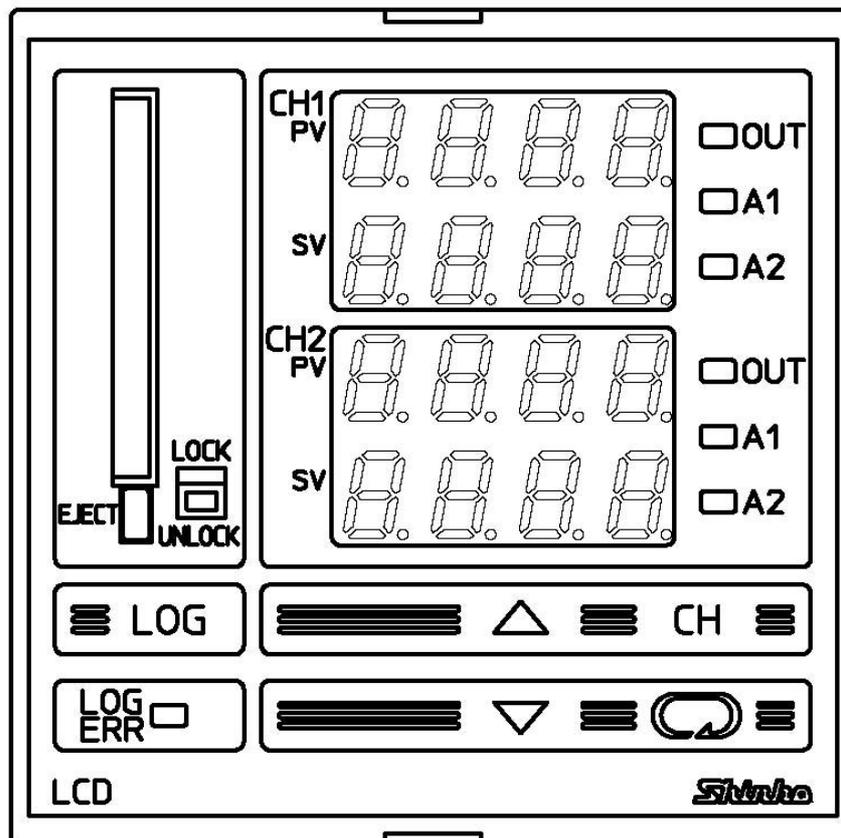


MICRO-COMPUTER BASED
2-CH DIGITAL INDICATING CONTROLLER/DATA LOGGER

LCD-13A

INSTRUCTION MANUAL



Shinko

Preface

Thank you for the purchase of our 2-CH Digital Indicating Controller/Data Logger LCD-13A. This manual contains instructions for the mounting, functions, operations and notes when operating the LCD-13A. To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

Notes

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- Specifications of the LCD-13A and the contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed within a control panel. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO., LTD. is not liable for any damages or secondary damages incurred as a result of using this product, including any indirect damages.

SAFETY PRECAUTIONS (Be sure to read these precautions before using our products.)

The safety precautions are classified into categories: "Warning" and "Caution".

Depending on circumstances, procedures indicated by  Caution may be linked to serious results, so be sure to follow the directions for usage.



Warning

Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.



Caution

Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.



Warning

- To prevent an electric shock or fire, only Shinko or qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to instrument, parts replacement may only be undertaken by Shinko or qualified service personnel.



SAFETY PRECAUTIONS

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after consulting purpose of use with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protection equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

Caution with respect to Export Trade Control Ordinance

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument.

In the case of resale, ensure that this instrument is not illegally exported.

1. Installation precautions

Caution

This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- Few mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change rapidly
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

Note: Although the case of this instrument is made of flame-resistant resin, do not install this instrument near flammable material.

Avoid setting this instrument directly on flammable material.

2. Wiring precautions

Caution

- Use the solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the LCD-13A.
- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw (M3).
- Tighten the terminal screw within the specified torque. If excessive force is applied to the screw when tightening, the screw (M3) or case may be damaged.
- Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor, as the input circuit may be burnt out.
- This controller has no built-in power switch or fuse. It is necessary to install them near the controller.

(Recommended fuse: Time-lag fuse, Rated voltage 250V AC, Rated current 2A)

3. Running and maintenance precautions

Caution

- It is recommended to perform PID auto-tuning during trial run.
- Do not touch live terminals. This may cause electric shock or problems in operation.
- Turn the power supply to the LCD-13A OFF before retightening the terminal. Working or touching the terminal with the power switched ON may result in severe injury or death due to Electric Shock.
- Be sure to turn the power to the LCD-13A OFF before cleaning.
- Wipe the instrument using a soft dry cloth. (Alcohol based substances may tarnish or deface the unit.)
- As the display section is vulnerable, do not strike or scratch it with a hard object.

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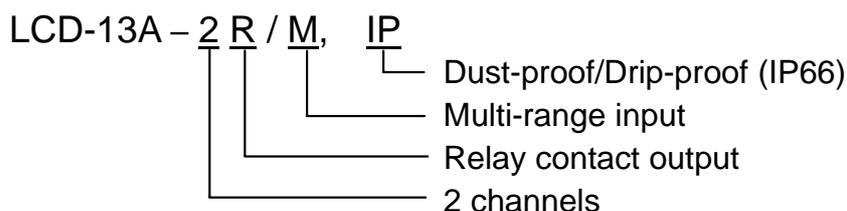
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1. Model

1.1 Model

Alphanumeric characters to represent the functions or type are entered where underlined.
[Example]



Standard specifications

| | | |
|----------------------|---|--|
| LCD-13A-2□/□ | | Series name: LCD-13A: W96 x H96 x D100mm |
| Alarm 1 (A1) | A | Alarm 1 (A1), Alarm 2 (A2) (*1) |
| Control output (OUT) | R | Relay contact |
| | S | Non-contact voltage (For SSR drive) |
| | A | DC current |
| Input | M | Multi-range (*2) |

(*1) 9 types of alarm and no alarm action can be selected by front keypad operation.

(*2) One input type can be selected from thermocouple (10 types), RTD (2 types), DC current (2 types) and DC voltage (4 types).

Optional specifications

| Code | Name |
|------|--|
| IP | Dust-proof/Drip-proof (IP66) |
| TC | Electrical shock protection terminal cover |
| P24 | Insulated power output |

1.2 Rated scale

(Table 1.2-1)

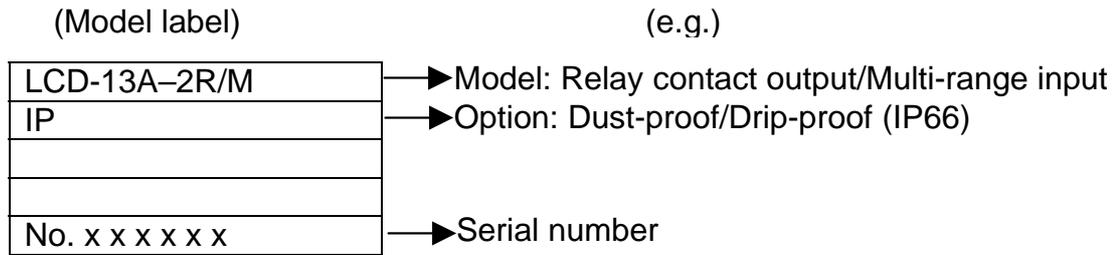
| Input type | | Input range | | Resolution |
|--------------------------|--------------|----------------------|--------------------|------------|
| Thermo-couple | K | -200 to 1370 °C | -320 to 2500 °F | 1°C(°F) |
| | | -199.9 to 400.0 °C | -199.9 to 750.0 °F | 0.1°C(°F) |
| | J | -200 to 1000 °C | -320 to 1800 °F | 1°C(°F) |
| | R | 0 to 1760 °C | 0 to 3200 °F | 1°C(°F) |
| | S | 0 to 1760 °C | 0 to 3200 °F | 1°C(°F) |
| | B | 0 to 1820 °C | 0 to 3300 °F | 1°C(°F) |
| | E | -200 to 800 °C | -320 to 1500 °F | 1°C(°F) |
| | T | -199.9 to 400.0 °C | -199.9 to 750.0 °F | 0.1°C(°F) |
| | N | -200 to 1300 °C | -320 to 2300 °F | 1°C(°F) |
| | PL-II | 0 to 1390 °C | 0 to 2500 °F | 1°C(°F) |
| C (W/Re5-26) | 0 to 2315 °C | 0 to 4200 °F | 1°C(°F) | |
| RTD | Pt100 | -199.9 to 850.0 °C | -199.9 to 999.9 °F | 0.1°C(°F) |
| | | -200 to 850 °C | -300 to 1500 °F | 1°C(°F) |
| | JPt100 | -199.9 to 500.0 °C | -199.9 to 900.0 °F | 0.1°C(°F) |
| | | -200 to 500 °C | -300 to 900 °F | 1°C(°F) |
| DC current DC voltage | 4 to 20mA DC | -1999 to 9999 *1, *2 | | 1 |
| | 0 to 20mA DC | -1999 to 9999 *1, *2 | | 1 |
| | 0 to 1V DC | -1999 to 9999 *1 | | 1 |
| | 0 to 10V DC | -1999 to 9999 *1 | | 1 |
| | 1 to 5V DC | -1999 to 9999 *1 | | 1 |
| | 0 to 5V DC | -1999 to 9999 *1 | | 1 |

*1: For DC current and voltage input, scaling and decimal point place change are possible.

*2: For DC current input, 50Ω shunt resistor (sold separately) must be installed between input terminals.

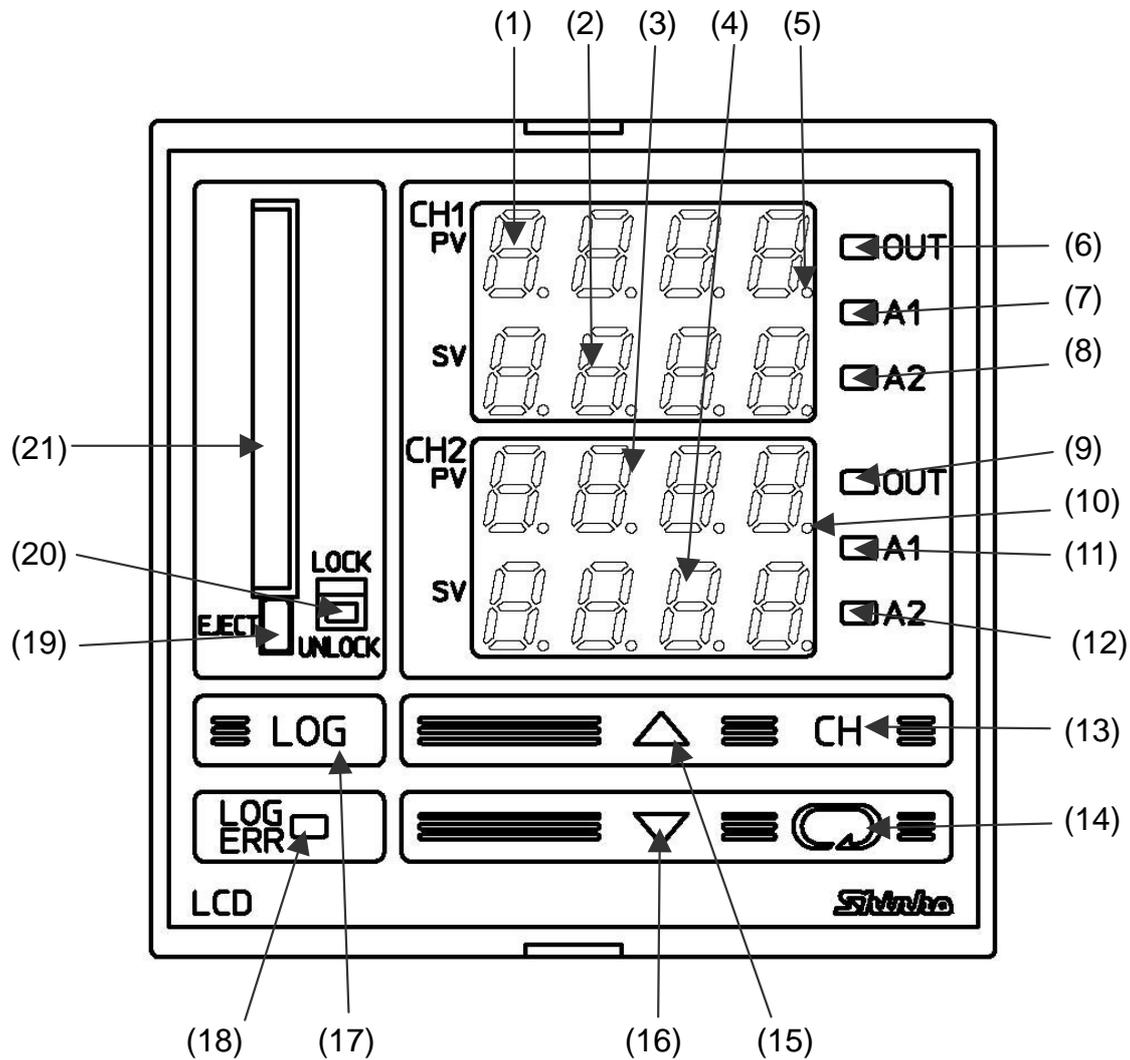
1.3 How to read the model name label

Model labels are attached to the case and inner assembly.



(Fig. 1.3-1)

2 Name and functions of the sections



(Fig. 2-1)

- (1) CH1 PV display : Indicates CH1 PV (Process variable) with a red LED.
- (2) CH1 SV display : Indicates CH1 SV (Set value) with a green LED.
- (3) CH2 PV display : Indicates CH2 PV (Process variable) with a red LED.
- (4) CH2 SV display : Indicates CH2 SV (Set value) with a green LED.
- (5) CH1 AT indicator : While CH1 AT (auto-tuning) or auto-reset is performing, the 1st point from the right on the CH1 PV display flashes.

- (6) CH1 OUT indicator : A green LED lights when CH1 control output is on.
(For DC current output, this is constantly lit)
- (7) CH1 A1 indicator : A red LED lights when CH1 Alarm 1 output is on.
- (8) CH1 A2 indicator : A red LED lights when CH1 Alarm 2 output is on.
- (9) CH2 OUT indicator : A green LED lights when CH2 control output is on.
(For DC current output, it is constantly lit)
- (10) CH2 AT indicator : While CH2 AT (auto-tuning) or auto-reset is performing, the 1st point from the right on the CH2 PV display flashes.
- (11) CH2 A1 indicator : A red LED lights when CH2 Alarm 1 output is on.
- (12) CH2 A2 indicator : A red LED lights when CH2 Alarm 2 output is on.
- (13) Channel key (CH) : During the setting mode, CH1 is switched to CH2 and vice versa with this key.
- (14) Mode key () : Switches the setting mode or registers the set value.
To register the set (selected) value, press this key.
- (15) Increase key () : Increases the numeric value.
- (16) Decrease key () : Decreases the numeric value.
- (17) LOG key : Starts or stops the data logging.
Data logging does not start if the items in the Data logging condition setting mode is not set. Data logging stops by pressing this key for 1 second or more.
- (18) LOG ERR indicator : A red LED lights if errors occur during data logging, when CF card is defective, if the Logging key is pressed without setting time, or while LCD-13A battery runs down.
- (19) CF card eject : By pressing this button, the CF card can be taken out.
Do not pull out the CF card while accessing the card (The LOG indicator flashes). The CF card may break.
 Make sure to note that the CF card does not fall from the LCD-13A due to this button being pressed too hard.
- (20) Safety lock switch with LOG indicator:
Switch for preventing the CF card from being taken out during logging.
Lights during logging.
Flashes while accessing the CF card.
- (21) CF card insertion slot: Slot to insert the CF card.



Notice

- **When setting the specifications and functions of this instrument, connect terminals 2 and 3 for power source first, then set them referring to “5. Setup” before performing “3. Mounting to the control panel” and “4. Wiring”.**
(Be sure to perform input specification change at this time.)
- **Make sure not to press the card ejection button too hard, as this may cause the CF card to fall to the ground.**

3. Mounting to the control panel

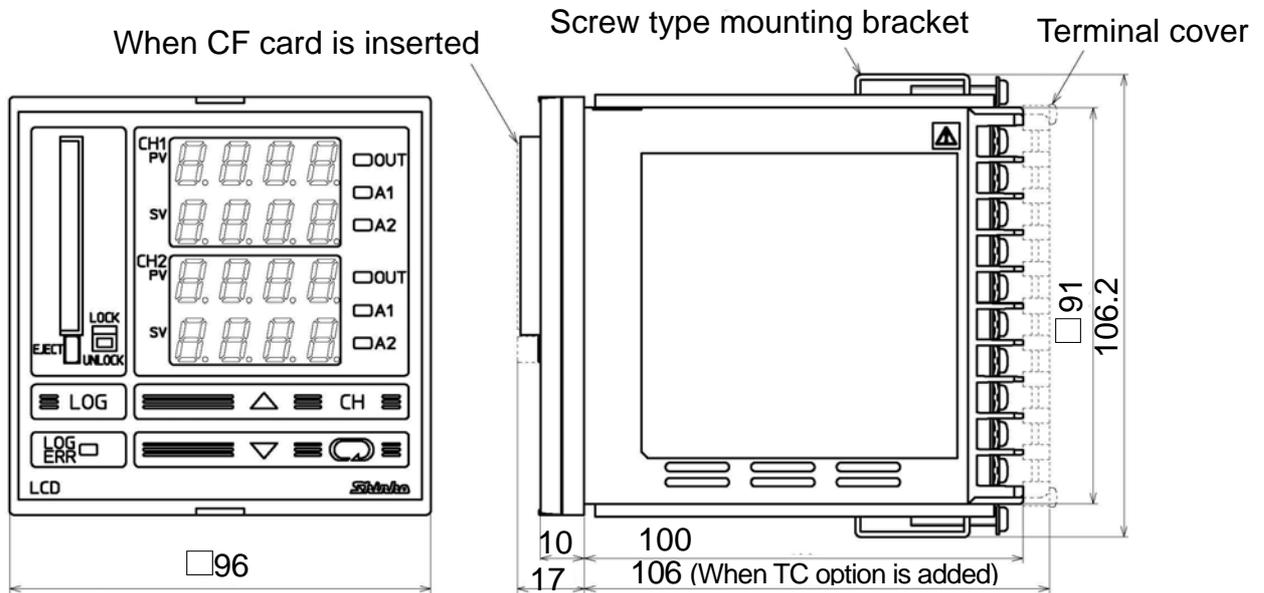
3.1 Site selection

This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

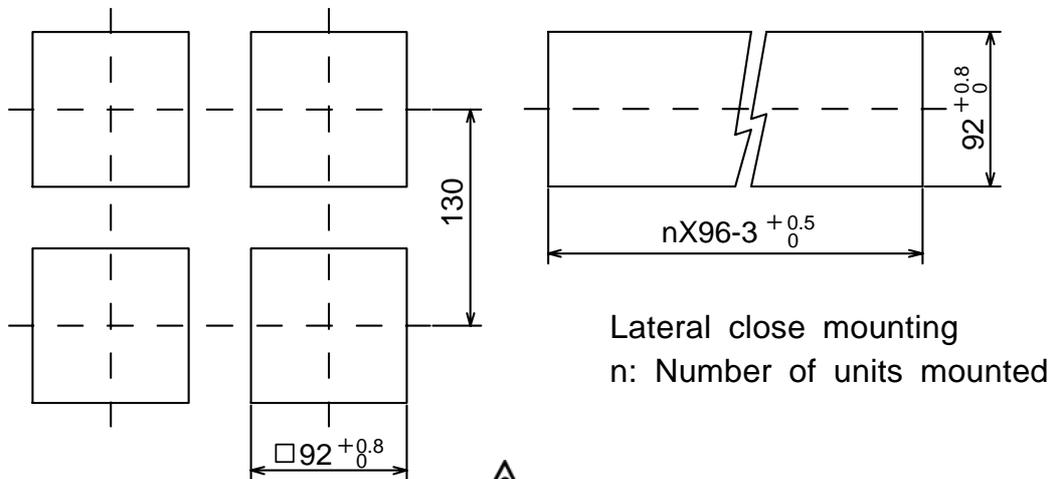
- (1) A minimum of dust, and an absence of corrosive gases
- (2) No flammable, explosive gases
- (3) No mechanical vibrations or shocks
- (4) No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change suddenly
- (5) An ambient non-condensing humidity of 35 to 85%RH
- (6) No large capacity electromagnetic switches or cables through which large current is flowing
- (7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the controller

3.2 External dimensions (unit: mm)



(Fig. 3.2-1)

3.3 Panel cutout (unit: mm)



(Fig. 3.3-1)

! If the IP option is applied, take the space for opening the waterproof cover into consideration.

3.4 Mounting



Notice

As the case is made of resin, do not use excessive force while screwing in the mounting bracket, or the case or screw type mounting bracket could be damaged. The torque is approximately 0.12N•m.

Mounting panel thickness is 1 to 15mm.

Insert the LCD-13A from the front of the control panel.

For the IP option, fitting the water-proof cover to the control panel cutout, mount it between the panel and the face of the LCD-13A.

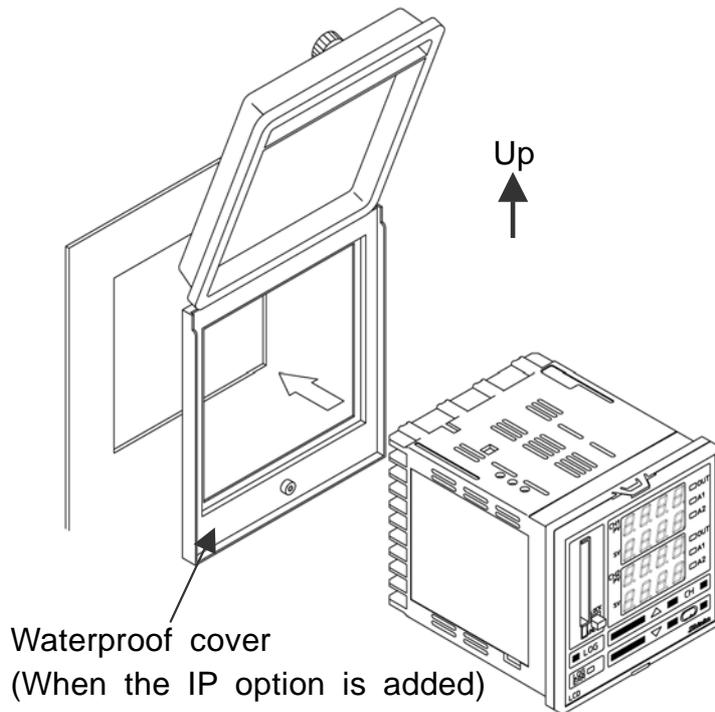
Waterproof cover

Cover : Polycarbonate 94V-2

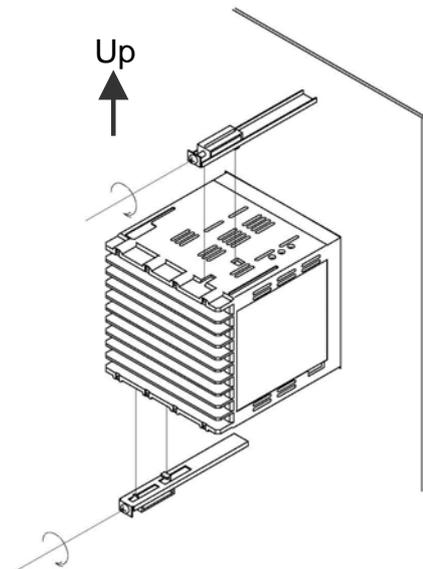
Packing : Chloroprene rubber

Panel : SUS304

Slot the mounting bracket to the holes at the top and bottom of the case, and screw in place.



(Fig. 3.4-1)



(Fig. 3.4-2)

4. Wiring



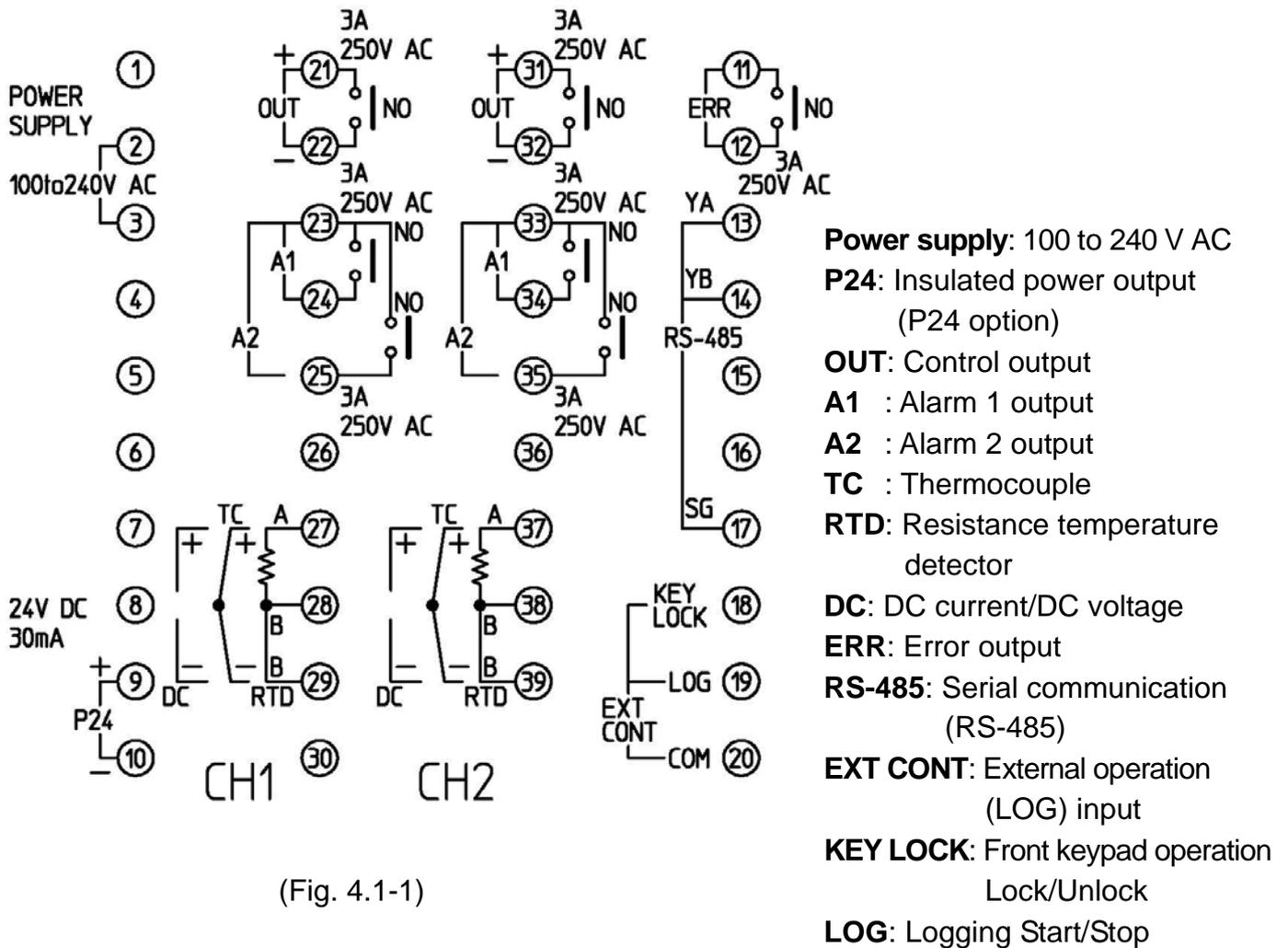
Warning

Turn the power supply to the instrument off before wiring or checking.

Working or touching the terminal with the power switched on may result in severe injury or death due to Electric Shock.

Moreover, the instrument must be grounded before the power supply to the instrument is turned on.

4.1 Terminal arrangement



(Fig. 4.1-1)



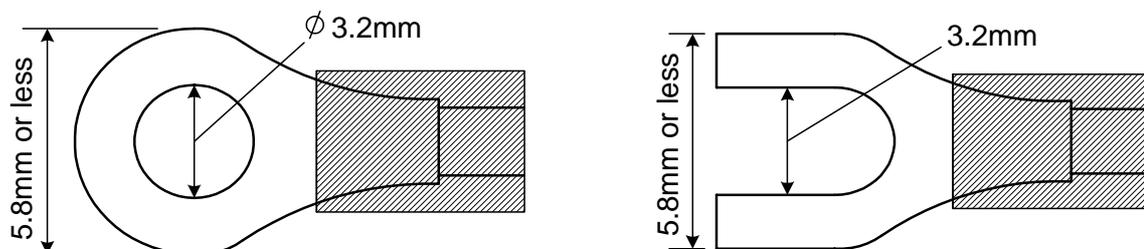
Notice

- The terminal block of the LCD-13A is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.

● Solderless terminal

Use a solderless terminal with an insulation sleeve in which the M3 screw fits as shown below.

| Solderless terminal | Manufacturer | Model | Tightening torque |
|---------------------|--|------------|-------------------|
| Y type | Nichifu Terminal Industries CO.,LTD. | 1.25Y-3 | 0.6N•m |
| | Japan Solderless Terminal MFG CO.,LTD. | VD1.25-B3A | |
| Round type | Nichifu Terminal Industries CO.,LTD. | 1.25-3 | Max. 1.0N•m |
| | Japan Solderless Terminal MFG CO.,LTD. | V1.25-3 | |



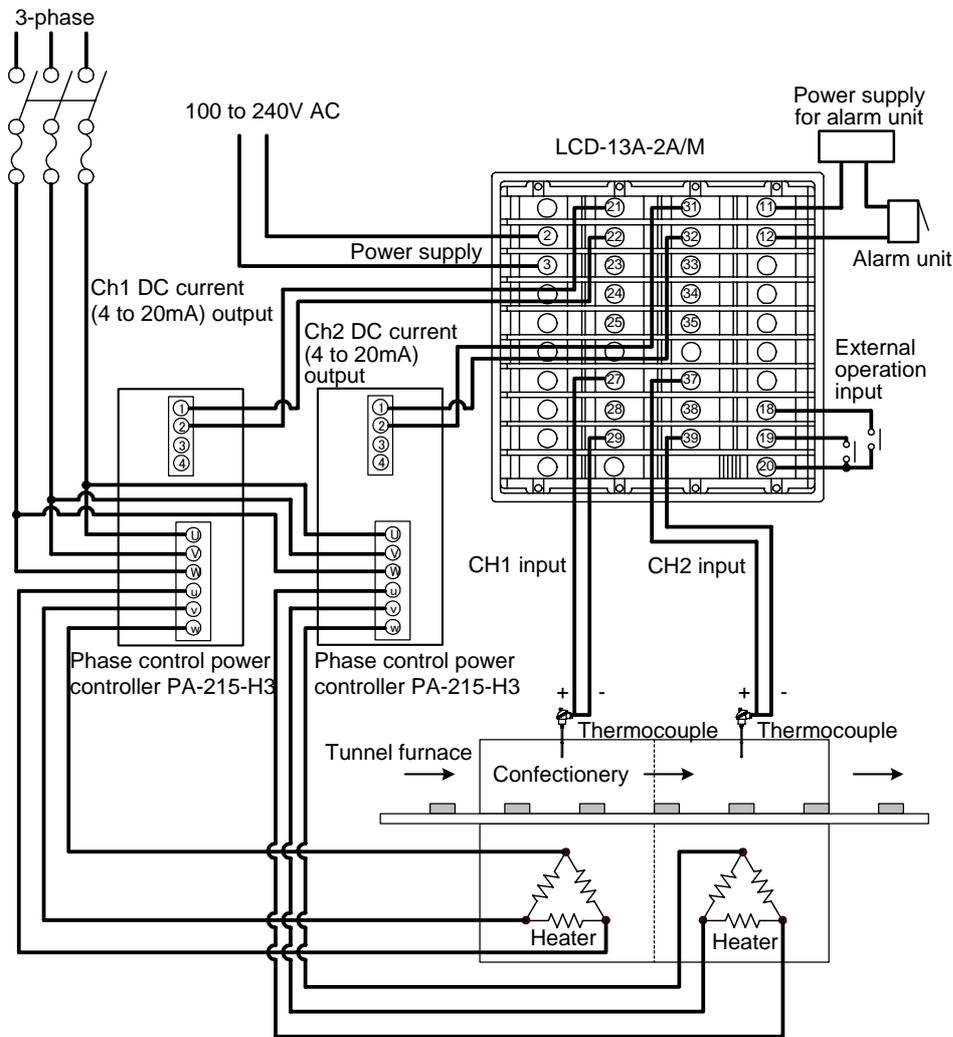
(Fig. 4.1-2)

4.2 Wiring examples

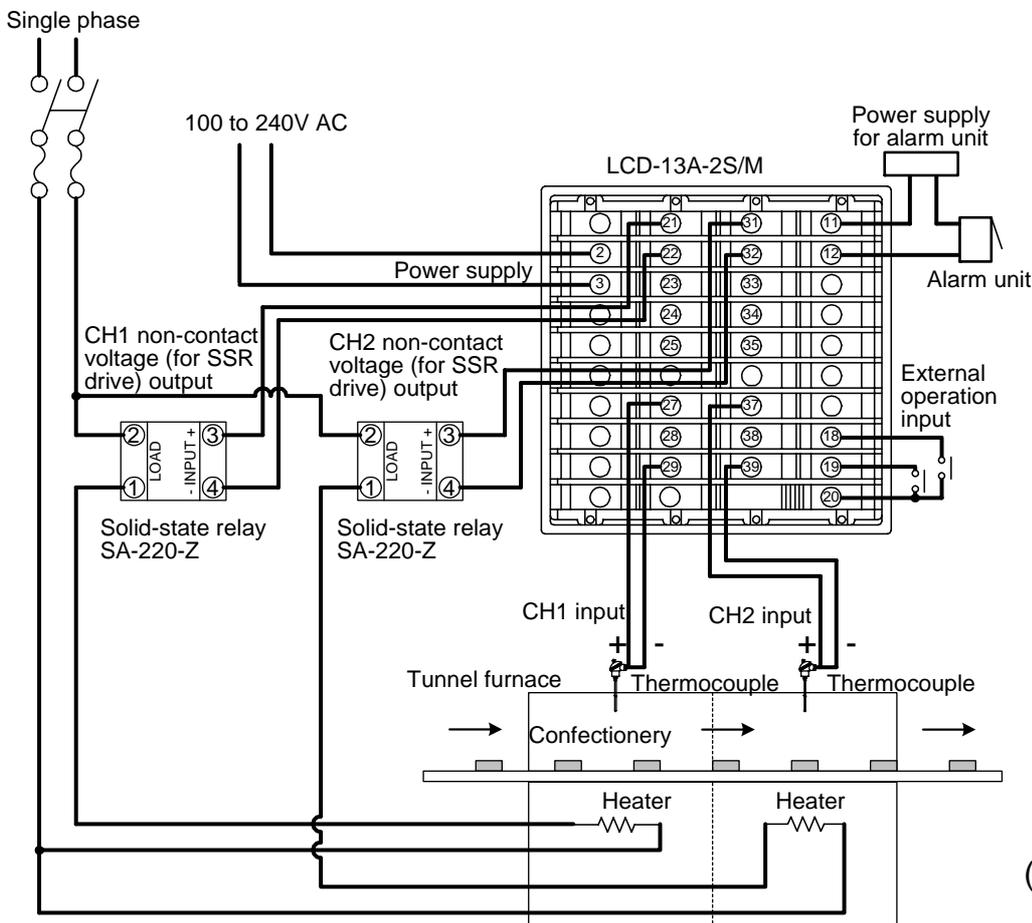


Caution

- Use a thermocouple, compensating lead wire and 3-wire system RTD in accordance with the sensor input specifications of this controller.
- This controller has neither a built-in power switch, circuit breaker nor a fuse. Therefore, it is necessary to install them in the circuit near the external controller. (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- With the relay contact output type, externally use an auxiliary electromagnetic switch according to the capacity of the load to protect the built-in relay contact. To prevent the unit from harmful effects of unexpected high level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.
- When wiring, keep input wire (thermocouple, RTD, etc.) away from AC source and load wire to avoid external interference.
- Use a thick wire for the ground (1.25 to 2.0mm²)
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.



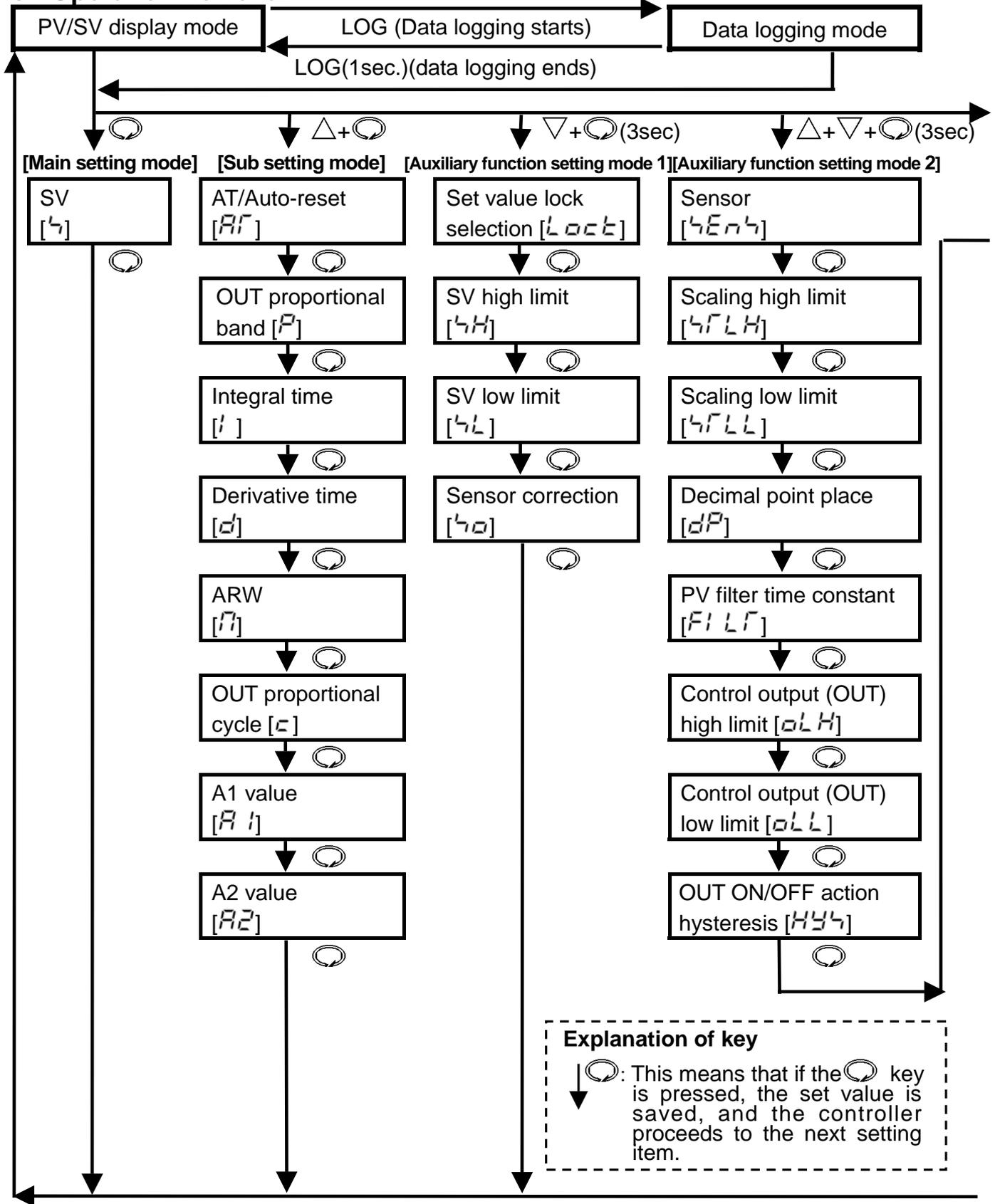
(Fig. 4.2-1)



(Fig. 4.2-2)

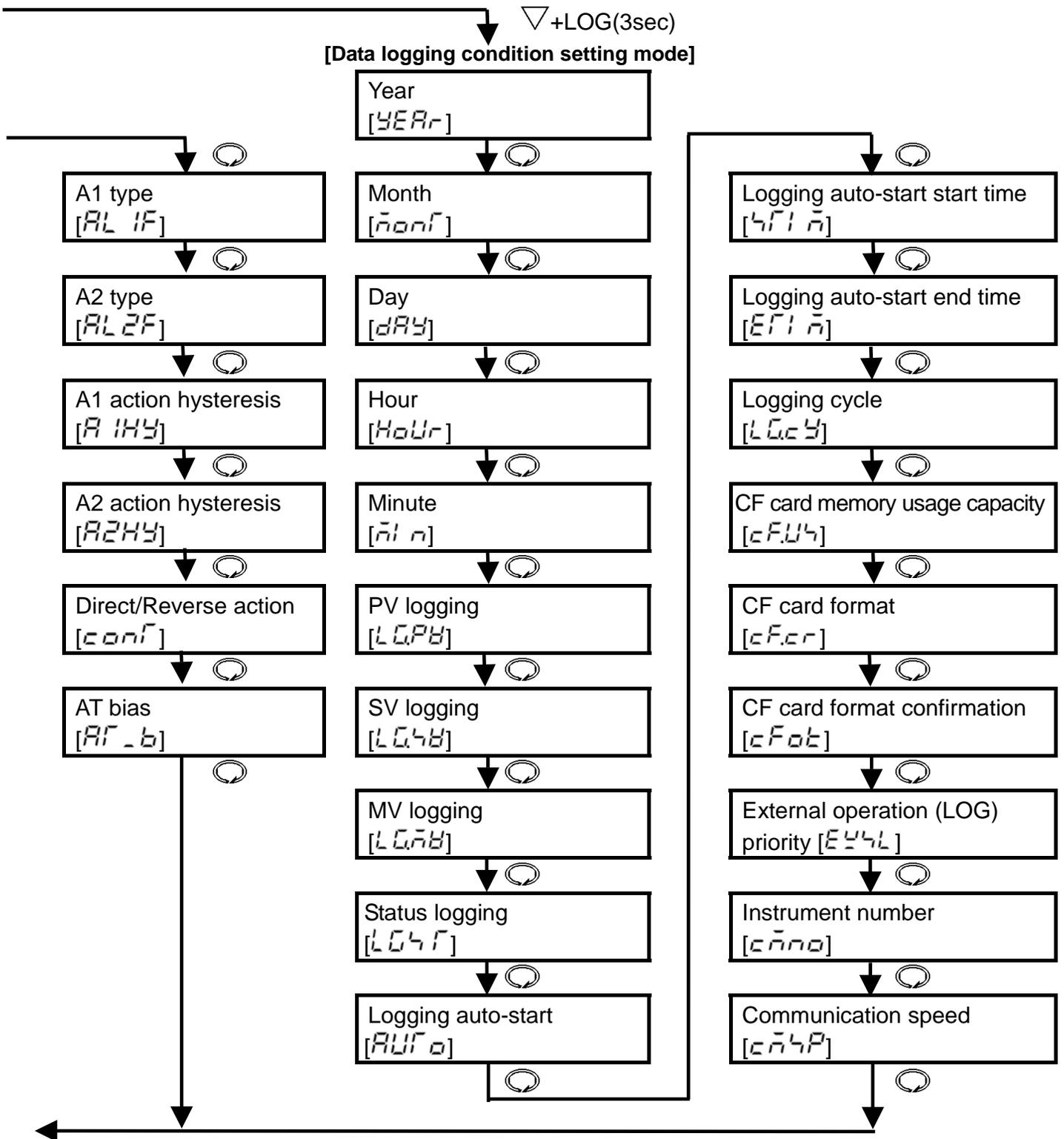
5. Setup

5.1 Operation flowchart



Explanation of key operation

- **ENTER** : Press the **ENTER** key.
- **Δ+ENTER** : Press the **ENTER** key while holding down the **Δ** key.
- **∇+ENTER (3sec)** : Press the **ENTER** key for approx. 3 seconds while holding down the **∇** key.
- **Δ+∇+ENTER (3sec)** : Press the **ENTER** key for approx. 3 seconds while holding down the **Δ** and **∇** keys.
- **∇+LOG (3sec)** : Press the **LOG** key for approx. 3 seconds while holding down the **∇** key.



Setting modes

- During the setting mode, data logging cannot be started with the LOG key. However, data logging can be terminated with the LOG key (by pressing for approx. 1 second).
- During any setting modes except main setting mode, the controller reverts to the PV/SV display mode by pressing the  key for approx. 3 seconds.
- If the CH key is pressed during the setting mode, the channel can be changed.

5.2 Setup (in Auxiliary function setting mode 2)

Before using this controller, it is necessary to set up the Sensor type, Alarm type, Control action, etc. according to the users' conditions.

If the users' specification is the same as the default value of the LCD-13A, it is not necessary to set up the controller. Proceed to Section "5.3 Data logging condition setting" (p.21)

Set up the controller after connecting terminals 2 and 3 for the power supply to this instrument, referring to "4. Wiring" (p.11).

Setup is conducted in Auxiliary function setting mode 2.

The setting items and default values in Auxiliary function setting mode 2 are shown below (Table 5.2-1).

(Table 5.2-1)

| | PV display | Setting/Selection item | Default value |
|------|------------|---|----------------------------------|
| (1) | 4E n 4 | Sensor Selects a sensor type and unit °C/°F. | Thermocouple K -200 to 1370°C |
| (2) | 4FLH | Scaling high limit Sets the scaling high limit value. | 9999 |
| (3) | 4FL L | Scaling low limit Sets the scaling low limit value. | -1999 |
| (4) | dP | Decimal point place Selects a decimal point place. | No decimal point |
| (5) | FILF | PV filter time constant Sets the PV filter time constant. | 0.0 seconds |
| (6) | oLH | Control output (OUT) high limit Sets control output high limit. | 100% |
| (7) | oL L | Control output (OUT) low limit Sets control output low limit. | 0% |
| (8) | HYY | OUT ON/OFF action hysteresis Sets control output ON/OFF action hysteresis. | 1.0°C |
| (9) | AL 1F | Alarm 1 (A1) type Selects Alarm 1 (A1) type. | No alarm action |
| (10) | AL 2F | Alarm 2 (A2) type Selects Alarm 2 (A2) type. | No alarm action |
| (11) | A1HY | Alarm 1 (A1) hysteresis Sets Alarm 1 (A1) hysteresis. | 1.0°C |
| (12) | A2HY | Alarm 2 (A2) hysteresis Sets Alarm 2 (A2) hysteresis. | 1.0°C |
| (13) | conF | Direct/Reverse action Selects Direct (Cooling) or Reverse (Heating) action. | Reverse (Heating) action |
| (14) | AT_b | AT bias Sets AT bias during auto-tuning. | 20°C |

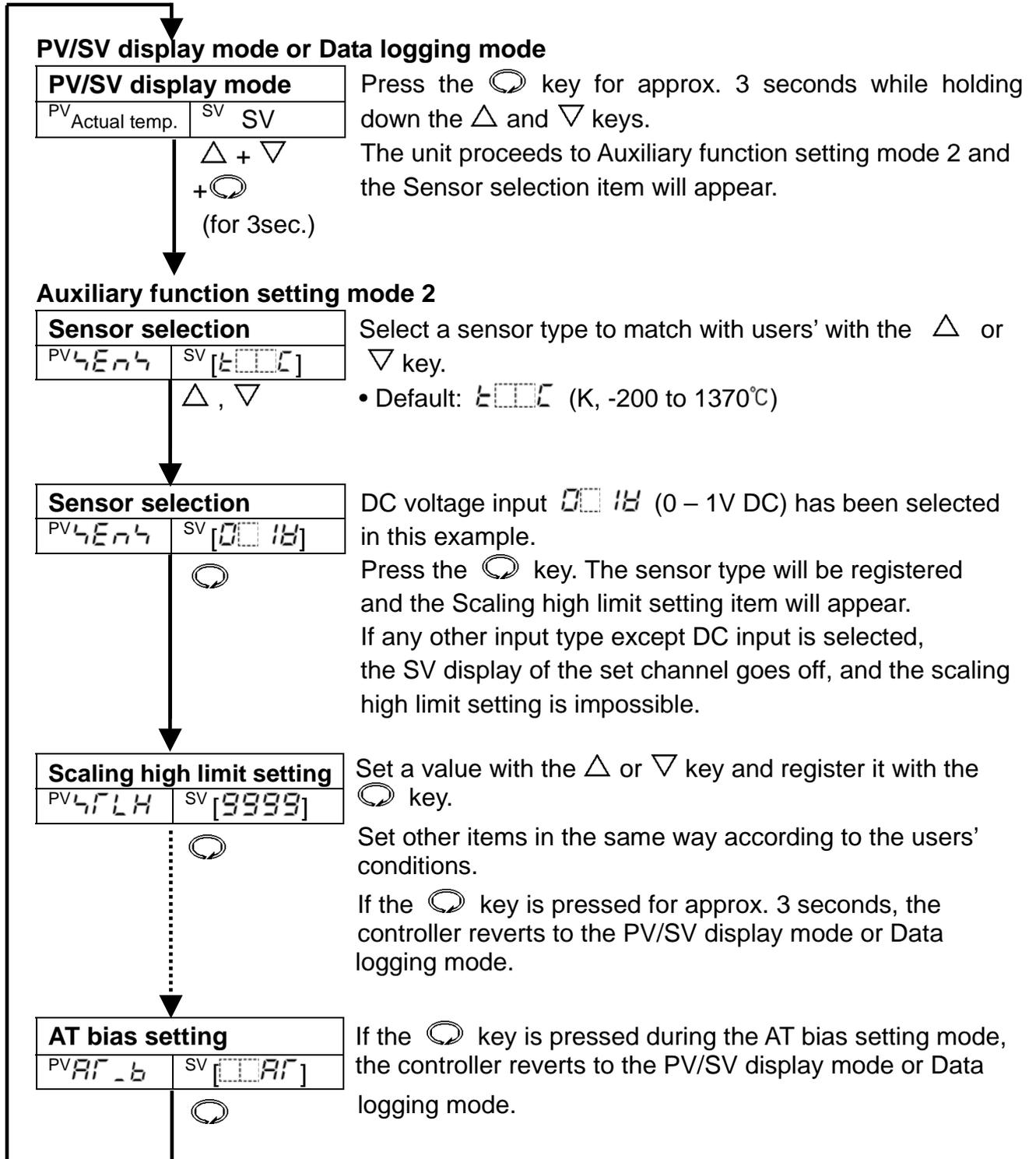
5.2.1 Basic operation for setup

The following shows how to enter Auxiliary function setting mode 2 and how to set items.

To proceed to Auxiliary function setting mode 2, press the  key for approx. 3 seconds while holding down the Δ and ∇ keys in the PV/SV display mode or in the Data logging mode.

Set or select the values with the Δ and ∇ key.

To register the values, use the  key.



5.2.2 Explanation of setting items (in Auxiliary function setting mode 2)

(1) 4E74: Sensor selection

Selects a sensor type and temperature unit.

Set the same sensor type as the users'.

- Selection item: Refer to (Table 5.2.2-1) below.

- Default value: 4000 (K, -200 to 1370°C)

(Table 5.2.2-1)

| Input type | | Scale range | Character | Scale range | Character |
|---------------|-------------|--------------------|-----------|--------------------|-----------|
| Thermo-couple | K | -200 to 1370 °C | 4000 | -320 to 2500 °F | 400F |
| | K | -199.9 to 400.0 °C | 40.F | -199.9 to 750.0 °F | 40.F |
| | J | -200 to 1000 °C | 4000 | -320 to 1800 °F | 400F |
| | R | 0 to 1760 °C | 4000 | 0 to 3200 °F | 400F |
| | S | 0 to 1760 °C | 4000 | 0 to 3200 °F | 400F |
| | B | 0 to 1820 °C | 4000 | 0 to 3300 °F | 400F |
| | E | -200 to 800 °C | 4000 | -320 to 1500 °F | 400F |
| | T | -199.9 to 400.0 °C | 40.F | -199.9 to 750.0 °F | 40.F |
| | N | -200 to 1300 °C | 4000 | -320 to 2300 °F | 400F |
| | PL-II | 0 to 1390 °C | PL20 | 0 to 2500 °F | PL2F |
| | C(W/Re5-26) | 0 to 2315 °C | 4000 | 0 to 4200 °F | 400F |
| RTD | Pt100 | -199.9 to 850.0 °C | PT.F | -199.9 to 999.9 °F | PT.F |
| | | -200 to 850 °C | PT00 | -300 to 1500 °F | PT0F |
| | JPt100 | -199.9 to 500.0 °C | JPT.F | -199.9 to 900.0 °F | JPT.F |
| | | -200 to 500 °C | JPT0 | -300 to 900 °F | JPTF |
| DC current | 4 to 20mA | -1999 to 9999 | | 420A | |
| | 0 to 20mA | -1999 to 9999 | | 020A | |
| DC voltage | 0 to 1V | -1999 to 9999 | | 00.1V | |
| | 0 to 5V | -1999 to 9999 | | 00.5V | |
| | 1 to 5V | -1999 to 9999 | | 10.5V | |
| | 0 to 10V | -1999 to 9999 | | 010V | |

(2) 4FLH Scaling high limit setting

- Setting range: Scaling low limit value to input range high limit value

- Default value: 9999

(3) 4FL L Scaling low limit setting

- Setting range: Input range low limit value to scaling high limit value

- Default value: -1999

(4) dP000 Decimal point place selection

For DC current and voltage inputs, the decimal point can be freely set.

If any other input except DC input is selected, the SV display of the set channel goes off, and decimal point place selection is impossible.

For example, if DC voltage input 0 to 1V DC is set, 0V corresponds to -1999 and 1V corresponds to 9999. To indicate 0V as 0.0 and 1V as 100.0, Scaling high limit is 1000, Scaling low limit is 0, and select the decimal point place as "1 digit after the decimal point (00.00)".

- Selection item: No decimal point
 1 digit after the decimal point
 2 digits after the decimal point
 3 digits after the decimal point
- Default value: (No decimal point)

(5) **FILF PV filter time constant setting**

Sets the PV filter time constant.

This reduces input fluctuation caused by noise.

When the input changes in a step, set the time that reaches 63% of the step.

However, if set value is set too large, it affects control result due to delay of response.

- Setting range: 0.0 to 10.0 seconds
- Default value: 0.0 seconds

(6) **oLH Control output (OUT) high limit setting**

Sets control output high limit value.

During ON/OFF action, SV display of the set channel goes off, and this setting is impossible.

- Setting range: Control output low limit value to 105%
- Default value: 100% (Setting higher than 100% is effective to DC current output type)

(7) **oLL Control output (OUT) low limit setting**

Sets control output low limit value.

During ON/OFF action, SV display of the set channel goes off, and this setting is impossible.

- Setting range: -5% to control output high limit value
- Default value: 0% (Setting less than 0% is effective to DC current output type)

(8) **H44 OUT ON/OFF action hysteresis setting**

Sets control output ON/OFF action hysteresis.

During PID, PI, PD and P action, SV display of the set channel goes off, and this setting is impossible.

- Setting range: 0.1 to 100.0°C (°F)
For DC input, 1 to 1000 (The placement of the decimal point follows the selection.)
- Default value: 1.0°C

(9) **AL1F Alarm 1 (A1) type selection**

Select Alarm 1 (A1) type, referring to “7.4 Alarm 1 (A1), Alarm 2 (A2) action” (p. 39).

- Selection item: - - - - No alarm action
H High limit alarm
L Low limit alarm
HL High and Low limits alarm
Hi High and Low limit range alarm
R4 Process High alarm
rR4 Process Low alarm
H High limit alarm with standby
L Low limit alarm with standby
HL High and Low limits alarm with standby
- Default value: - - - - No alarm action

(10) **AL2F Alarm 2 (A2) type selection**

Select Alarm 2 (A2) type, referring to “7.4 Alarm 1 (A1), Alarm 2 (A2) action” (p 39).

The selection item and default value are the same as those of Alarm 1 (A1) type selection.

(11) *A1HY* **Alarm 1 (A1) hysteresis setting**

Sets Alarm 1 (A1) hysteresis.

If No alarm action is selected during Alarm 1 (A1) type selection, SV display of the set channel goes off, and this setting is impossible.

- Setting range: 0.1 to 100.0°C (°F)

For DC input, 1 to 1000 (The placement of the decimal point follows the selection.)

- Default value: 1.0°C

(12) *A2HY* **Alarm 2 (A2) hysteresis setting**

Sets Alarm 2 (A2) hysteresis.

If No alarm action is selected during Alarm 2 (A2) type selection, SV display of the set channel goes off, and this setting is impossible.

The setting range and default value are the same as those of Alarm 1 (A1) hysteresis setting.

(13) *CONF* **Direct/Reverse action selection**

Selects the Direct (Cooling) or Reverse (Heating) action.

Direct action

When PV (process variable) is higher than SV (main set value), the control output is turned ON. This is a direct action.

This is used for cooling control for devices such as refrigerators.

Reverse action

When PV (process variable) is lower than SV (Main set value), the control output is turned ON. This is a reverse action.

This is used for heating control for devices such as electric furnaces.

- Selection item: *HEAT* Reverse (Heating) action

COOL Direct (cooling) action

- Default value: *HEAT* Reverse (Heating) action

(14) *AT_b* **AT bias setting**

Set the bias value when AT (auto-tuning) is performing.

When AT (auto-tuning) is performing, AT point is automatically set by the deviation between the PV and SV.

AT point

When PV is lower than (SV-AT bias value) : SV-AT bias value

When PV is within (SV±AT bias value) : SV

When PV is higher than (SV+AT bias value): SV+AT bias value

If any other action except PID action is selected, or DC input is selected during Sensor selection, the SV display of the set channel goes off, and the AT bias setting is impossible.

- Selection item: 0 to 50°C (0 to 100°F) or 0.0 to 50.0°C (0.0 to 100.0°F)

- Default value: 20°C

5.3 Data logging condition setting

Before data logging, it is necessary to set date, time, data logging item, data logging cycle, etc.

Set the data logging condition during Data logging condition setting mode.

To enter the Data logging condition setting mode, press the LOG key for approx. 3 seconds while holding down the ∇ key in the PV/SV display mode or Data logging mode.

To increase or decrease the set (numeric) value or to select a value, use the Δ or ∇ key.

Pressing the  key registers the set value and proceeds to the next setting item.

(1) *YEAR* **Year setting**

Sets the year.

Not available during data logging.

- Setting range: 00 to 99 (2000 to 2099)
- Default value: 00 (2000)

(2) *MONTH* **Month setting**

Sets the month.

Not available during data logging.

- Setting range: 1 to 12 (January to December)
- Default value: 1 (January)

(3) *DAY* **Day setting**

Sets the day.

Do not set a non-existent day such as 31st Feb. or 31st Nov.

Data logging file name and updated date will not coincide.

Not available during data logging.

- Setting range: 1 to 31
- Default value: 1

(4) *Hour* **Hour setting**

Sets the hour.

Not available during data logging.

- Setting range: 0 to 23
- Default value: 0

(5) *MIN* **Minute setting**

Sets the minute.

Not available during data logging.

- Setting range: 0 to 59
- Default value: 0

(6) *LOG PV* **PV logging selection**

Selects PV logging.

Not available during data logging.

- Selection item: *OFF* Not effective
ON Effective
- Default value: *ON* Effective

(7) *LOG SV* **SV logging selection**

Selects SV logging.

Not available during data logging.

- Selection item: *OFF* Not effective
ON Effective
- Default value: *OFF* Not effective

(8) *LOG MV* **MV logging selection**

Selects MV logging. Not available during data logging.

- Selection item: *OFF* Not effective
ON Effective
- Default value: *OFF* Not effective

(9) **LG47 Status logging selection**

Selects status logging.

Not available during data logging.

- Selection item: 0FF Not effective
 0n Effective
- Default value: 0FF Not effective

Status value

| Item | Status (Numerals: decimal) |
|---------------|--------------------------------------|
| OUT | 0: OFF 1: ON (DC current: Not fixed) |
| A1 output | 0: OFF 4: ON |
| A2 output | 0: OFF 8: ON |
| Overscale | 0: OFF 256: ON |
| Underscale | 0: OFF 512: ON |
| AT/Auto reset | 0: OFF 2048: AT/Auto reset |

When more than 2 items are ON, the added values of those items will become the status value.

(10) **RLW 0 Logging auto-start selection**

Selects Logging auto-start depending on the logging time setting.

Not available during data logging.

- Selection item: 0FF Not effective
 0n Effective
- Default value: 0FF Not effective

(11) **471 n Logging auto-start start time setting**

Sets start time of logging auto-start.

Not available during data logging or if “Not effective” is selected during Logging auto-start selection.

- Setting range: 00:00 to 23:59 (Hour:Minute)
- Default value: 00:00

(12) **471 n Logging auto-start end time setting**

Sets end time of logging auto-start.

Not available during data logging or if “Not effective” is selected during Logging auto-start selection.

- Setting range: 00:00 to 23:59 (Hour:Minute)
- Default value: 00:00

(13) **LG4 Logging cycle selection**

Selects the data logging cycle.

Not available during data logging

- Selection item: 0001 1 second
 0002 2 seconds
 0005 5 seconds
 0010 10 seconds
 0015 15 seconds
 0020 20 seconds
 0030 30 seconds
 0100 1 minute
 0200 2 minutes
 0500 5 minutes
 1000 10 minutes
 1500 15 minutes
 2000 20 minutes
 3000 30 minutes
 6000 60 minutes
- Default value: 0010 10 seconds

(14) **CF.U4 CF card memory usage capacity indication**

Used CF card memory is indicated as a percentage from 0.0 to 100.0%.

Take this into consideration when logging data.

Available only when the CF card is inserted.

(15) **CF.Fr CF card format**

Selects whether to format the CF card.

This item is indicated only when the CF card is inserted.

- Selection item: **OFF** No format

ON Format

- Default value: **OFF** No format

If “**ON** format” is selected and the  key is pressed, the unit will proceed to CF card format confirmation item.

(16) **CF.Fc CF card format confirmation**

Confirms whether to format the CF card.

- Selection item: **OFF** No format

ON Format

- Default value: **ON** Format

(17) **EXTL External operation (LOG) priority**

Selects whether priority is given to the external operation.

- Selection item: **EXT** External operation (LOG) input has priority.

KEY The LOG key operation has priority.

- Default value: **EXT** External operation (LOG) input has priority.

(18) **INNO Instrument number setting**

Sets the instrument number.

- Setting range: 0 to 95

- Default value: 0

(19) **COMM Communication speed selection**

Selects the communication speed.

- Selection item: 9600bps **96**

19200bps **192**

5.4 Main setting mode

If the  key is pressed in the PV/SV display mode or Data logging mode, main setting mode is selected.

By pressing the CH key, the set channel can be switched.

The set value (numeric value) can be increased or decreased by pressing the  or  key.

If the  key is pressed, the set value is registered and the controller will revert to the PV/SV display mode.

SV setting

- Sets the SV.

- Setting range: SV low limit to SV high limit

- Default: 0°C

5.5 Sub setting mode

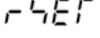
By pressing the  key while holding down the  key in the PV/SV display mode or Data logging mode, Sub setting mode can be selected.

The channel can be switched by pressing the CH key.

The  or  key increases or decreases the set value (numeric value).

By pressing the  key, the set value is registered and the next setting item is selected.

AT/Auto-reset setting

- Sets AT (Auto-tuning) Perform/Cancel or Auto-reset (offset correction) Perform.
- Auto-reset can be performed only during PD and P action.
(For PI and ON/OFF action, the SV display of the set channel goes off, and this setting is impossible)
- Setting range: - - - - AT (Auto-tuning) Cancel
 AT (Auto-tuning) Perform
 Auto-reset Perform
- Default: Auto-tuning Cancel

[AT (Auto-tuning)]

- During auto-tuning, AT indicator (the 1st point from the right on the PV display) of the set channel flashes.
- After auto-tuning ends, AT indicator (the 1st dot from the right on the PV display) is turned off and P, I, D and ARW values are automatically set.
- During auto-tuning, none of the settings can be performed.
- If AT (auto-tuning) is released during the process, P, I, D and ARW values revert to their former value.
- If AT does not finish 4 hours after starting, it is automatically cancelled.

[Auto-reset]

- If the auto-reset is performed, offset correction immediately starts [The corrected value is automatically set and AT indicator (the 1st dot from the right on the PV display) flashes] and the controller reverts to the PV/SV display mode.
- During 4 minutes of auto-reset performing, other settings cannot be performed to prevent key misoperations, and auto-reset cannot be cancelled while performing this function.
- After auto-reset ends, AT indicator (the 1st point from the right on the PV display) of the set channel is turned off, and all settings can be carried out.

OUT proportional band setting

- Sets the proportional band.
ON/OFF action when set to 0 or 0.0.
- Setting range: 0 to 1000°C (0 to 2000°F)
With a decimal point: 0.0 to 999.9°C(0.0 to 999.9°F)
DC input: 0.0 to 100.0%
- Default: 10°C

Integral time setting

- Sets the integral time.
Setting the value to 0 disables the function. (PD action)
- For ON/OFF action, the SV display of the set channel goes off, and this setting is impossible.
- Setting range: 0 to 1000 seconds
- Default: 200 seconds

Derivative time setting

- Sets the derivative time.
Setting the value to 0 disables the function. (PI action)
- For ON/OFF action, the SV display of the set channel goes off, and this setting is impossible.
- Setting range: 0 to 300 seconds
- Default: 50 seconds

| |
|---|
| <p>7.000 ARW (Anti-reset windup) setting</p> <ul style="list-style-type: none"> • Sets the anti-reset windup. • For other actions except PID action, the SV display of the set channel goes off, and this setting is impossible. • Setting range: 0 to 100% • Default: 50% |
| <p>7.001 OUT proportional cycle setting</p> <ul style="list-style-type: none"> • Sets the proportional cycle. For ON/OFF action and DC current output type, the SV display of the set channel remains off, and this setting is impossible. • For the relay contact output type, if the proportional cycle time is decreased, the frequency of the relay action increases and the life of the relay contact is shortened. • Setting range: 1 to 120 seconds • Default: 30 seconds for Relay contact output type, 3 seconds for Non-contact voltage output type |
| <p>7.002 Alarm 1 (A1) value setting</p> <ul style="list-style-type: none"> • Sets the action point of A1 output. Setting the value to 0 or 0.0 disables the function. (Excluding process high alarm and process low alarm) • When No alarm action is selected during A1 type selection, the SV display of the set channel goes off, and this setting is impossible. • Setting range: Refer to (Table 5.5-1) below. • Default: 0°C |
| <p>7.003 Alarm 2 (A2) value setting</p> <ul style="list-style-type: none"> • Sets the action point of A2 output. Setting the value to 0 or 0.0 disables the function. (Excluding process high alarm and process low alarm) • When No alarm action is selected during A2 type selection, the SV display of the set channel goes off, and this setting is impossible. • Setting range and default value are the same as those of Alarm 1 (A1) value setting. |

[A1, A2 setting range]

(Table 5.5-1)

| Alarm type | Setting range |
|------------------------------------|---|
| High limit alarm | -Input span to Input span *1 |
| Low limit alarm | -Input span to Input span *1 |
| High/Low limits alarm | 0 to Input span *1 |
| High/Low limit range alarm | 0 to Input span *1 |
| Process high alarm | Input range low limit to Input range high limit*2 |
| Process low alarm | Input range low limit to Input range high limit*2 |
| High limit alarm with standby | -Input span to Input span *1 |
| Low limit alarm with standby | -Input span to Input span *1 |
| High/Low limits alarm with standby | 0 to Input span *1 |

- When the input has a decimal point, the negative minimum value is -199.9, and the positive maximum value is 999.9.

*1: For DC input, the Input span is the same as the scaling span.

*2: For DC input, Input range low (or high) limit value is the same as the scaling low (or high) limit value.

5.6 Auxiliary function setting mode 1

In the PV/SV display mode or Data logging mode, if the  key is pressed for approx. 3 seconds while holding down the  key, Auxiliary function setting mode 1 can be selected.

Pressing the CH key switches the channel to be set.

The set value (numeric) can be increased or decreased by pressing the  or  key. If the  key is pressed, the set value is registered, and the unit will proceed to the next setting item.

Lock Set value lock selection

- Mode to lock the set value to prevent setting errors
The setting item to be locked depends on the selection.
- When selecting Lock, select Lock 1 or Lock 2 after setting the required items in the status Unlock.
- Selection item:
 - - - - (Unlock): All set values can be changed.
 - Loc 1* (Lock 1): Only Data logging condition setting mode can be changed.
 - Loc 2* (Lock 2): Data logging condition setting mode and main setting mode can be changed. Other settings cannot be changed.
- Default: - - - - (Unlock)

SV high limit setting

- Sets SV high limit.
- Setting range: SV low limit to input range high limit value
For DC input, SV low limit to scaling high limit value
(The placement of the decimal point follows the selection.)
- Default: Input range high limit value or scaling high limit value

SV low limit setting

- Sets SV low limit.
- Setting range: Input range low limit value to SV high limit value
For DC input: Scaling low limit value to SV high limit
(The placement of the decimal point follows the selection.)
- Default: Input range low limit value or scaling low limit value

Sensor correction setting

- Sets the sensor correction value.

Sensor correction function

When a sensor cannot be set at a location where control is desired, the sensor measuring temperature may deviate from the temperature in the controller location. When controlling with plural controllers, the accuracy of sensors affects the control. Therefore, sometimes the measured temperature (input value) does not concur with the same set value. In such a case, the control can be set at the desired temperature by adjusting the input value of sensors.

(However, sensor correction setting is effective within the input rating range regardless of the sensor correction value)

- Setting range: -100.0 to 100.0°C(°F)
For DC input: -1000 to 1000
(The placement of the decimal point follows the selection.)
- Default: 0.0°C

6. Operation

[Before running]

Before running the controller, check the mounting and wiring carefully, referring to “3. Mounting to the control panel” (p.9) and “4. Wiring” (p.11).

Check that settings are applicable for the users’ conditions, referring to “5.2 Setup” (p.16) and “5.3 Data logging condition setting” (p.21).

6.1 Input set values and run the LCD-13A.

(1) Turn the power supply to the LCD-13A ON.

Turn the power supply to the LCD-13A ON.

After the power to the controller is turned on, CH1 PV display indicates “L E -” for approx. 4 seconds.

During this time, all outputs and LED indicators are in OFF status.

After that, the PV display indicates sensor input value and the SV display indicates the SV, and control starts.

(2) Input set values.

Input each set value, referring to “5. Setup” (p.14).

(3) Turn the load circuit power on.

Turn the load circuit power on.

Control action starts so as to keep the control target at the SV (main set value).

If necessary, perform Sensor correction (p.32, 33) and AT (auto-tuning) (p.33 – 36).

6.2 Preparation for data logging

CF card included

Media : Type I (Thickness 3.3mm), Maximum capacity **256MB**

Format : **FAT16**

Writing method : Writing in a new file (Opens a new file every time logging starts, and saves data in it.)

CF card memory usage: When logging all items with data logging cycle 5 seconds, 1.7 to 2.0MB of the CF card can be used every 24 hours.

Data reliability when power failure occurs during data logging

The set data of the LCD-13A is backed up in the non-volatile IC memory.

The time it takes between detecting power failure and turning the power to the LCD-13A off is approx. 260mS for 85V AC and 4 seconds for 264V AC.

For the CF card included, writing time is 200ms and closing process time is 40mS.

Thus total time is 240mS. Writing and closing of the CF card can be finished within Shinko controllers’ power failure process time. Therefore data reliability can be maintained.

If any other CF cards (commercially available) are used, the data reliability is not guaranteed.

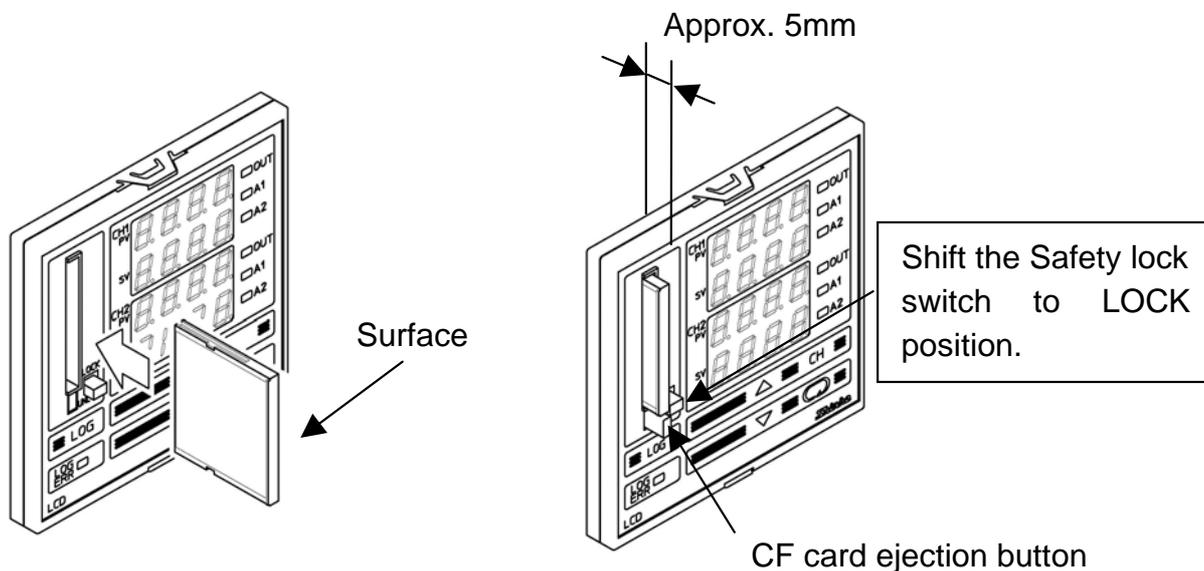
CF card insertion

(1) Insert the CF card with its surface facing the right. See (Fig. 6.2-1).

The groove width of the top and bottom of the card differ so that the CF card will be inserted correctly. However, do not insert the card forcibly in wrong direction.

After insertion, the card should protrude 5mm from the front of the instrument with the CF card ejection button also protruding. See (Fig. 6.2-2).

(2) Shift the Safety lock switch to LOCK position. See (Fig. 6.2-2).



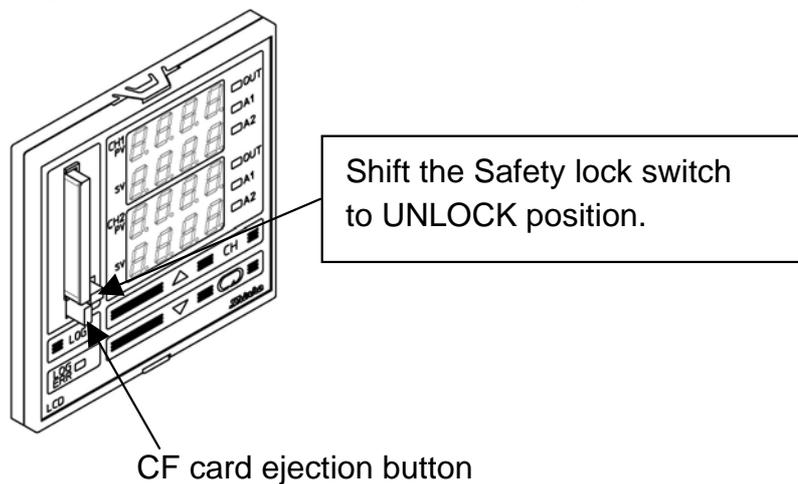
(Fig. 6.2-1)

(Fig. 6.2-2)

CF card ejection

(1) Shift the Safety lock switch to UNLOCK. See (Fig. 6.2-3).

(2) To eject the CF card, press the CF card ejection button. See (Fig. 6.2-3).



(Fig. 6.2-3)

Caution

- Make sure not to press the card ejection button too hard, as this may cause the CF card to fall to the ground.
- Be sure to pull the CF card out by pressing the CF card ejection button.
- If a defective CF card is inserted, the reset function to prevent malfunction is initiated, and the instrument reverts to the warm-up status.

6.3 How to start data logging

There are 2 ways to start data logging. One is with the LOG key, and the other is by the external operation input.

Data logging start with the LOG key

Press the LOG key.

Data logging starts on the conditions which have been set during the Data logging condition setting mode.

The LOG indicator is lit during data logging, and flashes while writing to the CF card.

Data logging start using the external operation input

Connect LOG terminals 19 and 20 (Contact Closed).

If the external operation (LOG) input is ON during auto-start, logging will continue even if the logging end time has expired.

Logging stops when external operation (LOG) input is OFF.

Even if logging is within its time, logging stops if the external operation (LOG) input is turned from ON to OFF.

Data logging starts on the conditions which have been set during the Data logging condition setting mode.

The LOG indicator is lit during data logging, and flashes while writing to the CF card.

CF card file

Every time the LCD-13A starts data logging, LCD-13A writes the data in a new file.

When logging data reaches 65,000 lines, the file is closed and a new file is opened for data writing.

The file is named as shown below.

| | | |
|-------------------|----|---|
| yymmdd_hhmmss.CSV | yy | : Lower 2 digits of the year (2003: 03) |
| | mm | : Month (January: 01) |
| | dd | : Day (the 1st : 01) |
| | hh | : Hour (8 a.m.: 08, 8 p.m.: 20) |
| | mm | : Minute |
| | ss | : Second |

For example, if data logging is started at 8:30 a.m. on January 1st, 2003, the file will be named as "030101_083000.CSV".

Limit of number of files

A maximum of 170 files can be saved in the CF card. If the number of files exceeds 170, an error message $\bar{u} \cdot \bar{E} \bar{z}$ appears on the CH1 PV display regardless of the remaining capacity in the CF card.

Power failure during data logging

If power failure occurs during data logging, data is automatically saved in the file.

After the power is restored, data logging is stopped.

However, if external operation (LOG) input terminals 19 and 20 are connected (Contact Closed), data logging automatically resumes, and writes the data in a new file.

If momentary power failure occurs while writing to the CF card, one batch of data logging might be lost.

6.4 How to stop data logging

There are 2 ways to stop data logging. One is with the LOG key, and the other is by the external operation (LOG) input.

To stop data logging with the LOG key

Press the LOG key for approx. 1 second.

The LOG indicator goes off, and data logging stops.

To stop data logging by the external operation input

Disconnect LOG terminals 19 and 20 (Contact Open).

The LOG indicator goes off, and data logging stops.

External operation (LOG) priority

If “External operation input has priority” is selected from the External operation priority item in the Data logging condition setting mode, data logging cannot be stopped by the LOG key when LOG terminals 19 and 20 are connected (p.23).

However, if LOG terminals 19 and 20 are disconnected, data logging can be started or stopped by the LOG key.

6.5 How to edit CF card data on the personal computer

To edit the CF card data on the PC, the CF card Reader/Writer is required.

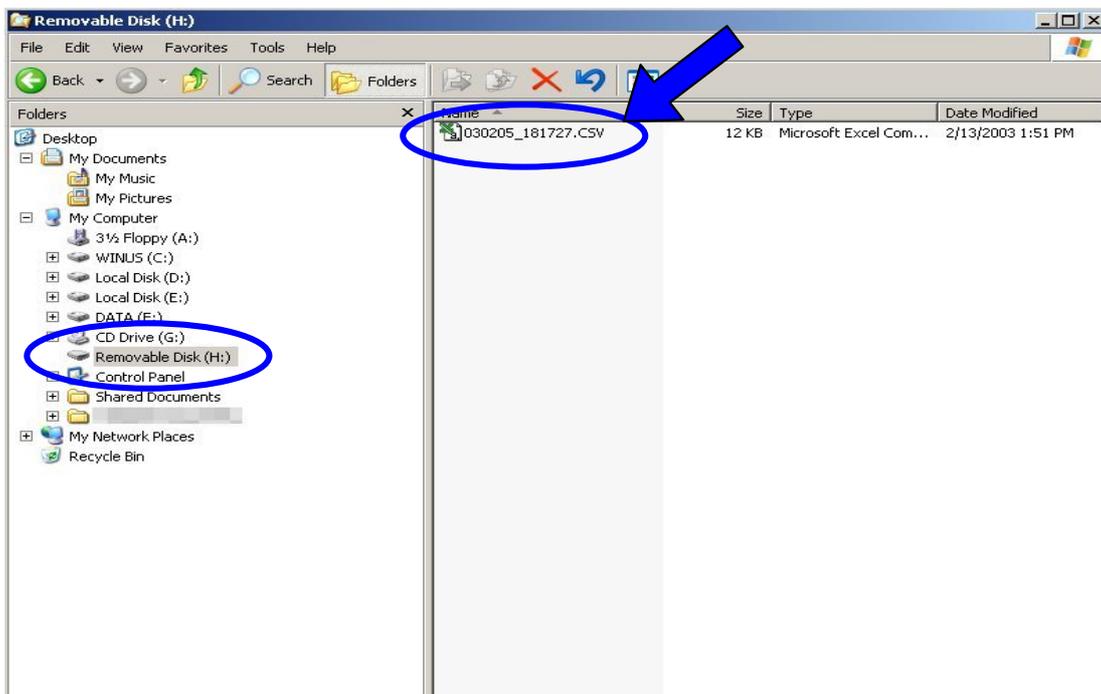
- (1) Insert the CF card into the CF card Reader/Writer.
- (2) Select the data in the CF card.

The following shows an example from Windows XP.

Select the Removable Disk and double-click on the data in the CF card.

See (Fig. 6.4-1).

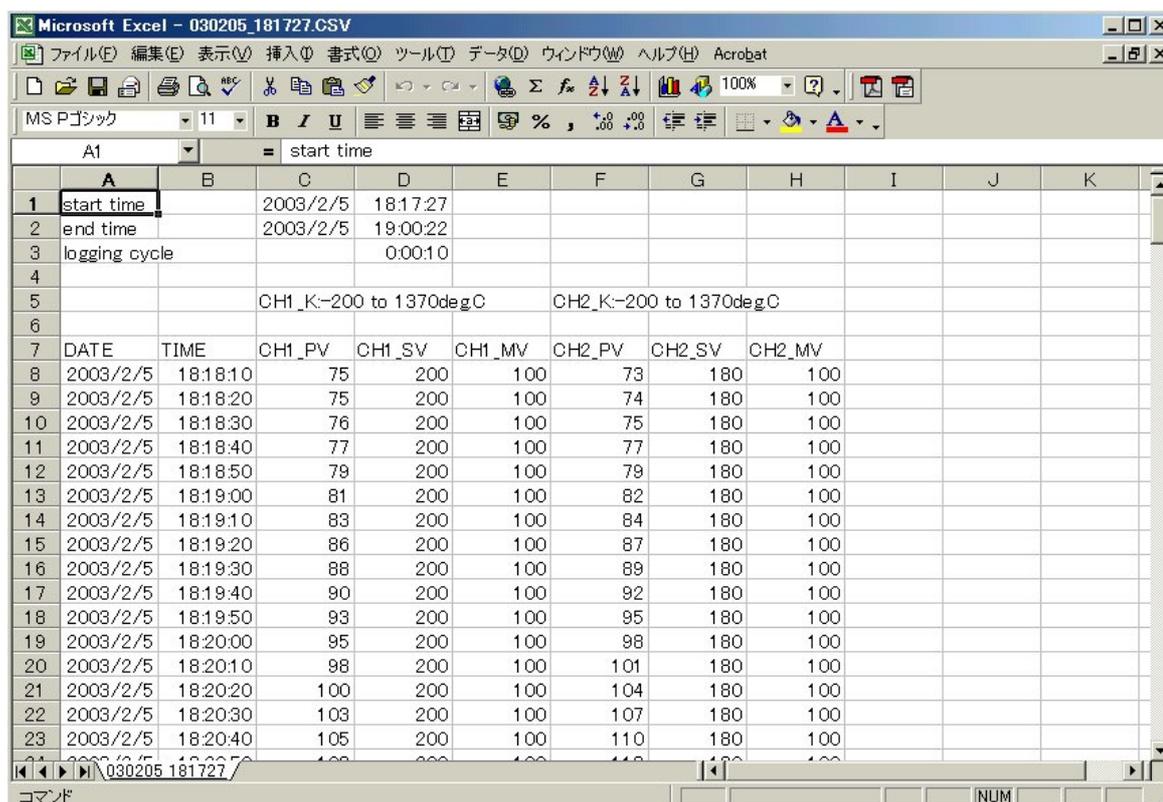
Microsoft EXCEL will start and the file will be opened.



(Fig. 6.4-1)

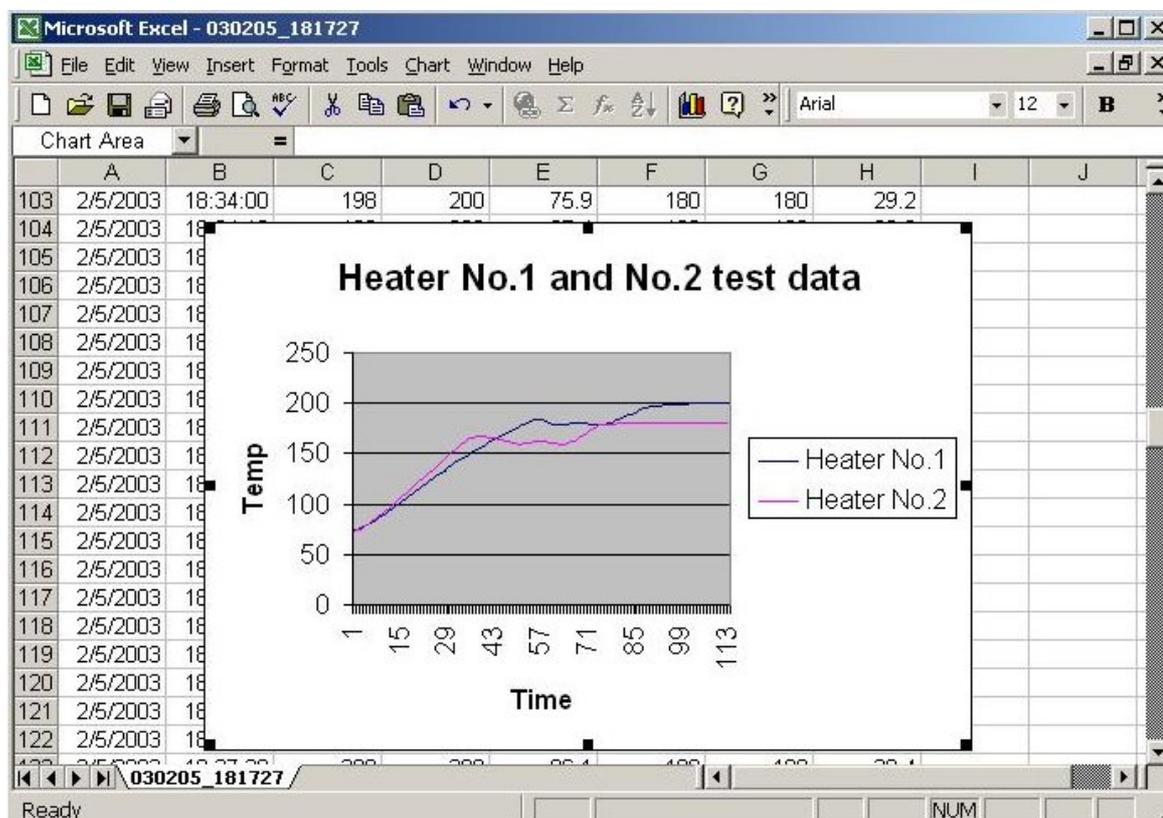
(3) Edit data in the CF card.

The logged data can be edited. See (Fig. 6.4-2) and (Fig. 6.4-3).



(Fig. 6.4-2)

The following is an example graphed on the graph wizard.



(Fig. 6.4-3)

6.6 How to format the CF card

Clear all data in the CF card and format the card on the LCD-13A.

The card can also be formatted using commercially available CF card Reader/Writer on Microsoft Windows.



Caution

- Please format the CF card on the LCD-13A.
- When formatting on the Windows, use the FAT16.

Formatting the CF card is effective only when the CF card is inserted.

The procedures for CF card formatting are shown below.

(1) Enter the Data logging condition setting mode.

Press the LOG key for approx. 3 seconds while holding down the ∇ key.

Data logging condition setting mode appears.

(2) Proceed to the CF card format item.

Press the \odot key several times until CF card format item [CF.F.C.F.] appears.

(3) Select “ \odot Format” in the CF card format item by pressing the \triangle key, then press the \odot key.

The unit proceeds to the CF card format confirmation item.

(4) Perform formatting the CF card.

Press the \odot key after confirming that “ \odot Format” has been selected.

The unit proceeds to External operation (LOG) priority [E.L.L.] item, and the formatting is completed.

6.7 How to lock front keypad operation by external contact

Front keypad operation Effective/Not effective can be switched by external contact.

Circuit current when contact is closed: 6mA

LOG terminals 18 and 20 are disconnected (Contact Open): Front key operation Effective

LOG terminals 18 and 20 are connected (Contact Closed): Front key operation Not effective

6.8 How to correct PV (Sensor correction function)

[Sensor correction function]

This corrects the input value from the sensor. When a sensor cannot be set at a location where control is desired, the sensor measuring temperature may deviate from the temperature in the controlled location.

When controlling with multiple controllers, the accuracy of the sensors or dispersion of load capacity has influence on the control.

Therefore, sometimes the measured temperature (input value) does not concur with the same set value.

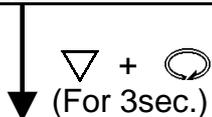
In such a case the control can be set at the desired temperature by correcting the input value of the sensors.

PV = Current actual temperature + (Sensor correction value)

[How to set sensor correction value]

[PV/SV display mode or Data logging mode]

PV/SV display mode
 PV Actual temp. SV SV



Press the key for approx. 3 seconds while holding down the key.

The unit proceeds to Auxiliary function setting mode 1, and Set value lock selection appears.

[Auxiliary function setting mode 1]

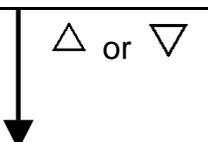
Set value lock selection
 PV *Lock* SV Selected value



Press the key 3 times.

Sensor correction setting item appears.

Sensor correction setting
 PV 40.00 SV 00.00

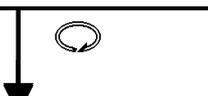


Set the sensor correction value with or key.

Setting range: -100.0 to 100.0°C (°F)

For DC input, -1000 to 1000 (The placement of the decimal point follows the selection)

Sensor correction setting
 PV 40.00 SV Set value



Press the key.

The unit reverts to the PV/SV display mode or Data logging mode.

[PV/SV display mode or Data logging mode]

PV/SV display mode
 PV Actual temp. SV SV

The value on the PV display is the one corrected by the sensor.

(e.g.) If actual temperature is 200°C, and sensor correction value is 2.0°C, PV becomes 202°C.

If actual temperature is 200°C, and sensor correction value is -2.0°C, PV becomes 198°C.

6.9 How to perform AT (auto-tuning)

In order to decide each value of P, I, D and ARW automatically, the auto-tuning process should be made to fluctuate to obtain an optimal value.



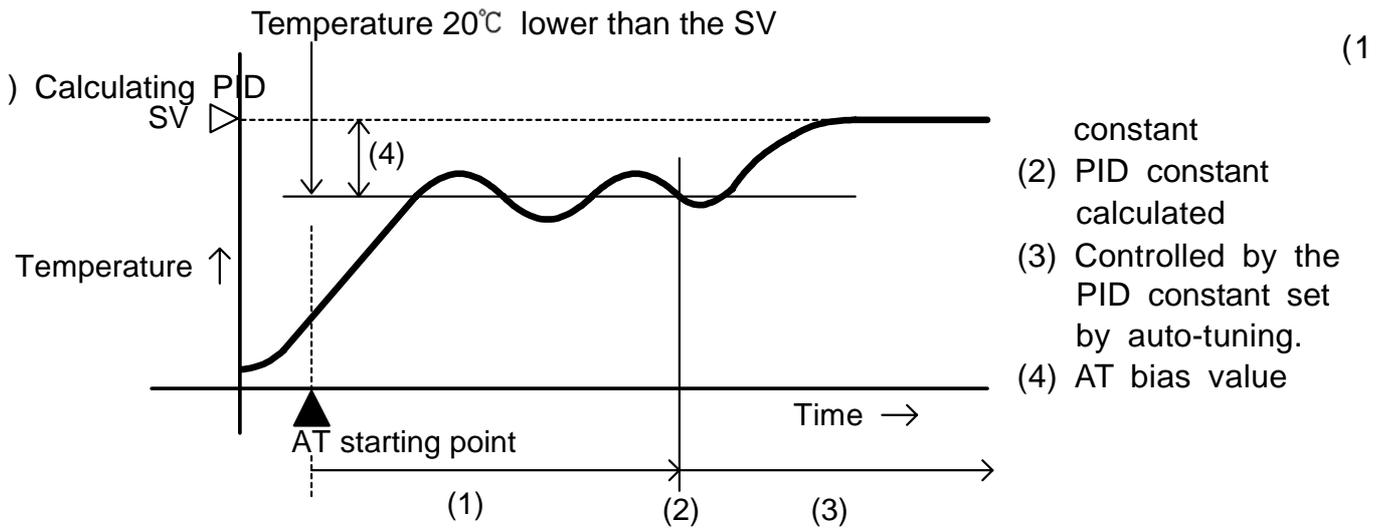
Notice

- Perform AT (auto-tuning) during the trial run.
- During AT (auto-tuning), none of the setting items can be set.
- If power failure occurs during AT (auto-tuning), the tuning stops.

[AT performing conditions] (When AT bias value is 20°C)

(1) When processing temperature is lower than (SV -20°C)

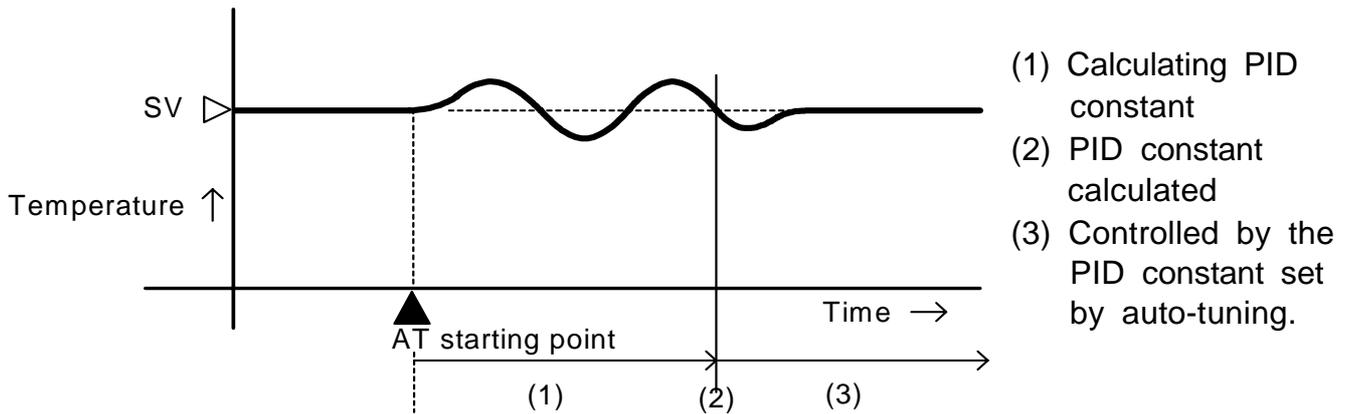
The AT process will fluctuate at the temperature 20°C lower than the SV (main set value).



(Fig. 6.9-1)

(2) When the control is stable or when processing temperature is within (SV ±20°C)

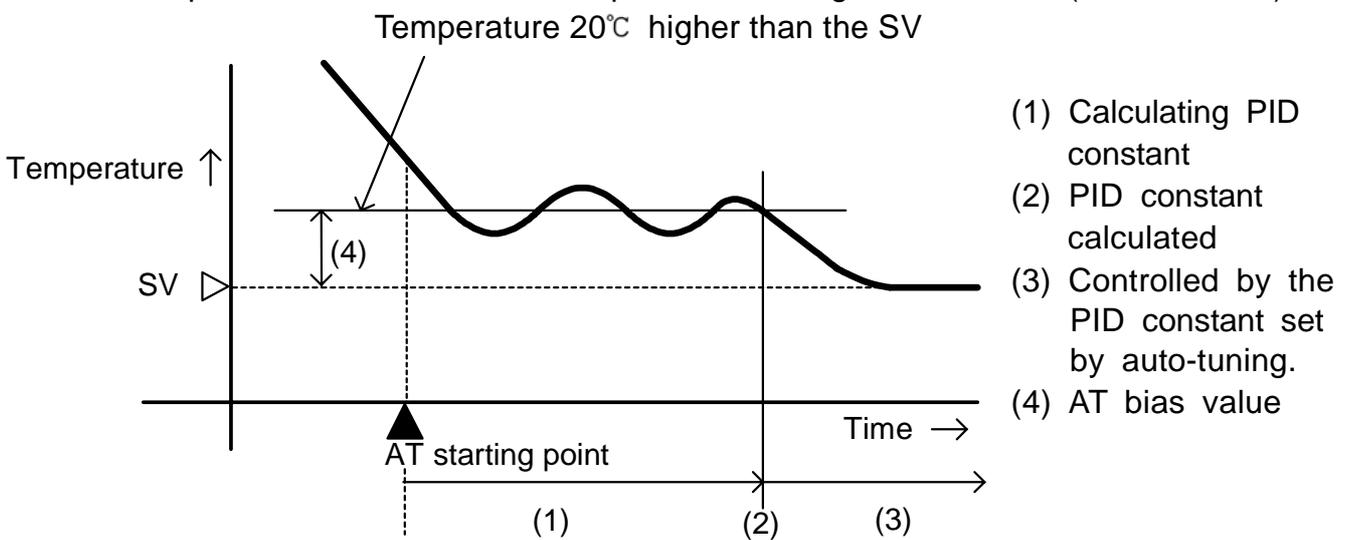
The AT process will fluctuate around the SV (main set value).



(Fig. 6.9-2)

(3) When the processing temperature is higher than (SV+20°C)

The AT process will fluctuate at the temperature 20°C higher than the SV (main set value).



(Fig. 6.9-3)

[If P, I, D, ARW values cannot be changed]

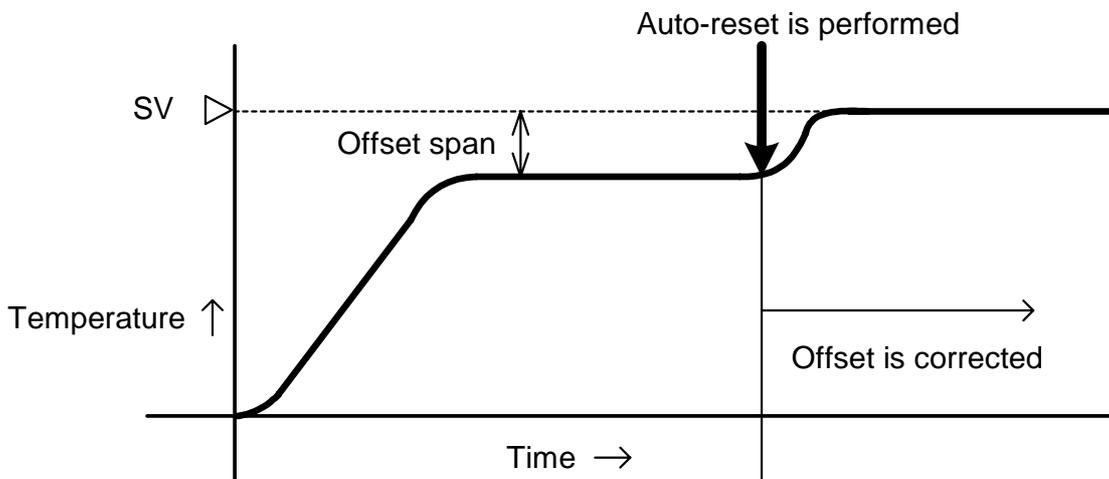
- If AT (auto-tuning) does not finish in 4 hours after it starts, PID auto-tuning is cancelled automatically, and P, I, D, ARW values return to the value set before the auto-tuning was performed. In this case, set P, I, D, ARW values manually.
- If AT (auto-tuning) is cancelled during the process, P, I, D, ARW values return to the value set before the auto-tuning was performed.

6.10 Auto-reset (offset correction)

Auto-reset is performed to correct the offset at the point at which PV indication is stabilized within the proportional band during the P or PD action.

Since the corrected value is internally memorized, it is not necessary to perform the auto-reset again as long as the process is the same.

However, when the proportional band is set to 0, the corrected value is cleared.



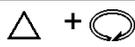
(Fig 6.10-1)

[How to perform AT (auto-tuning)/Auto-reset]

[PV/SV display mode or Data logging mode]



Press the key while holding down the key.
The unit proceeds to Sub setting mode, and AT/Auto-reset selection item is indicated.



[Sub setting mode]



Press the key.



Press the key several times or for approx. 3 seconds.
The controller reverts to the PV/SV display mode or Data logging mode, and performs AT (auto-tuning) or Auto-reset.



[PV/SV display mode or Data logging mode]



[Indication during AT/Auto-reset Perform]



PV display : Current actual temperature
SV display : Current SV
AT indicator : The 1st point from the right on the PV display for 2 channels flash while AT/Auto-reset is performing.
Other indicators : Lights or flashes according to the controller status.

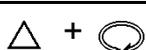
[How to cancel AT (auto-tuning)]

Effective only when AT (auto-tuning) is performing. Auto-reset cannot be cancelled.

[PID auto-tuning Perform]



Press the key while holding down the key.
Sub setting mode is selected and AT/Auto-reset selection item is indicated.



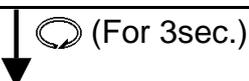
[Sub setting mode]



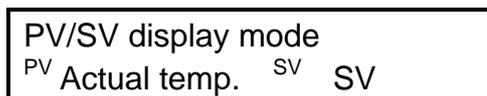
Press the key.



Press the key several times or for approx. 3 seconds.
AT (auto-tuning) is cancelled and the controller reverts to the PV/SV display mode or Data logging mode.



[PV/SV display mode or Data logging mode]



7. Control and Alarm action

7.1 P, I, D and ARW

(1) Proportional band (P)

Proportional action is the action during which the control output varies in proportion to the deviation between the SV (main set value) and the PV (processing temperature).

If the proportional band is narrowed, even if the output changes by a slight variation of the processing temperature, better control results can be obtained as the offset decreases.

However, if the proportional band is narrowed too much, even slight disturbances may cause variation in the processing temperature, control action changes to ON/OFF action and the so-called hunting phenomenon occurs.

Therefore, when the processing temperature comes to the balanced position near the SV and a constant temperature is maintained, the most suitable value is selected by gradually narrowing the proportional band while observing the control results.

(2) Integral time (I)

Integral action is used to eliminate offset. When the integral time is shortened, the returning speed to the set point is accelerated. However, the cycle of oscillation is also accelerated and the control becomes unstable.

(3) Derivative time (D)

Derivative action is used to restore the change in the processing temperature according to the rate of change. It reduces the amplitude of overshoot and undershoot width.

If the derivative time is shortened, restoring value becomes small, and if the derivative time is set longer, an excessive returning phenomenon may occur and the control system may be oscillated.

(4) ARW (Anti-reset windup)

ARW (Anti-reset windup) prevents overshoot caused by the integral action. The smaller the ARW value, the less the overshoot caused by the integral action in the transition status, however it takes time until stabilization.

When setting ARW manually, set it to the closest MV (manipulated variable) when the control is stabilized.

7.2 Control action

| | Heating (reverse) action | Cooling (direct) action |
|-----------------------------------|--|--|
| Control action | | |
| Relay contact output R/□ | <p>Cycle action is performed according to deviation.</p> | <p>Cycle action is performed according to deviation.</p> |
| Non-contact voltage output S/□ | <p>Cycle action is performed according to deviation.</p> | <p>Cycle action is performed according to deviation.</p> |
| DC current output A/□ | <p>Changes continuously according to deviation.</p> | <p>Changes continuously according to deviation.</p> |
| Indicator (OUT) Green | | |

: Acts ON (lit) or OFF (unlit).

For CH2 output terminals, use 31 and 32.

7.3 ON/OFF action

| | Heating (reverse) action | Cooling (direct) action |
|-----------------------------------|--------------------------|-------------------------|
| Control action | | |
| Relay contact output R/□ | | |
| Non-contact voltage output S/□ | | |
| DC current output A/□ | | |
| Indicator (OUT) Green | | |

: Acts ON (lit) or OFF (unlit).

For CH2 output terminals, use 31 and 32.

7.4 Alarm 1 (A1), Alarm 2 (A2) action

| | High limit alarm | Low limit alarm |
|--------------|------------------------------------|-------------------------------|
| Alarm action | | |
| | High/Low limits alarm | High/Low limit range alarm |
| Alarm action | | |
| | Process high alarm | Process low alarm |
| Alarm action | | |
| | High limit alarm with standby | Low limit alarm with standby |
| Alarm action | | |
| | High/Low limits alarm with standby | |
| Alarm action | | <p>■ : Standby functions.</p> |

CH1 A1 output terminals: 23 and 24,

CH1 A2 output terminals: 23 and 25

CH2 A1 output terminals: 33 and 34,

CH2 A2 output terminals: 33 and 35.

A1 and A2 indicators light when their terminals are connected, and go off when their terminals are disconnected respectively.

Alarm action in overscale and underscale

During overscale, High limit alarm, High/Low limits alarm and Process high alarm are activated.

During underscale, Low limit alarm, High/Low limits alarm and Process low alarm are activated.

7.5 ERR (error) output

With data logging, if the LOG key is pressed in the following status, CH1 PV display indicates an error type and the error output is turned on between terminals 11 and 12. (p.41, 42)

- CF card is defective.
- The battery is dead.
- The date or time has not been set.

8. Other functions

Power failure countermeasure

The set data is backed up in the non-volatile IC memory.

If power failure occurs during data logging, the data is automatically saved in the file.

After the power failure is restored, the data logging stops.

However, after the power failure is restored, if external operation (LOG) input terminals 19 and 20 are connected (Contact Closed), data logging is automatically resumes and the data is written in a new file.

If momentary power failure occurs while writing to the CF card, one batch of data logging might be lost.

Self-diagnosis

The CPU is monitored by a watchdog timer, and when an abnormal status is found on the CPU, all outputs are turned off and the indicator is switched to warm-up status.

Automatic cold junction temperature compensation (Only thermocouple input type)

This detects the temperature at the connecting terminal between the thermocouple and the instrument, and always keeps it set to the same status as when the reference junction is located at 0°C (32°F).

Burnout

When the thermocouple or RTD input is burnt out: Control output is turned off (for DC current output, control output low limit value), and PV display flashes “- - - -”.

When DC input is disconnected:

4 – 20mA DC, 1 – 5V DC : PV display flashes “- - - -”.

0 – 1V DC : PV display flashes “- - - -”.

0 – 20mA DC, 0 – 5V DC, 0 – 10V DC : PV display indicates the value corresponding with 0mA or 0V input.

Input burnout

| Indication | Contents | Control output (OUT) |
|----------------------|---|--|
| [- - - -] flashes. | Overscale If the input value exceeds the indication range high limit value. | Relay contact: OFF Non-contact voltage: 0V DC current output: 4mA or OUT low limit value |
| [- - - -] flashes. | Underscale If the input value goes under the indication range low limit value. | Relay contact: OFF Non-contact voltage: 0V DC current output: 4mA or OUT low limit value |

Thermocouple input

| Input | Input range | Indication range | Control range |
|-------|-------------------|-------------------|-------------------|
| K, T | -199.9 to 400.0°C | -199.9 to 450.0°C | -205.0 to 450.0°C |
| | -199.9 to 750.0°F | -199.9 to 850.0°F | -209.0 to 850.0°F |

Indication range and Control range of thermocouple inputs other than the above:

[Input range low limit value -50°C (100°F)] to [Input range high limit value +50°C (100°F)]

RTD input

| Input | Input range | Indication range | Control range |
|--------|-------------------|-------------------|--------------------|
| Pt100 | -199.9 to 850.0°C | -199.9 to 900.0°C | -210.0 to 900.0°C |
| | -200 to 850°C | -210 to 900°C | -210 to 900°C |
| | -199.9 to 999.9°F | -199.9 to 999.9°F | -211.0 to 1099.9°F |
| | -300 to 1500°F | -318 to 1600°F | -318 to 1600°F |
| JPt100 | -199.9 to 500.0°C | -199.9 to 550.0°C | -206.0 to 550.0°C |
| | -200 to 500°C | -206 to 550°C | -206 to 550°C |
| | -199.9 to 900.0°F | -199.9 to 999.9°F | -211.0 to 999.9°F |
| | -300 to 900°F | -312 to 1000°F | -312 to 1000°F |

DC input

Indication range: [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value +Scaling span x 10%]

(If the input value goes outside the range –1999 to 9999, the PV display flashes “ _ _ _ _ ” or “ _ _ _ _ ”)

Control range: [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value +Scaling span x 10%]

Error indication while accessing the CF card

| CH1 PV display | Error contents |
|----------------|--|
| <i>F_E1</i> | Format error (CF card is not inserted) |
| <i>F_E2</i> | Format error (CF card cannot be formatted. CF card is defective) |
| <i>W_E1</i> | Error when writing to CF card (CF card is not inserted. Unformatted CF card. CF card format does not coincide with the LCD format.) |
| <i>W_E2</i> | Error when writing to CF card (Excess CF card memory capacity) |
| <i>W_E3</i> | Undefined error |
| <i>R_E1</i> | Error when reading from CF card (CF card is not inserted) |
| <i>R_E2</i> | Error when reading from CF card (File number or data number does not exist.) |

When errors occurred, data logging is stopped, and the error indication remains until it is released by the  key.

The error indication cannot be released with data logging start/stop by external operation input.

Time error indication

| CH1 PV display | Error contents |
|----------------|---|
| <i>T_E1</i> | Clock lithium battery voltage for backup in a power failure is low. |
| <i>T_E2</i> | Logging when current date or time has not been set (Data logging cannot be started until date and time is set) |

When errors occurred, its indication can be released by the  key.

Error indication during data logging

| | |
|------------------------|---------------------------------------|
| CH1 PV display | Error contents |
| $\varepsilon - E \mid$ | When errors occur during data logging |

When errors occurred, it is required to repair the data logging circuit since it may break.

CF card remaining memory capacity indication

| | |
|--------------------------|---|
| CH2 SV display | Error contents |
| $\varepsilon F . E \mid$ | When remaining memory capacity of the CF card is 5% or less |

CH2 SV and the above characters are indicated in turn.

This indication can be released by stopping data logging or by using another card which has sufficient memory.

Momentary power failure indication

If momentary power failure occurs, CH1 PV and CH2 PV flash.

This can be released by the  key.

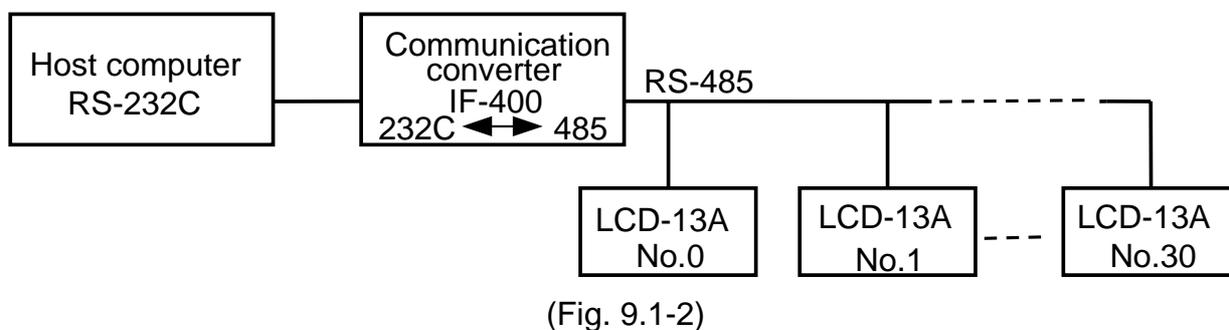
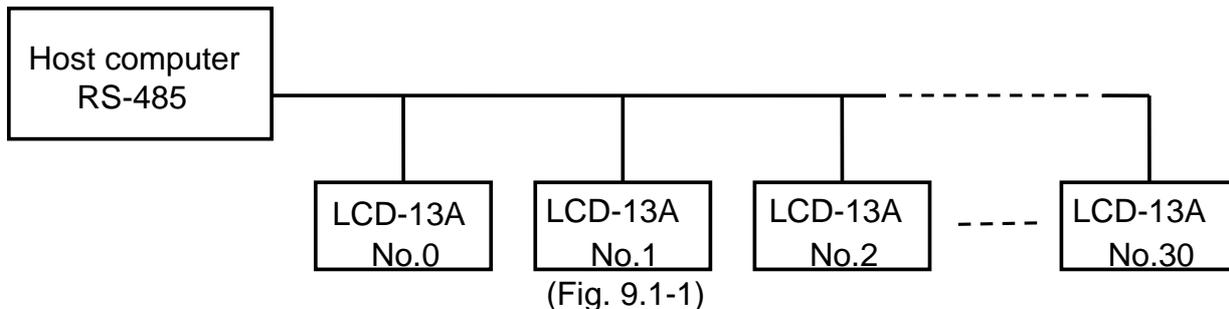
9. Communication

Warning

Turn the power supply to the instrument off before wiring or checking it.
Working or touching the terminal with the power switched on may result in severe injury or death due to Electric Shock.

9.1 System configuration

RS-485 multi-drop connection communication (Option: C5)

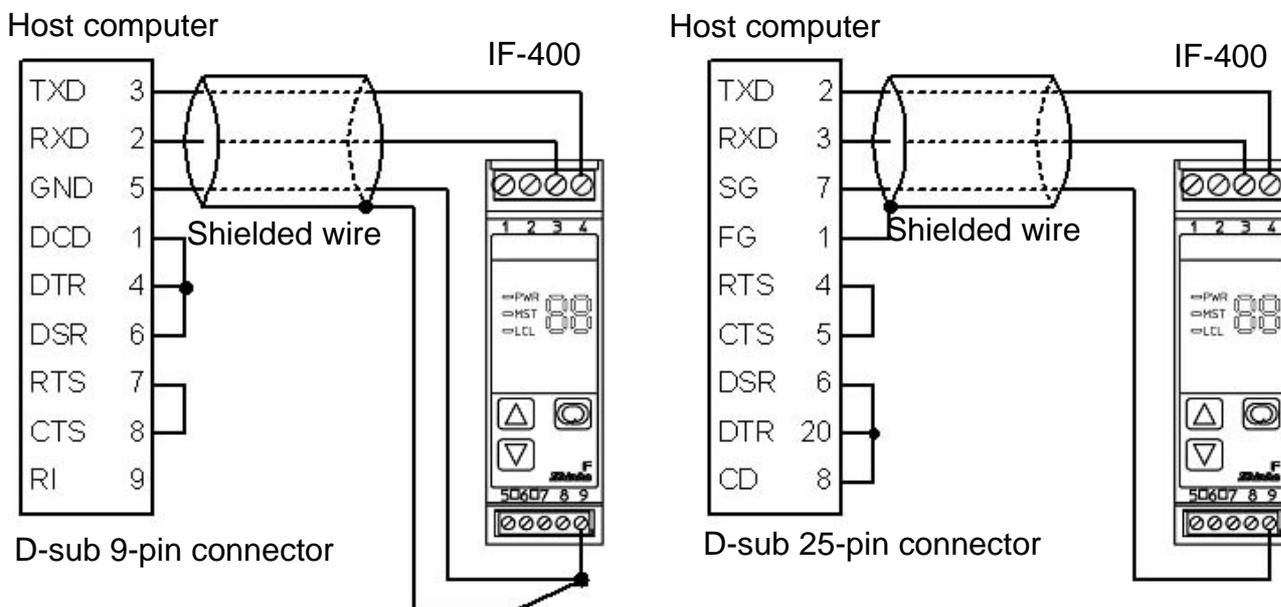


9.2 Wiring

Input (host computer) RS-232C

When using communication converter IF-400

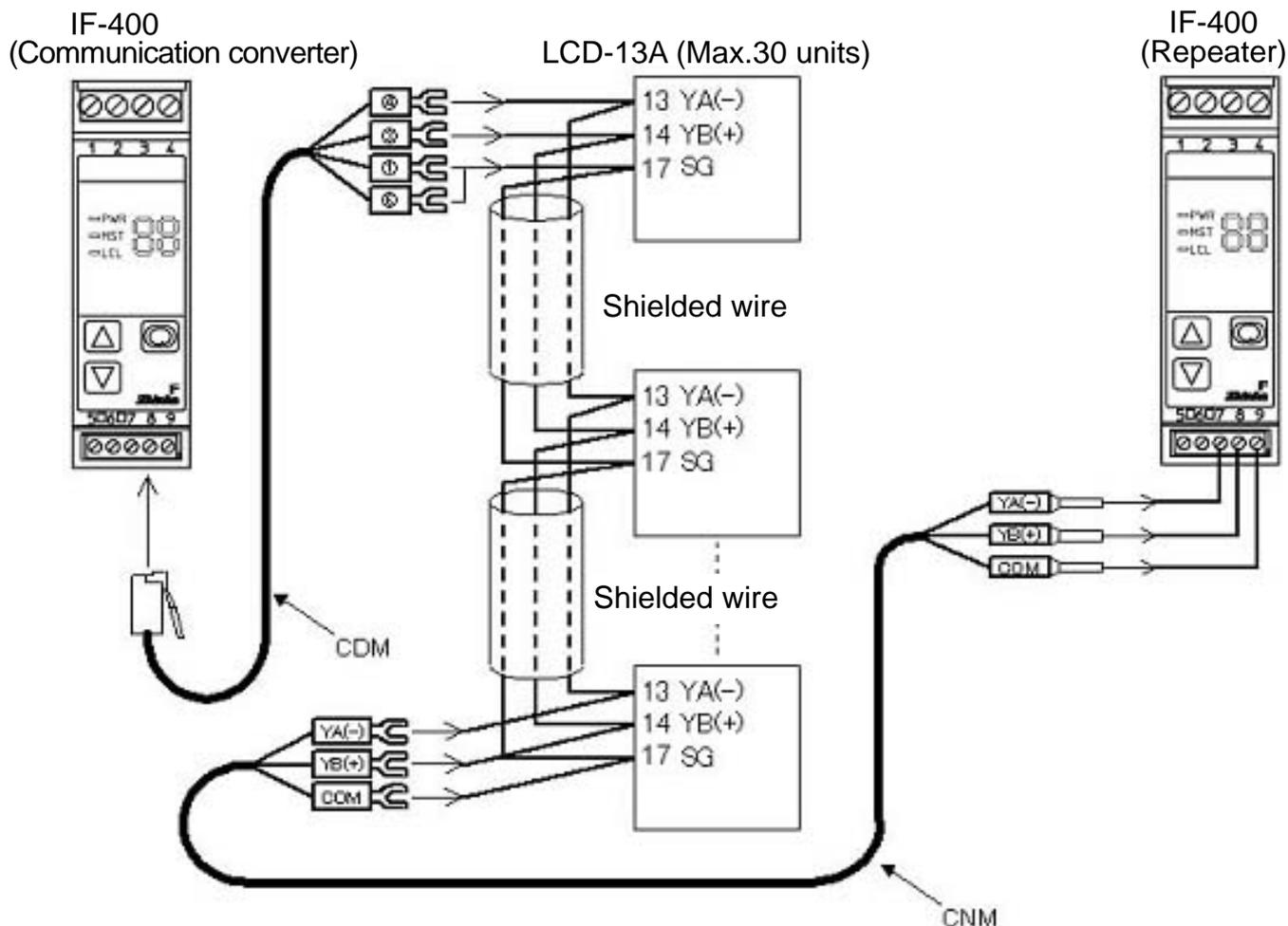
Connection: RS-232C ↔ RS-485 (Communication speed: 2400, 4800, 9600, 19200bps)



(Fig. 9.2-1)

When connecting with LCD-13A

Connection: RS-232C ↔ RS-485 (Communication speed: 9600, 19200bps)



(Fig. 9.2-2)

Shielded wire

Connect only one side of the shielded wire to the FG or GND terminal so that current cannot flow to the shielded wire.

(If both sides of the shielded wire are connected to the FG or GND terminal, the circuit will be closed between the shielded wire and the ground. As a result, current will run through the shielded wire and this may cause noise.)

Be sure to ground FG and GND terminals.

Terminator (Terminal resistor)

Do not connect terminator with the communication line because each LCD-13A has built-in pull-up and pull-down resistors instead of a terminator.

Please use the IF-400 (sold separately) as a communication converter.

Recommended cable

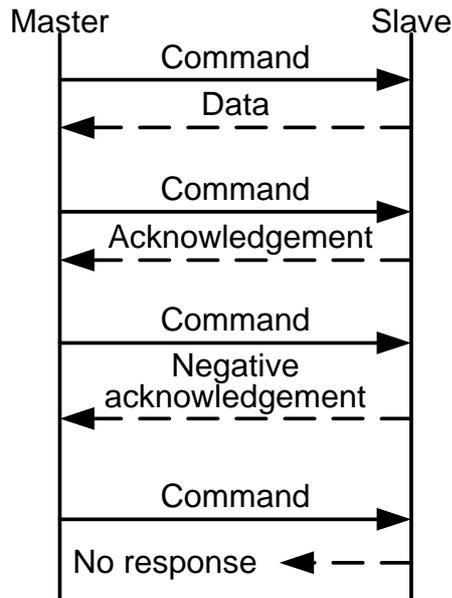
| | Manufacturer | Model |
|-------|------------------|--------------------|
| Cable | Onamba Co., Ltd. | OTSC-2PVB-7/0.32TA |

9.3 Setup of the LCD-33A

- It is necessary to set the instrument number individually to the LCD-13A when communicating by connecting plural units in serial communication. Select a communication speed of the LCD-13A in accordance with that of the host computer.
- For the instrument number setting and communication speed, refer to Section “5.3 Data logging condition setting” (p.23).

9.4 Communication procedure

Communication starts with command transmission from the host computer and ends with the response of the LCD-13A.



- **Response with data**

When the host computer sends the reading command, the LCD-13A responds with the corresponding set value or current status.

- **Acknowledgement**

When the host computer sends the setting command, the LCD-13A responds by sending the acknowledgement after the processing is terminated.

- **Negative acknowledgement**

When the host computer sends a non-existent command or value out of the setting range, the LCD-13A returns a negative acknowledgement.

- **No response**

The LCD-13A will not respond to the host computer when the global address is set, or when framing error or checksum error is detected.

Communication timing of the RS-485

LCD-13A side

When the LCD-13A starts transmission through the RS-485 communication line, the LCD-13A is arranged so as to provide an idle status (mark status) **transmission period of 1 or more characters** before sending the response to ensure the synchronization on the receiving side.

The LCD-13A is arranged so as to disconnect the transmitter from the communication line **within a 1 character transmission period** after sending the response.

Host computer side (Notice on programming)

Set the program so that the host computer can disconnect the transmitter from the communication line **within a 1 character transmission period** after sending the command in preparation for reception of the response from the LCD-13A.

To avoid the collision of transmissions between the host computer and the LCD-13A, send the next command after carefully checking that the host computer received the response.

Note:

When the host computer communicates with the LCD-13A through the communication converter (IF-400), make sure that the program is appropriate for the transmission timing.

9.5 Shinko protocol

9.5.1 Transmission mode

Shinko protocol is composed of ASCII codes.

Hexadecimal (0 to 9, A to F), which is divided into high order (4-bit) and low order (4-bit) out of 8-bit binary data in command is transmitted as ASCII characters.

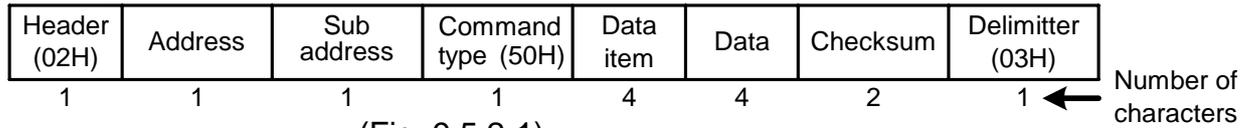
| | | |
|-------------|------------------|----------|
| Data format | Start bit | : 1 bit |
| | Data bit | : 7 bits |
| | Parity | : Even |
| | Stop bit | : 1 bit |
| | Error detection: | Checksum |

9.5.2 Command configuration

All commands are composed of ASCII. The data (set value, decimal number) is represented with hexadecimal number, and ASCII code is used.

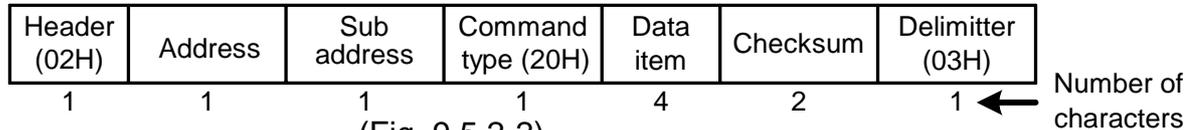
The negative numbers are represented with 2's complement.

(1) Setting command



(Fig. 9.5.2-1)

(2) Reading command



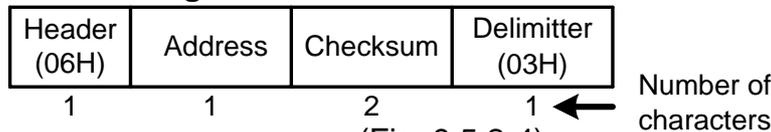
(Fig. 9.5.2-2)

(3) Response with data



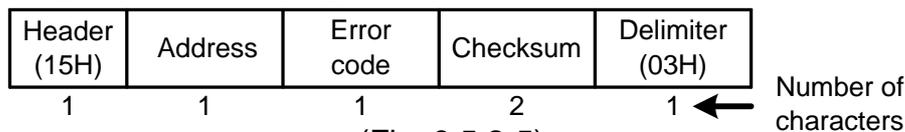
(Fig. 9.5.2-3)

(4) Acknowledgement



(Fig. 9.5.2-4)

(5) Negative acknowledgement



(Fig. 9.5.2-5)

Header : Control code to represent the beginning of the command or the response. ASCII codes are used.

Setting command, Reading command : 02H fixed

Response with data, Acknowledgement : 06H fixed

Negative acknowledgement : 15H fixed

Address : Numbers by which the host computer discerns each LCD-13A.

Instrument number 0 to 94 and the **Global address** 95

The numbers (20H to 7EH) are used by adding 20H of bias, because 00H to 1FH are used for control code.

95 (7FH) is called the **Global address**, which is used when the same command is sent to all the LCD-13A units connected. However, the response is not returned.

Sub address : Logging condition command: 20H

CH1, CH2 command : 21H, 22H

Command type : Code to discern Setting command (50H) and Reading command (20H)

Data item : Data classification of the command object

Composed of hexadecimal 4 digits (See the Communication command table)

Data : The contents of data (set value) differ depending on the setting command.

Composed of hexadecimal 4 digits (See the Communication command table)

Checksum : 2-character data to detect communication errors

Delimiter : Control code to represent the end of command

03H fixed

Error code : Represents an error type. Composed of hexadecimal 1 digit.

1 (31H)-----Non-existent command

2 (32H)-----Not used

3 (33H)-----Setting outside the setting range

4 (34H)-----Status unable to set (e.g. During logging or AT)

5 (35H)-----During setting mode by keypad operation

9.5.3 Checksum calculation

Checksum is used to detect receiving errors in the command or data.

Set the program for the host computer side as well to calculate the checksum of the response data from the LCD-13A so that the communication errors can be checked.

The ASCII code (hexadecimal) corresponding to the characters which range from the address to that before the checksum is converted to binary notation, and the total value is calculated.

The lower 2 digits of the total value are converted to 2's complements, and then to hexadecimal figures, that is, ASCII code for the checksum.

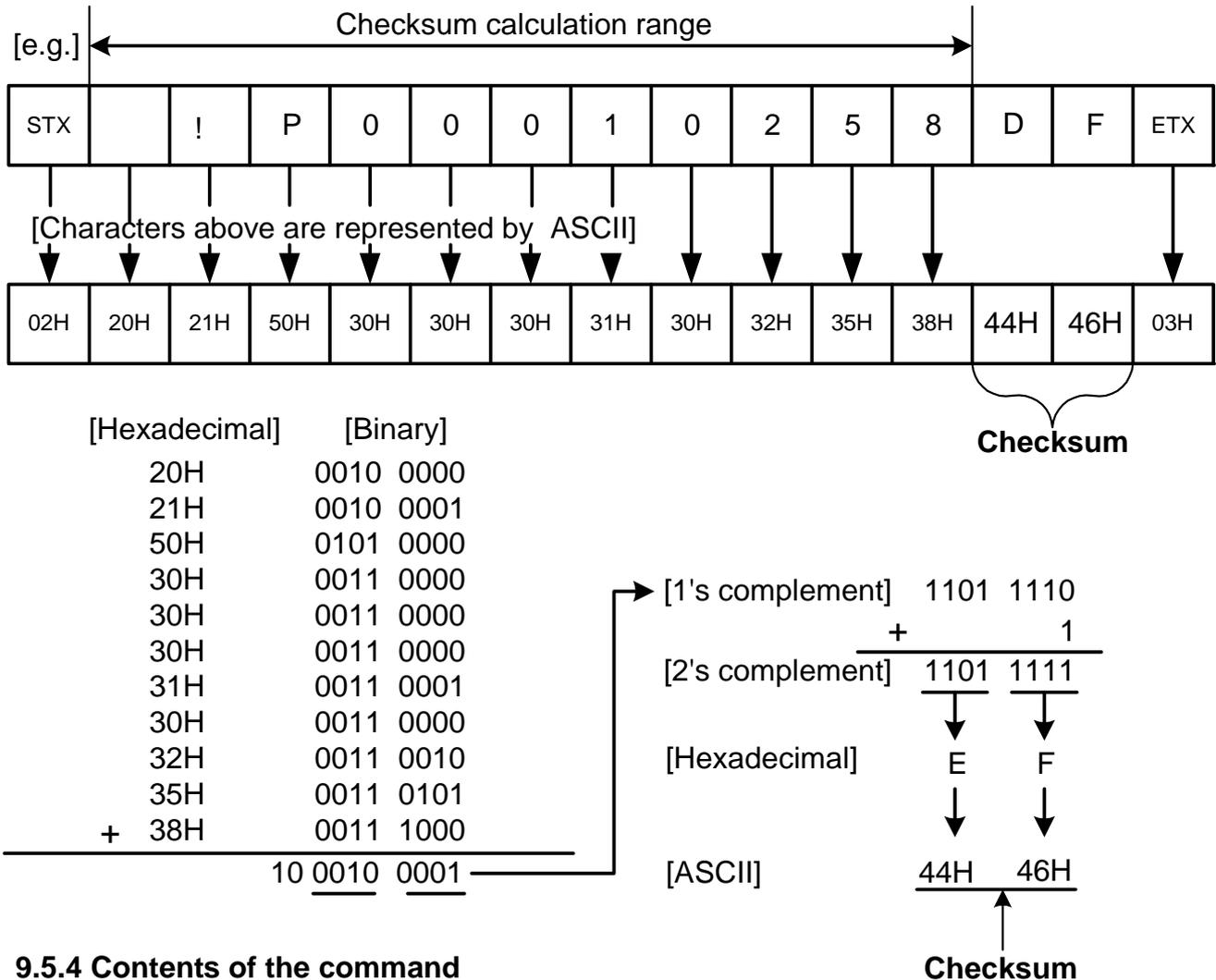
Refer to the following example procedure.

Checksum calculation example

CH1 SV1: 600°C (0258H)

Address (instrument number): 0 (20H)

- 1's complement: Reverse each binary bit. 0 will become 1 and vice versa.
- 2's complement: Add 1 to 1's complements.



9.5.4 Contents of the command

Notes on the setting command and reading command

- If it is possible to set the value with the setting command of the communication function even when the set value is locked.
- Although the options are not applied, setting the items for the options is possible by the setting command. However, they will not function.
- The memory can store up to 1,000,000 (one million) entries. If the number of settings exceeds the limit, the data will not be saved. So frequent transmission via communication is not recommended.
- When connecting plural LCD-13A units, the address (instrument number) must not be duplicated.

- When sending a command by Global address 95 (7FH), the same command is sent to all the LCD-13A units connected. However, the response is not returned.
- The instrument number and communication speed cannot be set by communication.

Setting command

- The settable range is the same as that by keypad operation.
For the communication command, refer to the communication command table of this manual.
- All commands are composed of ASCII.
- The data (set value, decimal) is converted to hexadecimal figures, and ASCII is used.
A negative number is represented with 2's complement. When the data (set value) has a decimal point, a whole number without a decimal point is used.

Reading command

- All commands are composed of ASCII.
- The data (set value, decimal) is converted to hexadecimal figures, and ASCII is used.
A negative number is represented by 2's complement. When the data (set value) has a decimal point, the response is returned as a whole number without a decimal point.

9.6 Communication command table

When the data (set value) has a decimal point, remove the decimal point and represent it as a whole number, then express it in hexadecimal figures.

9.6.1 Logging condition Reading/Setting command

| Shinko Command type | Sub address | Data item | Data |
|---------------------|-------------|--|---|
| 20H/50H | 0 | 0001H: PV logging | 0000H: Not effective, 0001H: Effective |
| 20H/50H | 0 | 0002H: SV logging | 0000H: Not effective, 0001H: Effective |
| 20H/50H | 0 | 0003H: MV logging | 0000H: Not effective, 0001H: Effective |
| 20H/50H | 0 | 0004H: Status logging | 0000H: Not effective, 0001H: Effective |
| 20H/50H | 0 | 0005H: Logging auto-start | 0000H: Not effective, 0001H: Effective |
| 20H/50H | 0 | 0006H: Logging auto-start start time (0 to 1439) | Set value |
| 20H/50H | 0 | 0007H: Logging auto-start end time (0 to 1439) | Set value |
| 20H/50H | 0 | 0008H: Logging cycle | 0000H: 1sec. 0001H: 2sec. 0002H: 5sec. 0003H: 10sec. 0004H: 15sec. 0005H: 20sec. 0006H: 30sec. 0007H: 1min. 0008H: 2min. 0009H: 5min. 000AH: 10min. 000BH: 15min. 000CH: 20min. 000DH: 30min. 000EH: 60min. |
| 20H/50H | 0 | 0009H: External operation (LOG) priority | 0000H: External operation (LOG) input has priority. 0001H: LOG key operation has priority. |
| 20H/50H | 0 | 000AH: Logging Start/Stop | 0000H: Stop, 0001H: Start |
| 20H | 0 | 0080H: CF card memory usage capacity | Capacity used |

9.6.2 CH1/CH2 Reading/Setting command

| Shinko command type | Sub address | Data item | Data |
|---------------------|------------------|--|---|
| 20H/50H | 1 or 2 | 0001H: SV | Set value, Decimal point ignored |
| | | 0002H: Not used | |
| 20H/50H | 1 or 2 | 0003H: AT/ Auto reset | 0000H: Cancel, 0001H: Perform |
| 20H/50H | 1 or 2 | 0004H: OUT proportional band | Set value, Decimal point ignored |
| | | 0005H: Not used | |
| 20H/50H | 1 or 2 | 0006H: Integral time | Set value |
| 20H/50H | 1 or 2 | 0007H: Derivative time | Set value |
| 20H/50H | 1 or 2 | 0008H: OUT proportional cycle | Set value |
| | | 0009H: Not used | |
| | | 000AH: Not used | |
| 20H/50H | 1 or 2 | 000BH: A1 value | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 000CH: A2 value | Set value, Decimal point ignored |
| | | 000DH: Not used | |
| | | 0012H: Not used | |
| 20H/50H | 1 or 2 | 0013H: SV high limit | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 0014H: SV low limit | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 0015H: Sensor correction | Set value, Decimal point ignored |
| | | 0016H: Not used | |
| | | 0017H: Not used | |
| 20H/50H | 1 or 2 | 0018H: Scaling high limit | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 0019H: Scaling low limit | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 001AH: Decimal point place | 0000H: XXXX(No decimal point) 0001H: XXX.X (1 digit after the decimal point) 0002H: XX.XX (2 digits after the decimal point) 0003H: X.XXX (3 digits after the decimal point) |
| 20H/50H | 1 or 2 | 001BH: PV filter time constant | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 001CH: OUT high limit | Set value |
| 20H/50H | 1 or 2 | 001DH: OUT low limit | Set value |
| 20H/50H | 1 or 2 | 001EH: OUT ON/OFF hysteresis | Set value, Decimal point ignored |
| | | 001FH: Not used | |
| | | 0022H: Not used | |
| 20H/50H | 1 or 2 1 or 2 | 0023H: A1 type (*1) 0024H: A2 type (*1) | 0000H: No alarm action 0001H: High limit alarm 0002H: Low limit alarm 0003H: High/Low limits alarm 0004H: High/Low limit range 0005H: Process high alarm 0006H: Process low alarm 0007H: High limit alarm with standby 0008H: Low limit alarm with standby 0009H: High/Low limits alarm with standby |

(*1) When alarm type is changed, the alarm set value reverts to the default value and alarm output status is also initialized.

| | | | |
|---------|--------|-----------------------|---|
| 20H/50H | 1 or 2 | 0025H: A1 hysteresis | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 0026H: A2 hysteresis | Set value, Decimal point ignored |
| | | 0027H: Not used | |
| | | 0043H: Not used | |
| 20H/50H | 1 or 2 | 0044H: Input type | 0000H: K [-200 to 1370°C] 0001H: K [-199.9 to 400.0°C] 0002H: J [-200 to 1000°C] 0003H: R [0 to 1760°C] 0004H: S [0 to 1760°C] 0005H: B [0 to 1820°C] 0006H: E [-200 to 800°C] 0007H: T [-199.9 to 400.0°C] 0008H: N [-200 to 1300°C] 0009H: PL-II [0 to 1390°C] 000AH: C(W/Re5-26) [0 to 2315°C] 000BH: Pt100 [-199.9 to 850.0°C] 000CH: JPt100 [-199.9 to 500.0°C] 000DH: Pt100 [-200 to 850°C] 000EH: JPt100 [-200 to 500°C] 000FH: K [-320 to 2500°F] 0010H: K [-199.9 to 750.0°F] 0011H: J [-320 to 1800°F] 0012H: R [0 to 3200°F] 0013H: S [0 to 3200°F] 0014H: B [0 to 3300°F] 0015H: E [-320 to 1500°F] 0016H: T [-199.9 to 750.0°F] 0017H: N [-320 to 2300°F] 0018H: PL-II [0 to 2500°F] 0019H: C(W/Re5-26) [0 to 4200°F] 001AH: Pt100 [-199.9 to 999.9°F] 001BH: JPt100 [-199.9 to 900.0°F] 001CH: Pt100 [-300 to 1500°F] 001DH: JPt100 [-300 to 900°F] 001EH: 4 to 20mA [-1999 to 9999] 001FH: 0 to 20mA [-1999 to 9999] 0020H: 0 to 1V [-1999 to 9999] 0021H: 0 to 5V [-1999 to 9999] 0022H: 1 to 5V [-1999 to 9999] 0023H: 0 to 10V [-1999 to 9999] |
| 20H/50H | 1 or 2 | 0045H: Direct/Reverse | 0000H: Heat (Reverse action) 0001H: Cool (Direct action) |
| | | 0046H: Not used | |
| 20H/50H | 1 or 2 | 0047H: AT bias | Set value, Decimal point ignored |
| 20H/50H | 1 or 2 | 0048H: ARW | Set value |
| 20H | 1 or 2 | 006FH: Key lock | 0000H: Key enabled 0001H: Key locked |
| | | | |
| 20H | 1 or 2 | 0080H: PV | PV, Decimal point ignored |
| 20H | 1 or 2 | 0081H: OUT MV | MV, Decimal point ignored |
| | | 0082H: Not used | |
| | | 0083H: Not used | |
| | | 0084H: Not used | |

| | | | |
|-----|--------|--------------------|---|
| 20H | 1 or 2 | 0085H: Status flag | 2^{15} 0000 0000 0000 0000 to 2^0 2^0 digit: OUT 0: OFF 1: ON 2^1 digit: Not used (Always 0) 2^2 digit: A1 output 0: OFF 1: ON 2^3 digit: A2 output 0: OFF 1: ON 2^4 digit: Not used (Always 0) 2^5 digit: Not used (Always 0) 2^6 digit: Not used (Always 0) 2^7 digit: Not used (Always 0) 2^8 digit: Overscale 0: OFF 1: ON 2^9 digit: Underscale 0: OFF 1: ON 2^{10} digit: Not used (Always 0) 2^{11} digit: During AT/Auto reset 0: OFF 1: ON 2^{12} digit: Not used (Always 0) 2^{13} digit: Not used (Always 0) 2^{14} digit: Not used (Always 0) |
| | | 0086H: Not used | |
| | | 0087H: Not used | |
| | | 00A0H: Not used | |

Notice

When data setting is changed by front keypad operation, the data that is related to the changed item is also changed automatically as shown in Example 1 below.

However, when the data setting is changed by communication function, the related data does not change as shown in Example 2 below. (Only the changed data is altered.)

(Example 1) SV high limit: 1370°C

SV: 1000°C

When SV high limit is changed to 800°C by the front keypad operation, both SV high limit and SV are changed to 800°C.

(Example 2) SV high limit: 1370°C

SV: 1000°C

When SV high limit is changed to 800°C by communication function, SV high limit is changed to 800°C, however, SV is maintained at the same temperature 1000°C.

10. Specifications

10.1 Standard specifications

Model : 2CH digital indicating controller/Data logger

Name : LCD-13A

Mounting : Flush

Setting : Input system using membrane sheet key

Display (CH1, CH2)

PV display : Red LED display 4 digits,
Character size, 10.0 (H) x 5.6 (W)mm

SV display : Green LED display 4 digits,
Character size, 10.0 (H) x 5.6 (W)mm

Input

Thermocouple : K, J, R, S, B, E, T, N, PL-II, C
External resistance, 100 Ω or less (for B input, 40 Ω or less)

RTD : Pt100, JPt100, 3-wire system
Allowable input lead wire resistance, 10 Ω or less per wire

DC current : 0 to 20mA DC, 4 to 20mA DC
Input impedance, 50 Ω
Allowable input current, 50mA DC or less
[50 Ω shunt resistor (sold separately) must be installed
between input terminals.]

DC voltage : 0 to 1V DC
Input impedance (1M Ω or more)
Allowable input voltage (5V DC or less)
Allowable signal source resistance (2k Ω or less)
: 0 to 5V DC, 1 to 5V DC, 0 to 10V DC
Input impedance (100k Ω or more)
Allowable input voltage (15V DC or less)
Allowable signal source resistance (100 Ω or less)

Input sampling period : 0.25 seconds

Accuracy (Indication and setting)

Thermocouple : Within $\pm 0.3\%$ of each input span ± 1 digit or
within $\pm 2^{\circ}\text{C}$ (4°F), whichever is greater
However, for R, S input, the range 0 to 200 $^{\circ}\text{C}$ (0 to 400 $^{\circ}\text{F}$):
Within $\pm 6^{\circ}\text{C}$ (12°F)
For B input, the range is 0 to 300 $^{\circ}\text{C}$ (0 to 600 $^{\circ}\text{F}$): Accuracy
is not guaranteed.
For K, J, E, T, N input, 0 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$) or less:
Within $\pm 0.4\%$ of each input span ± 1 digit or
within $\pm 4^{\circ}\text{C}$ (8°F), whichever is greater

RTD : Within $\pm 0.2\%$ of each input span ± 1 digit

DC current, voltage : Within $\pm 0.3\%$ of each input span ± 1 digit

Time setting accuracy : Within $\pm 0.5\%$ ± 1 second

Clock

Time indication : 24-hour clock (00:00 to 24:00)

Error : Within ± 60 seconds/month (at 25 $^{\circ}\text{C}$ ambient temperature)

Power failure guarantee: Backed up by lithium battery.

Lithium battery life: 10 years or more (at 20 $^{\circ}\text{C}$ ambient
temperature)

Control action

- PID action [With AT (auto-tuning) function]
- PI action (When derivative time is set to 0)
- PD action (With auto-reset, when integral time is set to 0)
- P action (With auto-reset, when both integral and derivative time are set to 0)
- ON/OFF action (When proportional band is set to 0 or 0.0)
 - Proportional band (P) : Thermocouple, RTD input without a decimal point, 0 to 1000°C (2000°F) (Default value: 10°C)
Thermocouple, RTD input with a decimal point, 0.0 to 999.9°C (999.9°F)
DC current, voltage input, 0.0 to 100.0%
 - Integral time (I) : 0 to 1000 sec. (off when set to 0) (Default: 200sec)
 - Derivative time (D) : 0 to 300 sec. (off when set to 0) (Default: 50sec)
 - Proportional cycle : 1 to 120 sec. [Default: -2R/M: 30sec, -2S/M: 3sec
-2A/M: Not available.]
 - ARW (Anti-reset windup) : 0 to 100% (Default value: 50%)
 - ON/OFF action hysteresis : 0.1 to 100.0°C (°F) (Default value: 1.0°C)
DC current, voltage input, 1 to 1000
 - Output high limit, low limit: 0 to 100% (for DC current output, -5 to 105%)
(Default: Output high limit; 100%, Output low limit; 0%)

Control output (OUT)

- Relay contact : 1a
Control capacity, 3A 250V AC (resistive load)
1A 250V AC (inductive load $\cos\phi=0.4$)
Electric life: 100,000 times
- Non-contact voltage : For SSR drive
12⁺²₀V DC maximum 40mA DC (short circuit protected)
- DC current : 4 to 20mA DC
Load resistance, maximum 550Ω

External memory device

- Media : CF card included [Type I (thickness 3.3mm)], Max. capacity 256MB
- Format : FAT16 (For commercially available CF card, it may be FAT32)
- Writing method: Writing in a new file (Opens a new file every time logging starts, and saves in it)
- CF card memory usage capacity: When logging all items with data logging cycle 5 seconds, 1.7 to 2.0MB of the CF card can be used every 24 hours.
- Others : If logging data reaches 65,000 lines, the file is closed and saves the data in a new file.
- Note : If pulling out the CF card while LOG indicator is lit, the CF card may break.
So be sure to take out the CF card after confirming that LOG indicator is unlit.
If a defective CF card is inserted or the CF card is taken out during data logging, the reset function to prevent malfunction is initiated, and the instrument reverts to the warm-up status.
Number of files: Max. 170
If the number of files exceeds 170, the error message is indicated regardless of CF card remaining memory capacity.

Alarm 1 (A1) and Alarm 2 (A2) output

- The alarm action point is set by \pm deviation from the SV (except Process alarm).
When the input goes outside the range, the output is turned ON or OFF (for High/Low limit range alarm).
- Setting accuracy : The same as the indication accuracy
- Action : ON/OFF action
- Hysteresis : 0.1 to 100.0°C (°F) (Default value: 1.0°C)
DC current, voltage input, 1 to 1000 (The placement of the decimal point follows the selection)
- Output : Relay contact, 1a
Control capacity, 3A 250V AC (resistive load)
Electric life: 100,000 times

Alarm output action: One alarm can be selected by the front keypad from 10 types of alarm; High limit alarm, Low limit alarm, High/Low limits alarm, High/Low limit range alarm, Process high alarm and Process low alarm, High limit alarm with the standby function, Low limit alarm with the standby function, High/Low limits alarm with the standby function and No alarm action.
[Default : No alarm action for Alarm 1(A1) and Alarm 2 (A2).]

ERR (error) output

During data logging, if the LOG key is pressed when the CF card is defective, when the battery is dead, or when the date or time is not set, CH1 PV display indicates the error type, and the error output is turned on between terminals 11 and 12.

Action: ON/OFF action

Output: Relay contact, 1a

Control capacity, 3A 250V AC (resistive load)

Electric life: 100,000 times

Logging auto-start function

If Logging auto-start "Effective" is selected during Logging auto-start selection, auto-start start time and end time can be set, and logging can be performed within the set time.

If logging auto-start start time and end time are set to the same value, logging continues until power-off or until CF card capacity is exceeded. Next time the power to the unit is turned on again, logging auto-start begins.

When the power is restored, logging auto-start begins within the set time depending on the logging start time and end time.

During auto-start, usual logging can start or stop.

If External operation (LOG) input is ON during auto-start, logging will continue even if logging end time has elapsed.

When external operation (LOG) input is OFF, logging stops.

If external operation (LOG) input is turned from ON to OFF, logging stops even within the set time.

Communication function

The following operations can be carried out from the external computer.

(1) Reading and setting of SV, PID values and each set value

(2) Reading of PV and action status (3) Change of the LOG functions

Cable length : Maximum communication distance 1.2km

Cable resistance: Within 50Ω(Terminator is not necessary or 120Ω or more on one side.)

Communication line : EIA RS-485

Communication method : Half-duplex communication start stop synchronous

Communication speed : 9600, 19200bps (Selectable by key) (Default: 9600bps)

Code form : ASCII, binary

Error correction : Command request repeat system

Error detection : Parity check, Checksum

Data format : Start bit : 1

Data bit : 7

Parity : Even parity

Stop bit : 1

Supply voltage : 100 to 240V AC 50/60Hz

Allowable voltage fluctuation: 85 to 264V AC

Ambient temperature : 0 to 50°C (32 to 122°F)

Ambient humidity : 35 to 85%RH (non-condensing)

Power consumption : Approx. 12VA

Weight : Approx. 550g

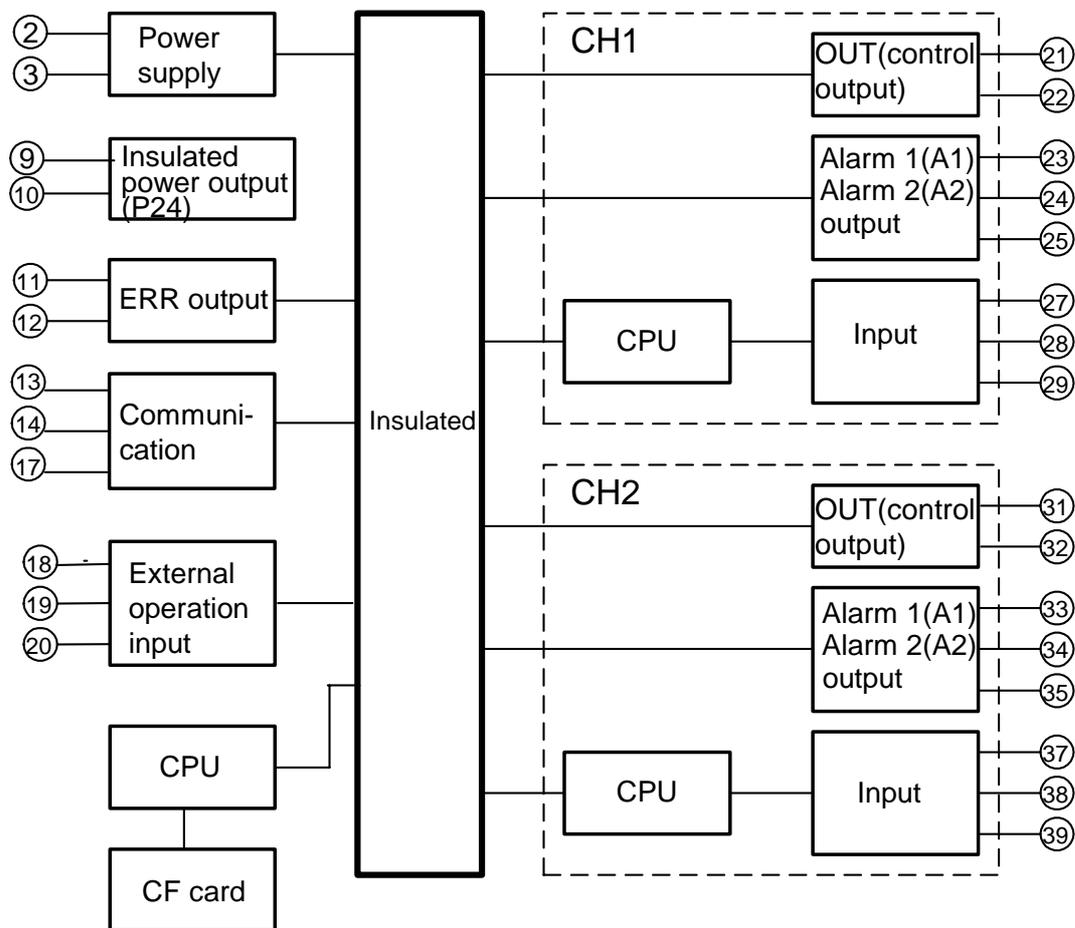
External dimensions : 96 x 96 x 100mm (W x H x D)

With water-proof cover, 115.6 x 131.7 x 100mm (W x H x D)

Material : Case, Flame-resistant resin

Color : Case, Light gray

Circuit insulation configuration



When CH1, CH2 OUT is non-contact voltage output type or DC current output type: CH1 OUT is not insulated from CH2 OUT. CH1 OUT is not insulated from External operation input. CH2 OUT is not insulated from External operation input. CH1 OUT is not insulated from Communication. CH2 OUT is not insulated from Communication.

Insulation resistance

10M Ω or more, at 500V DC for other combinations except those mentioned above

Dielectric strength

Between input terminal and power terminal, 1.5kV AC for 1 minute

Between output terminal and power terminal, 1.5kV AC for 1 minute

Attached functions : Set value lock, Sensor correction,
Power failure countermeasure, Self-diagnosis,
Automatic cold junction temperature compensation,
Burnout (overscale), Input burnout, Warm-up indication
Error indications, Momentary power failure indication

Accessories : Mounting brackets 1 set, Instruction manual 1 copy
CF card (32MB) 1
Water-proof cover 1 piece (When IP option is added)
Terminal cover 2 pieces (When TC option is added)

10.2 Optional specifications

Insulated power output (option code: P24)

Output voltage: 24 \pm 3V DC (when load current is 30mA)

Ripple voltage: Within 200mV DC (when load current is 30mA)

Maximum load current: 30mA DC

Dust-proof/Drip-proof (Option code: IP)

Dust-proof/Drip-proof specification, waterproof cover (IP66)

Terminal cover (Option code: TC)

Electrical shock protection terminal cover

11. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power and the wiring.



Warning

Turn the power supply to the instrument off before checking the wiring. Working or touching the terminal with the power switched on may result in severe injury or death due to Electric Shock.

[Indication]

| Problem | Presumed cause and solution |
|--|---|
| The PV display is flashing [_ _ _ _]. | <ul style="list-style-type: none"> The thermocouple or RTD input may be burnt out. How to check whether the sensor is burnt out [Thermocouple] If the input terminal of the instrument is shorted, and if approximate room temperature is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. [RTD] If approx. 100Ω resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if a value around 0°C (32°F) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. Check whether the input terminal of thermocouple or RTD is securely mounted to the instrument terminal. |
| The PV display is flashing [- - - -]. | <ul style="list-style-type: none"> Check whether polarity of thermocouple or compensating lead wire is correct. Check whether codes (A, B, B) of the RTD agree with the instrument terminal. |
| If indication of PV display is abnormal or unstable. | <ul style="list-style-type: none"> Check whether sensor specification is proper. Check whether the sensor input and temperature unit (°C or °F) setting are correct. Set the sensor type which is the same as users' and the temperature unit during Sensor selection [4 5 6 7]. (p.18) Set the sensor input and the temperature unit properly. Sensor correcting value is unsuitable. Set it to a suitable value. Set the value properly during Sensor correction setting [4 8 9] in Auxiliary function setting mode 1. (p.26, 32, 33) AC may be leaking into the sensor circuit. Use an ungrounded type sensor. There may be equipment that interferes with or makes noise near the controller. Keep equipment that interferes with or makes noise away from the controller. |
| PV display indicates [E r r]. | <ul style="list-style-type: none"> Internal memory is defective. Please contact our main office or dealers. |

[Keypad operation]

| Problem | Presumed cause and solution |
|---|--|
| If settings or selections are impossible. | <ul style="list-style-type: none"> • Set value lock (L O C K) is selected during the Set value lock selection in Auxiliary function setting mode 1. Release the lock selection, and set to "----". (p.26) • AT (auto-tuning) is performing. Cancel the auto-tuning (p.36). |
| If the setting indication does not change within the rated scale range even if the Δ , ∇ keys are pressed, and settings are impossible. | <ul style="list-style-type: none"> • SV high limit or low limit in Auxiliary function setting mode 1 may be set at the point where the value does not change. Set it (H H or L L) to a suitable value. (p.26) |

[Control]

| Problem | Presumed cause and solution |
|--|--|
| If process variable (temperature) does not rise. | <ul style="list-style-type: none"> • Thermocouple or RTD is burnt out. • Lead wire of thermocouple or RTD is not securely connected to the instrument terminals. Check the wiring for input and output. • Direct (Cooling) action [C O O L] has been selected in the Direct/Reverse action selection [C O N T]. Select Reverse (Heating) [H E A T] action. (p.20) |
| If the control output (OUT) remains ON status. | <ul style="list-style-type: none"> • Control output low limit value is set to 100% or higher in Auxiliary function setting mode 2. (p.19) • The proportional band is set at extremely small value. Set it to a suitable value (p.24) |
| If the control output (OUT) remains OFF status. | <ul style="list-style-type: none"> • Control output high limit value is set to 0% or less in Auxiliary function setting mode 2. (p.19) • The proportional band is set at extremely high value. Set it to a suitable value (p.24) |

[Data logging]

| Problem | Presumed cause and solution |
|-----------------------------|---|
| Data logging is impossible. | <ul style="list-style-type: none"> • Refer to "8. Other functions". (p.40, 41, 42) |

[Communication]

| Problem | Presumed cause and solution |
|---|--|
| Communication failure | <ul style="list-style-type: none"> • The connection or wiring of communication cable is not secure. • Burnout or imperfect contact on the communication cable and the connector. • Communication speed of the LCD-13A does not coincide with that of the personal computer. • The data bit, parity and stop bit of the personal computer do not accord with those of the LCD-13A. • The instrument number of the LCD-13A does not coincide with that of the command. • The instrument numbers are duplicated in multiple slaves. • Make sure that the program is appropriate for the transmission timing. |
| Although communication is occurring, the response is 'NAK'. | <ul style="list-style-type: none"> • Check that a non-existent command code has not been sent. • The setting command data exceeds the setting range of the slave. • The controller cannot be set when functions such as AT are performing. • The operation mode is under the front keypad operation setting mode. |

11. Character table

Photocopiable material

[Main setting mode]

| Indication | Setting item | Default value | Data |
|------------|--------------|---------------|------|
| SV | SV | 0°C | |

[Sub setting mode]

| Indication | Setting item | Default value | Data |
|------------|--------------------|--|------|
| AT | AT/Auto-reset | Cancel | |
| P | Proportional band | 10°C | |
| I | Integral time | 200 seconds | |
| d | Derivative time | 50 seconds | |
| ARW | ARW | 50% | |
| c | Proportional cycle | 2R/M: 30sec 2S/M: 3sec 2A/M: SV display is unlit. | |
| A1 | A1 value | 0°C | |
| A2 | A2 value | 0°C | |

[Auxiliary function setting mode 1]

| Indication | Setting item | Default value | Data |
|------------|-------------------|---------------|------|
| Lock | Set value lock | Unlock | |
| SH | SV high limit | 1370°C | |
| SL | SV low limit | -200°C | |
| Sc | Sensor correction | 0.0°C | |

[Auxiliary function setting mode 2]

| Indication | Setting item | Default value | Data |
|------------|---|-------------------|------|
| Sen | Sensor selection | K, -200 to 1370°C | |
| SHL | Scaling high limit value | 9999 | |
| SLL | Scaling low limit value | -1999 | |
| dP | Decimal point place | No decimal point | |
| FILT | PV filter time constant | 0.0 seconds | |
| oLH | Control output (OUT) high limit | 100% | |
| oLL | Control output (OUT) low limit | 0% | |
| HY | OUT ON/OFF action hysteresis | 1.0°C | |
| AL1F | Alarm 1 (A1) type | No alarm action | |
| AL2F | Alarm 2 (A2) type | No alarm action | |
| A1HY | Alarm 1 (A1) hysteresis | 1.0°C | |
| A2HY | Alarm 2 (A2) hysteresis | 1.0°C | |
| conf | Direct (Cooling)/Reverse (Heating) action | Reverse (Heating) | |
| AT_b | AT bias | 20°C | |

[Data logging condition setting mode]

| Indication | Setting item | Default value | Data |
|------------|-----------------------------------|---|------|
| YEAR | Year | 00 (2000) | |
| MON | Month | 1 (January) | |
| DAY | Day | 1 (the 1st) | |
| Hour | Hour | 0 hours | |
| Min | Minute | 0 minutes | |
| LOGP | PV logging | Effective | |
| LOGS | SV logging | Not effective | |
| LOGM | MV logging | Not effective | |
| LOGT | Status logging | Not effective | |
| LOGA | Logging auto-start | Not effective | |
| LOGS | Logging auto-start start time | 00:00 | |
| LOGE | Logging auto-start end time | 00:00 | |
| LOGC | Logging cycle | 10 seconds | |
| CFU | CF card memory usage capacity | | |
| CFR | CF card format | No format | |
| CFOK | CF card format confirmation | Format | |
| EY4L | External operation (LOG) priority | External operation (LOG) input has priority | |
| INST | Instrument number | 0 | |
| COMSP | Communication speed | 9600bps | |

***** Inquiry *****

For any inquiries about this unit, please contact the shop where you purchased the unit after checking the following.

[Example]

- Model ----- LCD-13A-2R/M
- Option ----- IP
- Serial number ----- No. xxxxxx

In addition to the above, please let us know the details of the malfunction, if any, and the operating conditions.

SHINKO TECHNOS CO.,LTD.
OVERSEAS DIVISION

Reg. Office : 2-5-1, Senbahigashi, Minoo, Osaka, Japan

URL : <http://www.shinko-technos.co.jp>

Tel : 81-72-727-6100

E-mail : overseas@shinko-technos.co.jp

Fax: 81-72-727-7006