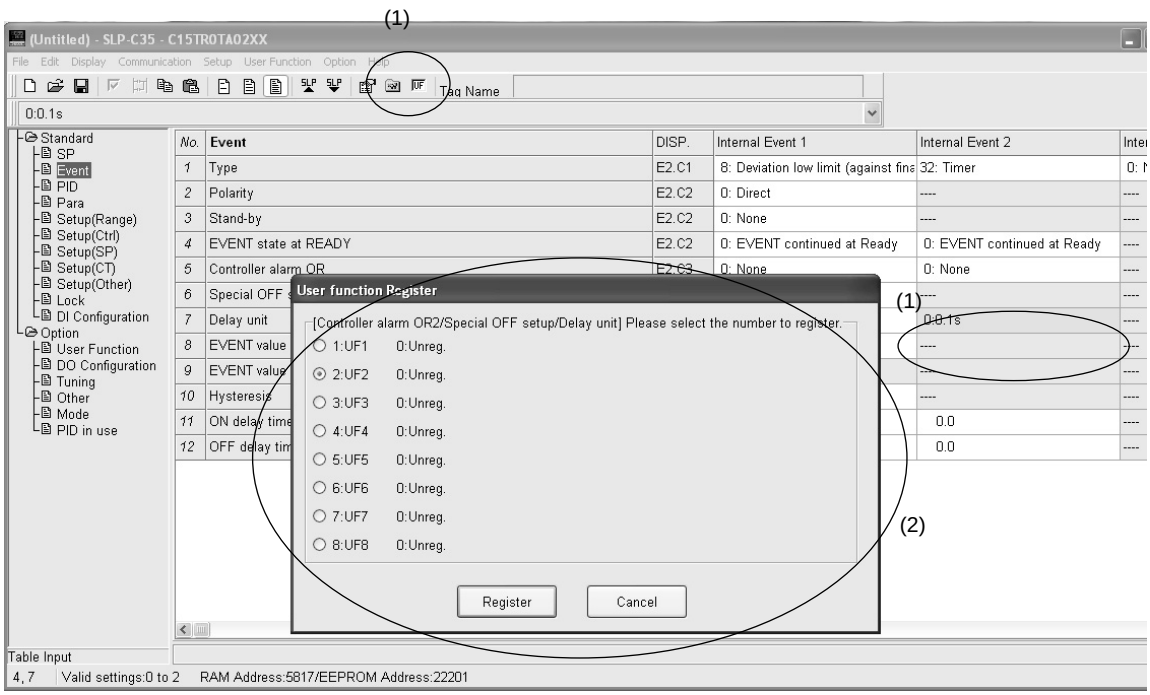
(1) Select [Option] → [User Function].
(2) Select [1: Event] in [Group select].
(3) Select [801: Event value] in [Item select].



2. To register currently setting item into the user function:
   If there are any parameters you wish to register into the user function during setting, follow the steps below to register such parameters.

(1) Keep the cursor placed in an item you wish to register and set, and then left-click the [UF] icon.
   >> The user function register box will appear.

(2) Check on Nos. you wish to register and click [Register].
   >> Items you have checked on are then registered.



Note

The registered contents can also be checked by selecting [Option] → [User Function].

■ Key lock, communication lock, and loader lock

The setting (changing) or display can be set disabled using the key lock.

Item (Bank)	Display	Contents	Initial value	User level
Key lock (Lock bank)	LoC	0: All settings are possible. 1: Mode, event, operation display, SP, UF, lock, manual MV, and mode key can be set. 2: Operation display, SP, UF, lock, manual MV, and mode key can be set. 3: UF, lock, manual MV, and mode key can be set.	0	Simple, Standard, High function
Communication lock (Lock bank)	C.LoC	0: RS-485 communication read/write enabled. 1: RS-485 communication read/write disabled.	0	High function
Loader lock (Lock bank)	L.LoC	0: Loader communication read/write enabled. 1: Loader communication read/write disabled.	0	High function

The communication can be set disabled using the communication lock and loader lock.

- When using only the key lock setting, key lock objects can be displayed, but the setting (changing) cannot be configured.
- When locked with the password, the display and setting of key lock objects cannot be configured.

■ Password

The setting (changing) of the key lock, communication lock, and loader lock can be set disabled using the password.

Item (Bank)	Display	Contents	Initial value	User level
Password display (Lock bank)	PASS	0 to 15 5: Password 1A to 2B display	0 (The initial value becomes "0" when the power is turned ON.)	Simple, Standard, High function
Password 1A (Lock bank)	PS 1A	0000 to FFFF (Hexadecimal value)	0000	Simple, Standard, High function
Password 2A (Lock bank)	PS2A	0000 to FFFF (Hexadecimal value)	0000	
Password 1B (Lock bank)	PS 1b	0000 to FFFF (Hexadecimal value)	0000	
Password 2B (Lock bank)	PS2b	0000 to FFFF (Hexadecimal value)	0000	

- When using only the key lock setting, the display can be made, but the setting (changing) cannot be made.
- When locked with the password, the display and setting cannot be made.
- The display and setting of [Password 1A: PS1A] and [Password 2A: PS2A] can be made only when [Password display: PASS] is "5" and the passwords of two groups (1A and 1B, 2A and 2B) are matched.
- The display and setting of [Password1B: PS1b] and [Password 2B: PS2b] can be made only when [Password display: PASS] is "5".
- The value set in [Password1A: PS1A] is automatically set to [Password1B: PS1b].
- The value set in [Password2A: PS2A] is automatically set to [Password2B: PS2b].

! Handling Precautions

- Before setting the passwords 1A to 2B, determine two hexadecimal values to be used as passwords and take a memorandum of these passwords to record them.
- [PASS] is used to prevent incorrect password setting by limiting the display conditions of passwords 1A to 2B.
- When other values are set for passwords 1B and 2B after the values to be used as passwords have been set for passwords 1A and 2A, the passwords 1A and 2A cannot be displayed and the key lock, communication lock and loader lock cannot be changed.
  This status is called "password lock status".
- The settings, which cannot be changed by the key lock, cannot be displayed in the password lock mode.
- If the password lock cannot be unlocked, contact Yamatake or its dealer. At Yamatake's factory, the password lock can be unlocked by returning the setting to the initial setting. In this case, note that the data, which has been set by the customer, cannot be saved (retained).

5 - 14 Position Proportional Control

When the control output type of the model is R1 (motor drive relay output), the position proportional control is performed. In the position proportional control, the ON/OFF control of the relays on the open and close sides is performed so that the MV (manipulated variable) by the PID control, MANUAL operation, and output at READY meets the opening (MFB) of the modutrol motor.

■ Position proportional type

Item (Bank)	Display	Contents	Initial value	User level
Position proportional type (Setup bank)	C 57	1: MFB control 2: Estimated position control (MFB disabled) 3: Estimated position control (MFB disabled) + Position adjustment at power ON.	0	Simple, Standard, High function

- When the control output type is R1 (motor drive relay output), the display and setting can be performed.

● Setting 0 (MFB control + Estimated position control)

When the Motor Feed Back (MFB) input is correct, the motor position is controlled by actually measured MFB.
When using this setting, the setup (C60) is set at "1" to perform the motor auto adjust.

- If the MFB input is faulty, the motor position is controlled by the estimated MFB value. This status is called "estimated position control status".
  For example, if the motor is rotated to the position where the feedback potentiometer deteriorates, the MFB input is changed rapidly.
  This rapid change is detected as error to estimate the correct MFB position.
  Additionally, if the MFB burnout alarm occurs, the motor position is also controlled by the estimated MFB value.
- In the estimated position control status, an error occurs between the actual motor opening and estimated MFB value.
  Therefore, if the output (MV) ≤ 0.0%, the relay on the close side is always turned ON. If the output (MV) ≥ 100.0%, the relay on the open side is always turned ON.
  According to the above control, the motor is put in the fully closed status or fully opened status to correct the error.
  However, the error is not corrected if the MV value is limited to a range of 0.1 to 99.9% by the output limiter or if the MV value does not become 0.0% or less or 100% or more according to the control status.
- The following may be the cause if the estimated position control is activated easily.
  - The motor opening is adjusted incorrectly.
  - The feedback potentiometer deteriorates or the resolution is insufficient.
  - The MFB wiring is faulty.

● Setting 1 (MFB control)

The motor is controlled by actually measured MFB. If the MFB burnout alarm (AL07) occurs, the MFB is changed to "150%" so that the relay on the close side is always turned ON. When using this setting, the setup (C60) is set at "1" to perform the motor auto adjust.

● **Setting 2 (Estimated position control)**

- The motor is always controlled in the estimated position control status. Regardless of the presence of the MFB wiring, the motor position is controlled by the estimated MFB value.
- When using this setting, [C63: Motor full close-full open time] must be input correctly.
- The MFB burnout alarm does not occur.
- The error between the actual motor opening and estimated MFB value is corrected by forcibly moving the motor continuously in the close or open direction when the MV is 0.0% or 100%.

● **Setting 3 (Estimated position control + Position adjustment at power ON)**

When the power is turned ON, the relay on the close side is kept turned ON for a period of time set in [C63: Motor full close-full open time] to make "0%" of the estimated MFB matched with the motor opening. Subsequent operation is the same as that described for setting 2 (Estimated position control).

■ Position proportional dead zone

Item (Bank)	Display	Contents	Initial value	User level
Position proportional dead zone (Setup bank)	C 58	0.5 to 25.0%	10.0%	Simple, Standard, High function

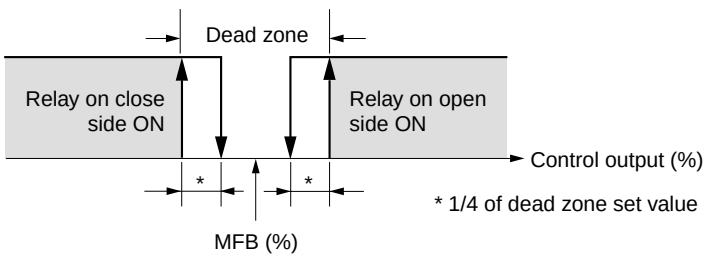
- When the control output type is R1 (motor drive relay output), the display and setting can be performed. However, if [C59: Motor long life mode] is set at "1" (aiming at the service life of the potentiometer), the display and setting cannot be performed.

The dead zone between the motor open and motor close in the position proportional control is set.

For setting reference, this dead zone is changed when the manual output is output at a constant rate. The value, which is obtained when the hunting of the motor is stopped, is the minimum value of the dead zone.

If the exactly minimum value is set, the motor is always moved, causing the service life of the motor to be shortened extremely.

The default setting before shipment is "10.0%". With this default value used as reference value, the setting is made correctly by taking the control results and service life of the motor into consideration.



■ Motor long life mode

Item (Bank)	Display	Contents	Initial value	User level
Motor long life mode (Setup bank)	C 59	0: Aiming at controllability 1: Aiming at service life of potentiometer	1	Simple, Standard, High function

- When the control output type is R1 (motor drive relay output), the display and setting can be performed.
- When this setting is set at "1" (aiming at service life of potentiometer), the values set in [oUtL: Output variation limit] and [C58: Position proportional dead zone] become invalid and the value suitable for aiming at the service life of the potentiometer is calculated automatically.

■ Motor auto adjust

Item (Bank)	Display	Contents	Initial value	User level
Motor auto adjust (Setup bank)	C 60	0: Stop 1: Start	0	Simple, Standard, High function

- When the control output type is R1 (motor drive relay output), the display and setting can be performed. However, when [C57: Position proportional type] is set at "2" (Estimated position control) or "3" (Estimated position control + Position adjustment at power ON), the display and setting cannot be performed.
- When using the motor auto adjust function of the position proportional control, [C61: Input with motor fully closed], [C62: Input with motor fully open], and [C63: Motor full close-full open time] are set automatically.

- Motor auto adjusting procedures
  1. Set "0" or "1" to [C57: Position proportional type].
  2. Set "1" to [C60: Motor auto adjust] and press the [enter] key.
     When this setup (C60) is already set at "1", press the [enter] key twice.
  3. The motor auto adjust is then started.
     - The upper display shows CACL and the relay on the close side is turned ON.
     - The motor is moved toward the close side and the MFB count value is shown on the lower display. When the counting becomes stable, the fully closed adjustment is completed. This count value is then written into [C61: Input with motor fully closed].
     - The upper display shows CAoP and the relay on the open side is turned ON.
     - The motor is moved toward the open side and the MFB count value is shown on the lower display. When the counting becomes stable, the fully open adjustment is completed. This count value is then written into [C62: Input with motor fully open]. Additionally, a period of time, which has elapsed from the fully closed position to the fully open position, is written into [C63: Motor full close-full open time]. However, if this time is 240.0s or longer, "240.0s" is set to this parameter.
     - When the motor auto adjust has been completed, the basic display screen will appear.

4. To cancel the adjustment, press the [display] key.
   When the motor auto adjust is started, keys other than the [display] key used to cancel the adjustment cannot be operated.
   If any of the following arises, each value is returned to its default setting before shipment and “AL10” is shown as the troubleshooting process.
   “AL10” is cleared only when the motor auto adjust is restarted and completed correctly or when the power is reset.
   - The count value between the fully closed position and fully open position is less than “260”.
   - The fully closed count is greater than the fully open count.
   - The period of time from the fully closed position to the fully open position is less than 5s.
   - The MFB burnout alarm (AL07) is continued or occurs frequently.
   - The period of time that the MFB count value becomes stable exceeds 5min.
   - The MFB or open/close relay has faulty wiring.
     (However, all of faulty wiring cannot be detected as error.)

- As the data is written into the motor auto adjust (decimal address: 5260) through the CPL or MODBUS communication, the starting of the motor auto adjust can be cancelled. To start the motor auto adjust, “1” is written. On the contrary, to cancel the motor auto adjust, “0” is written.

[!] Handling Precautions

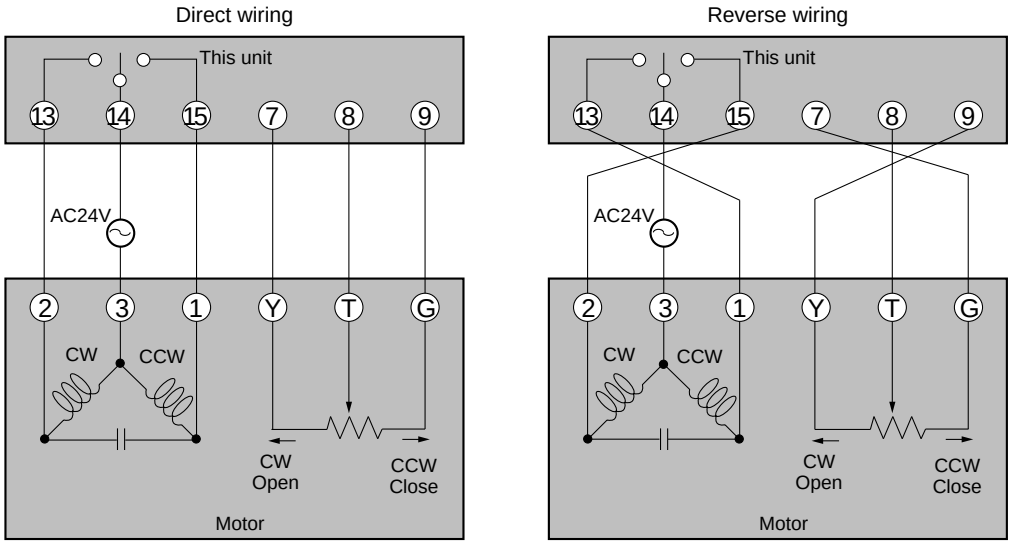
- If the power to the measuring instrument is turned OFF during motor auto adjust of the position proportional control, the motor auto adjust is cancelled when the power is turned ON again.
- Even though the AUTO/MANUAL mode, RUN/READY mode, or LSP/RSP is changed during motor auto adjust, the motor auto adjust is continued.

■ Motor wiring and motor auto adjust operation

For wiring method between the motor and controller, two kinds of wiring methods, direct wiring and reverse wiring, are provided as described below.
The direct wiring means that the motor is rotated clockwise (CW, ↷) as the output of the controller increases.
If it is required to rotate the motor counterclockwise according to the control contents, such as cooling control, two kinds of methods are provided as described below.

- The wiring is not changed and the control action direction is changed on the controller side.
- The wiring is changed to construct the reverse wiring.

In this unit, the control action (Direct/Reverse) can be changed.
If the direct wiring is used for the wiring to the motor, the thinking way of each control is simplified and the trouble can be solved easily.
Therefore, it is recommended to perform the direct wiring where possible.



CW: Clock Wise (Clockwise, ↷)
CCW: Counter Clock Wise (Counterclockwise, ↶)

This unit has functions (AL07, AL10) that detect incorrect wiring with the motor and the MFB burnout or short-circuit.
In the same manner as described for the direct wiring, the unit judges the reverse wiring as correct and does not give any alarm.
Additionally, when [C57: Position proportional type] is set at [0: MFB control + estimated position control], the operation continues even though the MFB burnout is detected.
The following Tables summarize symptoms of each wiring method during motor auto adjust ([C60: Motor auto adjust] is set at [1: Start]).
At this time, note that the motor is started from the fully closed position (position where the motor rotated counterclockwise fully). Numeric values shown in the lower display column of the Tables show examples. The lit LED column in the Tables shows examples with initial values of the DO Assignment, that is, control output 1 uses the open side and control output 2 uses the close side. Additionally, the alarm is shown after the motor has been closed or opened fully.

● Correct direct wiring

Upper display	Lit LED	Lower display	Motor motion	Remarks
CACL ↓ CAoP	ot2 ot1	Decreases like 2000 → 1500 and becomes stable. Increases like 1500 → 3500 and becomes stable.	CCW CW	When the motor is moved CCW with "ot2" lit, the motor terminals 1 and 2 are the direct wiring.

● Correct reverse wiring

Upper display	Lit LED	Lower display	Motor motion	Remarks
CACL ↓ CAoP	ot2 ot1	Decreases like 3500 → 1500 and becomes stable. Increases like 1500 → 3500 and becomes stable.	CW CCW	When the motor is moved CW with 1 and 2 connected reversely, G and Y connected reversely, and "ot2" lit, the motor terminals 1 and 2 are the reverse wiring.

● Alarm indications and causes due to incorrect wiring

Upper display	Lit LED	Lower display	Motor motion	Alarm indication	Cause
CACL ↓ CAoP	ot2 ot1	Increases and becomes stable. Decreases and becomes stable.	CCW CW	AL 10	G and Y are connected reversely.
CACL ↓ CAoP	ot2 ot1	Increases and becomes stable. Decreases and becomes stable.	CCW CW	None. However, the MFB value does not meet the motor opening.	T and G are connected reversely.
CACL ↓ CAoP	ot2 ot1	Decrease or increase is unclear. (Motor motion is changed before fully closed or opened.)	CCW CW	AL 10 or none.	T and Y are connected reversely.
CACL ↓ CAoP	ot2 ot1	Increases and becomes stable. Decreases and becomes stable.	CW CCW	AL 10	1 and 2 are connected reversely.
CACL ↓ CAoP	ot2 ot1	Increases and becomes stable. Decreases and becomes stable.	CW CCW	AL 10	1 and 2 are connected reversely; T and G are connected reversely.
CACL ↓ CAoP	ot2 Oot1	Decrease or increase is unclear. (Motor motion is changed before fully closed or opened.)	CW CCW	AL 10 or none.	1 and 2 are connected reversely; T and Y are connected reversely.

■ Input with motor fully closed and input with motor fully open

Item (Bank)	Display	Contents	Initial value	User level
Input with motor fully closed (Setup bank)	C 61	0 to 9999	1000	Simple, Standard, High function
Input with motor fully closed (Setup bank)	C 62	0 to 9999	3000	

- When the control output type is R1 (motor drive relay output), the display and setting can be performed. However, if [C57: Position proportional type] is set at "2" (Estimated position control) or "3" (Estimated position control + Position adjustment at power ON), the display and setting cannot be performed.
- If you use the motor auto adjust function of the position proportional control, these parameters can be set automatically. Additionally, they can also be set manually in the same manner as described for normal set values.

📖 Note

For details about motor auto adjust,
☞ refer to ■ Motor auto adjust (on page 5-106).

■ Motor full close-full open time

Item (Bank)	Display	Contents	Initial value	User level
Motor full close-full open time (Setup bank)	C 63	5.0 to 240.0s	30.0s	Simple, Standard, High function

- When the control output type is R1 (motor drive relay output), the display and setting can be performed.
- When using the motor auto adjust function of the position proportional control with [C57: Position proportional type] set at "0" (MFB control + Estimated position control) or "1" (MFB control), the motor full close-full open time can be set automatically. Additionally, this time can also be set manually in the same manner as described for normal set values.

📖 Note

For details about motor auto adjust,
☞ refer to ■ Motor auto adjust (on page 5-106).

- When [C57: Position proportional type] is set at "2" (Estimated position control) or "3" (Estimated position control + Position adjustment at power ON), the actually measured motor full open time is set.

Chapter 6. LIST OF DISPLAYS AND SETTING DATA

6 - 1 List of Operation Displays

The following shows the meanings of the values stated in the “User Level” column:

0: Simple, Standard, and High function configuration

1: Standard and High function configuration

2: High function configuration

■ Operation displays

Display	Item	Contents	Initial value	User level	Remarks
Upper display: PV Lower display: SP	SP (Target value)	SP low limit (C07) to SP high limit (C08)	0	0	Whether or not this item is displayed is selected by the PV/SP display setup (C74).
LSP1 (Display example) Lower display: LSP	LSP group number (1st digit: Value at the right end digit)	1 to LSP system group (C30, Max. 8)	1	0	Displayed when LSP system group (C30) is “2” or more. The lower display shows the LSP set value corresponding to the LSP group number. Whether or not this item is displayed is selected by the PV/SP display setup (C74).
St.1 (Display example) Lower display: Step remain time	Step No. and step remain time	Setting is disabled. Upper display shows the step No. (1 to 8), and distinction among the soak, up ramp, and down ramp on the right of “St.”. Lower display shows the soak remain time or ramp remain time.	1	0	Regardless of the soak or ramp operation, the remain time is displayed in step time unit (setup C33). When the unit is 1s, “min.s” is displayed. When the unit is 1min, “h.min” is displayed.
Upper display: PV Lower display: MV	MV (Manipulated Variable)	-10.0 to +110.0% Setting is disabled in AUTO mode. (Numeric value does not flash.) Setting is enabled in MANUAL mode. (Numeric value flashes.)	—	0	In the ON/OFF control (CtrL = 0), "100.0" is displayed at ON and "0.0" is displayed at OFF. Whether or not this item is displayed is selected by the MV display setup (C75).
HEAt	Heat MV (Manipulated Variable)	Setting is disabled. -10.0 to +110.0%	—	0	This item is displayed when using the Heat/Cool control (C26 = 1). Whether or not this item is displayed is selected by the MV display setup (C75).
CooL	Cool MV (Manipulated Variable)		—	0	
Fb	MFB (Motor opening feedback value)	Setting is disabled. -10.0 to +110.0% Flashing when the value is 0.0 to 100.0% during estimate.	—	0	Displayed when the output type is the position proportional output. Whether or not the MFB is displayed is selected using the MV display setup (C75).
Upper display: PV At 1 (Display example)	AT progress display (1st digit = Numeric value at right end digit)	Setting is disabled. Lower display shows the AT progress value on the right of “At”. 1 - : During execution of AT (Value is decreased.) 0: Completion of AT	—	0	Displayed during execution of AT. (The display is continued even after completion of AT.) Whether or not this item is displayed is selected by the MV display setup (C75).
Ct1	CT (Current transformer) current value 1	Setting is disabled.	—	0	Displayed when the optional model has two current transformer points. Whether or not this item is displayed is selected by the CT display setup (C78).
Ct2	CT (Current transformer) current value 2	Setting is disabled.	—	0	
E1	Internal Event 1 main setting	The allowable setting range may vary depending on the operation type of the internal event. -1999 to +9999U: Set value is other than the following values: 0 to 9999U: Set value is an absolute value. -199.9 to +999.9%: Set value is MV.	0	0	Setting required by the operation type of the internal event is displayed. Whether or not this item is displayed is selected by the EV display setup (C76).
E1Sb	Internal Event 1 sub setting		0	0	

Display	Item	Contents	Initial value	User level	Remarks
t 1	Timer remain time 1	Setting is disabled. Upper display: Displays the distinction between ON delay and OFF delay next to “t1.”. Lower display: Displays in the unit (any of 0.1s, s, and min), which is determined according to the delay time unit of internal event 1 (3rd digit of E1.C3).	—	0	Whether or not this item is displayed is selected by the timer remain time display setup (C77). “Γ ” is displayed at the right end digit when using the ON delay time. “L” is displayed at the right end digit when using the OFF delay time.
E2	Internal Event 2 main setting	The allowable setting range may vary depending on the operation type of the internal event. -1999 to +9999U: Set value is other than the following values: 0 to 9999U: Set value is an absolute value. -199.9 to +999.9%: Set value is MV.	0	0	Setting required by the operation type of the internal event is displayed. Whether or not this item is displayed is selected by the EV display setup (C76).
E2.Sb	Internal Event 2 sub setting		0	0	
t2	Timer remain time 2	Setting is disabled. Upper display: Displays the distinction between ON delay and OFF delay next to “t2.”. Lower display: Displays in the unit (any of 0.1s, s, and min), which is determined according to the delay time unit of internal event 2 (3rd digit of E2.C3).	—	0	Whether or not this item is displayed is selected by the timer remain time display setup (C77). “Γ ” is displayed at the right end digit when using the ON delay time. “L” is displayed at the right end digit when using the OFF delay time.
E3	Internal Event 3 main setting	The allowable setting range may vary depending on the operation type of the internal event. -1999 to +9999U: Set value is other than the following values. 0 to 9999U: Set value is an absolute value. -199.9 to +999.9%: Set value is MV.	0	0	Setting required by the operation type of the internal event is displayed. Whether or not this item is displayed is selected by the EV display setup (C76).
E3.Sb	Internal Event 3 sub setting		0	0	
t3	Timer remain time 3	Setting is disabled. Upper display: Displays the distinction between ON delay and OFF delay next to “t3.”. Lower display: Displays in the unit (any of 0.1s, s, and min), which is determined according to the delay time unit of internal event 3 (3rd digit of E3.C3).	—	0	Whether or not this item is displayed is selected by the timer remain time display setup (C77). “Γ ” is displayed at the right end digit when using the ON delay time. “L” is displayed at the right end digit when using the OFF delay time.

6 - 2 List of Parameter Setting Displays

The following shows the meanings of the values stated in the “User Level” column:

0: Simple, Standard, and High function configuration

1: Standard and High function configuration

2: High function configuration

The initial value may vary depending on the model No.

■ Mode bank

Bank selection: mode

Display	Item	Contents	Initial value	User level	Remarks
A--M	AUTO/MANUAL	AUto: AUTO mode MAn: MANUAL mode	AUTO	0	Displayed when the control method is other than the ON/OFF control (CtrL≠0). Whether or not this item is displayed is selected by the display mode setup (C73).
r--r	RUN/READY	rUn: RUN mode rdy: READY mode	RUN	0	Whether or not this item is displayed is selected by the display mode setup (C73).
L--r	LSP/RSP	LSP: LSP mode rSP: RSP mode	LSP	0	When the model provides the RSP input, the display is possible. Whether or not this item is displayed is selected by the display mode setup (C73).
At	AT stop/start	At.oF: AT stop At.on: AT start	AT stop	0	Displayed when the control method is other than the ON/OFF control (CtrL≠0). Whether or not this item is displayed is selected by the display mode setup (C73).
do.Lt	Release all DO latches	Lt.on: Latch continue Lt.oF: Latch release	Latch con-tinue	0	All DO latches such as control outputs (relay and voltage pulse) and event outputs can be released. Whether or not this item is displayed is selected by the display mode setup (C73).
C.dI 1	Communication DI	dI.oF: OFF dI.on: ON	OFF	0	Whether or not this item is displayed is selected by the display mode setup (C73).

■ SP bank

Bank selection: SP

Display	Item	Contents	Initial value	User level	Remarks
rSP	RSP	Setting is disabled.	—	0	Displayed when the optional model provides the RSP input.
PId.r	PID group No. (For RSP)	1 to 8	1	1	Displayed when the optional model provides the RSP input, the control is other than ON/OFF control (CtrL≠0), and the zone PID is not used (C24=0).
SP-1	SP of LSP 1 group	SP low limit (C07) to SP high limit (C08)	0	0	
PId.1	PID group No. (For LSP1)	1 to 8	1	1	Displayed when the control is other than ON/OFF control (CtrL≠0) and the zone PID is not used (C24=0).
rmP.1	Ramp (For LSP1)	0 to 9999 (The decimal point position is determined by the decimal point position of PV and the SP ramp unit.)	0	2	Displayed when the SP ramp type (C31) is “1” or more.
t1n.1	Time (For LSP1)	0.0 to 999.9 (The time unit of the step operation is “0.1s”.) 0 to 9999 (The time unit of the step operation is “1s” or “1min”.)	0	2	Displayed when the SP ramp type (C31) is “2” or more.
SP-2	SP of LSP 2 group	Same as LSP1 group.	0	0	Displayed when the LSP system group (C30) is “2” or more and the same conditions as those for the LSP1 group are satisfied.
PId.2	PID group No. (For LSP2)		1	1	
rmP.2	Ramp (For LSP2)		0	2	
t1n.2	Time (For LSP2)		0	2	
SP-3	SP of LSP 3 group	Same as LSP1 group.	0	0	Displayed when the LSP system group (C30) is “3” or more and the same conditions as those for the LSP1 group are satisfied.
PId.3	PID group No. (For LSP3)		1	1	
rmP.3	Ramp (For LSP3)		0	2	
t1n.3	Time (For LSP3)		0	2	
SP-4	SP of LSP 4 group	Same as LSP1 group.	0	0	Displayed when the LSP system group (C30) is “4” or more and the same conditions as those for the LSP1 group are satisfied.
PId.4	PID group No. (For LSP4)		1	1	
rmP.4	Ramp (For LSP4)		0	2	
t1n.4	Time (For LSP4)		0	2	
SP-5	SP of LSP 5 group	Same as LSP1 group.	0	0	Displayed when the LSP system group (C30) is “5” or more and the same conditions as those for the LSP1 group are satisfied.
PId.5	PID group No. (For LSP5)		1	1	
rmP.5	Ramp (For LSP5)		0	2	
t1n.5	Time (For LSP5)		0	2	
SP-6	SP of LSP 6 group	Same as LSP1 group.	0	0	Displayed when the LSP system group (C30) is “6” or more and the same conditions as those for the LSP1 group are satisfied.
PId.6	PID group No. (For LSP6)		1	1	
rmP.6	Ramp (For LSP6)		0	2	
t1n.6	Time (For LSP6)		0	2	
SP-7	SP of LSP 7 group	Same as LSP1 group.	0	0	Displayed when the LSP system group (C30) is “7” or more and the same conditions as those for the LSP1 group are satisfied.
PId.7	PID group No. (For LSP7)		1	1	
rmP.7	Ramp (For LSP7)		0	2	
t1n.7	Time (For LSP7)		0	2	
SP-8	SP of LSP 8 group	Same as LSP1 group.	0	0	Displayed when the LSP system group (C30) is “8” or more and the same conditions as those for the LSP1 group are satisfied.
PId.8	PID group No. (For LSP8)		1	1	
rmP.8	Ramp (For LSP8)		0	2	
t1n.8	Time (For LSP8)		0	2	

■ Event bank

Bank selection: Eu

Display	Item	Contents	Initial value	User level	Remarks
E 1	Internal Event 1 main setting	-1999 to +9999 The decimal point position may vary so that it meets the operation type of the internal event. The above value becomes 0 to 9999 in some operation types.	0	0	Necessary settings are displayed according to Internal Event 1 operation type (E1.C1).
E 1.Sb	Internal Event 1 sub-setting		0	0	
E 1.HY	Internal Event 1 Hysteresis	0 to 9999 The decimal point position may vary so that it meets the operation type of the internal event.	5	0	
E 1.on	Internal Event 1 ON delay time	0.0 to 999.9 (Delay unit is 0.1s.) 0 to 9999 (Delay unit is other than 0.1s.)	0	2	
E 1.oF	Internal Event 1 OFF delay time		0	2	
E2	Internal Event 2 main setting	Same as Internal Event 1.	0	0	Necessary settings are displayed according to Internal Event 2 operation type (E2.C1).
E2.Sb	Internal Event 2 sub-setting		0	0	
E2.HY	Internal Event 2 Hysteresis		5	0	
E2.on	Internal Event 2 ON delay time		0	2	
E2.oF	Internal Event 2 OFF delay time		0	2	
E3	Internal Event 3 main setting	Same as Internal Event 1.	0	0	Necessary settings are displayed according to Internal Event 3 operation type (E3.C1).
E3.Sb	Internal Event 3 sub-setting		0	0	
E3.HY	Internal Event 3 Hysteresis		5	0	
E3.on	Internal Event 3 ON delay time		0	2	
E3.oF	Internal Event 3 OFF delay time		0	2	
E4	Internal Event 4 main setting	Same as Internal Event 1.	0	0	Necessary settings are displayed according to Internal Event 4 operation type (E4.C1).
E4.Sb	Internal Event 4 sub-setting		0	0	
E4.HY	Internal Event 4 Hysteresis		5	0	
E4.on	Internal Event 4 ON delay time		0	2	
E4.oF	Internal Event 4 OFF delay time		0	2	
E5	Internal Event 5 main setting	Same as Internal Event 1.	0	0	Necessary settings are displayed according to Internal Event 5 operation type (E5.C1).
E5.Sb	Internal Event 5 sub-setting		0	0	
E5.HY	Internal Event 5 Hysteresis		5	0	
E5.on	Internal Event 5 ON delay time		0	2	
E5.oF	Internal Event 5 OFF delay time		0	2	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
E6	Internal Event 6 main setting	Same as Internal Event 1.	0	0	Necessary settings are displayed according to Internal Event 6 operation type (E6.C1).
E6.Sb	Internal Event 6 sub-setting		0	0	
E6.HY	Internal Event 6 Hysteresis		5	0	
E6.on	Internal Event 6 ON delay time		0	2	
E6.oF	Internal Event 6 OFF delay time		0	2	
E7	Internal Event 7 main setting	Same as Internal Event 1.	0	0	Necessary settings are displayed according to Internal Event 7 operation type (E7.C1).
E7.Sb	Internal Event 7 sub-setting		0	0	
E7.HY	Internal Event 7 Hysteresis		5	0	
E7.on	Internal Event 7 ON delay time		0	2	
E7.oF	Internal Event 7 OFF delay time		0	2	
E8	Internal Event 8 main setting	Same as Internal Event 1.	0	0	Necessary settings are displayed according to Internal Event 8 operation type (E8.C1).
E8.Sb	Internal Event 8 sub-setting		0	0	
E8.HY	Internal Event 8 Hysteresis		5	0	
E8.on	Internal Event 8 ON delay time		0	2	
E8.oF	Internal Event 8 OFF delay time		0	2	

■ PID bank

Bank selection: PId

Display	Item	Contents	Initial value	User level	Remarks
P-1	Proportional band (PID 1)	0.1 to 999.9%	5.0	0	Displayed when the control method is other than the ON/OFF control (CtrL≠0).
I-1	Integral time (PID 1)	0 to 9999s or 0.0 to 999.9s (Note) (No integration control action when set at "0".)	120	0	
d-1	Derivative time (PID 1)	0 to 9999s or 0.0 to 999.9s (Note) (No derivative control action when set at "0".)	30	0	
rE-1	Manual reset (PID 1)	-10.0 to +110.0%	50.0	0	Displayed when the control method is other than the ON/OFF control (CtrL≠0) and the I (Integral time) in the same PID group is “0”.
oL-1	MV low limit (PID 1)	-10.0 to +110.0%	0.0	1	Displayed when the control method is other than the ON/OFF control (CtrL≠0) or Displayed when the control method is other than the ON/OFF control (CtrL≠0) and the Heat/Cool control is used (C26 = 1).
oH-1	MV high limit (PID 1)	-10.0 to +110.0%	100.0	1	
P-1C	Proportional band for cool side (PID 1)	0.1 to 999.9%	5.0	0	
I-1C	Integral time for cool side (PID 1)	0 to 9999s or 0.0 to 999.9s (Note) (No integration control action when set at "0".)	120	0	
d-1C	Derivative time for cool side (PID 1)	0 to 9999s or 0.0 to 999.9s (Note) (No derivative control action when set at "0".)	30	0	
oL.1C	Output low limit for cool side (PID 1)	-10.0 to +110.0%	0.0	1	
oH.1C	Output high limit for cool side (PID 1)	-10.0 to +110.0%	100.0	1	
P-2	Proportional band (PID 2)	Same as PID 1	5.0	0	Same as PID 1
I-2	Integral time (PID 2)		120	0	
d-2	Derivative time (PID 2)		30	0	
rE-2	Manual reset (PID 2)		50.0	0	
oL-2	MV low limit (PID 2)		0.0	1	
oH-2	MV high limit (PID 2)		100.0	1	
P-2C	Proportional band for cool side (PID 2)		5.0	0	
I-2C	Integral time for cool side (PID 2)		120	0	
d-2C	Derivative time for cool side (PID 2)		30	0	
oL.2C	Output low limit for cool side (PID 2)		0.0	1	
oH.2C	Output high limit for cool side (PID 2)		100.0	1	

(Note) For presence of the decimal point, when [C23: PID Decimal point position] is set at “0”, the decimal point does not exist. When this setting is set at “1”, the decimal point exists.

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
P-3	Proportional band (PID 3)	Same as PID 1	5.0	0	Same as PID 1
I-3	Integral time (PID 3)		120	0	
d-3	Derivative time (PID 3)		30	0	
rE-3	Manual reset (PID 3)		50.0	0	
oL-3	MV low limit (PID 3)		0.0	1	
oH-3	MV high limit (PID 3)		100.0	1	
P-3.C	Proportional band for cool side (PID 3)		5.0	0	
I-3.C	Integral time for cool side (PID 3)		120	0	
d-3.C	Derivative time for cool side (PID 3)		30	0	
oL.3C	Output low limit for cool side (PID 3)		0.0	1	
oH.3C	Output high limit for cool side (PID 3)		100.0	1	
P-4	Proportional band (PID 4)	Same as PID 1	5.0	0	Same as PID 1
I-4	Integral time (PID 4)		120	0	
d-4	Derivative time (PID 4)		30	0	
rE-4	Manual reset (PID 4)		50.0	0	
oL-4	MV low limit (PID 4)		0.0	1	
oH-4	MV high limit (PID 4)		100.0	1	
P-4.C	Proportional band for cool side (PID 4)		5.0	0	
I-4.C	Integral time for cool side (PID 4)		120	0	
d-4.C	Derivative time for cool side (PID 4)		30	0	
oL.4C	Output low limit for cool side (PID 4)		0.0	1	
oH.4C	Output high limit for cool side (PID 4)		100.0	1	
P-5	Proportional band (PID 5)	Same as PID 1	5.0	0	Same as PID 1
I-5	Integral time (PID 5)		120	0	
d-5	Derivative time (PID 5)		30	0	
rE-5	Manual reset (PID 5)		50.0	0	
oL-5	MV low limit (PID 5)		0.0	1	
oH-5	MV high limit (PID 5)		100.0	1	
P-5.C	Proportional band for cool side (PID 5)		5.0	0	
I-5.C	Integral time for cool side (PID 5)		120	0	
d-5.C	Derivative time for cool side (PID 5)		30	0	
oL.5C	Output low limit for cool side (PID 5)		0.0	1	
oH.5C	Output high limit for cool side (PID 5)		100.0	1	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
P-6	Proportional band (PID 6)	Same as PID 1	5.0	0	Same as PID 1
I-6	Integral time (PID 6)		120	0	
d-6	Derivative time (PID 6)		30	0	
rE-6	Manual reset (PID 6)		50.0	0	
oL-6	MV low limit (PID 6)		0.0	1	
oH-6	MV high limit (PID 6)		100.0	1	
P-6.C	Proportional band for cool side (PID 6)		5.0	0	
I-6.C	Integral time for cool side (PID 6)		120	0	
d-6.C	Derivative time for cool side (PID 6)		30	0	
oL.6C	Output low limit for cool side (PID 6)		0.0	1	
oH.6C	Output high limit for cool side (PID 6)		100.0	1	
P-7	Proportional band (PID 7)	Same as PID 1	5.0	0	Same as PID 1
I-7	Integral time (PID 7)		120	0	
d-7	Derivative time (PID 7)		30	0	
rE-7	Manual reset (PID 7)		50.0	0	
oL-7	MV low limit (PID 7)		0.0	1	
oH-7	MV high limit (PID 7)		100.0	1	
P-7.C	Proportional band for cool side (PID 7)		5.0	0	
I-7.C	Integral time for cool side (PID 7)		120	0	
d-7.C	Derivative time for cool side (PID 7)		30	0	
oL.7C	Output low limit for cool side (PID 7)		0.0	1	
oH.7C	Output high limit for cool side (PID 7)		100.0	1	
P-8	Proportional band (PID 8)	Same as PID 1	5.0	0	Same as PID 1
I-8	Integral time (PID 8)		120	0	
d-8	Derivative time (PID 8)		30	0	
rE-8	Manual reset (PID 8)		50.0	0	
oL-8	MV low limit (PID 8)		0.0	1	
oH-8	MV high limit (PID 8)		100.0	1	
P-8.C	Proportional band for cool side (PID 8)		5.0	0	
I-8.C	Integral time for cool side (PID 8)		120	0	
d-8.C	Derivative time for cool side (PID 8)		30	0	
oL.8C	Output low limit for cool side (PID 8)		0.0	1	
oH.8C	Output high limit for cool side (PID 8)		100.0	1	

■ Parameter bank

Bank selection: PAr A

Display	Item	Contents	Initial value	User level	Remarks
CtrL	Control method	0: ON/OFF control 1: Fixed PID	0 or 1	0	The initial value is “0” when the control output uses only one point and is the relay output. The initial value is “1” in other cases.
At.oL	MV low limit at AT	-10.0 to +110.0%	0.0	0	Displayed when the control method is other than the ON/OFF control (CtrL≠0).
At.oH	MV high limit at AT	-10.0 to +110.0%	100.0	0	
dIFF	Differential (for ON/OFF control)	0 to 9999U	5	0	Displayed when the control method is the ON/OFF control (CtrL=0).
oFFS	ON/OFF control action point offset	-1999 to +9999U	0	2	
FIL	PV filter	0 to 120.0s	0.0	0	
rA	PV ratio	0.001 to 9.999	1.000	1	
bI	PV bias	-1999 to +9999U	0	0	
FIL2	RSP filter	0.0 to 120.0s	0.0	0	Displayed when the model provides the RSP input.
rA2	RSP ratio	0.001 to 9.999	1.000	1	
bI 2	RSP bias	-1999 to +9999U	0	0	
CYU	Time proportional cycle unit 1 (for MV1)	0: 1s unit 1: Cycle fixed at 0.5s. 2: Cycle fixed at 0.25s. 3: Cycle fixed at 0.1s If the set value is other than “0”, the time proportional cycle 1 (Cy) cannot be set.	0	2	Displayed when MV1 (time proportional output (heat) of Heat/Cool control) is connected to the relay control output, voltage pulse output, or event output in the DO Assignment. The initial value of time proportional cycle 1 is “10” when the control output is the relay output. The initial value is “2” in other cases.
CY	Time proportional cycle 1 (for MV1)	5 to 120s (Output destination of MV1 includes the relay output.) 1 to 120s (Output destination of MV1 does not include the relay output.) If the time proportional unit 1 (CyU) ≠ 0, this setting becomes invalid and the setting becomes impossible.	10 or 2	0	
CYU2	Time proportional cycle unit 2 (for MV2)	0: 1s unit 1: Cycle fixed at 0.5s. 2: Cycle fixed at 0.25s. 3: Cycle fixed at 0.1s If the set value is other than “0”, the time proportional cycle 2 (Cy2) cannot be set.	0	2	Displayed when the Heat/Cool control is used (C26=1) and MV2 (time proportional output (heat) of Heat/Cool control) is connected to the relay control output, voltage pulse control output, or event output. The initial value of time proportional cycle 2 is “10” when the model has one control output point. The initial value is “2” in other cases.
CY2	Time proportional cycle 2 (for MV2)	5 to 120s (Output destination of MV2 includes the relay output.) 1 to 120s (Output destination of MV2 does not include the relay output.) If the time proportional unit 2 (CyU2) ≠ 0, this setting becomes invalid and the setting becomes impossible.	10 or 2	0	
tPtY	Time proportional cycle mode	0: Controllability aiming type 1: Actuator service life aiming type (Only one ON/OFF operation within time proportional cycle)	0 or 1	2	The initial value is “1” when control output 1 is the relay output. The initial value is “0” in other cases.
oUtL	Output variation limit	0.0: No limit. 0.1 to 999.9%/s	0.0	2	Not displayed when the model provides the motor drive relay output and [aiming at service life of potentiometer] is set (C59=1).
SPU	SP ramp-up	0.0 to 999.9U (No ramp when set at “0.0U”)	0.0	2	Time unit of the ramp is selected by the SP ramp unit (C32). Displayed when the SP ramp type is set at “standard” (C31=0).
SPd	SP ramp-down		0.0	2	

■ Extended tuning bank

Bank selection: Et

Display	Item	Contents	Initial value	User level	Remarks
At.tY	AT type	0: Normal (Standard control characteristics) 1: Immediate response (Control characteristics that respond immediately to external disturbance.) 2: Stable (Control characteristics having less up/down fluctuation of PV)	1	0	Displayed when the control method is other than the ON/OFF control (CtrL≠0). The initial value of "At-d" is "0.00" when the control output type is R1. The initial value of "At-d" is "1.00" when the control output type is other than R1.
JF.bd	Just-FiTTER settling band	0.00 to 10.00	0.30	2	
SP.Lg	SP lag constant	0.0 to 999.9	0.0	2	
At-P	AT Proportional band adjust	0.00 to 99.99	1.00	2	
At-I	AT Integral time adjust	0.00 to 99.99	1.00	2	
At-d	AT Derivative time adjust	0.00 to 99.99	1.00 or 0.00	2	
Ctr.A	Control algorithm	0: PID (Conventional PID) 1: RationaLOOP (High-performance PID)	0	1	
JF.ou	Just-FiTTER overshoot limit/restraint/control coefficient	0 to 100	0	1	

■ Zone bank

Bank selection: Zone

Display	Item	Contents	Initial value	User level	Remarks
Zn-1	Zone 1	-1999 to +9999U	9999U	2	Displayed when the zone PID operation is used (C24≠0).
Zn-2	Zone 2		9999U	2	
Zn-3	Zone 3		9999U	2	
Zn-4	Zone 4		9999U	2	
Zn-5	Zone 5		9999U	2	
Zn-6	Zone 6		9999U	2	
Zn-7	Zone 7		9999U	2	
Zn.dF	Zone hysteresis	0 to 9999	5U	2	

6 - 3 List of Setup Setting Displays

The following shows the meanings of the values stated in the “User Level” column:

0: Simple, Standard, and High function configuration
1: Standard and High function configuration
2: High function configuration

Initial value may differ depending on model No.

■ Setup bank

Bank selection: SEtUP

Display	Item	Contents	Initial value	User level	Remarks
C 01	PV input range type	Range of thermocouple: 1 to 26 Range of RTD: 41 to 68 Range of DC voltage and DC current: 81 to 84, 86 to 90	88	0	For details, refer to the PV Input Range Table (on page 5-2).
C 02	Temperature unit	0: Celsius (°C) 1: Fahrenheit (°F)	0	0	Displayed when the PV input range type is thermocouple or RTD.
C 03	Cold junction compensation (T/C)	0: Cold junction compensation (T/C) is performed (internal). 1: Cold junction compensation (T/C) is not performed (external).	0	2	Displayed when the PV input range type is thermocouple.
C 04	Decimal point position	0: No decimal point 1: 1 digit after decimal point 2: 2 digits after decimal point 3: 3 digits after decimal point (Range with decimal point of thermocouple/RTD: 0 to 1)	0	0	Displayed when the PV input type is DC voltage/DC current or thermocouple/RTD having the range with the decimal point.
C 05	PV input range low limit	When the PV input range type is thermocouple or RTD, the input range low limit selected with the PV input range type (C01) is displayed, but the setting is disabled. When the PV input range type is DC voltage/DC current, a value ranging from –1999 to +9999 is set.	0	0	
C 06	PV input range high limit	When the PV input range type is thermocouple or RTD, the input range high limit selected with the PV input range type (C01) is displayed, but the setting is disabled. When the PV input type is DC voltage/DC current, a value ranging from –1999 to +9999 is set.	1000	0	
C 07	SP low limit	PV input range low limit to PV input range high limit	0	1	
C 08	SP high limit		1000	1	
C 09	PV square root extraction dropout	0.0 to 100.0 (PV square root extraction is not performed when set at “0.0”.)	0.0	2	Displayed when the PV input range type is DC voltage/DC current.
C 10	RSP input type	0: 4 to 20mA 1: 0 to 20mA 2: 0 to 5V 3: 1 to 5V 4: 0 to 10V	0	0	Displayed when the model provides the RSP input.
C 11	RSP input range low limit	-1999 to +9999U	0	0	
C 12	RSP input range high limit	-1999 to +9999U	1000	0	
C 14	Control action (Direct/Reverse)	0: Reverse action (Heat) 1: Direct action (Cool)	0	0	Displayed when the heat/cool control is not used (C26=0).
C 15	Output operation at PV alarm	0: Control calculation is continued. 1: Output at PV alarm is output.	0	2	
C 16	Output at PV alarm	-10.0 to +110.0%	0.0	2	
C 17	Output at READY (Heat)	-10.0 to +110.0%	0.0	1	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
C 18	Output at READY (Cool)	-10.0 to +110.0%	0.0	1	Displayed when the control method is other than the ON/OFF control (CtrL≠0) and the heat/cool control (C26 = 1) is used.
C 19	Output operation at changing Auto/Manual	0: Bumpless transfer 1: Preset	0	1	Displayed when the control method is other than the ON/OFF control (CtrL≠0). When the operation mode is the MANUAL mode at power ON, the preset MANUAL value (C20) becomes the Manipulated Variable (MV).
C 20	Preset MANUAL value	-10.0 to +110.0% (Used when the operation mode is the MANUAL mode at power ON.)	0.0 or 50.0	1	
C 21	Initial output type (mode) of PID control	0: Auto 1: Not initialized. 2: Initialized (If SP value different from the current value is input.)	0	2	
C 22	Initial output of PID control	-10.0 to +110.0%	0.0 or 50.0	2	
C 23	PID Decimal point position	0: No decimal point 1: 1 digit after decimal point (Decimal point of integral time and derivative time)	0	2	Displayed when the control method is other than the ON/OFF control (CtrL≠0).
C 24	Zone PID operation	0: Disabled. 1: Changed by SP. 2: Changed by PV.	0	2	
C 26	Heat/Cool control	0: Not used. 1: Used.	0	0	Displayed when the control method is other than the ON/OFF control (CtrL≠0). When set at “1”, the control action is set to the reverse action (C14 = 0), the preset MANUAL value (C20) is set to “50.0”, and the initial output of the PID control (C22) is changed to “50.0”.
C 27	Heat/Cool selection	0: Normal 1: Energy saving	0	1	Displayed when the Heat/Cool control is used (C26 = 1).
C 28	Heat/Cool control dead zone	-100.0 to +100.0%	0.0	0	
C 29	Heat/Cool control change point	-10.0 to +110.0%	50.0	2	
C 30	LSP system group	1 to 8	1	0	
C 31	SP ramp type	0: Standard 1: Multi-ramp 2: Step operation When the power is turned ON again, the step operation is stopped (READY). 3: Step operation When the power is turned ON again, the step operation is reset.	0	2	
C 32	SP ramp unit	0: 0.1U/s 1: 0.1U/min 2: 0.1U/h	1	2	"0.1U" shows that the decimal point position of the PV is shifted one digit rightward.
C 33	STEP time unit	0: 0.1s 1: 1s (“min. s” is displayed on the console.) 2: 1min (“h. min” is displayed on the console.)	0	2	Displayed when the SP ramp type is the step operation (C31≥2).
C 34	STEP PV start	0: Disabled. 1: Enabled.	0	2	
C 35	STEP loop	0: Stop (No loop) 1: Loop 2: Final step continued. (No loop)	0	2	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
C 36	CT1 operation type	0: Heater burnout detection 1: Current value measurement	0	0	Displayed when the optional model has two current transformer input points.
C 37	CT1 output	0: Control output 1 1: Control output 2 2: Event output 1 3: Event output 2 4: Event output 3	0	0	Displayed when the optional model has two current transformer input points and the CT1 operation type is set to "heater burnout detection" (C36 = 0).
C 38	CT1 measurement wait time	30 to 300ms	30	0	
C 39	CT2 operation type	Same as CT1 operation type	0	0	Displayed when the optional model has two current transformer input points.
C 40	CT2 output	Same as CT1 output	0	0	Displayed when the optional model has two current transformer input points and the CT2 operation type is set to "heater burnout detection" (C39 = 0).
C 41	CT2 measurement wait time	Same as CT1 measurement wait time	30	0	
C 42	Control output 1 range	Current output 1: 4 to 20mA 2: 0 to 20mA Continuous voltage output 1: 1 to 5V 2: 0 to 5V 3: 0 to 10V	1	0	Displayed when control output 1 of the model is the current output or continuous voltage output. The decimal point position of the scaling low limit/high limit becomes 1 digit after the decimal point when the control output 1 type is related to the MV and CT. When the control output 1 type is related to the PV and SP, the decimal point position becomes the same as that of the PV.
C 43	Control output 1 type	0: MV 1: Heat MV (for heat/cool control) 2: Cool MV (for heat/cool control) 3: PV 4: PV before ratio, bias, and filter 5: SP 6: Deviation 7: CT1 current value 8: CT2 current value 9: MFB (including estimated MFB)	0	0	
C 44	Control output 1 scaling low limit	-1999 to +9999 The decimal point position may vary depending on control output 1 type.	0	0	
C 45	Control output 1 scaling high limit		100.0	0	
C 47	Control output 2 range	Same as control output 1.	1	0	Displayed when control output 2 of the model is the current output or continuous voltage output. The decimal point position is same as that of control output 1.
C 48	Control output 2 type		3	0	
C 49	Control output 2 scaling low limit	-1999 to +9999 The decimal point position may vary depending on control output 2 type.	0	0	
C 50	Control output 2 scaling high limit		1000	0	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
C 52	AUX range type	Same as control output 1.	1	0	Displayed when the auxiliary output of the model is the current output or continuous voltage output. The decimal point position is the same as that of the control output 1.
C 53	AUX type		3	0	
C 54	AUX Value at 0% output	-1999 to +9999 (The decimal point position may vary depending on the AUX type.)	0	0	
C 55	AUX Value at 100% output		1000	0	
C 57	Position proportional type	0: MFB control + Estimated position control 1: MFB control 2: Estimated position control (MFB disabled) 3: Estimated position control (MFB disabled) + Position adjustment at power ON.	0	0	Displayed when the model provides the position proportional output.
C 58	Position proportional dead zone	0.5 to 25.0%	10.0	0	
C 59	Motor long life mode	0: Aiming at controllability 1: Aiming at service life of potentiometer	1	0	
C 60	Motor auto adjust	0: Stop 1: Start	0	0	Displayed when the model provides the position proportional output. The motor adjust is stopped using the [disp] or [mode] key through the control operation. It is impossible to write data through the loader.
C 61	Input with motor fully closed	0 to 9999	1000	0	Displayed when the model provides the position proportional output. It is impossible to write data through the loader.
C 62	Input with motor fully open	0 to 9999	3000	0	
C 63	Motor full close-full open time	5.0 to 240.0s	30.0	0	
C 64	CPL/MODBUS	0: CPL 1: MODBUS (ASCII format) 2: MODBUS (RTU format)	0	0	Displayed when the optional model has RS-485.
C 65	Station address	0 to 127 (Communication is disabled when set at "0".)	0	0	
C 66	Transmission speed	0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps	2	0	
C 67	Data format (Data length)	0: 7 bits 1: 8 bits	1	0	
C 68	Data format (Parity)	0: Even parity 1: Odd parity 2: No parity	0	0	
C 69	Data format (Stop bit)	0: 1 bit 1: 2 bits	0	0	
C 70	Response time-out	1 to 250ms	3	2	
C 71	Key operation type	0: Standard type 1: Special type	0	2	
C 72	[mode] key function	0: Invalid 1: AUTO/MANUAL selection 2: RUN/READY selection 3: AT Stop/Start 4: LSP group selection 5: Release all DO latches 6: LSP/RSP selection 7: Communication DI1 selection 8: Invalid	1	0	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
C 73	MODE display setup	Whether or not the mode bank setup is displayed is determined by the sum of the following weights: Bit 0: AUTO/MANUAL display Disabled: 0, Enabled: +1 Bit 1: RUN/READY display Disabled: 0, Enabled: +2 Bit 2: LSP/RSP display Disabled: 0, Enabled: +4 Bit 3: AT stop/start display Disabled: 0, Enabled: +8 Bit 4: Release all DO latches display Disabled: 0, Enabled: +16 Bit 5: Communication DI1 ON/OFF display Disabled: 0, Enabled: +32 Other invalid settings, 0, +64, +128	255	1	
C 74	PV/SP display setup	Whether or not the PV/SP value related items are displayed in the basic display mode is determined by the sum of the following weights: Bit 0: PV display Disabled: 0, Enabled: +1 Bit 1: SP display Disabled: 0, Enabled: +2 Bit 2: LSP group number display Disabled: 0, Enabled: +4 Other invalid settings, 0, +8	15	1	
C 75	MV display setup	Whether or not the PV/SP value related items are displayed in the basic display mode is determined by the sum of the following weights: Bit 0: MV display Disabled: 0, Enabled: +1 Bit 1: Heat MV/cool MV display Disabled: 0, Enabled: +2 Bit 2: MFB display Disabled: 0, Enabled: +4 Bit 3: AT progress display Disabled: 0, Enabled: +8	15	1	
C 76	EV display setup (Setup setting/Setup bank)	0: Internal Event set value is not displayed in the operation display mode. 1: Set value of Internal Event 1 is displayed in the operation display mode. 2: Set values of Internal Events 1 to 2 are displayed in the operation display mode. 3: Set values of Internal Events 1 to 3 are displayed in the operation display mode.	0	1	
C 77	Timer remaining time display setup	0: ON/OFF delay remaining time of Internal Event is not displayed in the operation display mode. 1: ON/OFF delay remaining time of Internal Event 1 is displayed in the operation display mode. 2: ON/OFF delay remaining time of Internal Events 1 to 2 are displayed in the operation display mode. 3: ON/OFF delay remaining time of Internal Events 1 to 3 are displayed in the operation display mode.	0	1	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
C 78	CT display setup	0: CT current value is not displayed in the operation display mode. 1: CT1 current value is displayed in the operation display mode. 2: CT1 to 2 current values are displayed in the operation display mode.	0	1	
C 79	User level	0: Simple configuration 1: Standard configuration 2: High function configuration	0	0	
C 80	Communication monitoring display	0: Not used. 1: Flashing while data is being sent through RS-485 communication. 2: Flashing while data is being received through RS-485 communication. 3: Logical OR of all DI statuses 4: Flashing in READY mode	0	2	
C 81	Multi Status (MS) display, Condition (top priority)	0: Normally open (Normally OFF=0) 1: Normally close (Normally ON=1) 2 to 9: Internal event 1 to 8 10 to 13: Undefined. 14: MV1 (ON/OFF, Time proportional 1, Heat-side, OPEN-side output) 15: MV2 (Time proportional 2, Cool-side, CLOSE-side output) 16 to 17: Undefined. 18 to 21: DI1 to DI4 22 to 25: Undefined. 26 to 30: Internal contact 1 to 5 31 to 33: Undefined. 34 to 37: Communication DI1 to DI4 38: MANUAL 39: READY 40: RSP 41: AT 42: During ramp 43: Undefined. 44: Alarm 45: PV alarm 46: Undefined. 47: [mode] key pressing status 48: Event output 1 terminal status 49: Control output 1 terminal status	39	2	
C 82	Multi Status (MS) display, Status (top priority)	0: Lit. 1: Slow flashing 2: Flashing twice 3: Fast flashing 4: Left to right 5: Right to left 6: Reciprocating between left and right 7: Deviation OK 8: Deviation graph 9: MV graph 10: Heat-side MV graph (For heat/cool control) 11: Cool-side MV graph (For heat/cool control) 12: MFB graph (including MFB being estimated) 13: DI monitor 14: Internal contact monitor 15: Internal event monitor	1	2	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
C 83	Multi Status (MS) display, Condition (second priority)	Same as Multi Status (MS) display, Condition (top priority)	44	2	
C 84	Multi Status (MS) display, Status (second priority)	Same as Multi Status (MS) display, Status (top priority)	6	2	
C 85	Multi Status (MS) display, Condition (third priority)	Same as Multi Status (MS) display, Condition (top priority)	1	2	
C 86	Multi Status (MS) display, Status (third priority)	Same as Multi Status (MS) display, Status (top priority)	9	2	
C 87	Multi Status (MS) display, deviation range	0 to 9999U	5	2	
C 88	Special function	0 to 15 (This value becomes “0” when the power is turned ON.)	0	2	
C 89	Zener barrier adjustment	The value can be changed with the adjustment. The numeric value cannot be directly input with the manual operation.	0.00	2	Displayed when the PV range type is RTD and the special function (C88) is set at “5”.

■ Event configuration bank

Bank selection: EuCF

Display	Item	Contents	Initial value	User level	Remarks
E1C1	Internal Event 1 Configuration 1 Operation type	0: No event 1: PV high limit 2: PV low limit 3: PV high/low limit 4: Deviation high limit 5: Deviation low limit 6: Deviation high/low limit 7: Deviation high limit (Final SP reference) 8: Deviation low limit (Final SP reference) 9: Deviation high/low limit (Final SP reference) 10: SP high limit 11: SP low limit 12: SP high/low limit 13: MV high limit 14: MV low limit 15: MV high/low limit 16: CT1 heater burnout/over-current 17: CT1 heater short-circuit 18: CT2 heater burnout/over-current 19: CT2 heater short-circuit 20: Loop diagnosis 1 21: Loop diagnosis 2 22: Loop diagnosis 3 23: Alarm (status) 24: READY (status) 25: MANUAL (status) 26: RSP (status) 27: During AT execution (status) 28: During SP ramp (status) 29: Control direct action (status) 30: ST setting standby (status) (Invalid in this unit.) 31: During estimate of motor opening (status) 32: Timer (status)	0	0	
E1C2	Internal Event 1 Configuration 2	The digits are determined to 1st digit, 2nd digit, 3rd digit, and 4th digit from the right end.	0000	0	
	1st digit: Direct/ Reverse	0: Direct 1: Reverse			
	2nd digit: Standby	0: None 1: Standby 2: Standby + Standby at SP change			
	3rd digit: EVENT state at READY	0: Continue 1: Forced OFF			
	4th digit: Undefined	0			

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
E 1.C 3	Internal Event Configuration 3	The digits are determined to 1st digit, 2nd digit, 3rd digit, and 4th digit from the right end.	0000	2	
	1st digit: Controller alarm OR	0: None 1: Alarm direct + OR operation 2: Alarm direct + AND operation 3: Alarm reverse + OR operation 4: Alarm reverse + AND operation			
	2nd digit: Special OFF setup	0: As usual. 1: When the event set value (main setting) is “0”, the event is “OFF”.			
	3rd digit: Delay unit	0: 0.1s 1: 1s 2: 1min			
	4th digit: Undefined.	0			
E 2.C 1	Internal Event 2 Configuration 1 Operation type	Same as Internal Event 1 Configuration 1.	0	0	
E 2.C 2	Internal Event 2 Configuration 2 1st digit: Direct/ Reverse 2nd digit: Standby 3rd digit: EVENT state at READY 4th digit: Undefined.	Same as Internal Event 1 Configuration 2.	0000	0	
E 2.C 3	Internal Event 2 Configuration 3 1st digit: Controller alarm OR 2nd digit: Special OFF setup 3rd digit: Delay unit 4th digit: Undefined.	Same as Internal Event 1 Configuration 3.	0000	2	
E 3.C 1	Internal Event 3 Configuration 1 Operation type	Same as Internal Event 1 Configuration 1.	0	0	
E 3.C 2	Internal Event 3 Configuration 2 1st digit: Direct/ Reverse 2nd digit: Standby 3rd digit: EVENT state at READY 4th digit: Undefined.	Same as Internal Event 1 Configuration 2.	0000	0	
E 3.C 3	Internal Event 3 Configuration 3 1st digit: Controller alarm OR 2nd digit: Special OFF setup 3rd digit: Delay unit 4th digit: Undefined.	Same as Internal Event 1 Configuration 3.	0000	2	
E 4.C 1	Internal Event 4 Configuration 1 Operation type	Same as Internal Event 1 Configuration 1.	0	0	
E 4.C 2	Internal Event 4 Configuration 2 1st digit: Direct/ Reverse 2nd digit: Standby 3rd digit: EVENT state at READY 4th digit: Undefined.	Same as Internal Event 1 Configuration 2.	0000	2	
E 4.C 3	Internal Event 4 Configuration 3 1st digit: Controller alarm OR 2nd digit: Special OFF setup 3rd digit: Delay unit 4th digit: Undefined.	Same as Internal Event 1 Configuration 3.	0000	2	
E 5.C 1	Internal Event 5 Configuration 1 Operation type	Same as Internal Event 1 Configuration 1.	0	0	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
E5.C2	Internal Event 5 Configuration 2 1st digit: Direct/ Reverse 2nd digit: Standby 3rd digit: EVENT state at READY 4th digit: Undefined.	Same as Internal Event 1 Configuration 2.	0000	0	
E5.C3	Internal Event 5 Configuration 3 1st digit: Controller alarm OR 2nd digit: Special OFF setup 3rd digit: Delay unit 4th digit: Undefined.	Same as Internal Event 1 Configuration 3.	0000	2	
E6.C1	Internal Event 6 Configuration 1 Operation type	Same as Internal Event 1 Configuration 1.	0	0	
E6.C2	Internal Event 6 Configuration 2 1st digit: Direct/ Reverse 2nd digit: Standby 3rd digit: EVENT state at READY 4th digit: Undefined.	Same as Internal Event 1 Configuration 2.	0000	0	
E6.C3	Internal Event 6 Configuration 3 1st digit: Controller alarm OR 2nd digit: Special OFF setup 3rd digit: Delay unit 4th digit: Undefined.	Same as Internal Event 1 Configuration 3.	0000	2	
E7.C1	Internal Event 7 Configuration 1 Operation type	Same as Internal Event 1 Configuration 1.	0	0	
E7.C2	Internal Event 7 Configuration 2 1st digit: Direct/ Reverse 2nd digit: Standby 3rd digit: EVENT state at READY 4th digit: Undefined.	Same as Internal Event 1 Configuration 2.	0000	0	
E7.C3	Internal Event 7 Configuration 3 1st digit: Controller alarm OR 2nd digit: Special OFF setup 3rd digit: Delay unit 4th digit: Undefined.	Same as Internal Event 1 Configuration 3.	0000	2	
E8.C1	Internal Event 8 Configuration 1 Operation type	Same as Internal Event 1 Configuration 1.	0	0	
E8.C2	Internal Event 8 Configuration 2 1st digit: Direct/ Reverse 2nd digit: Standby 3rd digit: EVENT state at READY 4th digit: Undefined.	Same as Internal Event 1 Configuration 2.	0000	0	
E8.C3	Internal Event 8 Configuration 3 1st digit: Controller alarm OR 2nd digit: Special OFF setup 3rd digit: Delay unit 4th digit: Undefined.	Same as Internal Event 1 Configuration 3.	0000	2	

■ DI Assignment bank

Bank selection: dI

Display	Item	Contents	Initial value	User level	Remarks
dI 1.1	Internal Contact 1 Operation type	0: No function 1: LSP group selection (0/+1) 2: LSP group selection (0/+2) 3: LSP group selection (0/+4) 4: PID group selection (0/+1) 5: PID group selection (0/+2) 6: PID group selection (0/+4) 7: RUN/READY selection 8: AUTO/MANUAL selection 9: LSP/RSP selection 10: AT Stop/Start 11: Invalid 12: Control action direct/reverse selection (As setting/opposite operation of setting) 13: SP RAMP enabled/disabled 14: PV Hold (No-hold/Hold) 15: PV maximum value hold (No-hold/Hold) 16: PV minimum value hold (No-hold/Hold) 17: Timer Stop/Start 18: Release all DO latches (Continue/Release) 19: Advance (No-advance/Advance) 20: Step hold (No-hold/Hold)	0	0	
dI 1.2	Internal Contact 1 Input bit function	0: Not used (Default input) 1: Function 1 ((A and B) or (C and D)) 2: Function 2 ((A or B) and (C or D)) 3: Function 3 (A or B or C or D) 4: Function 4 (A and B and C and D)	0	2	When using internal contact 1, the default input is digital input (DI) 1.

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
dI 1.3	Internal Contact 1 Input assignment A	0: Normally opened. (OFF, 0) 1: Normally closed. (ON, 1) 2: DI1 3: DI2 4: DI3 5: DI4 6 to 9: Undefined. 10: Internal Event 1 11: Internal Event 2 12: Internal Event 3 13: Internal Event 4 14: Internal Event 5 15: Internal Event 6 16: Internal Event 7 17: Internal Event 8 18: Communication DI1 19: Communication DI2 20: Communication DI3 21: Communication DI4 22: MANUAL mode 23: READY mode 24: RSP mode 25: AT running 26: During SP ramp 27: Undefined. 28: Alarm occurs. 29: PV alarm occurs. 30: Undefined. 31: mode key pressing status 32: Event output 1 status 33: Control output 1 status	2	2	Displayed when internal contact 1 Input bit function is set 1 to 4 (DI1.2≠0).
dI 1.4	Internal Contact 1 Input assignment B		0	2	
dI 1.5	Internal Contact 1 Input assignment C		0	2	
dI 1.6	Internal Contact 1 Input assignment D		0	2	
dI 1.7	Internal Contact 1 Polarity A to D 1st digit: Polarity A (Polarity of Input assignment A) 2nd digit: Polarity B (Polarity of Input assignment B) 3rd digit: Polarity C (Polarity of Input assignment C) 4th digit: Polarity D (Polarity of Input assignment D)	The digits are determined to 1st digit, 2nd digit, 3rd digit, and 4th digit from the right end. 0: Direct 1: Reverse	0000	2	
dI 1.8	Internal Contact 1 Polarity	0: Direct 1: Reverse	0	2	
dI 1.9	Internal Contact 1 Event channel def.	0: None 1 to 8: Internal Event No.	0	2	Displayed when the operation type of internal contact 1 is timer stop/start (DI1.1 = 17).
dI 2.1	Internal Contact 2 Operation type	Same as Internal Contact 1 Operation type.	0	0	
dI 2.2	Internal Contact 2 Input bit function	Same as Internal Contact 1 Input bit function. 0: Not used. (Default input) 1 to 4: Function 1 to 4	0	2	When using internal contact 2, the default input is digital input (DI) 2.

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
dI 2.3	Internal Contact 2 Input assignment A	Same as Internal Contact 1 Input assignment A to D.	3	2	Displayed when internal contact 2 Input bit function is set 1 to 4 (DIl2.2≠0).
dI 2.4	Internal Contact 2 Input assignment B		0	2	
dI 2.5	Internal Contact 2 Input assignment C		0	2	
dI 2.6	Internal Contact 2 Input assignment D		0	2	
dI 2.7	Internal Contact 2 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Internal Contact 1 Polarity A to D The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
dI 2.8	Internal Contact 2 Polarity	0: Direct 1: Reverse	0	2	
dI 2.9	Internal Contact 2 Event channel def.	0: None 1 to 8: Internal Event No.	0	2	Displayed when the operation type of internal contact 2 is timer stop/start (DI2.1 = 17).
dI 3.1	Internal Contact 3 Operation type	Same as Internal Contact 1 Operation type.	0	0	
dI 3.2	Internal Contact 3 Input bit function	Same as Internal Contact 1 Input bit function. 0: Not used. (Default input) 1 to 4: Function 1 to 4	0	2	When using internal contact 3, the default input is digital input (DI) 3.
dI 3.3	Internal Contact 3 Input assignment A	Same as Internal Contact 1 Input assignment A to D.	4	2	Displayed when internal contact 3 Input bit function is set 1 to 4 (DI3.2≠0).
dI 3.4	Internal Contact 3 Input assignment B		0	2	
dI 3.5	Internal Contact 3 Input assignment C		0	2	
dI 3.6	Internal Contact 3 Input assignment D		0	2	
dI 3.7	Internal Contact 3 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Internal Contact 1 Polarity A to D The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
dI 3.8	Internal Contact 3 Polarity	0: Direct 1: Reverse	0	2	
dI 3.9	Internal Contact 3 Event channel def.	0: None 1 to 8: Internal Event No.	0	2	Displayed when the operation type of internal contact 3 is timer stop/start (DI3.1 = 17).
dI 4.1	Internal Contact 4 Operation type	Same as Internal Contact 1 Operation type.	0	0	
dI 4.2	Internal Contact 4 Input bit function	Same as Internal Contact 1 Input bit function. 0: Not used. (Default input) 1 to 4: Function 1 to 4	0	2	When using internal contact 4, the default input is digital input (DI) 4.

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
dI 4.3	Internal Contact 4 Input assignment A	Same as Internal Contact 1 Input assignment A to D.	5	2	Displayed when internal contact 4 input bit function is set 1 to 4 (DI4.2≠0).
dI 4.4	Internal Contact 4 Input assignment B		0	2	
dI 4.5	Internal Contact 4 Input assignment C		0	2	
dI 4.6	Internal Contact 4 Input assignment D		0	2	
dI 4.7	Internal Contact 4 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Internal Contact 1 Polarity A to D The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
dI 4.8	Internal Contact 4 Polarity	0: Direct 1: Reverse	0	2	
dI 4.9	Internal Contact 4 Event channel def.	0: None 1 to 8: Internal Event No.	0	2	Displayed when the operation type of internal contact 4 is timer stop/start (DI4.1 = 17).
dI 5.1	Internal Contact 5 Operation type	Same as Internal Contact 1 Operation type.	0	0	
dI 5.2	Internal Contact 5 Input bit function	Same as Internal Contact 1 Input bit function. 0: Not used. (Default input) 1 to 4: Function 1 to 4	0	2	When using internal contact 4, the default input is invalid.
dI 5.3	Internal Contact 5 Input assignment A	Same as Internal Contact 1 Input assignment A to D.	0	2	Displayed when internal contact 5 input bit function is set 1 to 4 (DI5.2≠0).
dI 5.4	Internal Contact 5 Input assignment B		0	2	
dI 5.5	Internal Contact 5 Input assignment C		0	2	
dI 5.6	Internal Contact 5 Input assignment D		0	2	
dI 5.7	Internal Contact 5 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Internal Contact 1 Polarity A to D The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
dI 5.8	Internal Contact 5 Polarity	0: Direct 1: Reverse	0	2	
dI 5.9	Internal Contact 5 Event channel def.	0: None 1 to 8: Internal Event No.	0	2	Displayed when the operation type of internal contact 5 is timer stop/start (DI5.1 = 17).

■ DO Assignment bank

Bank selection: do

Display	Item	Contents	Initial value	User level	Remarks
ot 1.1	Control output 1 Operation type	0: Default output 1: MV 1 (ON/OFF control output, time proportional output, and time proportional output (heat) of Heat/Cool control.) 2: MV2 (Time proportional output (cool) of Heat/Cool control) 3: Function 1 ((A and B) or (C and D)) 4: Function 2 ((A or B) and (C or D)) 5: Function 3 (A or B or C or D) 6: Function 4 (A and B and C and D)	0	2	Displayed when control output 1 of the model is relay output or voltage pulse output. When using control output 1, the default output is MV1.
ot 1.2	Control output 1 Output assignment A	0: Normally opened. (OFF, 0) 1: Normally closed. (ON, 1) 2: Internal Event 1 3: Internal Event 2 4: Internal Event 3 5: Internal Event 4 6: Internal Event 5 7: Internal Event 6 8: Internal Event 7 9: Internal Event 8 10 to 13: Undefined. 14: MV1 15: MV2 16 to 17: Undefined. 18: DI1 19: DI2 20: DI3 21: DI4 22 to 25: Undefined. 26: Internal Contact 1 27: Internal Contact 2 28: Internal Contact 3 29: Internal Contact 4 30: Internal Contact 5 31 to 33: Undefined. 34: Communication DI1 35: Communication DI2 36: Communication DI3 37: Communication DI4 38: MANUAL mode 39: READY mode 40: RSP mode 41: AT running 42: During SP ramp 43: Undefined. 44: Alarm occurs. 45: PV alarm occurs. 46: Undefined. 47: mode key pressing status 48: Event output 1 status 49: Control output 1 status	14	2	Displayed when control output 1 of the model is relay output or voltage pulse output, and the operation type of control output 1 is set 1 to 4 (ot1.1 > 2).
ot 1.3	Control output 1 Output assignment B		0	2	
ot 1.4	Control output 1 Output assignment C		0	2	
ot 1.5	Control output 1 Output assignment D		0	2	
ot 1.6	Control output 2 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	The digits are determined to 1st digit, 2nd digit, 3rd digit, and 4th digit from the right end. 0: Direct 1: Reverse	0000	2	
ot 1.7	Control output 1 Polarity	0: Direct 1: Reverse	0	2	
ot 1.8	Control output 1 Latch	0: None 1: Latch (Latch at ON) 2: Latch (Latch at OFF except for initialization at power ON)	0	2	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
ot2.1	Control output 2 Operation type	Same as Control output 1 Operation type. 0: Default output 1: MV1 2: MV2 3 to 6: Function 1 to 4	0	2	Displayed when the control output of the model is set to the position proportional output or the control output 2 of the model is voltage pulse output. When using control output 2, the default output is MV2.
ot2.2	Control output 2 Output assignment A	Same as Control output 1 Output assignment A to D.	15	2	Displayed when control output 2 of the model is set to the voltage pulse output and the operation type of control output 2 is set 1 to 4 (ot2.1 > 2).
ot2.3	Control output 2 Output assignment B		0	2	
ot2.4	Control output 2 Output assignment C		0	2	
ot2.5	Control output 2 Output assignment D		0	2	
ot2.6	Control output 2 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Control output 1 Polarity A to D. The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
ot2.7	Control output 2 Polarity	0: Direct 1: Reverse	0	2	
ot2.8	Control output 2 Latch	0: None 1: Latch (Latch at ON) 2: Latch (Latch at OFF except for initialization at power ON)	0	2	
Ev1.1	Event output 1 Operation type	Same as Control output 1 Operation type. 0: Default output 1: MV1 2: MV2 3 to 6: Function 1 to 4	0	2	Displayed when the optional model has Event output 1. When using Event output 1, the default output is Internal Event 1.
Ev1.2	Event output 1 Output assignment A	Same as Control output 1 Output assignment A to D.	2	2	Displayed when the optional model has Event output 1 and the operation type of Event output 1 is set 1 to 4 (Ev1.1 > 2).
Ev1.3	Event output 1 Output assignment B		0	2	
Ev1.4	Event output 1 Output assignment C		0	2	
Ev1.5	Event output 1 Output assignment D		0	2	
Ev1.6	Event output 1 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Control output 1 Polarity A to D. The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
Ev1.7	Event output 1 Polarity	0: Direct 1: Reverse	0	2	
Ev1.8	Event output 1 Latch	0: None 1: Latch (Latch at ON) 2: Latch (Latch at OFF except for initialization at power ON)	0	2	

(To be continued to the next page.)

Display	Item	Contents	Initial value	User level	Remarks
Eu2.1	Event output 2 Operation type	Same as Control output 1 Operation type. 0: Default output 1: MV1 2: MV2 3 to 6: Function 1 to 4	0	2	Displayed when the optional model has Event output 2. When using Event output 2, the default output is Internal Event 2.
Eu2.2	Event output 2 Output assignment A	Same as Control output 1 Output assignment A to D.	3	2	Displayed when the optional model has Event output 2 and the operation type of Event output 2 is set 1 to 4 (Ev2.1 > 2).
Eu2.3	Event output 2 Output assignment B		0	2	
Eu2.4	Event output 2 Output assignment C		0	2	
Eu2.5	Event output 2 Output assignment D		0	2	
Eu2.6	Event output 2 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Control output 1 Polarity A to D. The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
Eu2.7	Event output 2 Polarity	0: Direct 1: Reverse	0	2	
Eu2.8	Event output 2 Latch	0: None 1: Latch (Latch at ON) 2: Latch (Latch at OFF except for initialization at power ON)	0	2	
Eu3.1	Event output 3 Operation type	Same as Control output 1 Operation type. 0: Default output 1: MV1 2: MV2 3 to 6: Function 1 to 4	0	2	Displayed when the optional model has Event output 3. When using Event output 3, the default output is Internal Event 3.
Eu3.2	Event output 3 Output assignment A	Same as Control output 1 Output assignment A to D.	4	2	Displayed when the optional model has Event output 3 and the operation type of Event output 3 is set 1 to 4 (Ev3.1 > 2).
Eu3.3	Event output 3 Output assignment B		0	2	
Eu3.4	Event output 3 Output assignment C		0	2	
Eu3.5	Event output 3 Output assignment D		0	2	
Eu3.6	Event output 3 Polarity A to D 1st digit: Polarity A 2nd digit: Polarity B 3rd digit: Polarity C 4th digit: Polarity D	Same as Control output 1 Polarity A to D. The following setting applies to each digit: 0: Direct 1: Reverse	0000	2	
Eu3.7	Event output 3 Polarity	0: Direct 1: Reverse	0	2	
Eu3.8	Event output 3 Latch	0: None 1: Latch (Latch at ON) 2: Latch (Latch at OFF except for initialization at power ON)	0	2	

■ User Function bank

Bank selection: UF

Display	Item	Contents	Initial value	User level	Remarks
UF-1	User Function 1	Each setting is set on the upper display. The following shows the setting exceptions: – – – – : Not registered. P – _ : Proportional band of currently used PID group I – _ : Integral time of currently used PID group d – _ : Derivative time of currently used PID group rE – _ : Manual reset of currently used PID group oL – _ : Output low limit of currently used PID oH – _ : Output high limit of currently used PID group P – _C : Proportional band for cool side of currently used PID group I – _C : Integration time for cool side of currently used PID group d – _C : Derivative time for cool side of currently used PID group oL.– _C : Output low limit for cool side of currently used PID group oH.– _C : Output high limit for cool side of currently used PID group	----	1	It is possible to register only the settings, which can be displayed. (Example: Manual reset of the PID constant can be registered when the I (Integral time) is set at “0”.) The registered setting is added to the end of the display order of the basic display.
UF-2	User Function 2		----	1	
UF-3	User Function 3		----	1	
UF-4	User Function 4		----	1	
UF-5	User Function 5		----	1	
UF-6	User Function 6		----	1	
UF-7	User Function 7		----	1	
UF-8	User Function 8		----	1	

■ Lock bank

Bank selection: LoC

Display	Item	Contents	Initial value	User level	Remarks
LoC	Key lock	0: All settings are possible. 1: Mode, event, operation display, SP, UF, lock, and manual MV can be set. 2: Operation display, SP, UF, lock, and manual MV can be set. 3: UF, lock, and manual MV can be set.	0	0	When two sets of passwords (1A and 1B, 2A and 2B) are matched, the setting is possible. [mode] key operation, MV setting in MANUAL mode, key lock, password display, and password 1A to 2B can be set when the key lock (LoC) is a value of 0 to 3.
C.LoC	Communication lock	0: RS-485 communication read/write enabled. 1: RS-485 communication read/write disabled.	0	2	
L.LoC	Loader lock	0: Loader communication read/write enabled. 1: Loader communication read/write disabled.	0	2	
PASS	Password display	0 to 15 5: Password 1A to 2B display	0	0	
PS1A	Password 1A	0000 to FFFF (Hexadecimal value)	0000	0	Displayed when the password display (PASS) is “5” and two sets of passwords (1A and 1B, 2A and 2B) are matched.
PS2A	Password 2A	0000 to FFFF (Hexadecimal value)	0000	0	
PS1b	Password 1B	0000 to FFFF (Hexadecimal value)	0000	0	Displayed when the password display (PASS) is “5”.
PS2b	Password 2B	0000 to FFFF (Hexadecimal value)	0000	0	

■ Instrument information bank

Bank selection: Id

Display	Item	Contents	Initial value	User level	Remarks
Id01	ROM ID	0: SDC15 1: SDC25/26 2: SDC35/36	0	2	Identification of ROM firmware setting is disabled.
Id02	ROM Version 1	XX.XX (2 digits after decimal point)	—	2	
Id03	ROM Version 2	XX.XX (2 digits after decimal point)	—	2	
Id04	LOADER Information		—	2	
Id05	EST Information		—	2	
Id06	Manufacturing date code (year)	Year - 2000 Example: "3" means the year 2003.	—	2	Manufacturing date and unit identification No. setting is disabled.
Id07	Manufacturing date code (month, day)	Month + Day ÷ 100. Example: "12.01" means the 1st day of December.	—	2	
Id08	Serial No.		—	2	

Chapter 7. CPL COMMUNICATION FUNCTION

7 - 1 Outline of Communication

If the optional model is provided with the RS-485 communication function, communication with a PC, PLC or other host devices are available using a user-configured program.
The communication protocol can be selected from the Controller Peripheral Link (CPL) communication (Yamatake's host communication protocol) and the MODBUS communication. This chapter describes the CPL communications.

■ Features

The features of the SDC35/36's communication function are as follows:

- Up to 31 units can be connected to a single master station as a host device.
- When the communication specifications of the host device conform to the RS-232C interface, the communication converter CMC10L (sold separately) is required. The CMC10L allows the conversion between RS-232C and RS-485.
- Almost all of the device parameters can be communicated.
  For details on communication parameters,
  ☞ refer to Chapter 9, LIST OF COMMUNICATION DATA.
- Random access commands are available.
  Two or more number of parameters at separated addresses can be read or written by a single command.

■ Setup

The following setups are required for performing the CPL communications:
The items on the table below can be displayed and set up only when the optional model number is provided with the RS-485 communication function.

Item (Setting display/bank)	Display	Contents	Initial value	User level
CPL/MODBUS (Setup setting/Setup bank)	C 64	0: CPL 1: MODBUS ASCII format 2: MODBUS RTU format	0	Simple, Standard, High function
Station address (Same as above)	C 65	0: Does not communicate 1 to 127	0	
Transmission speed (Same as above)	C 66	0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps	2	
Data format (Data length) (Same as above)	C 67	0: 7 bits 1: 8 bits	1	
Data format (Parity) (Same as above)	C 68	0: Even parity 1: Odd parity 2: No parity	0	
Data format (Stop bit) (Same as above)	C 69	0: 1 stop bit 1: 2 stop bits	0	
Response time-out	C 70	1 to 250ms	3	High function

[!] Handling Precautions

- Setups can be performed through key operation on the console or the smart loader package SLP-C35. However, they cannot be performed via RS-485 communications.
- If you use the Yamatake CMC10L as an RS-232C/RS-485 converter, set the response time-out (C70) to 3ms or longer.

■ Communication procedures

The communication procedure is as follows:

(1) The instruction message is sent from the host device (master station) to one unit (slave station) to communicate with.

(2) The slave station receives the instruction message, and performs read or write processing according to the content of the message.

(3) The slave station sends a message corresponding to the processing content as a response message.

(4) The master station receives the response message.

Handling Precautions

It is not allowed to use two or more number of protocols together on a single RS-485 transmission line such as CPL, MODBUS ASCII format, and MODBUS RTU format.

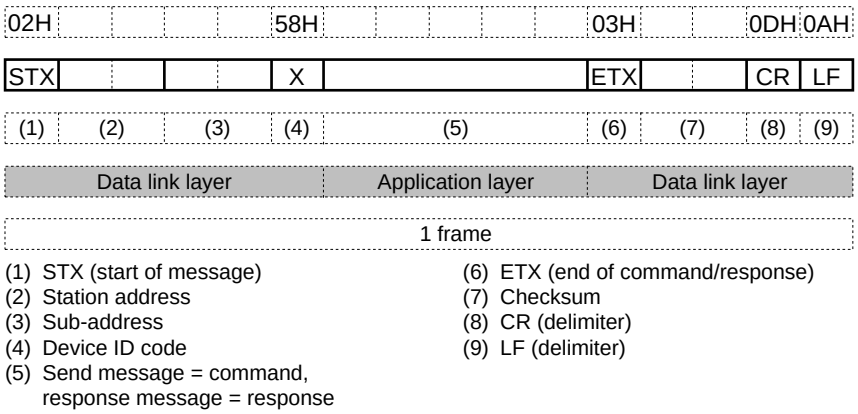
7 - 2 Message Structure

■ Message structure

The following shows the message structure:
Messages are broadly classified into two layers; the data link layer and the application layer.

- Data link layer
  This layer contains the basic information required for the communication such as the destination of the communication message and the check information of the message.
- Application layer
  Data is read and written in this layer. The content of the layer varies according to the purpose of the message.

Messages comprise parts (1) to (9) as shown in the figure below.
The command (details sent from the master station) and the response (details returned from the slave station) are stored in the application layer.



(1) STX (start of message)
(2) Station address
(3) Sub-address
(4) Device ID code
(5) Send message = command, response message = response
(6) ETX (end of command/response)
(7) Checksum
(8) CR (delimiter)
(9) LF (delimiter)

■ Data link layer

● Outline

The data link layer is of a fixed length. The position of each data item and the number of its characters are already decided. Note, however, that the data positions of the data link layer from ETX onwards shift according to the number of characters in the application layer. The character length, however, remains unchanged.

● Response start conditions

- The device sends the response message only when (1) message structure, station address, sub-address, checksum and message length of a single frame in the data link layer are all correct. If even one of these is incorrect, no response messages are sent, and the device waits for new message.

- Number of word addresses accessible by a single frame

Type	Description of command	RAM area	EEPROM area
RS	Decimal format read command	16	16
WS	Decimal format write command	16	16
RD	Hexadecimal format read command	28	28
WD	Hexadecimal format write command	27	16
RU	Hexadecimal format random read command	28	28
WU	Hexadecimal format random write command	14	14

● List of data link layer data definitions

The following list shows the definitions for data in the data link layer:

Data name	Character code	Number of characters	Meaning of data
STX	02H	1	Start of message
Station address	0 to 7FH are expressed as hexadecimal character codes.	2	Identification of device to communicate with
Sub-address	"00" (30H, 30H)	2	No function
Device ID code	"X" (58H) or "x" (78H)	1	Device type
ETX	ETX (03H)	1	End position of the application layer
Checksum	00H to FFH are expressed as two-digit hexadecimal character codes.	2	Checksum of message
CR	0DH	1	End of message (1)
LF	0AH	1	End of message (2)

● Description of data items

• STX (02H)

When STX is received, the device judges this to be the start of the send message. For this reason, the device returns to the initial state whatever reception state it was in, and processing is started on the assumption that the STX, the first character, has been received. The purpose of this is to enable recovery of the device's response at the next correct message (e.g. RETRY message) from the master station in the event that noise, for example, causes an error in the sent message.

• Station address

Of the messages sent by the master station, the device creates response messages only when station addresses are the same. Station addresses in the messages are expressed as two-digit hexadecimal characters.

The station address is set up by the station address setup (setup setting C65). However, when the station address is set to 0 (30H 30H), the device creates no response even if station addresses match.

The device returns the same station address as that of the received message.

• Sub-address

The C35/36 does not use the sub-address. For this reason, set "00" (30H 30H).

The device returns the same sub-address as that of the received message.

• Device ID code

The device sets X (58H) or x (78H) as the device ID code. This code is determined for each device series, and other codes cannot be selected. The device returns the same device ID code as that of the received message. X (58H) is used as the default, and x (78H) is used for judging the message as the resend message.

• ETX

ETX indicates the end of the application layer.

• Checksum

This value is for checking whether or not some abnormality (e.g. noise) causes the message content to change during communications.

The checksum is expressed as two hexadecimal characters.

• How to calculate a checksum

(1) Add the character codes in the message from STX through ETX in single byte units.

(2) Take two's complement of the low-order one byte of the addition result.

(3) Convert the obtained two's complement to a two-byte ASCII code.

The following is a sample checksum calculation:

[Sample message]

STX: 02H
'0': 30H (first byte of the station address)
'1': 31H (second byte of the station address)
'0': 30H (first byte of the sub-address)
'0': 30H (second byte of the sub-address)
'X': 58H (device ID code)
'R': 52H (first byte of the command)
'S': 53H (second byte of the command)
(omitted)
ETX: 03H

(1) Add the character codes in the message from STX through ETX in single byte units.
The add operation in single byte units is as follows:
02H + 30H + 31H + 30H + 30H + 58H + 52H + 53H + • • • + 03H.
Assume that the result is 376H.

(2) The low-order one byte of the addition result 376H is 76H. The two's complement of 76H is 8AH.

(3) Convert the obtained 8AH to a two-byte ASCII code.
The result is:
'8': 38H
'A': 41H,
and the two bytes, '8'(38H) and 'A'(41H), are the checksum.

• CR/LF

This indicates the end of the message. Immediately after LF is received, the device enters a state allowed to process the received message.

■ Application layer

The table below shows the configuration of the application layer.

Item	Description
Command	"RS" (decimal number format continuous address data read command)
	"WS" (decimal number format continuous address data write command)
	"RD" (hexadecimal number format continuous address data read command)
	"WD" (hexadecimal number format continuous address data write command)
	"RU" (hexadecimal number format random address data read command)
	"WU" (hexadecimal number format random address data write command)
Data delimiter	RS, WS: "," (comma) Other commands: None
Word address	RS, WS: "501W", etc. Other commands: "01F5", etc.
Read count	Numerical value of characters expressed as "1" for example
Numerical value to be written	RS, WS: Numerical value of characters expressed as "100" for example Other commands: Numerical value of characters expressed in hexadecimal as "0064" for example

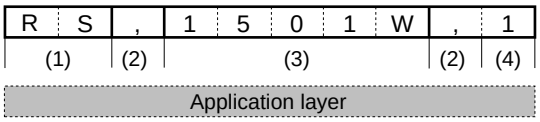
7 - 3 Description of Commands

■ Continuous data read command (RS command)

This command reads data of continuous addresses by a single command.

● Send message

This command enables the content of continuous data addresses starting with the specified read start address to be read as a single message. The figure below shows the structure of the application layer of the send message when the data is read.

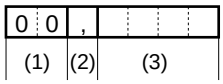


(1) Continuous read command
(2) Data delimiter
(3) Data address
(4) Number of read data

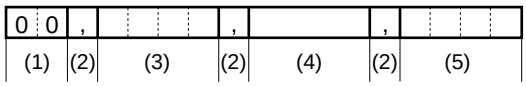
● Response message

If the message is correctly received, a response message corresponding to the command content is returned.
The figure below shows the structure of the application layer of the response message when the data is read.

• Normal termination (reading of single data item)



• Normal termination (reading of multiple data items)



• Abnormal termination

The abnormal termination code is entered at XX.
For details of codes,
refer to 7-6, List of Termination Codes (on page 7-14).

(1) Termination code
(2) Data delimiter
(3) Data
(4) Data 2 to (n-1)
(5) Data n

● Maximum number of read data per message

Up to 16 words for both RAM and EEPROM areas

■ Continuous data write command (WS command)

This command writes data to continuous addresses.

● Send message

The figure below shows the structure of the application layer of the send message for the data write command.

W	S	,	1	5	0	1	W	,	1	,	6	5
(1)		(2)	(3)					(2)	(4)	(2)	(5)	

(1) Write command
(2) Data delimiter
(3) Start write data address
(4) Write data (first word)
(5) Write data (second word)

● Response message

The figure below shows the structure of the application layer of the response message for the data write command.

• Normal termination

0	0
(1)	

• Abnormal termination or warning

X	X
(1)	

The abnormal termination code is entered at XX.
For details of codes,
☞ refer to 7-6, List of Termination Codes (on page 7-14).

(1) Termination code

● Maximum number of write data per message

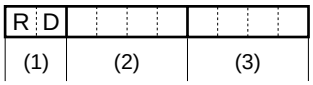
Up to 16 words for both RAM and EEPROM areas

■ Fixed length continuous data read command (RD command)

This command reads continuous data in two-byte units. This command is suitable for handling data in ladder programs sent by PLC communications as the data is of a fixed length.
The start data address is expressed as four hexadecimal digits. The number of read data is expressed as four digits, and data is expressed as four X n (n is a positive integer) hexadecimal digits.

● Send message

The read start data address (four hexadecimal digits) and the number of read data (four hexadecimal digits) are sent.

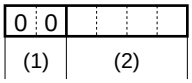


(1) Fixed length continuous data read command
(2) Start data address
(3) Number of read data

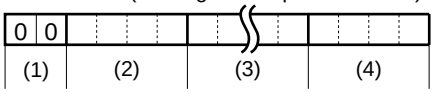
● Response message

If the message is sent successfully, the termination code is taken to be normal (two decimal digits) and returned appended with the number of read data (four hexadecimal digits X number of read data) specified by the command. If message transmission ends in error, the termination code is taken to be in error (two decimal digits) and returned without the read data.

• Normal termination (reading of single data item)



• Normal termination (reading of multiple data items)



• Abnormal termination

The abnormal termination code is entered at XX.
For details of codes,
☞ refer to 7-6, List of Termination Codes (on page 7-14).

(1) Termination code
(2) Data
(3) Data 2 to data (n-1)
(4) Data n

● Maximum number of read data per message

Up to 28 words for both RAM and EEPROM areas

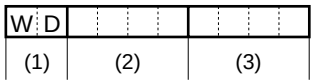
■ Fixed length continuous data write command (WD command)

This command writes continuous data in two-byte units. This command is suitable for handling data in ladder programs sent by PLC communications as the data is of a fixed length.
The start data address is expressed as four hexadecimal digits. Data is expressed as four X n (n is a positive integer) hexadecimal digits.

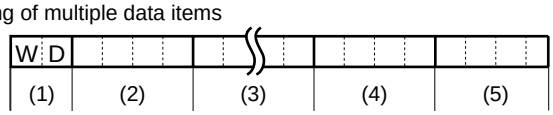
● Send message

The write start data address (four hexadecimal digits) and the number of write data (four X n hexadecimal digits) are sent.

• Writing of single data item



• Writing of multiple data items



(1) Fixed length continuous data write command
(2) Start data address
(3) Data 1
(4) Data 2 to data (n-1)
(5) Data n

● Response message

If writing is successful, the normal termination code (two decimal digits) is returned. If only part of the data is written, and the remaining data is not written, the warning termination code (two decimal digits) is returned. If none of the data is written, the abnormal termination code (two decimal digits) is returned.

• Normal termination

• Abnormal termination or warning

The abnormal termination code is entered at XX.
For details of codes,
☞ refer to 7-6, List of Termination Codes (on page 7-14).

(1) Termination code

● Maximum number of write data per message

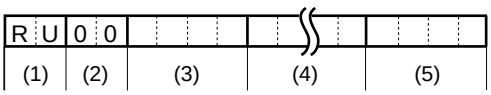
RAM area: Up to 27 words
EEPROM area: Up to 16 words

■ Fixed length random data read command (RU command)

This command reads random data in two-byte units.

● Send message

The data address (four hexadecimal digits) of the data to be read is sent in the specified order.

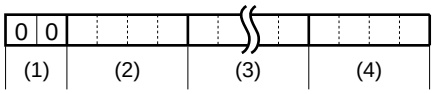


(1) Fixed length random data write command
(2) Sub-command: fixed to "00".
(3) Data address 1
(4) Data address 2
(5) Data address n

● Response message

If the message is sent successfully, the termination code is taken to be normal (two decimal digits) and returned appended with the number of read data (four hexadecimal digits X number of read data) specified by the command. If message transmission ends in error, the termination code is taken to be in error (two decimal digits) and returned without the read data.

• Normal termination



• Abnormal termination

The abnormal termination code is entered at XX.
For details of codes,
☞ refer to 7-6, List of Termination Codes (on page 7-14).

(1) Termination code
(2) Data 1
(3) Data 2 to data (n-1)
(4) Data n

● Maximum number of read data per message

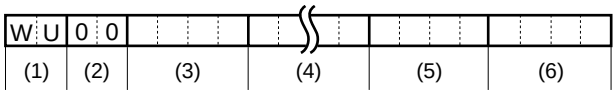
Up to 28 words for both RAM and EEPROM areas

■ Fixed length random data write command (WU command)

This command writes data to random addresses in two-byte units. Data is expressed in four hexadecimal digits.

● Send message

Data is sent for the specified number of write data with the data address (four hexadecimal digits) of the data to be written and the data (four hexadecimal digits) as a pair.



(1) Fixed length random data write command
(2) Sub-command: fixed to "00".
(3) Data address 1
(4) Write data 1
(5) Data address n
(6) Write data n

● Response message

If writing is successful, the normal termination code (two decimal digits) is returned. If only part of the data is written, and the remaining data is not written, the warning termination code (two decimal digits) is returned. If none of the data is written, the abnormal termination code (two decimal digits) is returned.

• Normal termination

• Abnormal termination or warning

The abnormal termination code is entered at XX.
For details of codes,
☞ refer to 7-6, List of Termination Codes (on page 7-14).

(1) Termination code

● Maximum number of write data per message

Up to 14 words for both RAM and EEPROM areas

7 - 4 Definition of Data Addresses

● RAM and EEPROM areas of data addresses

Data addresses are categorized as follows:

Data address (hexadecimal notation)	Name	Remarks
273W to 14859W (0111 to 3A0B)	RAM access data address	Reading and writing of these addresses are both performed on RAM. Since writing is not performed to EEPROM, the value returns to that stored in EEPROM after restarted.
16657W to 31243W (4111 to 7A0B)	EEPROM access data address	Writing is performed to both RAM and EEPROM; reading is performed only on RAM. Since writing is also performed to EEPROM, the value does not change even after restarted.

! Handling Precautions

Erase/write cycle of EEPROM is limited (100,000 cycles). Accordingly, we recommend writing parameters that are written extremely frequently to RAM that can be written without limitation.
However, that when writing to RAM is performed, the data in EEPROM is transferred to RAM when the power is turned ON again.

● Write data range

If the write value exceeds the range determined by parameters, writing is not performed and an abnormal termination code is returned.

● Write conditions

An abnormal termination code is also returned when the writing is not possible due to the conditions.

7 - 5 Numeric Representation in the Application Layer

The specifications of numeric representation are decimal variable-length (zero suppress) for RS and WS commands and hexadecimal fixed-length for RD, WD, RU and WU commands. Details are as follows:

- **RS and WS commands**

Item	Specifications	Remedies
Unwanted space	Cannot be appended.	The message processing is aborted and an abnormal termination code is returned as a response message.
Unwanted zero	Cannot be appended.	
Numerical value = zero	Cannot be omitted. Be sure to use "0".	
Other unwanted characters	Numerical values may be prefixed with a "-" expressing a negative number. Any other character cannot be appended. The "+" sign must not be appended to indicate positive numerical values.	
Range of available numerical values	-32768 to +32767 Values out of this range are not allowed.	

- **RD, WD, RU and WU commands**

Item	Specifications	Remedy
Unwanted space	Cannot be appended.	The message processing is aborted and an abnormal termination code is returned as a response message.
Unwanted zero	Cannot be appended.	
Numerical value = zero	Cannot be omitted. Be sure to use "0000".	
Other unwanted characters	Cannot be appended.	
Range of available numerical values	0000H to FFFFH	

7 - 6 List of Termination Codes

When an error occurred in the application layer, an abnormal termination code is returned as a response message.

Termination code	Description	Remedies	Example
00	Normal termination	All the processing has normally completed.	
99	Undefined command Other error	Only the termination code is returned but the message processing is not performed.	AA,1001W,1 RX03E80001
10	Conversion error of a numerical value • A numerical value of 7 digits or more • A figure other than 0 of which the leading digit is 0 • The conversion result is 65535 or greater, or -65536 or smaller. • Other obvious illegal representation of an integer	Processing is aborted just when a conversion error or a range error has occurred. (Processing is performed just before an error has occurred.)	RS,1001W,100000 RS,01001W,1 RS,+1001W,1 WS,10?1W,1 RD03E9000> RU0103E9
22	The value of written data is out of the specified range.	Processing is continued excluding the data address with abnormal data.	(Example: Specified range for 500W is 0 to 1) (Processing aborted) WS,5001W,3000 WD13890BB8 WU0013890BB8
23	Writing disabled due to instrument set value conditions, instrument external conditions, etc.	Processing is continued excluding the data address with abnormal data.	
	Writing/reading disabled because communications/loader locked	Only the termination code is returned but the message processing is not performed.	
40	Read/write word count error	Only the termination code is returned but the message processing is not performed.	RS,1001W,100 RD03E90064
41	Data address is out of the range. • Out of the range between 256 and 65534	Only the termination code is returned but the message processing is not performed.	RS,100000W,1 RD03G90001 RU00$3E903EA WS,03E9W,1 WD0XXX0001 WU00o3E9001
42	Value of data is out of the specified range. • -32769 or smaller, or 32768 or greater	Processing is performed up to the data address with abnormal data; the succeeding processing is not performed.	WS,2101W,100,XXX WS,2101W,100000 WD03E900010XXX

7 - 7 Reception and Transmission Timing

■ Timing specifications for instruction and response message

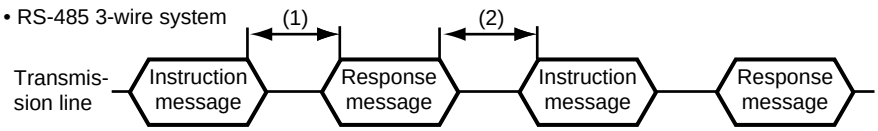
The cautions below are required with regard to the timing to transmit a instruction message from the master station and a response message from the slave station.

● Response monitor time

The maximum response time from the end of the instruction message transmission by the master station until when the master station receives a response message from the slave station is two seconds ((1) in the figure below). So, the response monitor time should be set to two seconds.
Generally, when a response time-out occurs, the instruction message is resent.

● Transmission start time

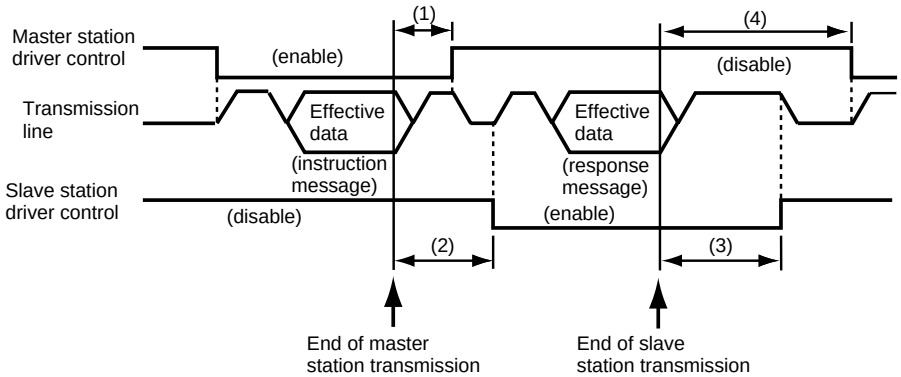
A wait time of 10ms is required before the master station starts to transmit the next instruction message (to the same slave station or a different slave station) after the end of receiving response message ((2) in the figure below).



(1) End of master station transmission -
Transmission start time of slave station = Max. 2000ms
(2) End of slave station transmission -
Transmission start time of master station = Min. 10ms

■ RS-485 driver control timing specifications

When the transmission/reception on the RS-485 3-wire system is directly controlled by the master station, care should be paid to the following timing:



(1) End of master station transmission - Driver disable time = Max. 500μs
(2) End of slave station reception - Driver enable time = Response time-out setup setting (C70) or greater
(3) End of slave station transmission - Driver disable time = Max. 10ms
(4) End of master station reception - Driver enable time = Min. 10ms

7 - 8 Cautions when Making Communication Programs for the Master Station

Pay attention to the following points when making communication programs:

- The longest response time on the device is two seconds. For this reason, set the response monitor time to two seconds.
- Resend the same message if there is no response within two seconds. Set a communication error to occur if there is no response even after two retries.
- Be sure to make the above resends to guard against the case when the message cannot be send correctly due to the influence of noise, for example, during communications.

Note

When the master station resends the message, alternatively use the device ID codes "X" and "x." This is convenient as you can tell whether or not the received message is the previously received message.

■ Example of communications program

A sample program is installed in the folder in which the smart loader package SLP-C35 has been installed.
In the default setting, the directory is "c:¥program files¥slp¥slpc35¥cpl.cpp".
The program is written in Borland's C++Builder5.0 or Borland C++Compiler5.5 for Windows95/98/NT/2000.
This program is given here as a reference when the user makes a program, and does not assure all the operations.
You can download Borland C++Compiler5.5 from Borland Home Page.

Handling Precautions

Yamatake assumes no responsibility with regard to any trouble caused by using this program.

● Prior to running the sample program

Make sure to check the settings for communications type, station address, transmission speed and data format of the instrument.

● Running the sample program

This program is used for reading and writing data. When the program is executed, the application layers of the instruction message and response message communicated are indicated.

```
command:RS,14356W,2
result:00,0,0
command:WS,14357W,2
result:00
```

Sample indication of execution results

● Processing of the sample program

- Communication settings
  Call open() and initialize the RS-232C serial port.
- Command execution
  Set a desired character string in 'command' and call AppCPL().

Chapter 8. MODBUS COMMUNICATION FUNCTION

8 - 1 Outline of Communication

If the optional model is provided with the RS-485 communications function, communication with a PC, PLC or other host devices are available using a user-configured program.
The communication protocol can be selected from the Controller Peripheral Link (CPL) communication (Yamatake's host communication protocol) and the MODBUS communication. This chapter describes the MODBUS communications.

■ Features

The features of the C35/36's communication function are as follows:

- Up to 31 units can be connected to a single master station as a host device.
- When the communication specifications of the host device conform to the RS-232C interface, the communication converter CMC10L (sold separately) is required. The CMC10L allows the conversion between RS-232C and RS-485.
- Almost all of the device parameters can be communicated.
  For details on communication parameters,
  ☞ refer to Chapter 9, LIST OF COMMUNICATION DATA.

■ Setup

The following setups are required for performing the MODBUS communication:

Item (Setting display/bank)	Display	Contents	Initial value	User level
CPL/MODBUS (Setup setting/Setup bank)	C 64	0: CPL 1: MODBUS ASCII format 2: MODBUS RTU format	0	Simple, Standard, High function
Station address (Same as above)	C 65	0: Does not communicate 1 to 127	0	
Transmission speed (Same as above)	C 66	0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps	2	
Data format (Data length) (Same as above)	C 67	0: 7 bits 1: 8 bits	1	
Data format (Parity) (Same as above)	C 68	0: Even parity 1: Odd parity 2: No parity	0	
Data format (Stop bit) (Same as above)	C 69	0: 1 stop bit 1: 2 stop bits	0	
Response time-out	C 70	1 to 250ms	3	High function

- If the optional model number is provided with the RS-485 communications function, display and setup are available.
- If the communications type is set to MODBUS RTU format, data format (data length) cannot be displayed nor set up, and the action is fixed to 8-bit data.

[!] Handling Precautions

- Setups can be performed through key operation on the console or the smart loader package SLP-C35. However, they cannot be performed via RS-485 communications.
- If you use the Yamatake CMC10L as an RS-232C/RS-485 converter, set the response time-out (C70) to 3ms or longer.

■ Communication procedures

The communication procedure is as follows:

(1) The instruction message is sent from the host device (master station) to one unit (slave station) to communicate with.

(2) The slave station receives the instruction message, and performs read or write processing according to the content of the message.

(3) The slave station sends a message corresponding to the processing content as a response message.

(4) The master station receives the response message.

Handling Precautions

It is not allowed to use two or more number of protocols together on a single RS-485 transmission line such as CPL, MODBUS ASCII format, and MODBUS RTU format.

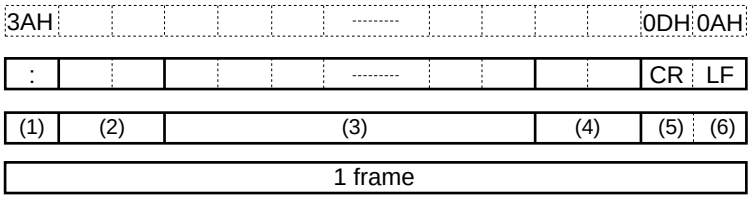
8 - 2 Message Structure

■ Message structure

This section describes the message structure.
All messages are expressed in hexadecimal.

● MODBUS ASCII

All messages other than delimiters are written in hexadecimal ASCII codes.
A message of MODBUS ASCII consists of (1) to (6) below.
The part of (3) stores commands, which are transmission contents from the master station and responses, which are transmission contents from the slave station.
All messages use ASCII codes. (Each slot below corresponds to one character.)



(1) Start of message (colon, expressed with ASCII code 3AH)
(2) Station address (2 bytes)
(3) Send message, response message
(4) Checksum (two-byte LRC)
(5) CR (delimiter)
(6) LF (delimiter)

• Colon (3AH)
When a colon (3AH) is received, the device judges this to be the start of the send message. For this reason, the device returns to the initial state whatever reception state it was in, and processing is started on the assumption that the colon (3AH), the first character, has been received. The purpose of this is to enable recovery of the device's response at the next correct message (e.g. RETRY message) from the master station in the event that noise, for example, causes an error in the sent message.

• Station address
Of the messages sent by the master station, the device creates response messages only when station addresses are the same. Station addresses in the messages are expressed as two hexadecimal characters. The station address is set up by the station address setup (setup setting C65). However, when the station address is set to 0 (30H 30H), the device creates no response even if station addresses match. The device returns the same station address as that of the received message.

• Checksum (LRC)
This value is for checking whether or not some abnormality (e.g. noise) causes the message content to change during communications. The checksum is expressed as two hexadecimal characters. The method to calculate a checksum is as follows:
(1) Add the data from the top up to just before the checksum. Note that the values to be added are not the ASCII character values in the send message but the one-byte binary data converted from two ASCII characters.

(2) Take two's complement of the addition result.
(3) Convert the low-order one byte of the addition result to a character code.

The following is a sample checksum calculation:
[Sample message]

:	: 3AH (start of the message)
'0'	: 30H (first byte of the station address)
'A'	: 41H (second byte of the station address)
'0'	: 30H (first byte of the read command)
'3'	: 33H (second byte of the read command)
'0'	: 30H (first byte of the start data address)
'3'	: 33H (second byte of the start data address)
'E'	: 45H (third byte of the start data address)
'9'	: 39H (fourth byte of the start data address)
'0'	: 30H (first byte of the number of read data)
'0'	: 30H (second byte of the number of read data)
'0'	: 30H (third byte of the number of read data)
'2'	: 32H (fourth byte of the number of read data)

(1) Add the data from the top up to just before the checksum.
The add operation is as follows:
0AH + 03H + 03H + E9H + 00H + 02H
The result is FBH.

(2) The low-order byte of the addition result FBH is FBH as is. The two's complement of FBH is 05H.

(3) Convert the obtained 05H to a two-byte ASCII code.
The result is:

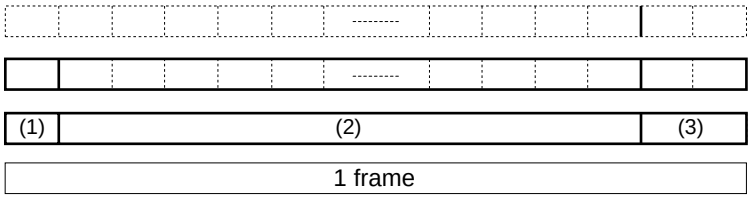
'0'	: 30H
'5'	: 35H,

and the two bytes, '0' (30H) and '5' (35H), are the checksum.

• CR/LF
This indicates the end of the message. After LF is received, the device immediately stands by for permission to process the received message.

● MODBUS RTU

All messages are written in binary data.
A MODBUS RTU message consists of (1) to (3) below.
The part of (2) stores commands, which are transmission contents from the master station and responses, which are transmission contents from the slave station.
All messages use binary data. (Each slot below corresponds to one character.)



(1) Station address (1 byte)
(2) Send message, response message
(3) Checksum (2 bytes)

• Station address

Of the messages sent by the master station, the device creates response messages only when station addresses are the same. Station addresses in the messages are expressed in one byte. The station address is set up by the station address setup (setup setting C65). However, when the station address is set to 0, the device creates no response even if station addresses match. The device returns the same station address as that of the received message.

• Checksum (CRC)

This value is for checking whether or not some abnormality (e.g. noise) causes the message content to change during communications. The checksum is expressed as 2 bytes.

The checksum (CRC) creation method is shown below.

```
/* CRC calculation */
/* Input        unsigned char  length   : Number of transmission bytes     */
/*              unsigned char  *top      : Transmission data start pointer  */
/* Output       unsigned short  CRC     : CRC calculation result           */
unsigned short crc16( unsigned char length, unsigned char *top )
{
      unsigned short  CRC= 0xffff;
      unsigned short  next;
      unsigned short  carry;
      unsigned short  n;
      unsigned char   crcl;

      while ( length-- ) {
                  next = (unsigned short)*top;
                  CRC ^= next;
                  for (n = 0; n < 8; n++) {
                              carry = CRC & 1;
                              CRC >>= 1;
                              if (carry) {
                                          CRC ^= 0xA001;
                              }
                  }
                  top++;
      }

      crcl = (CRC & 0xff00)>>8;
      CRC <<= 8;
      CRC |= crcl;

      return CRC;
}
```

• 1-frame end judgment

A message end (1-frame end) is determined when a time period specified for each transmission speed has passed during which no character is received. It is considered that 1 frame has ended when the next character is not received before the time-out time shown below passes.

However, the time-out time has a fluctuation of ±1ms from the values in the table below.

Set transmission speed (bps)	Time-out time
4800	16ms or more
9600	8ms or more
19200	4ms or more
38400	2ms or more

■ Command type

There are two command (send message) types as shown below.

Command	Description	
	ASCII	RTU (binary)
Read command	"03" (sample)	03H (sample)
Write command	"10" (sample)	10H (sample)

■ Other specifications

• Supporting the MODBUS Class 0

• Abnormal termination codes

Code	Description
01	Command error
02	Address error
03	Data error

• Maximum number of communication data words

Command	Number of data	
	ASCII	RTU
03 (READ)	16	16
10 (WRITE)	16	16

• The others

For the details of MODBUS specifications,

☞ refer to OPEN MODBUS/TCP SPECIFICATION (Release 1.0) by Modicon Inc.

8 - 3 Description of Commands

■ Read command (03H)

● Send Message

This is a command capable of reading the contents of continuous data addresses from a specified read start data address with a single message. The following is an example of send message while reading data:

MODBUS ASCII

3AH	30H	41H	30H	33H	30H	33H	45H	39H	30H	30H	30H	32H	30H	35H	0DH	0AH
:	0	A	0	3	0	3	E	9	0	0	0	2	0	5	CR	LF
(1)	(2)		(3)		(4)				(5)				(6)		(7)	

(1) Start of message
(2) Station address
(3) Read command
(4) Start data address
(5) Number of read data
(6) Checksum (LRC)
(7) Delimiter

MODBUS RTU

0AH	03H	03H	E9H	00H	02H	14H	C0H
(1)	(2)	(3)		(4)		(5)	

(1) Station address
(2) Read command
(3) Start data address
(4) Number of read data
(5) Checksum (CRC)

● Response Message

A response message corresponding to the command content is returned when the message is correctly received.
The figure below shows the structure of the response message while reading data.

MODBUS ASCII

3AH	30H	41H	30H	33H	30H	34H	30H	33H	30H	31H	30H	30H	30H	33H	45H	38H	D0H	0AH
:	0	A	0	3	0	4	0	3	0	1	0	0	0	3	E	8	CR	LF
(1)	(2)		(3)		(4)		(5)				(6)				(7)		(8)	

• Example in case of normal reception

(1) Start of message
(2) Station address
(3) Read command
(4) Number of read data X 2
(5) Read data 1
(6) Read data 2
(7) Checksum (LRC)
(8) Delimiter

• Example in case of error

3AH	30H	41H	38H	34H	30H	31H	37H	31H	0DH	0AH
:	0	A	8	4	0	1	7	1	CR	LF
(1)	(2)		(3)		(4)		(5)		(6)	

(1) Start of message
(2) Station address
(3) Error flag (since undefined "04" is sent as a command with a send message, the most significant bit is turned ON and sent back as "84".)
(4) Abnormal termination code (☞ refer to page 8-6)
(5) Checksum (LRC)
(6) Delimiter

MODBUS RTU

• Example in case of normal reception

0AH	03H	04H	03H	01H	00H	03H	51H	76H
(1)	(2)	(3)	(4)		(5)		(6)	

(1) Station address
(2) Read command
(3) Number of read data X 2 (bytes)
(4) Read data 1
(5) Read data 2
(6) Checksum (CRC)

• Example in case of error

0AH	84H	01H	F3H	02H
(1)	(2)	(3)	(4)	

(1) Station address
(2) Error flag (since undefined "04H" is sent as a command with a send message, the most significant bit is turned ON and sent back as "84H".)
(3) Abnormal termination code (☞ refer to page 8-6)
(4) Checksum (CRC)

■ Write command (10H)

● Send Message

This is a command capable of writing the contents of continuous data addresses from a specified write start data address with a single message. The following is an example of send message while writing data:

(Example) Writing 01A0H and 0E53H in the continuous data addresses consisting of 2 words following 1501W (05DDH).

MODBUS ASCII

3AH	30H	31H	31H	30H	30H	35H	44H	44H	30H	30H	30H	32H	30H	34H
:	0	1	1	0	0	5	D	D	0	0	0	2	0	4
(1)	(2)		(3)		(4)				(5)				(6)	

30H	31H	41H	30H	30H	45H	35H	33H	30H	35H	0DH	0AH
0	1	A	0	0	E	5	3	0	5	CR	LF
(7)				(8)				(9)		(10)	

(1) Start of message
(2) Station address
(3) Write command 10H
(4) Start data address
(5) Number of write data
(6) Number of write data X 2
(7) Write data 1
(8) Write data 2
(9) Checksum
(10) Delimiter

MODBUS RTU

01H	10H	05H	DDH	00H	02H	04H	01H	A0H	0EH	53H	45H	B9H
(1)	(2)	(3)		(4)		(5)	(6)		(7)		(8)	

(1) Station address
(2) Write command 10H
(3) Start data address
(4) Number of write data
(5) Number of write data x 2
(6) Write data 1
(7) Write data 2
(8) Checksum

● Response Message

A response message corresponding to the command content is returned when the message is correctly received.
The figure below shows the structure of the response message when the data is written.

MODBUS ASCII

3AH	30H	31H	31H	30H	30H	35H	44H	44H	30H	30H	30H	32H	30H	42H	0DH	0AH
:	0	1	1	0	0	5	D	D	0	0	0	2	0	B	CR	LF
(1)	(2)		(3)		(4)				(5)				(6)		(7)	

(1) Start of message
(2) Station address
(3) Write command 10H
(4) Start data address
(5) Number of write data
(6) Checksum
(7) Delimiter

MODBUS RTU

01H	10H	05H	DDH	00H	02H	D1H	3EH
(1)	(2)	(3)		(4)		(5)	

(1) Station address
(2) Write command 10H
(3) Start data address
(4) Number of write data
(5) Checksum

Note

The response message at the time of abnormal termination is the same as that for the read command.

8 - 4 Specifications Common with CPL Communication Function

■ Definition of data addresses

☞ Refer to 7-4 Definition of Data Addresses (on page 7-12)

■ Numeric representation

The specifications of numeric representation is the same as the following:

☞ ● RD, WD, RU and WU commands in 7-5 Numeric Representation in the Application Layer (on page 7-13).

■ RS-485 driver control timing specifications

☞ Refer to 7-7 Reception and Transmission Timing (on page 7-15).

Chapter 9. LIST OF COMMUNICATION DATA

■ List of communication data

The following shows the meanings of the symbols stated in the “RAM/EEPROM Read/Write” columns:

No symbol: Possible.
✻: Possible according to the conditions.
Δ: Possible, but data is invalid.
X: Impossible.

Note: When reading the EEPROM address, data in the RAM is read in the same manner as reading of the RAM address.

Decimal point information: No decimal point
1 to 3: Decimal point position (The communication data becomes that the original value is multiplied by 10, 100, or 1000.)
P: Follows the PV input range.
S: Follows various conditions.

RS/WS commands of CPL communication: Decimal data address with “W” attached next to it is used.
RD/WD/RU/WU commands of CPL communication: Hexadecimal data address is used.
Commands of MODBUS communication: Hexadecimal data address is used.

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Instrument information	ROM ID	273	0111	16657	4111		X		X	—	"2" when using SDC35/36.
	ROM Version 1	274	0112	16658	4112		X		X	2	
	ROM Version 2	275	0113	16659	4113		X		X	2	
	LOADER Information	276	0114	16660	4114		X		X	—	
	EST Information	277	0115	16661	4115		X		X	—	
	Manufacturing date code (year)	278	0116	16662	4116		X		X	—	Year - 2000 Example: Year of 2003 is expressed as "3"
	Manufacturing date code (month, day)	279	0117	16663	4117		X		X	2	Month + (Day ÷ 100) Example: Dec. 1st is expressed as "12.01".
	Serial No.	280	0118	16664	4118		X		X	—	
Lock	Key lock	5001	1389	21385	5389					—	
	Communication lock	5002	138A	21386	538A	✻	X	✻	X	—	When the communication lock exists, the error response is sent.
	Loader lock	5003	138B	21387	538B		X		X	—	
	Password display	5004	138C	21388	538C				X	—	
	Password 1A	—	—	—	—	X	X	X	X	—	Communication and loader cannot read and write the password.
	Password 2A	—	—	—	—	X	X	X	X	—	Same as above.
	Password 1B	—	—	—	—	X	X	X	X	—	Same as above.
	Password 2B	—	—	—	—	X	X	X	X	—	Same as above.
User Function	User Function 1	5101	13ED	21485	53ED					—	
	User Function 2	5102	13EE	21486	53EE					—	
	User Function 3	5103	13EF	21487	53EF					—	
	User Function 4	5104	13F0	21488	53F0					—	
	User Function 5	5105	13F1	21489	53F1					—	
	User Function 6	5106	13F2	21490	53F2					—	
	User Function 7	5107	13F3	21491	53F3					—	
	User Function 8	5108	13F4	21492	53F4					—	
Setup	PV input range type	5201	1451	21585	5451					—	
	Temperature unit	5202	1452	21586	5452		✻		✻	—	
	Cold junction compensation (T/C)	5203	1453	21587	5453		✻		✻	—	
	Decimal point position	5204	1454	21588	5454		✻		✻	—	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Setup	PV input range low limit	5205	1455	21589	5455		✻		✻	P	
	PV input range high limit	5206	1456	21590	5456		✻		✻	P	
	SP low limit	5207	1457	21591	5457					P	
	SP high limit	5208	1458	21592	5458					P	
	PV square root extraction dropout	5209	1459	21593	5459		✻		✻	1	
	RSP input type	5210	145A	21594	545A		✻		✻	—	
	RSP input range low limit	5211	145B	21595	545B		✻		✻	P	
	RSP input range high limit	5212	145C	21596	545C		✻		✻	P	
	(Reserved for future extension.)	5213	145D	21597	545D	Δ	X	Δ	X	—	
	Control action (Direct/Reverse)	5214	145E	21598	545E					—	
	Output operation at PV alarm	5215	145F	21599	545F					—	
	Output at PV alarm	5216	1460	21600	5460					1	
	Output at READY (Heat)	5217	1461	21601	5461					1	
	Output at READY (Cool)	5218	1462	21602	5462					1	
	Output operation at changing Auto/Manual	5219	1463	21603	5463					—	
	Preset MANUAL value	5220	1464	21604	5464					1	
	Initial output type (mode) of PID control	5221	1465	21605	5465					—	
	Initial output of PID control	5222	1466	21606	5466					1	
	PID decimal point position	5223	1467	21607	5467					—	
	Zone PID operation	5224	1468	21608	5468					—	
	(Reserved for future extension.)	5225	1469	21609	5469	Δ	X	Δ	X	—	
	Heat/Cool control	5226	146A	21610	546A					—	
	Heat/Cool selection	5227	146B	21611	546B					—	
	Heat/Cool control dead zone	5228	146C	21612	546C					1	
	Heat/Cool control change point	5229	146D	21613	546D					1	
	LSP system group	5230	146E	21614	546E					—	
	SP ramp type	5231	146F	21615	546F					—	
	SP ramp unit	5232	1470	21616	5470					—	
	STEP time unit	5233	1471	21617	5471					—	
	STEP PV start	5234	1472	21618	5472					—	
	STEP loop	5235	1473	21619	5473					—	
	CT1 operation type	5236	1474	21620	5474					—	
	CT1 output	5237	1475	21621	5475					—	
	CT1 measurement wait time	5238	1476	21622	5476					—	
	CT2 operation type	5239	1477	21623	5477					—	
	CT2 output	5240	1478	21624	5478					—	
	CT2 measurement wait time	5241	1479	21625	5479					—	
	Control output 1 range	5242	147A	21626	547A					—	
	Control output 1 type	5243	147B	21627	547B					—	
	Control output 1 scaling low limit	5244	147C	21628	547C					S	
	Control output 1 scaling high limit	5245	147D	21629	547D					S	
	(Reserved for future extension.)	5246	147E	21630	547E	Δ	X	Δ	X	—	
	Control output 2 range	5247	147F	21631	547F					—	
	Control output 2 type	5248	1480	21632	5480					—	
	Control output 2 scaling low limit	5249	1481	21633	5481					S	
	Control output 2 scaling high limit	5250	1482	21634	5482					S	
	(Reserved for future extension.)	5251	1483	21635	5483	Δ	X	Δ	X	—	
	AUX output range	5252	1484	21636	5484					—	
	AUX output type	5253	1485	21637	5485					—	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Setup	AUX output scaling low limit	5254	1486	21638	5486					S	
	AUX output scaling high limit	5255	1487	21639	5487					S	
	(Reserved for future extension.)	5256	1488	21640	5488	Δ	X	Δ	X	—	
	Position proportional type	5257	1489	21641	5489		✻		✻	—	
	Position proportional dead zone	5258	148A	21642	548A		✻		✻	1	
	Motor long life mode	5259	148B	21643	548B		✻		✻	—	
	Motor auto adjust	5260	148C	21644	548C		✻		✻	—	
	Input with motor fully closed	5261	148D	21645	548D		✻		✻	—	
	Input with motor fully open	5262	148E	21646	548E		✻		✻	—	
	Motor full close-full open time	5263	148F	21647	548F		✻		✻	1	
	CPL/MODBUS	5264	1490	21648	5490		X		X	—	
	Station address	5265	1491	21649	5491		X		X	—	
	Transmission speed	5266	1492	21650	5492		X		X	—	
	Data format (Data length)	5267	1493	21651	5493		X		X	—	
	Data format (Parity)	5268	1494	21652	5494		X		X	—	
	Data format (Stop bit)	5269	1495	21653	5495		X		X	—	
	Response time-out	5270	1496	21654	5496		X		X	—	
	Key operation type	5271	1497	21655	5497					—	
	[mode] key function	5272	1498	21656	5498					—	
	MODE display setup	5273	1499	21657	5499					—	
	PV/SP display setup	5274	149A	21658	549A					—	
	MV display setup	5275	149B	21659	549B					—	
	EV display setup	5276	149C	21660	549C					—	
	Timer remaining time display setup	5277	149D	21661	549D					—	
	CT display setup	5278	149E	21662	549E					—	
	User level	5279	149F	21663	549F					—	
	Communication monitoring display	5280	14A0	21664	54A0					—	
	Multi Status (MS) display, Condition (top priority)	5281	14A1	21665	54A1					—	
	Multi Status (MS) display, Status (top priority)	5282	14A2	21666	54A2					—	
	Multi Status (MS) display, Condition (second priority)	5283	14A3	21667	54A3					—	
	Multi Status (MS) display, Status (second priority)	5284	14A4	21668	54A4					—	
	Multi Status (MS) display, Condition (third priority)	5285	14A5	21669	54A5					—	
	Multi Status (MS) display, Status (third priority)	5286	14A6	21670	54A6					—	
	Multi Status (MS) display, deviation range	5287	14A7	21671	54A7					—	
	Special function	5288	14A8	21672	54A8				X	—	
	Zener barrier adjustment	5289	14A9	21673	54A9		X		X	—	
DI Assignment	Internal Contact 1 Operation type	5401	1519	21785	5519					—	
	Internal Contact 1 Input bit function	5402	151A	21786	551A					—	
	Internal Contact 1 Input assignment A	5403	151B	21787	551B					—	
	Internal Contact 1 Input assignment B	5404	151C	21788	551C					—	
	Internal Contact 1 Input assignment C	5405	151D	21789	551D					—	
	Internal Contact 1 Input assignment D	5406	151E	21790	551E					—	
	Internal Contact 1 Polarity A	5407	151F	21791	551F					—	
	Internal Contact 1 Polarity B	5408	1520	21792	5520					—	
	Internal Contact 1 Polarity C	5409	1521	21793	5521					—	
	Internal Contact 1 Polarity D	5410	1522	21794	5522					—	
	Internal Contact 1 Polarity	5411	1523	21795	5523					—	
	Internal Contact 1 Event channel definition	5412	1524	21796	5524					—	
	Internal Contact 2 Operation type	5413	1525	21797	5525					—	
	Internal Contact 2 Input bit function	5414	1526	21798	5526					—	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
DI Assignment	Internal Contact 2 Input assignment A	5415	1527	21799	5527					—	
	Internal Contact 2 Input assignment B	5416	1528	21800	5528					—	
	Internal Contact 2 Input assignment C	5417	1529	21801	5529					—	
	Internal Contact 2 Input assignment D	5418	152A	21802	552A					—	
	Internal Contact 2 Polarity A	5419	152B	21803	552B					—	
	Internal Contact 2 Polarity B	5420	152C	21804	552C					—	
	Internal Contact 2 Polarity C	5421	152D	21805	552D					—	
	Internal Contact 2 Polarity D	5422	152E	21806	552E					—	
	Internal Contact 2 Polarity	5423	152F	21807	552F					—	
	Internal Contact 2 Event channel definition	5424	1530	21808	5530					—	
	Internal Contact 3 Operation type	5425	1531	21809	5531					—	
	Internal Contact 3 Input bit function	5426	1532	21810	5532					—	
	Internal Contact 3 Input assignment A	5427	1533	21811	5533					—	
	Internal Contact 3 Input assignment B	5428	1534	21812	5534					—	
	Internal Contact 3 Input assignment C	5429	1535	21813	5535					—	
	Internal Contact 3 Input assignment D	5430	1536	21814	5536					—	
	Internal Contact 3 Polarity A	5431	1537	21815	5537					—	
	Internal Contact 3 Polarity B	5432	1538	21816	5538					—	
	Internal Contact 3 Polarity C	5433	1539	21817	5539					—	
	Internal Contact 3 Polarity D	5434	153A	21818	553A					—	
	Internal Contact 3 Polarity	5435	153B	21819	553B					—	
	Internal Contact 3 Event channel definition	5436	153C	21820	553C					—	
	Internal Contact 4 Operation type	5437	153D	21821	553D					—	
	Internal Contact 4 Input bit function	5438	153E	2182	553E					—	
	Internal Contact 4 Input assignment A	5439	153F	2182	553F					—	
	Internal Contact 4 Input assignment B	5440	1540	21824	5540					—	
	Internal Contact 4 Input assignment C	5441	1541	21825	5541					—	
	Internal Contact 4 Input assignment D	5442	1542	21826	5542					—	
	Internal Contact 4 Polarity A	5443	1543	21827	5543					—	
	Internal Contact 4 Polarity B	5444	1544	21828	5544					—	
	Internal Contact 4 Polarity C	5445	1545	21829	5545					—	
	Internal Contact 4 Polarity D	5446	1546	21830	5546					—	
	Internal Contact 4 Polarity	5447	1547	21831	5547					—	
	Internal Contact 4 Event channel definition	5448	1548	21832	5548					—	
	Internal Contact 5 Operation type	5449	1549	21833	5549					—	
	Internal Contact 5 Input bit function	5450	154A	21834	554A					—	
	Internal Contact 5 Input assignment A	5451	154B	21835	554B					—	
	Internal Contact 5 Input assignment B	5452	154C	21836	554C					—	
	Internal Contact 5 Input assignment C	5453	154D	21837	554D					—	
	Internal Contact 5 Input assignment D	5454	154E	21838	554E					—	
	Internal Contact 5 Polarity A	5455	154F	21839	554F					—	
	Internal Contact 5 Polarity B	5456	1550	21840	5550					—	
	Internal Contact 5 Polarity C	5457	1551	21841	5551					—	
	Internal Contact 5 Polarity	5458	1552	21842	5552					—	
	Internal Contact 5 Polarity	5459	1553	21843	5553					—	
	Internal Contact 5 Event channel definition	5460	1554	21844	5554					—	
DO Assignment	Control output 1 Operation type	5601	15E1	21985	55E1					—	
	Control output 1 Output assignment A	5602	15E2	21986	55E2					—	
	Control output 1 Output assignment B	5603	15E3	21987	55E3					—	
	Control output 1 Output assignment C	5604	15E4	21988	55E4					—	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
DO Assignment	Control output 1 Output assignment D	5605	15E5	21989	55E5					—	
	Control output 1 Polarity A	5606	15E6	21990	55E6					—	
	Control output 1 Polarity B	5607	15E7	21991	55E7					—	
	Control output 1 Polarity C	5608	15E8	21992	55E8					—	
	Control output 1 Polarity D	5609	15E9	21993	55E9					—	
	Control output 1 Polarity	5610	15EA	21994	55EA					—	
	Control output 1 Latch	5611	15EB	21995	55EB					—	
	Control output 2 Operation type	5612	15EC	21996	55EC					—	
	Control output 2 Output assignment A	5613	15ED	21997	55ED					—	
	Control output 2 Output assignment B	5614	15EE	21998	55EE					—	
	Control output 2 Output assignment C	5615	15EF	21999	55EF					—	
	Control output 2 Output assignment D	5616	15F0	22000	55F0					—	
	Control output 2 Polarity A	5617	15F1	22001	55F1					—	
	Control output 2 Polarity B	5618	15F2	22002	55F2					—	
	Control output 2 Polarity C	5619	15F3	22003	55F3					—	
	Control output 2 Polarity D	5620	15F4	22004	55F4					—	
	Control output 2 Polarity	5621	15F5	22005	55F5					—	
	Control output 2 Latch	5622	15F6	22006	55F6					—	
	Event output 1 Operation type	5623	15F7	22007	55F7					—	
	Event output 1 Output assignment A	5624	15F8	22008	55F8					—	
	Event output 1 Output assignment B	5625	15F9	22009	55F9					—	
	Event output 1 Output assignment C	5626	15FA	22010	55FA					—	
	Event output 1 Output assignment D	5627	15FB	22011	55FB					—	
	Event output 1 Polarity A	5628	15FC	22012	55FC					—	
	Event output 1 Polarity B	5629	15FD	22013	55FD					—	
	Event output 1 Polarity C	5630	15FE	22014	55FE					—	
	Event output 1 Polarity D	5631	15FF	22015	55FF					—	
	Event output 1 Polarity	5632	1600	22016	5600					—	
	Event output 1 Latch	5633	1601	22017	5601					—	
	Event output 2 Operation type	5634	1602	22018	5602					—	
	Event output 2 Output assignment A	5635	1603	22019	5603					—	
	Event output 2 Output assignment B	5636	1604	22020	5604					—	
	Event output 2 Output assignment C	5637	1605	22021	5605					—	
	Event output 2 Output assignment D	5638	1606	22022	5606					—	
	Event output 2 Polarity A	5639	1607	22023	5607					—	
	Event output 2 Polarity B	5640	1608	22024	5608					—	
	Event output 2 Polarity C	5641	1609	22025	5609					—	
	Event output 2 Polarity D	5642	160A	22026	560A					—	
	Event output 2 Polarity	5643	160B	22027	560B					—	
	Event output 2 Latch	5644	160C	22028	560C					—	
	Event output 3 Operation type	5645	160D	22029	560D					—	
	Event output 3 Output assignment A	5646	160E	22030	560E					—	
	Event output 3 Output assignment B	5647	160F	22031	560F					—	
	Event output 3 Output assignment C	5648	1610	22032	5610					—	
	Event output 3 Output assignment D	5649	1611	22033	5611					—	
	Event output 3 Polarity A	5650	1612	22034	5612					—	
	Event output 3 Polarity B	5651	1613	22035	5613					—	
	Event output 3 Polarity C	5652	1614	22036	5614					—	
	Event output 3 Polarity D	5653	1615	22037	5615					—	
	Event output 3 Polarity	5654	1616	22038	5616					—	
	Event output 3 Latch	5655	1617	22039	5617					—	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Event Configuration	Internal Event 1 Operation type	5801	16A9	22185	56A9					—	
	Internal Event 1 Direct/Reverse	5802	16AA	22186	56AA					—	
	Internal Event 1 Standby	5803	16AB	22187	56AB					—	
	Internal Event 1 state at READY	5804	16AC	22188	56AC					—	
	(Reserved for future extension.)	5805	16AD	22189	56AD	Δ	Δ	Δ	Δ	—	
	Internal Event 1 Alarm OR	5806	16AE	22190	56AE					—	
	Internal Event 1 Special OFF	5807	16AF	22191	56AF					—	
	Internal Event 1 Delay time unit	5808	16B0	22192	56B0					—	
	(Reserved for future extension.)	5809	16B1	22193	56B1	Δ	Δ	Δ	Δ	—	
	Internal Event 2 Operation type	5810	16B2	22194	56B2					—	
	Internal Event 2 Direct/Reverse	5811	16B3	22195	56B3					—	
	Internal Event 2 Standby	5812	16B4	22196	56B4					—	
	Internal Event 2 state at READY	5813	16B5	22197	56B5					—	
	(Reserved for future extension.)	5814	16B6	22198	56B6	Δ	Δ	Δ	Δ	—	
	Internal Event 2 Alarm OR	5815	16B7	22199	56B7					—	
	Internal Event 2 Special OFF	5816	16B8	22200	56B8					—	
	Internal Event 2 Delay time unit	5817	16B9	22201	56B9					—	
	(Reserved for future extension.)	5818	16BA	22202	56BA	Δ	Δ	Δ	Δ	—	
	Internal Event 3 Operation type	5819	16BB	22203	56BB					—	
	Internal Event 3 Direct/Reverse	5820	16BC	22204	56BC					—	
	Internal Event 3 Standby	5821	16BD	22205	56BD					—	
	Internal Event 3 state at READY	5822	16BE	22206	56BE					—	
	(Reserved for future extension.)	5823	16BF	22207	56BF	Δ	Δ	Δ	Δ	—	
	Internal Event 3 Alarm OR	5824	16C0	22208	56C0					—	
	Internal Event 3 Special OFF	5825	16C1	22209	56C1					—	
	Internal Event 3 Delay time unit	5826	16C2	22210	56C2					—	
	(Reserved for future extension.)	5827	16C3	22211	56C3	Δ	Δ	Δ	Δ	—	
	Internal Event 4 Operation type	5828	16C4	22212	56C4					—	
	Internal Event 4 Direct/Reverse	5829	16C5	22213	56C5					—	
	Internal Event 4 Standby	5830	16C6	22214	56C6					—	
	Internal Event 4 state at READY	5831	16C7	22215	56C7					—	
	(Reserved for future extension.)	5832	16C8	22216	56C8	Δ	Δ	Δ	Δ	—	
	Internal Event 4 Alarm OR	5833	16C9	22217	56C9					—	
	Internal Event 4 Special OFF	5834	16CA	22218	56CA					—	
	Internal Event 4 Delay time unit	5835	16CB	22219	56CB					—	
	(Reserved for future extension.)	5836	16CC	22220	56CC	Δ	Δ	Δ	Δ	—	
	Internal Event 5 Operation type	5837	16CD	22221	56CD					—	
	Internal Event 5 Direct/Reverse	5838	16CE	22222	56CE					—	
	Internal Event 5 Standby	5839	16CF	22223	56CF					—	
	Internal Event 5 state at READY	5840	16D0	22224	56D0					—	
	(Reserved for future extension.)	5841	16D1	22225	56D1	Δ	Δ	Δ	Δ	—	
	Internal Event 5 Alarm OR	5842	16D2	22226	56D2					—	
	Internal Event 5 Special OFF	5843	16D3	22227	56D3					—	
	Internal Event 5 Delay time unit	5844	16D4	22228	56D4					—	
	(Reserved for future extension.)	5845	16D5	22229	56D5	Δ	Δ	Δ	Δ	—	
	Internal Event 6 Operation type	5846	16D6	22230	56D6					—	
	Internal Event 6 Direct/Reverse	5847	16D7	22231	56D7					—	
	Internal Event 6 Standby	5848	16D8	22232	56D8					—	
	Internal Event 6 state at READY	5849	16D9	22233	56D9					—	
	(Reserved for future extension.)	5850	16DA	22234	56DA	Δ	Δ	Δ	Δ	—	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Event Configuration	Internal Event 6 Alarm OR	5851	16DB	22235	56DB					—	
	Internal Event 6 Special OFF	5852	16DC	22236	56DC					—	
	Internal Event 6 Delay time unit	5853	16DD	22237	56DD					—	
	(Reserved for future extension.)	5854	16DE	22238	56DE	Δ	Δ	Δ	Δ	—	
	Internal Event 7 Operation type	5855	16DF	22239	56DF					—	
	Internal Event 7 Direct/Reverse	5856	16E0	22240	56E0					—	
	Internal Event 7 Standby	5857	16E1	22241	56E1					—	
	Internal Event 7 state at READY	5858	16E2	22242	56E2					—	
	(Reserved for future extension.)	5859	16E3	22243	56E3	Δ	Δ	Δ	Δ	—	
	Internal Event 7 Alarm OR	5860	16E4	22244	56E4					—	
	Internal Event 7 Special OFF	5861	16E5	22245	56E5					—	
	Internal Event 7 Delay time unit	5862	16E6	22246	56E6					—	
	(Reserved for future extension.)	5863	16E7	22247	56E7	Δ	Δ	Δ	Δ	—	
	Internal Event 8 Operation type	5864	16E8	22248	56E8					—	
	Internal Event 8 Direct/Reverse	5865	16E9	22249	56E9					—	
	Internal Event 8 Standby	5866	16EA	22250	56EA					—	
	Internal Event 8 state at READY	5867	16EB	22251	56EB					—	
	(Reserved for future extension.)	5868	16EC	22252	56EC	Δ	Δ	Δ	Δ	—	
	Internal Event 8 Alarm OR	5869	16ED	22253	56ED					—	
	Internal Event 8 Special OFF	5870	16EE	22254	56EE					—	
	Internal Event 8 Delay time unit	5871	16EF	22255	56EF					—	
	(Reserved for future extension.)	5872	16F0	22256	56F0	Δ	Δ	Δ	Δ	—	
Parameter	Control method	6001	1771	22385	5771					—	
	MV low limit at AT	6002	1772	22386	5772					1	
	MV high limit at AT	6003	1773	22387	5773					1	
	Differential (for ON/OFF control)	6004	1774	22388	5774					P	
	ON/OFF control action point offset	6005	1775	22389	5775					P	
	PV filter	6006	1776	22390	5776					1	
	PV ratio	6007	1777	22391	5777					3	
	PV bias	6008	1778	22392	5778					P	
	RSP filter	6009	1779	22393	5779					1	
	RSP ratio	6010	177A	22394	577A					3	
	RSP bias	6011	177B	22395	577B					P	
	Time proportional unit 1	6012	177C	22396	577C					—	
	Time proportional cycle 1	6013	177D	22397	577D					—	
	Time proportional unit 2	6014	177E	22398	577E					—	
	Time proportional cycle 2	6015	177F	22399	577F					—	
	Time proportional cycle mode	6016	1780	22400	5780					—	
	Output variation limit	6017	1781	22401	5781					1	
	SP ramp-up	6018	1782	22402	5782					S	
	SP ramp-down	6019	1783	22403	5783					S	
	(Reserved for future extension.)	6020	1784	22404	5784	Δ	Δ	Δ	Δ	P	
Zone	Zone 1	6201	1839	22585	5839					P	
	Zone 2	6202	183A	22586	583A					P	
	Zone 3	6203	183B	22587	583B					P	
	Zone 4	6204	183C	22588	583C					P	
	Zone 5	6205	183D	22589	583D					P	
	Zone 6	6206	183E	22590	583E					P	
	Zone 7	6207	183F	22591	583F					P	
	Zone hysteresis	6208	1840	22592	5840					P	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
SP	RSP	7001	1B59	23385	5B59		X		X	P	
	PID group number for RSP	7002	1B5A	23386	5B5A					—	
	(Reserved for future extension.)	7003	1B5B	23387	5B5B	Δ	Δ	Δ	Δ	S	
	(Reserved for future extension.)	7004	1B5C	23388	5B5C	Δ	Δ	Δ	Δ	S	
	LSP1	7005	1B5D	23389	5B5D					P	Same as RAM address 13312 (decimal).
	PID group number for LSP1	7006	1B5E	23390	5B5E					—	
	Ramp for LSP1	7007	1B5F	23391	5B5F					S	
	Time for LSP1	7008	1B60	23392	5B60					S	
	LSP2	7009	1B61	23393	5B61					P	Same as RAM address 13313 (decimal).
	PID group number for LSP2	7010	1B62	23394	5B62					—	
	Ramp for LSP2	7011	1B63	23395	5B63					S	
	Time for LSP2	7012	1B64	23396	5B64					S	
	LSP3	7013	1B65	23397	5B65					P	Same as RAM address 13314 (decimal).
	PID group number for LSP3	7014	1B66	23398	5B66					—	
	Ramp for LSP3	7015	1B67	23399	5B67					S	
	Time for LSP3	7016	1B68	23400	5B68					S	
	LSP4	7017	1B69	23401	5B69					P	Same as RAM address 13315 (decimal).
	PID group number for LSP4	7018	1B6A	23402	5B6A					—	
	Ramp for LSP4	7019	1B6B	23403	5B6B					S	
	Time for LSP4	7020	1B6C	23404	5B6C					S	
	LSP5	7021	1B6D	23405	5B6D					P	Same as RAM address 13316 (decimal).
	PID group number for LSP5	7022	1B6E	23406	5B6E					—	
	Ramp for LSP5	7023	1B6F	23407	5B6F					S	
	Time for LSP5	7024	1B70	23408	5B70					S	
	LSP6	7025	1B71	23409	5B71					P	Same as RAM address 13317 (decimal).
	PID group number for LSP6	7026	1B72	23410	5B72					—	
	Ramp for LSP6	7027	1B73	23411	5B73					S	
	Time for LSP6	7028	1B74	23412	5B74					S	
	LSP7	7029	1B75	23413	5B75					P	Same as RAM address 13318 (decimal).
	PID group number for LSP7	7030	1B76	23414	5B76					—	
	Ramp for LSP7	7031	1B77	23415	5B77					S	
	Time for LSP7	7032	1B78	23416	5B78					S	
	LSP8	7033	1B79	23417	5B79					P	Same as RAM address 13319 (decimal).
	PID group number for LSP8	7034	1B7A	23418	5B7A					—	
	Ramp for LSP8	7035	1B7B	23419	5B7B					S	
	Time for LSP8	7036	1B7C	23420	5B7C					S	
Event	Internal Event 1 main setting	7501	1D4D	23885	5D4D					S	Same as RAM address 13056 (decimal).
	Internal Event 1 sub-setting	7502	1D4E	23886	5D4E					S	Same as RAM address 13057 (decimal).
	Internal Event 1 Hysteresis	7503	1D4F	23887	5D4F					S	
	Internal Event 1 ON delay time	7504	1D50	23888	5D50					S	
	Internal Event 1 OFF delay time	7505	1D51	23889	5D51					S	

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Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Event	Internal Event 2 main setting	7506	1D52	23890	5D52					S	Same as RAM address 13058 (decimal).
	Internal Event 2 sub-setting	7507	1D53	23891	5D53					S	Same as RAM address 13059 (decimal).
	Internal Event 2 Hysteresis	7508	1D54	23892	5D54					S	
	Internal Event 2 ON delay time	7509	1D55	23893	5D55					S	
	Internal Event 2 OFF delay time	7510	1D56	23894	5D56					S	
	Internal Event 3 main setting	7511	1D57	23895	5D57					S	Same as RAM address 13060 (decimal).
	Internal Event 3 sub-setting	7512	1D58	23896	5D58					S	Same as RAM address 13061 (decimal).
	Internal Event 3 Hysteresis	7513	1D59	23897	5D59					S	
	Internal Event 3 ON delay time	7514	1D5A	23898	5D5A					S	
	Internal Event 3 OFF delay time	7515	1D5B	23899	5D5B					S	
	Internal Event 4 main setting	7516	1D5C	23900	5D5C					S	Same as RAM address 13062 (decimal).
	Internal Event 4 sub-setting	7517	1D5D	23901	5D5D					S	Same as RAM address 13063 (decimal).
	Internal Event 4 Hysteresis	7518	1D5E	23902	5D5E					S	
	Internal Event 4 ON delay time	7519	1D5F	23903	5D5F					S	
	Internal Event 4 OFF delay time	7520	1D60	23904	5D60					S	
	Internal Event 5 main setting	7521	1D61	23905	5D61					S	Same as RAM address 13064 (decimal).
	Internal Event 5 sub-setting	7522	1D62	23906	5D62					S	Same as RAM address 13065 (decimal).
	Internal Event 5 Hysteresis	7523	1D63	23907	5D63					S	
	Internal Event 5 ON delay time	7524	1D64	23908	5D64					S	
	Internal Event 5 OFF delay time	7525	1D65	23909	5D65					S	
	Internal Event 6 main setting	7526	1D66	23910	5D66					S	Same as RAM address 13066 (decimal).
	Internal Event 6 sub-setting	7527	1D67	23911	5D67					S	Same as RAM address 13067 (decimal).
	Internal Event 6 Hysteresis	7528	1D68	23912	5D68					S	
	Internal Event 6 ON delay time	7529	1D69	23913	5D69					S	
	Internal Event 6 OFF delay time	7530	1D6A	23914	5D6A					S	
	Internal Event 7 main setting	7531	1D6B	23915	5D6B					S	Same as RAM address 13068 (decimal).
	Internal Event 7 sub-setting	7532	1D6C	23916	5D6C					S	Same as RAM address 13069 (decimal).
	Internal Event 7 Hysteresis	7533	1D6D	23917	5D6D					S	
	Internal Event 7 ON delay time	7534	1D6E	23918	5D6E					S	
	Internal Event 7 OFF delay time	7535	1D6F	23919	5D6F					S	
	Internal Event 8 main setting	7536	1D70	23920	5D70					S	Same as RAM address 13070 (decimal).
	Internal Event 8 sub-setting	7537	1D71	23921	5D71					S	Same as RAM address 13071 (decimal).
	Internal Event 8 Hysteresis	7538	1D72	23922	5D72					S	
	Internal Event 8 ON delay time	7539	1D73	23923	5D73					S	
	Internal Event 8 OFF delay time	7540	1D74	23924	5D74					S	
Extended tuning	AT type	8501	2135	24885	6135					—	
	(Reserved for future extension.)	8502	2136	24886	6136	Δ	X	Δ	X	—	
	Just-FiTTER settling band	8503	2137	24887	6137					—	
	SP lag constant	8504	2138	24888	6138					1	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Extended tuning	(Reserved for future extension.)	8505	2139	24889	6139	Δ	X	Δ	X	—	
	AT Proportional band adjust	8506	213A	24890	613A					2	
	AT Integral time adjust	8507	213B	24891	613B					2	
	AT Derivative time adjust	8508	213C	24892	613C					2	
	Control algorithm	8509	213D	24893	613D					—	
	Just-FiTTER overshoot limit/restraint/ control coefficient	8510	213E	24894	613E					—	
	(Reserved for future extension.)	8511	213F	24895	613F	Δ	X	Δ	X	—	
	(Reserved for future extension.)	8512	2140	24896	6140	Δ	X	Δ	X	—	
	(Reserved for future extension.)	8513	2141	24897	6141	Δ	X	Δ	X	—	
	(Reserved for future extension.)	8514	2142	24898	6142	Δ	X	Δ	X	—	
	(Reserved for future extension.)	8515	2143	24899	6143	Δ	Δ	Δ	Δ	2	
	(Reserved for future extension.)	8516	2144	24900	6144	Δ	Δ	Δ	Δ	2	
	(Reserved for future extension.)	8517	2145	24901	6145	Δ	Δ	Δ	Δ	2	
	(Reserved for future extension.)	8518	2146	24902	6146	Δ	Δ	Δ	Δ	—	
Mode	AUTO/MANUAL	9001	2329	25385	6329		✻		✻	—	Same as RAM address 14596 (decimal). Writing is enabled under no DI Assignment and other conditions.
	RUN/READY	9002	232A	25386	632A		✻		✻	—	Same as RAM address 14595 (decimal). Writing is enabled under no DI Assignment conditions.
	LSP/RSP	9003	232B	25387	632B		✻		✻	—	Same as RAM address 14598 (decimal). Writing is enabled under no DI Assignment conditions.
	AT stop/start	9004	232C	25388	632C		✻		✻	—	Same as RAM address 14597 (decimal). Writing is enabled under no DI Assignment and other conditions.
	Release all DO latches	9005	232D	25389	632D		✻		✻	—	Writing is enabled under no DI Assignment conditions.
Operation display	PV	9101	238D	25485	638D		X		X	P	Same as RAM address 14356 (decimal).
	SP (Target value)	9102	238E	25486	638E					P	(Note 1)
	LSP group selection	9103	238F	25487	638F		✻		✻	—	Same as RAM address 14592 (decimal). Writing is enabled under no DI Assignment conditions. (Note 2)
	PID group being selected.	9104	2390	25488	6390		X		X	—	
	Manipulated Variable (MV)	9105	2391	25489	6391		✻		✻	1	Same as RAM address 14594 (decimal). Writing is enabled in the MANUAL mode.
	Heat Manipulated Variable (Heat MV)	9106	2392	25490	6392		X		X	1	Same as RAM address 14420 (decimal).
	Cool Manipulated Variable (Cool MV)	9107	2393	25491	6393		X		X	1	Same as RAM address 14421 (decimal).
	Motor opening feedback value (MFB)	9108	2394	25492	6394		X		X	1	Same as RAM address 14417 (decimal).
	AT progress	9109	2395	25493	6395		X		X	—	
	Current transformer (CT) current value 1	9110	2396	25494	6396		X		X	1	Same as RAM address 14418 (decimal).
	Current transformer (CT) current value 2	9111	2397	25495	6397		X		X	1	Same as RAM address 14419 (decimal).

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Operation display	Timer remaining time 1	9112	2398	25496	6398		X		X	S	
	Timer remaining time 2	9113	2399	25497	6399		X		X	S	
	Timer remaining time 3	9114	239A	25498	639A		X		X	S	
	Timer remaining time 4	9115	239B	25499	639B		X		X	S	
	Timer remaining time 5	9116	239C	25500	639C		X		X	S	
	Timer remaining time 6	9117	239D	25501	639D		X		X	S	
	Timer remaining time 7	9118	239E	25502	639E		X		X	S	
	Timer remaining time 8	9119	239F	25503	639F		X		X	S	
	STEP operation No.	9120	23A0	25504	63A0		X		X	S	
	STEP operation remaining time	9121	23A1	25505	63A1		X		X	S	
	STEP operation remaining time (sec.)	9122	23A2	25506	63A2		X		X	S	
	LSP value in use	9123	23A3	25507	63A3		X		X	P	Same as RAM address 14593 (decimal). (Note 1)
	PV before ratio, bias, and filter	9124	23A4	25508	63A4		X		X	P	
	RSP before ratio, bias, and filter	9125	23A5	25509	63A5		X		X	P	
Status	Input alarm status	9201	23F1	25585	63F1		X		X	—	Bit 0: AL01 (PV over-range) Bit 1: AL01 (PV under-range) Bit 2: AL03 (CJ, RTD burnout) Bit 3: Undefined. Bit 4: AL05 (RSP over-range) Bit 5: AL06 (RSP under-range) Bit 6: AL07 (MFB burnout) Bit 7 to 8: Undefined. Bit 9: AL10 (Motor adjustment failure) Bit 10 to 15: Undefined.
	Instrument alarm status	9202	23F2	25586	63F2		X		X	—	Bits 0 to 1: Undefined. Bit 2: AL70 (A/D) Bit 3: AL95 (Set data) Bit 4: AL96 (Adjustment data) Bit 5: AL97 (Set data/RAM) Bit 6: AL98 (Adjustment data/RAM) Bit 7: AL99 (ROM) Bits 8 to 15 Undefined.
	Internal Event/Internal Contact function	9203	23F3	25587	63F3		X		X	—	Bit 0 to 7: Internal event 1 to 8 Bit 8 to 12: Internal contact 1 to 5 Bit 13 to 15: Undefined.

(Note 1) If the value is read immediately after it has been written into the SP or the LSP in use, the value still may not be changed. The value is updated after the cycle time has elapsed.

(Note 2) If the SP or the LSP in use is read immediately after the value has been written into the LSP group selection, the value still may not be changed. The value is updated after the cycle time has elapsed.

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Status	Control status	9204	23F4	25588	63F4		X		X	—	Bit 0: MANUAL mode Bit 1: READY mode Bit 2: RSP mode Bit 3: During AT Bit 4: During ST (Invalid in this unit) Bit 5: During SOAK of step operation Bit 6: During SP ramp Bit 7: During SP ramp-up Bit 8: During SP ramp-down Bits 9 to 10: Undefined. Bit 11: During estimate of MFB Bit 12: During adjustment of MFB Bit 13: PID (Heat) is being used. Bit 14: PID (Cool) is being used. Bit 15: Undefined.
	DO status	9205	23F5	25589	63F5		X		X	—	Same as RAM address 14337 (decimal). Bit 0: Control output 1 Bit 1: Control output 2 Bit 2: Event output 1 Bit 3: Event output 2 Bit 4: Event output 3 Bits 5 to 15: Undefined.
	DI status	9206	23F6	25590	63F6		X		X	—	Same as RAM address 14338 (decimal). Bit 0: DI1 Bit 1: DI2 Bit 2: DI3 Bit 3: DI4 Bits 4 to 15: Undefined.
	Communication DI (DI1 to 4)	9207	23F7	25591	63F7					—	Bit 0: Communication DI1 Bit 1: Communication DI2 Bit 2: Communication DI3 Bit 3: Communication DI4
	Communication DI1	9208	23F8	25592	63F8					—	
	Communication DI2	9209	23F9	25593	63F9					—	
	Communication DI3	9210	23FA	25594	63FA					—	
	Communication DI4	9211	23FB	25595	63FB					—	
Tag	Tag 1	9301	2455	25685	6455					—	Display and setting cannot be made with the console.
	Tag 2	9302	2456	25686	6456					—	Same as above.
	Tag 3	9303	2457	25687	6457					—	Same as above.
	Tag 4	9304	2458	25688	6458					—	Same as above.
	Tag 5	9305	2459	25689	6459					—	Same as above.
	Tag 6	9306	245A	25690	645A					—	Same as above.
	Tag 7	9307	245B	25691	645B					—	Same as above.
	Tag 8	9308	245C	25692	645C					—	Same as above.
	Tag 9	9309	245D	25693	645D					—	Same as above.
	Tag 10	9310	245E	25694	645E					—	Same as above.
	Tag 11	9311	245F	25695	645F					—	Same as above.
	Tag 12	9312	2460	25696	6460					—	Same as above.
	Tag 13	9313	2461	25697	6461					—	Same as above.
	Tag 14	9314	2462	25698	6462					—	Same as above.
	Tag 15	9315	2463	25699	6463					—	Same as above.
	Tag 16	9316	2464	25700	6464					—	Same as above.

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Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
PID	Proportional band (P-1)	12288	3000	28672	7000					1	
	Integral time (I-1)	12289	3001	28673	7001					S	
	Derivative time (D-1)	12290	3002	28674	7002					S	
	Manual reset (RE-1)	12291	3003	28675	7003					1	
	Output low limit (OL-1)	12292	3004	28676	7004					1	
	Output high limit (OH-1)	12293	3005	28677	7005					1	
	Proportional band (P-2)	12294	3006	28678	7006					1	
	Integral time (I-2)	12295	3007	28679	7007					S	
	Derivative time (D-2)	12296	3008	28680	7008					S	
	Manual reset (RE-2)	12297	3009	28681	7009					1	
	Output low limit (OL-2)	12298	300A	28682	700A					1	
	Output high limit (OH-2)	12299	300B	28683	700B					1	
	Proportional band (P-3)	12300	300C	28684	700C					1	
	Integral time (I-3)	12301	300D	28685	700D					S	
	Derivative time (D-3)	12302	300E	28686	700E					S	
	Manual reset (RE-3)	12303	300F	28687	700F					1	
	Output low limit (OL-3)	12304	3010	28688	7010					1	
	Output high limit (OH-3)	12305	3011	28689	7011					1	
	Proportional band (P-4)	12306	3012	28690	7012					1	
	Integral time (I-4)	12307	3013	28691	7013					S	
	Derivative time (D-4)	12308	3014	28692	7014					S	
	Manual reset (RE-4)	12309	3015	28693	7015					1	
	Output low limit (OL-4)	12310	3016	28694	7016					1	
	Output high limit (OH-4)	12311	3017	28695	7017					1	
	Proportional band (P-5)	12312	3018	28696	7018					1	
	Integral time (I-5)	12313	3019	28697	7019					S	
	Derivative time (D-5)	12314	301A	28698	701A					S	
	Manual reset (RE-5)	12315	301B	28699	701B					1	
	Output low limit (OL-5)	12316	301C	28700	701C					1	
	Output high limit (OH-5)	12317	301D	28701	701D					1	
	Proportional band (P-6)	12318	301E	28702	701E					1	
	Integral time (I-6)	12319	301F	28703	701F					S	
	Derivative time (D-6)	12320	3020	28704	7020					S	
	Manual reset (RE-6)	12321	3021	28705	7021					1	
	Output low limit (OL-6)	12322	3022	28706	7022					1	
	Output high limit (OH-6)	12323	3023	28707	7023					1	
	Proportional band (P-7)	12324	3024	28708	7024					1	
	Integral time (I-7)	12325	3025	28709	7025					S	
	Derivative time (D-7)	12326	3026	28710	7026					S	
	Manual reset (RE-7)	12327	3027	28711	7027					1	
	Output low limit (OL-7)	12328	3028	28712	7028					1	
	Output high limit (OH-7)	12329	3029	28713	7029					1	
	Proportional band (P-8)	12330	302A	28714	702A					1	
	Integral time (I-8)	12331	302B	28715	702B					S	
	Derivative time (D-8)	12332	302C	28716	702C					S	
	Manual reset (RE-8)	12333	302D	28717	702D					1	
	Output low limit (OL-8)	12334	302E	28718	702E					1	
	Output high limit (OH-8)	12335	302F	28719	702F					1	
	Proportional band for cool side (P-1.C)	12336	3030	28720	7030					1	
	Integral time for cool side (I-1.C)	12337	3031	28721	7031					S	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
	Derivative time for cool side (D-1.C)	12338	3032	28722	7032					S	
	(Reserved for future extension.)	12339	3033	28723	7033	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL1.C)	12340	3034	28724	7034					1	
	Output high limit for cool side (OH1.C)	12341	3035	28725	7035					1	
	Proportional band for cool side (P-2.C)	12342	3036	28726	7036					1	
	Integral time for cool side (I-2.C)	12343	3037	28727	7037					S	
	Derivative time for cool side (D-2.C)	12344	3038	28728	7038					S	
	(Reserved for future extension.)	12345	3039	28729	7039	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL2.C)	12346	303A	28730	703A					1	
	Output high limit for cool side (OH2.C)	12347	303B	28731	703B					1	
	Proportional band for cool side (P-3.C)	12348	303C	28732	703C					1	
	Integral time for cool side (I-3.C)	12349	303D	28733	703D					S	
	Derivative time for cool side (D-3.C)	12350	303E	28734	703E					S	
	(Reserved for future extension.)	12351	303F	28735	703F	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL3.C)	12352	3040	28736	7040					1	
	Output high limit for cool side (OH3.C)	12353	3041	28737	7041					1	
	Proportional band for cool side (P-4.C)	12354	3042	28738	7042					1	
	Integral time for cool side (I-4.C)	12355	3043	28739	7043					S	
	Derivative time for cool side (D-4.C)	12356	3044	28740	7044					S	
	(Reserved for future extension.)	12357	3045	28741	7045	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL4.C)	12358	3046	28742	7046					1	
	Output high limit for cool side (OH4.C)	12359	3047	28743	7047					1	
	Proportional band for cool side (P-5.C)	12360	3048	28744	7048					1	
	Integral time for cool side (I-5.C)	12361	3049	28745	7049					S	
	Derivative time for cool side (D-5.C)	12362	304A	28746	704A					S	
	(Reserved for future extension.)	12363	304B	28747	704B	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL5.C)	12364	304C	28748	704C					1	
	Output high limit for cool side (OH5.C)	12365	304D	28749	704D					1	
	Proportional band for cool side (P-6.C)	12366	304E	28750	704E					1	
	Integral time for cool side (I-6.C)	12367	304F	28751	704F					S	
	Derivative time for cool side (D-6.C)	12368	3050	28752	7050					S	
	(Reserved for future extension.)	12369	3051	28753	7051	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL6.C)	12370	3052	28754	7052					1	
	Output high limit for cool side (OH6.C)	12371	3053	28755	7053					1	
	Proportional band for cool side (P-7.C)	12372	3054	28756	7054					1	
	Integral time for cool side (I-7.C)	12373	3055	28757	7055					S	
	Derivative time for cool side (D-7.C)	12374	3056	28758	7056					S	
	(Reserved for future extension.)	12375	3057	28759	7057	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL7.C)	12376	3058	28760	7058					1	
	Output high limit for cool side (OH7.C)	12377	3059	28761	7059					1	
	Proportional band for cool side (P-8.C)	12378	305A	28762	705A					1	
	Integral time for cool side (I-8.C)	12379	305B	28763	705B					S	
	Derivative time for cool side (D-8.C)	12380	305C	28764	705C					S	
	(Reserved for future extension.)	12381	305D	28765	705D	Δ	Δ	Δ	Δ	—	
	Output low limit for cool side (OL8.C)	12382	305E	28766	705E					1	
	Output high limit for cool side (OH8.C)	12383	305F	28767	705F					1	
Event	Internal Event 1 main setting	13056	3300	29440	7300					S	
	Internal Event 1 sub-setting	13057	3301	29441	7301					S	
	Internal Event 2 main setting	13058	3302	29442	7302					S	
	Internal Event 2 sub-setting	13059	3303	29443	7303					S	

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Event	Internal Event 3 main setting	13060	3304	29444	7304					S	
	Internal Event 3 sub-setting	13061	3305	29445	7305					S	
	Internal Event 4 main setting	13062	3306	29446	7306					S	
	Internal Event 4 sub-setting	13063	3307	29447	7307					S	
	Internal Event 5 main setting	13064	3308	29448	7308					S	
	Internal Event 5 sub-setting	13065	3309	29449	7309					S	
	Internal Event 6 main setting	13066	330A	29450	730A					S	
	Internal Event 6 sub-setting	13067	330B	29451	730B					S	
	Internal Event 7 main setting	13068	330C	29452	730C					S	
	Internal Event 7 sub-setting	13069	330D	29453	730D					S	
	Internal Event 8 main setting	13070	330E	29454	730E					S	
	Internal Event 8 sub-setting	13071	330F	29455	730F					S	
LSP	LSP1	13312	3400	29696	7400					P	
	LSP2	13313	3401	29697	7401					P	
	LSP3	13314	3402	29698	7402					P	
	LSP4	13315	3403	29699	7403					P	
	LSP5	13316	3404	29700	7404					P	
	LSP6	13317	3405	29701	7405					P	
	LSP7	13318	3406	29702	7406					P	
	LSP8	13319	3407	29703	7407					P	
Instrument status 1	Typical alarm	14336	3800	30720	7800		X		X	—	Bit 0: PV failure (AL01 to 03) Bits 1 to 11: Undefined. Bit 12: Hardware failure (AL70) Bit 13: Parameter failure (AL95/97) Bit 14: Adjustment data failure (AL96/98) Bit 15: ROM failure (AL99)
	DO status	14337	3801	30721	7801		X		X	—	Same as RAM address 9205 (decimal).
	DI status	14338	3802	30722	7802		X		X	—	Same as RAM address 9206 (decimal).
Instrument status 2	RUN/READY	14352	3810	30736	7810		X		X	—	
	AUTO/MANUAL	14353	3811	30737	7811		X		X	—	
	AT stop/start	14354	3812	30738	7812		X		X	—	
	LSP/RSP	14355	3813	30739	7813		X		X	—	
	PV	14356	3814	30740	7814		X		X	P	
	SP (Target value)	14357	3815	30741	7815		X		X	P	
	Manipulated Variable (MV)	14358	3816	30742	7816		X		X	1	
Instrument status 3	RSP	14416	3850	30800	7850		X		X	P	Same as RAM address 7001 (decimal).
	MFB (Motor opening feedback value)	14417	3851	30801	7851		X		X	1	Same as RAM address 9108 (decimal).
	Current transformer (CT) input 1 current value	14418	3852	30802	7852		X		X	1	Same as RAM address 9110 (decimal).
	Current transformer (CT) input 2 current value	14419	3853	30803	7853		X		X	1	Same as RAM address 9111 (decimal).
	Heat MV (for heat/cool control)	14420	3854	30804	7854		X		X	1	Same as RAM address 9106 (decimal).
	Cool MV (for heat/cool control)	14421	3855	30805	7855		X		X	1	Same as RAM address 9107 (decimal).

(To be continued to the next page.)

Bank	Item name	RAM address		EEPROM address		RAM		EEPROM		Decimal point information	Remarks
		Decimal	Hexadecimal	Decimal	Hexadecimal	Read	Write	Read	Write		
Operation	LSP group selection	14592	3900	30976	7900		✻		✻	—	Writing is enabled under no DI Assignment conditions. Same as RAM address 9103 (decimal).
	LSP value in use	14593	3901	30977	7901					P	Same as RAM address 9123 (decimal).
	Manual manipulated variable (MV)	14594	3902	30978	7902		✻		✻	1	Writing is enabled in the MANUAL mode. Same as RAM address 9105 (decimal).
	RUN/READY	14595	3903	30979	7903		✻		✻	—	Writing is enabled under no DI Assignment conditions. Same as RAM address 9002 (decimal).
	AUTO/MANUAL	14596	3904	30980	7904		✻		✻	—	Writing is enabled under no DI Assignment and other conditions. Same as RAM address 9001 (decimal).
	AT stop/start	14597	3905	30981	7905		✻		✻	—	Writing is enabled under no DI Assignment and other conditions. Same as RAM address 9004 (decimal).
	LSP/RSP	14598	3906	30982	7906		X		X	—	Same as RAM address 9003 (decimal).
PID group in use	Proportional band (P)	14848	3A00	31232	7A00					1	
	Integral time (I)	14849	3A01	31233	7A01					S	
	Derivative time (D)	14850	3A02	31234	7A02					S	
	Manual reset	14851	3A03	31235	7A03					1	
	MV low limit	14852	3A04	31236	7A04					1	
	MV high limit	14853	3A05	31237	7A05					1	
	Proportional band for cool side	14854	3A06	31238	7A06					1	
	Integral time for cool side	14855	3A07	31239	7A07					S	
	Derivative time for cool side	14856	3A08	31240	7A08					S	
	(Reserved for future extension.)	14857	3A09	31241	7A09	Δ	Δ	Δ	Δ	1	
	Output low limit for cool side	14858	3A0A	31242	7A0A					1	
	Output high limit for cool side	14859	3A0B	31243	7A0B					1	

Chapter 10. MAINTENANCE AND TROUBLESHOOTING

■ Maintenance

● Cleaning

When removing dirt from the instrument, wipe it off with a soft cloth rag. At this time, do not use any organic solvent, such as paint thinner or benzene.

● Part replacement

Do not replace any parts of this unit.

● Fuse replacement

When replacing the fuse connected to the electric wiring, always use the specified standard fuse.

Standard	IEC127
Shut-down speed	Slow-action type (T)
Rated voltage	250V
Rated current	500mA

■ Alarm displays and corrective action

The following table shows the alarm displays and corrective actions if any failure occurs in this unit:

Alarm code	Failure name	Cause	Corrective action
AL01	PV input failure (Over-range)	Sensor burnout, incorrect wiring, incorrect PV input type setting	Check the wiring. Set the PV input type again.
AL02	PV input failure (Under-range)	Sensor burnout, incorrect wiring, incorrect PV input type setting	
AL03	CJ failure	Terminal temperature is faulty (thermocouple).	Check the ambient temperature.
	PV input failure (RTD)	Sensor burnout, incorrect wiring	Check the wiring.
AL05	RSP input failure (Over-range) (Displayed only in the RSP mode.)	Sensor burnout, incorrect wiring, incorrect RSP input type setting	Check the wiring. Set the RSP input type again.
AL06	RSP input failure (Under-range) (Displayed only in the RSP mode.)	Sensor burnout, incorrect wiring, incorrect RSP input type setting	Check the wiring. Set the RSP input type again.
AL07	MFB input failure	Burnout, incorrect wiring	Check the wiring. Check the MFB input value.
AL 10	Motor adjustment failure	Check for burnout or incorrect wiring. Motor power shutdown.	Readjust the motor after checking the wiring and motor power.
AL 70	A/D conversion failure	A/D converter is faulty.	Replace the unit.
AL95	Parameter failure	Data is corrupted by noise, or power is shut-down while the data is being set.	• Restart the unit. • Set the data again (set data for AL95/97 and adjustment data for AL96/98). • Replace the unit.
AL96	Adjustment data failure	Data is corrupted by noise, or power is shut-down while the data is being set.	
AL97	Parameter failure (RAM area)	Data is corrupted by noise.	
AL98	Adjustment data failure (RAM area)	Data is corrupted by noise.	
AL99	ROM failure	ROM (memory) is faulty.	• Restart the unit. • Replace the unit.

■ Behavior in case of PV input failure

(1) AL01, 02, or 03 occurs.

Control output: It is possible to make the settings so that the control action is continued or stopped.

Other actions: Actions are continued.

(2) Alarm occurs other than those shown above.

All actions are continued.

The following table shows the indications and alarms of this unit by the sensor type if PV input failure occurs:

● Thermocouple

Failure status	Range No.	Indication value	Alarm code
Sensor burnout		Upscale (110%FS)	AL01
CJ failure		PV having incorrect cold junction compensation.	AL03
Over-range, burnout	19 (PLII)	1365˚C (105%FS)	AL01

● RTD

Failure status	Range No.	Indication value	Alarm code
RTD burnout		Upscale (110%FS)	AL01
A-wire burnout		Upscale (110%FS)	AL01
B-wire burnout		Upscale (110%FS)	AL01, AL03
C-wire burnout		Upscale (110%FS)	AL01, AL03
2 or 3-wire burnout		Upscale (110%FS)	AL01, AL03
A and B-wire short-circuit		Downscale (-10%FS)	AL02
A and C-wire short-circuit		Downscale (-10%FS)	AL02
A and B-wire/A and C-wire short-circuit	41,43 (Pt100)	-235˚C (-5%FS)	AL02
A and B-wire/A and C-wire short-circuit	42,44 (JPt100)	-235˚C (-5%FS)	AL02

● DC voltage/DC current

Failure status	Range No.	Indication value	Alarm code
Burnout	81 (0 to 10mV)	Downscale (-10%FS)	AL02
	82 (-10 to +10mV)	Downscale (-10%FS)	AL02
	83 (0 to 100mV)	Downscale (-10%FS)	AL02
	84 (0 to 1V)	Downscale (-3%FS)	AL02
	86 (1 to 5V)	Downscale (-10%FS)	AL02
	87 (0 to 5V)	Downscale (-3%FS)	AL02
	88 (0 to 10V)	Downscale (0%FS)	None
	89 (0 to 20mA)	Indefiniteness (around 0%FS)	None
	90 (4 to 20mA)	Downscale (-10%FS)	AL02

■ Behavior in case of RSP input failure

When an alarm occurs, all actions are continued.

The following table shows the indications and alarms of this unit if RSP input failure occurs:

Failure status	Range No.	Indication value	Alarm code
Burnout	0 (4 to 20mA)	Downscale (-10%FS)	AL06
	1 (0 to 20mA)	Indefiniteness (around 0%FS)	None
	2 (0 to 5V)	Downscale (-10%FS)	AL06
	3 (1 to 5V)	Downscale (-10%FS)	AL06
	4 (0 to 10V)	Downscale (-10%FS)	AL06

Chapter 11. CALIBRATION

⚠ CAUTION

Do not change the mode to the calibration mode while the control object is being operated.
When this unit is put in the calibration mode, the control output and event output enter the fixed status and they do not function. Always start the calibration by considering this point carefully.

Handling Precautions

It may be required to disconnect and reconnect the wiring for calibration. At this time, strictly observe the warnings and cautions about wiring stated in Chapter 4, WIRING.

This chapter describes how to calibrate this unit.
To calibrate this unit, Smart Loader Package SLP-C35 is required.

■ Starting the calibration

Start up the Smart Loader Package SLP-C35. On the menu screen, select [Calibration (J)] from the [Menu (M)] pull-down menu. The [Calibrate] confirmation screen will appear.
On this screen, select [OK]. The Calibration screen will appear and this unit enters the calibration mode.
When this unit is in the calibration mode, "tESt" will appear on the lower display. However, note that another message appears when inspecting the LED.

Handling Precautions

- Yamatake shall not be held responsible for any defects arising from improper calibration made by the customer.
- To return the unit to the calibration status of the default settings before shipment during calibration, follow the steps below. From the pull-down menu, select [Command] → [Data retrieval]. The data, which has been calibrated, is disposed of and the data is then returned to the default settings before shipment. If this operation is performed accidentally during calibration, all contents, which have been calibrated by the customer, will be lost.

■ Exiting the calibration

To exit the calibration, perform either of the following operations:

(1) On the Calibration screen of the Smart Loader Package, select [Quit (Q)] from the [File (F)] pull-down menu.

(2) Click [X] at the upper right corner of the Calibration screen to close the screen. The screen will be returned to the menu screen and the unit also returns to the normal mode.

Handling Precautions

If the loader cable is disconnected before starting the calibration exit operation with the Smart Loader Package, this unit is continuously kept in the calibration mode. At this condition, turn OFF the power, and turn it ON again. The unit will return to the normal mode.

■ Cautions before starting the calibration

When calibrating the unit, strictly observe the following cautions. Failure to do so may cause inaccuracy:

- Before starting the calibration, supply the power to this unit for at least 1 hr.
- The ambient temperature of the calibration place must conform to the standard conditions specified in the unit specifications.
- Do not calibrate the unit in a place where it is in contact with the wind or during ambient temperature fluctuation.
- Do not calibrate the unit with the measuring instruments having lower specifications stated in the next section, ■ Measuring instruments required for calibration.

■ Measuring instruments required for calibration

Measuring instrument	Specifications
Reference current/ voltage generator	Accuracy: ±0.1% or less, Minimum resolution: 100 µV or less (voltage), Minimum resolution: 100 µA or less (current)
Resistor	Accuracy: ±0.1% or less, Minimum resolution: 0.1Ω or less
Ammeter	Accuracy: ±0.1% or less, Minimum resolution: 1µA or less
Voltmeter	Accuracy: ±0.1% or less, Minimum resolution: 1mV or less
Thermometer	Accuracy: ±0.1˚C or less, Minimum resolution: 0.1˚C or less

■ Calibration procedures

● I/O check

(1) Select the [I/O Check] tab.

(2) Select a desired item from the check contents.

(3) Click [Execute].

The input system (key and digital input) is shown on the personal computer screen while the input status (ON/OFF) of this unit is being read continuously.

For the output system (control output and event output), the status (ON/OFF) you have checked on desired check boxes is output from the output terminal of this unit.

● PV input calibration

(1) Select the [PV Calibration] tab.

(2) Select the model, [4: C25/26/35/36 T/C], [5: C25/26/35/36 RTD], or [6: C25/26/35/36 LIN].

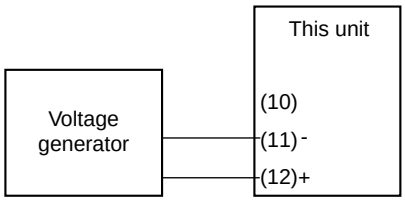
(3) Select the gain No. in the ascending order and perform the operation from step (4).

(4) Click [Read].

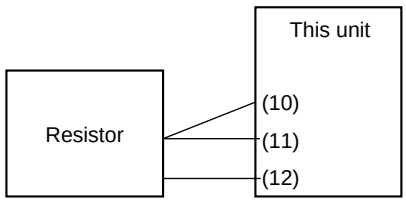
(5) Apply the voltage, current, and resistance values written next to the gain No. to the PV input terminal.

For details about how to connect measuring instruments in the apply status, refer to the following figures:

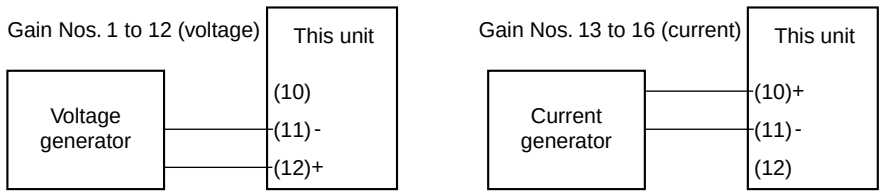
• The PV input type is T/C (thermocouple).



• The PV input type is RTD.



• The PV input type is LIN (DC voltage/DC current).



(6) Keep the apply status for approximately 30s.
(7) Click [Write].
(8) Return to step (3) and repeat the procedure until the final gain No. is completed.

Handling Precautions

- In the PV input calibration, always adjust all gains.
- Do not leave the PV input terminal open during heat-up between power ON of this unit and starting of calibration. When the input type is thermocouple or DC voltage, put the unit in the 0 volt input (or terminals are short-circuited) status. When the input type is RTD, put the unit in the 100Ω-input (or terminals are short-circuited) status.

● RSP input calibration

(1) Select the [PV Calibration] tab.

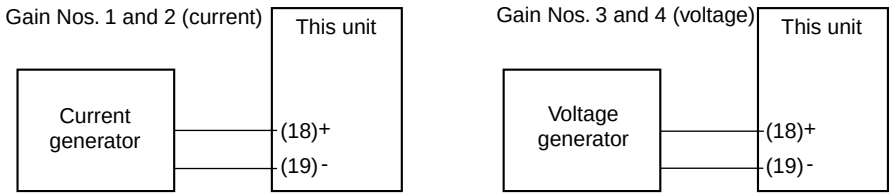
(2) Select the model [7: C35/36 RSP].

(3) Select the gain No. in the ascending order and perform the operation from step (4).

(4) Click [Read].

(5) Apply the voltage and current values written next to the gain No. to the PV input terminal.

For details about how to connect measuring instruments in the apply status, refer to the following Figures:



(6) Keep the apply status for approximately 30s.

(7) Click [Write].

(8) Return to step (3) and repeat the procedure until the final gain No. is completed.

Handling Precautions

- In the RSP input calibration, it is always necessary to adjust all gains.
- Do not leave the RSP input terminal open during heat-up between power ON of this unit and starting of calibration. When the input type is DC voltage, put the unit in the 0 volt input (or terminals are short-circuited) status.

● Current Transformer (CT) input calibration

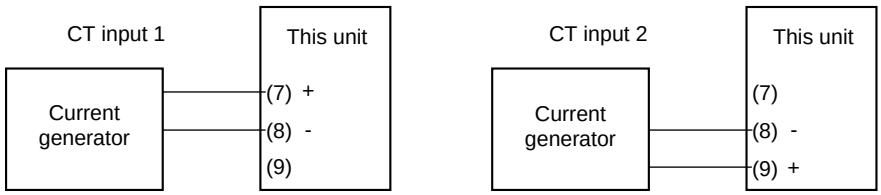
(1) Select the [CT input calibration] tab.

(2) Select a desired channel to be calibrated.

(3) Select [Zero] from the zero span selection items.
(When selecting a channel, perform the [Zero] calibration first, and then perform the [Span] calibration next since “Zero/Span” is set for one channel.)

(4) Click [Read].

(5) A current value of “0” is applied to the CT input terminal of the channel you have selected and keep the apply status for approximately 30 sec. For details about how to connect measuring instruments in the apply status, refer to the following Figures:



(6) Click [Write].

(7) Select [Span] from the zero span selection items.

(8) Click [Read].

(9) Apply a span current value to the CT input terminal of the channel you have selected and keep the apply status for approximately 30s.

(10) Click [Write].

(11) If any channels to be calibrated remain, return to operation step (2).

[!] Handling Precautions

To calibrate the CT input, connect the DC current (mA) to the input terminal.

- **Current output/continuous voltage output calibration**

(1) Select the [Analog Output Calibration] tab.

(2) Select a desired channel to be calibrated.
Select [ch1] for control output 1, [ch2] for control output 2, and [ch3] for auxiliary output.

(3) Select [Zero] from the zero span selection items.
(When selecting a channel, perform the [Zero] calibration first, and then perform the [Span] calibration next since "Zero/Span" is set for one channel.)

(4) When clicking [Read], the zero calibration current/continuous voltage is output to the output terminal of the channel you have selected.

(5) Keep this status for approximately 30s.

(6) Read the current value in units of 0.001 mA from the ammeter or the voltage value in units of 0.001V from the voltmeter, input them in [Current (mA)/Voltage (V)], and click [Write].

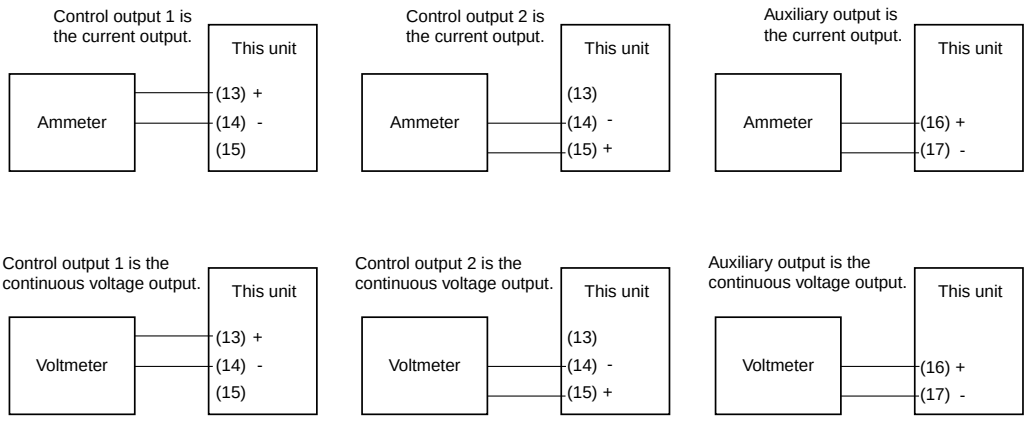
(7) Select [Span] from the zero span selection items.

(8) When clicking [Read], the span calibration current/continuous voltage is output to the output terminal of the channel you have selected.

(9) Keep this status for approximately 30s.

(10) Read the current value in units of 0.001 mA from the ammeter or the voltage value in units of 0.001V from the voltmeter, input them in [Current (mA)/Voltage (V)], and click [Write].

(11) If any channels to be calibrated remain, return to operation step (2).
For details about how to connect measuring instruments, refer to the following Figures:



Chapter 12. DISPOSAL

When disposing of this unit, dispose of it appropriately as an industrial waste in accordance with local laws and regulations.

Chapter 13. SPECIFICATIONS

■ Specifications

● PV input

Input type: Thermocouple K, J, E, T, R, S, B, N, PL II, WRe5-26, Ni-NiMo, PR40-20, DIN U, and DIN L
RTD Pt100/JPt100
DC voltage input 0 to 10mVdc, -10 to +10mVdc, 0 to 100mVdc, 0 to 1Vdc, 1 to 5Vdc, 0 to 5Vdc, 0 to 10Vdc
DC current input 0 to 20mAdc, 4 to 20mAdc

Selection of input type: A desired type can be selected (full-multi range).

Sampling cycle time: 0.1s

Indication accuracy: ±0.1%FS±1 digit, ±0.2%FS±1digit in the negative area of the thermocouple (Specified by the input conversion at an ambient temperature of 23±2˚C)
However, the following ranges have different values:

- Sensor type B (range 17):
  ±4%FS at 260˚C or less, ±0.4%FS at 260 to 800˚C, ±0.2%FS at 800 to 1800˚C
- Sensor type R (range 15), sensor type S (range 16):
  ±0.2%FS at 100˚C or less, ±0.15%FS at 100 to 1600˚C
- Sensor type PR40-20 (range 23):
  ±2.5%FS at 0 to 300˚C, ±1.5%FS at 300 to 800˚C, ±0.5%FS at 800 to 1900˚C
- Sensor type golden iron chromel (range 26): ±1.5K
- Sensor type Pt, JPt (RTD) (range 55 to 62): ±0.15%FS
- Sensor type 0 to 10mV (DC voltage) (range 81): ±0.15%FS

Cold junction compensation accuracy:
±0.5˚C (at an ambient temperature of 23±2˚C)
±1.0˚C (at an ambient temperature of 15 to 35˚C)
±1.5˚C (at an ambient temperature of 0 to 15˚C or 35 to 50˚C)

Cold junction compensation method: Compensation inside or outside (only at 0˚C) the measuring instrument can be selected.

PV bias: -1999 to +9999 or -199.9 to +999.9

• Thermocouple (T/C) input

Input bias current: +0.2µA (flows from terminal A.)

Burnout indication: Upscale + AL01

• Resistance temperature detector (RTD) input

Input bias current: Approx. +1mA (flows from terminal A.)

Burnout indication:
RTD burnout or A-wire burnout · · · · Upscale + AL01
B-wire burnout or C-wire burnout· · · Upscale + AL01, AL03
2 or more wires burnout · · · · · · · · · · Upscale + AL01, AL03

Effect of wiring resistance: Max. ±0.05%FS/Ω

Allowable wiring resistance:
10Ω or less for range No. 53 to 62 (Zener barrier cannot be used.)
85Ω or less for ranges other than above range (including the resistance of the Zener barrier)

• DC voltage input

Input bias current:
1V range or less · · · · · · · · · · · · · · Max. 1µA (flows to the (+) terminal)
0 to 5V, 1 to 5V range · · · · · · · · · Max. 3.5µA (flows to the (+) terminal)
0 to 10V range · · · · · · · · · · · · · · · Max. 7µA (flows to the (+) terminal)

Burnout indication: Downscale + AL02
However, the burnout cannot be detected in a range of 0 to 10V.

• DC current input

Input impedance: Max. 100Ω
Burnout indication: Downscale + AL02
However, the burnout cannot be detected in a range of 0 to 20mA.

● Motor feedback potentiometer input (R1 model)

Allowable resistance: 100 to 2500Ω
Burnout detection: AL07 indication

● RSP input

Input type: Linear 0 to 20mA/4 to 20mA or linear 0 to 5V/1 to 5V/0 to 10V
Scaling: Possible in a range of -1999 to +9999. It is also possible to set the decimal point position.
Sampling cycle: 100ms
Indication accuracy: ±0.1%FS±1digit (at an ambient temperature of 23±2˚C)

• Voltage input specifications

Input bias current: 0 to 5V, 1 to 5V range . . . . . Max. 3µA (flows to the (+) terminal)
0 to 10V range . . . . . Max. 5µA (flows to the (+) terminal)
Burnout indication: Downscale + AL06

• Current input specifications

Input impedance: Max. 100Ω
Burnout indication: Downscale + AL06
However, the burnout cannot be detected in a range of 0 to 20mA.

● External contact input

Number of input points: 4 points
Input type: Potential free contact or open collector
Allowable ON contact resistance: Max. 250Ω
Allowable OFF contact resistance: Min.100 kΩ
Allowable ON-state residual voltage: Max. 1.0V
Open terminal voltage: DC5.5V±1V
ON terminal current: Approx. 7.5mA (at short-circuit), Approx. 5.0mA (at contact resistance of 250Ω)
Min. hold time: 200ms or more

● Current transformer input

Number of input points: 2 points
Input object: Number of current transformer with windings of 800 turns
Optional unit Model No.: QN206A (Hole diameter: 5.8 mm)
Optional unit Model No.: QN212A (Hole diameter: 12mm)
Measurement current range: 0.4 to 50.0A
Display accuracy: ±5%FS±1digit
Display resolution: 0.1A
Display range: 0.0A to 70.0A

● Control output

• Relay output

Contact rating:	NO side 250Vac/30Vdc, 3A (resistance load) NC side 250Vac/30Vdc, 1A (resistance load)
Life:	50,000 cycles or more on NO side 100,000 cycles or more on NC side
Min. open/close specifications:	5V, 100mA
Min. open time/ close times	250ms

• Motor drive relay output (R1 model)

Contact type:	1c, 2 circuits
Contact rating:	250Vac, 8A (resistive load)
Life:	120,000 cycles or more
Min. open/close specifications:	24Vdc, 40mA

• Voltage pulse output (For SSR drive)

Voltage between terminals at open:	19Vdc±15%
Internal resistance:	82Ω±0.5%
Allowable current:	Max. 24mAdc
OFF leak current:	Max. 100μA
Min. OFF time/ ON time:	1ms when the time proportional cycle time is less than 10s. 250ms when the time proportional cycle time is more than 10s.

• Current output

Output type:	0 to 20mAdc or 4 to 20mAdc
Allowance load resistance:	Max. 600Ω
Output accuracy:	±0.1%FS (at an ambient temperature of 23±2˚C) However, ±1.0%FS in a range of 0 to 1mA.
Output resolution:	1/10000

• Continuous voltage output

Output type:	0 to 5Vdc, 1 to 5Vdc or 0 to 10Vdc
Allowable load resistance:	Min. 1000Ω
Output accuracy:	±0.1%FS (at an ambient temperature of 23±2˚C) However, ±1%FS at 0 to 0.05V.
Output resolution:	1/10000

● Auxiliary output

• Current output

Output type:	0 to 20mAdc or 4 to 20mAdct
Allowable load resistance:	Min. 600Ω
Output accuracy:	±0.1%FS (at an ambient temperature of 23±2˚C) However, ±1%FS at 0 to 1mA.
Output resolution:	1/10000

• Continuous voltage output

Output type:	0 to 5Vdc, 1 to 5Vdc or 0 to 10Vdc voltage output
Allowable load resistance:	Min. 1000Ω
Output accuracy:	±0.1%FS (at an ambient temperature of 23±2˚C) However, ±1%FS at 0 to 0.05V.
Output resolution:	1/10000

● Event relay output

Number of output points:	2 to 3 points (This may vary depending on the model.)
Output type:	SPST contact
	3 points, 3 points/common; 2 points, Each individual contact
Output rating:	250Vac/30Vdc, 2A (resistive load)
Life:	100,000 cycles or more
Min. open/close specifications:	5V, 10mA (Reference value)

● RS-485 communication

Transmission line:	3-wire method
Transmission speed:	4800, 9600, 19200, 38400 bps
Communication distance:	Max. 500m
Communication method:	Half duplex, start/stop synchronization method
Communication protocol:	In conformity with CPL and MODBUS
Number of connection units:	Max. 31 units
Terminating resistor:	Connection prohibited.

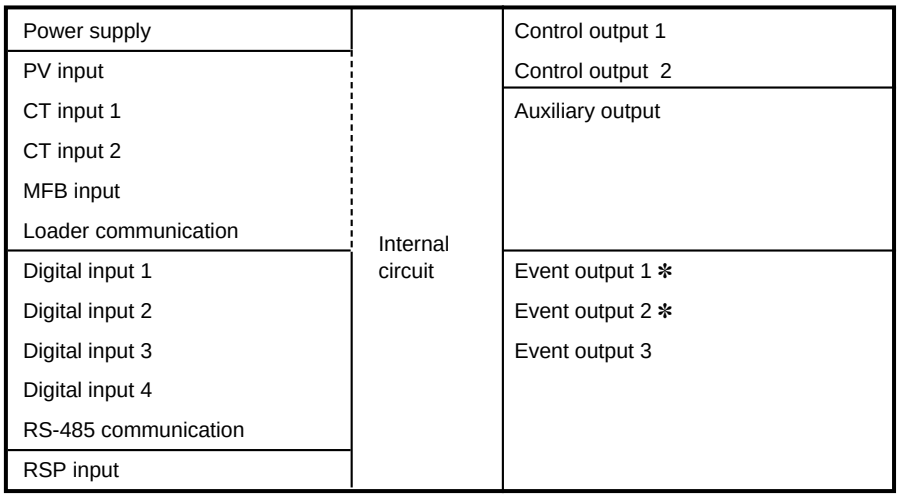
● Loader communication

Transmission line:	3-wire method
Transmission speed:	Fixed at 19200 bps.
Recommended cable:	Specially designed cable, 2m Model No.: 81440793-001

● Isolation between input and output

Portions enclosed by solid lines are insulated from other signals.

Portions enclosed by dotted lines are not insulated.



The inputs and outputs provided may vary depending upon the model.

✻ In case of the independent contacts, the output 1 and the output 2 are isolated.

● Environment conditions

• Standard conditions

Ambient temperature:	23±2˚C
Ambient humidity:	60±5%RH
Power supply voltage:	AC power model, 105Vac±1%, 50/60Hz±1Hz
	DC power model, 24Vac±1%, 50/60Hz±1Hz
	24Vdc±5%
Vibration:	0m/s^2
Shock:	0m/s^2
Mounting angle:	(Reference plane) ±3˚

• Operating conditions

Ambient temperature:	0 to 50˚C (0 to 40˚C for gang-mounting)
Ambient humidity:	10 to 90%RH (non-condensing)
Rated power supply voltage:	AC power model, 100 to 240Vac, 50/60Hz
Power supply voltage:	AC power model, 85 to 264Vac, 50/60Hz±2Hz
Vibration:	0 to 2m/s^2 (10 to 60Hz for 2h in each of the X, Y, and Z-direction)
Shock:	0 to 10m/s^2
Mounting angle:	Reference plane (vertical) ±10˚

• Transportation conditions

Ambient temperature:	-20 to +70˚C
Ambient humidity:	10 to 95%RH (non-condensing)

● Other specifications

Power consumption:	AC power model, Max. 12VA
Insulation resistance:	Between power supply terminal and secondary terminal, 500Vdc, 20MΩ or more
Dielectric strength:	AC power model, Between power supply terminal and secondary terminal, 1500Vac for 1min.
Inrush current at power ON:	AC power model, Max. 20A
Altitude:	2000m or less
Mass:	C35 48 X 96 Approx. 250g (including mounting bracket)
	C36 96 X 96 Approx. 300g (including mounting bracket)
Terminal screw tightening torque:	0.4N·m or less
Applicable standards:	CE; EN61010-1, EN61326-1
Over-voltage category:	Category II (IEC60364-4-443, IEC60664-1)
Allowable pollution degree:	Pollution degree 2
Console material:	Polycarbonate
Case material/color:	Reformed PPE/Light gray (DIC650)

■ Accessories and optional parts

Name	Model No.
Mounting bracket	81409654-001 (Accessory)
Current transformer	QN206A (5.8mm hole dia.)
	QN212A (12mm hole dia.)
Hard cover	81446915-001 (for C35) 81446916-001 (for C36)
Terminal cover	81446912-001 (for C35) 81446913-001 (for C36)
Smart Loader Package	SLP-C35J50

Appendix

Glossary

Abbreviations are used in the descriptions, tables, and figures in this manual. The following shows the main abbreviations:

AT	Auto Tuning
CT	Current Transformer
DI	Digital Input
DO	Digital Output (Control outputs of relay and voltage pulse, and event output)
EV	Event
LSP	Local Set Point. This value is the SP value stored in the instrument.
MFB	Motor Feed Back. This indicates the feed back of motor opening which is used for position proportional control.
MV	Manipulated Variable
PV	Process Variable
RSP	Remote Set Point. This is the set point which is set by the analog input from an external device.
SP	Set Point
U	Unit. This indicates the minimum digit of the selected PV input range with industrial unit (˚C, Pa, l/min., etc.). 1U = 1˚C in a range of –200 to +200˚C. 1U = 0.1˚C in a range of 0.0 to 200.0˚C. Additionally, 1U = 0.01 when the DC voltage input is scaled to 0.00 to 10.00. Furthermore, 0.1U means 1/10 of 1U.

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