④ Unit selecting method (When DC voltage or DC current is specified.)(*5)

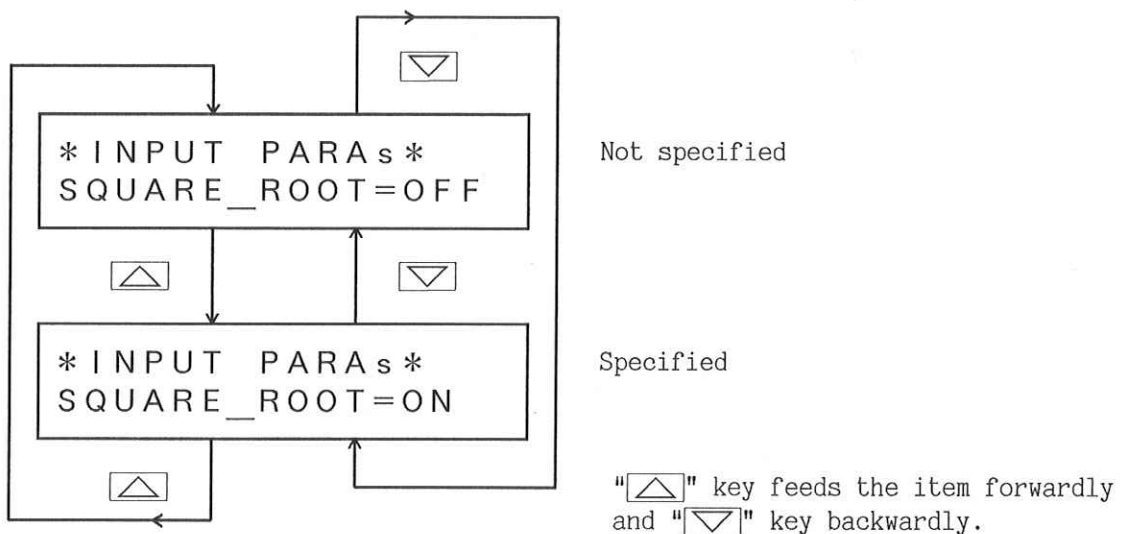```
            ┌──────────▷──────────┐
            │   ┌───┐   │
            │   │ ▽ │   │
            ↓   └───┘   │
  ┌──────────────────────────┐   │   Unit: None
  │ * I N P U T   P A R A s * │   │
  │ T Y P E = n o n e   │   │
  └──────────────────────────┘   │
       ┌───┐   ┌───┐   │
       │ △ │   │ ▽ │   │
       └───┘   └───┘   │
            ↓   ↑   │
  ┌──────────────────────────┐   │   Unit: Centigrade (°C)
  │ * I N P U T   P A R A s * │   │
  │ U N I T = °C   │   │
  └──────────────────────────┘   │
       ┌───┐   ┌───┐   │
       │ △ │   │ ▽ │   │
       └───┘   └───┘   │
            ↓   ↑   │
  ┌──────────────────────────┐   │   Unit: Fahrenheit (°F)
  │ * I N P U T   P A R A s * │   │
  │ U N I T = °F   │   │
  └──────────────────────────┘   │
       ┌───┐   ↑   │
       │ △ │   └──────────┘
       └───┘
        └──────────◁──────────┘
```

"△" key feeds the item forwardly
and "▽" key backwardly.
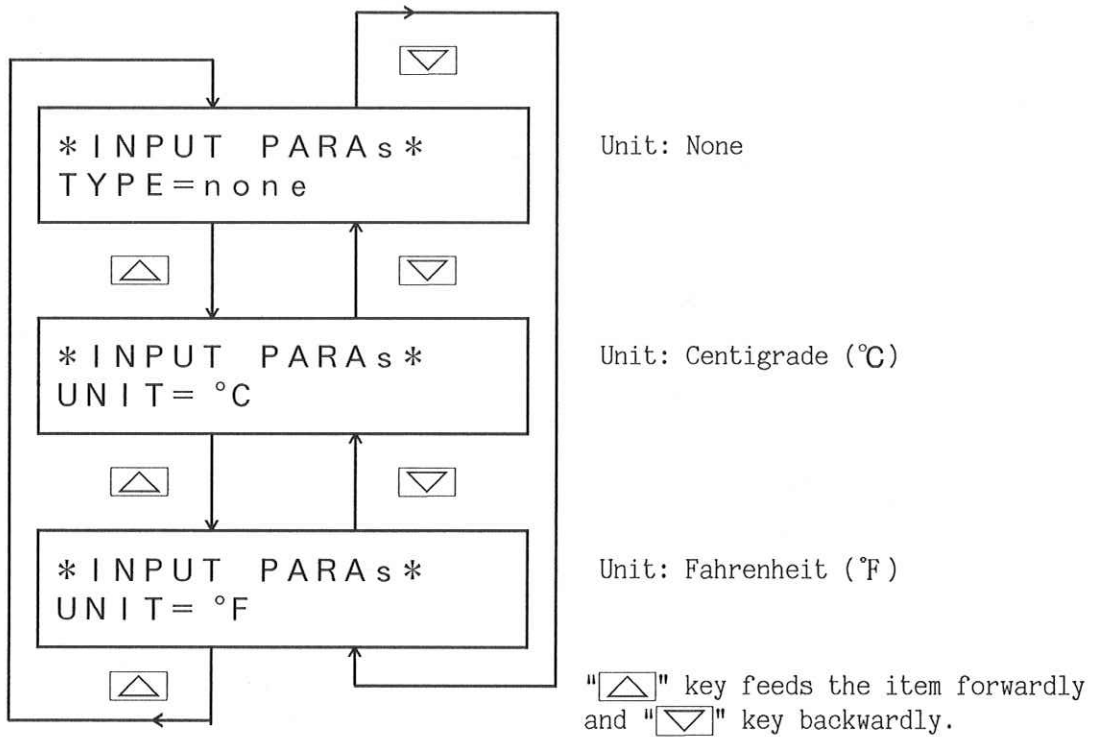
Note: The unit of thermocouple and RTD is decided by input selection.

⑤ Sensor correcting value setting(*6)

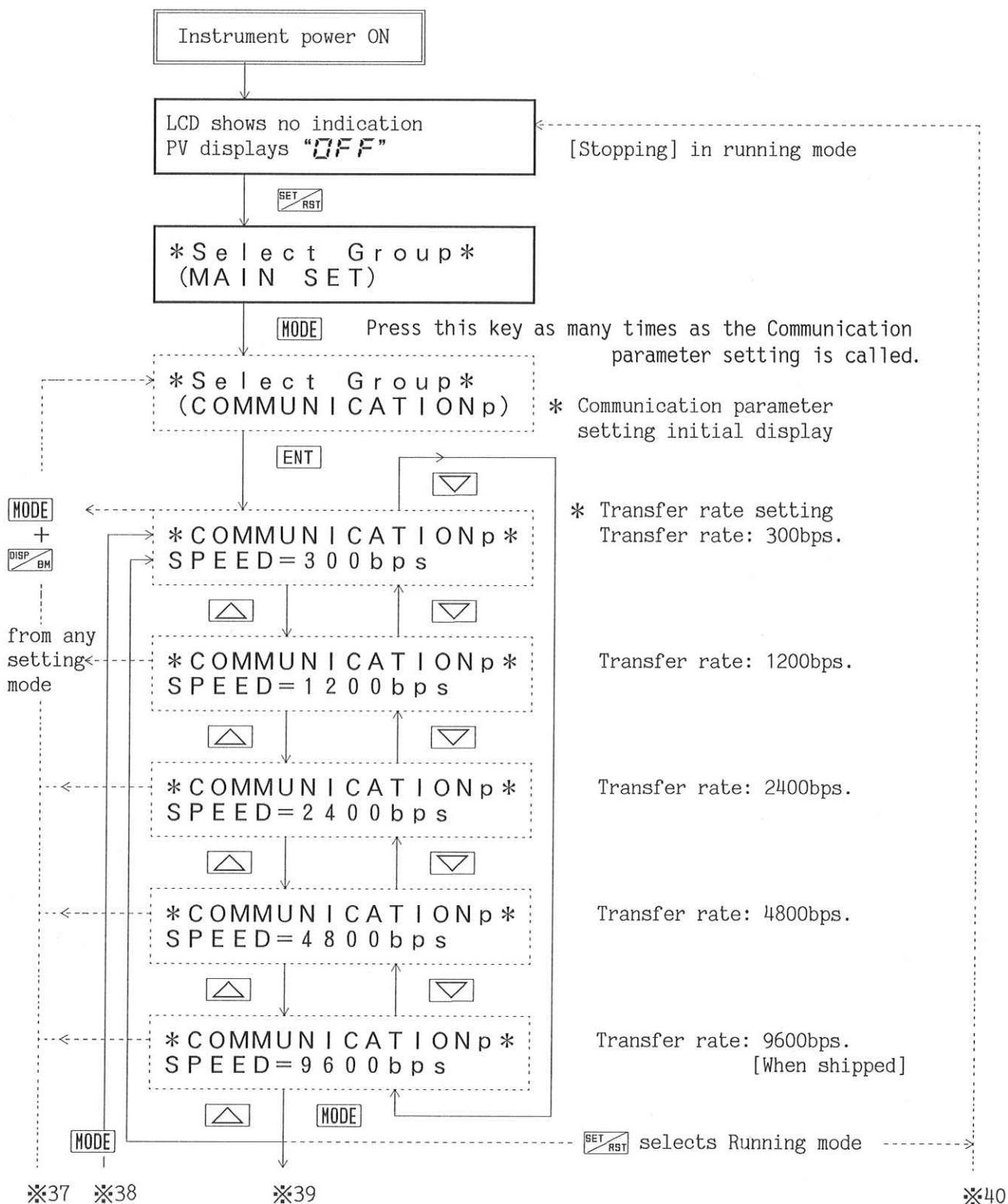· Settable: ±10.0% of scaling range span

Notes: 1. The decimal point place is as specified.
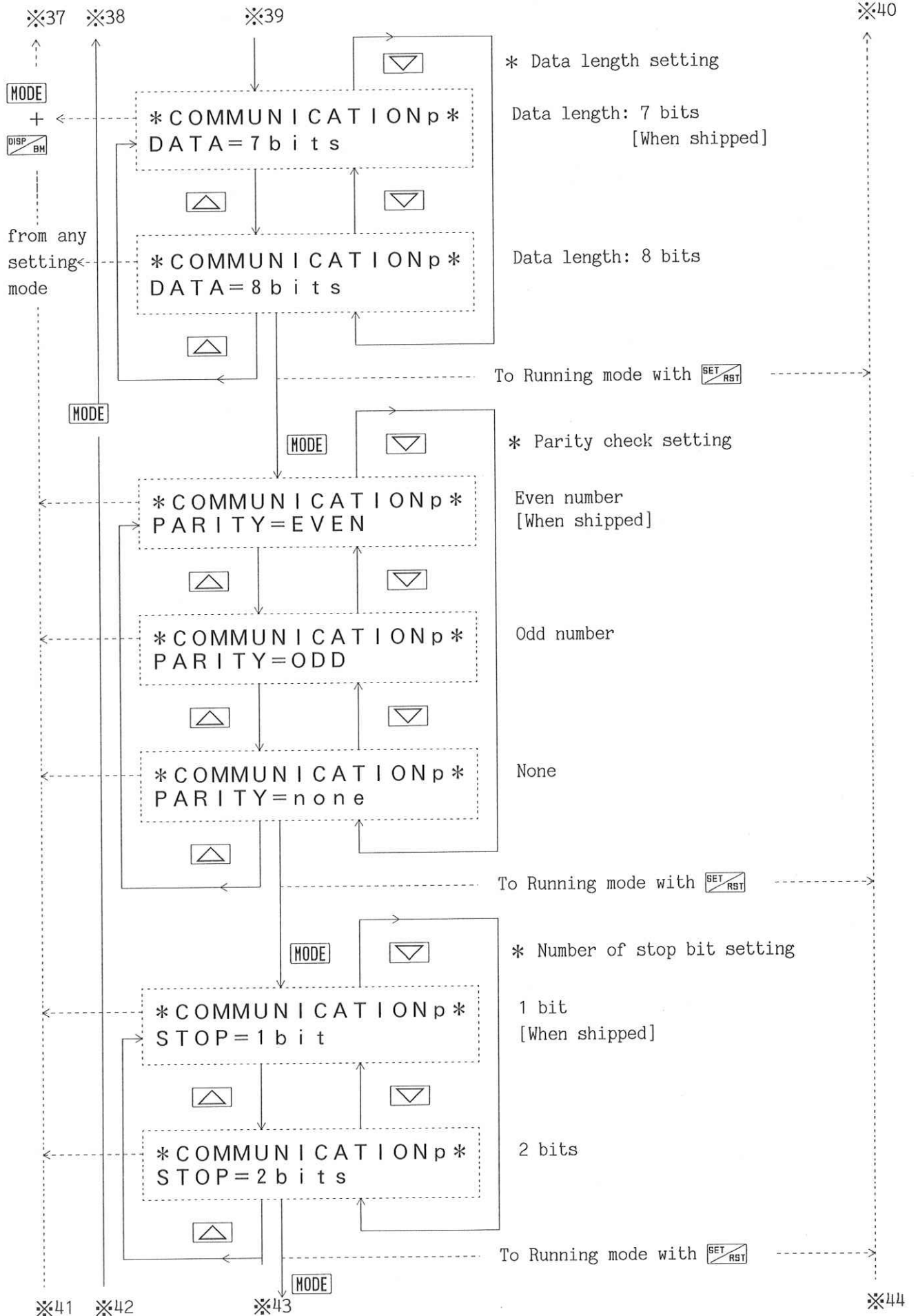       2. The unit is as selected in unit selection.

⑥ Square root extraction function designating method (*7)

```
            ┌──────────▷──────────┐
            │         ┌───┐       │
            │         │ ▽ │       │
            ↓         └───┘       │
  ┌──────────────────────────┐    │      Not specified
  │ * I N P U T   P A R A s * │   │
  │ S Q U A R E _ R O O T = O F F │
  └──────────────────────────┘    │
       ┌───┐        ┌───┐          │
       │ △ │        │ ▽ │          │
       └───┘        └───┘          │
            ↓            ↑          │
  ┌──────────────────────────┐    │      Specified
  │ * I N P U T   P A R A s * │   │
  │ S Q U A R E _ R O O T = O N  │
  └──────────────────────────┘    │
       ┌───┐            ↑          │
       │ △ │            └──────────┘
       └───┘
        └──────────◁──────────┘
```

"△" key feeds the item forwardly
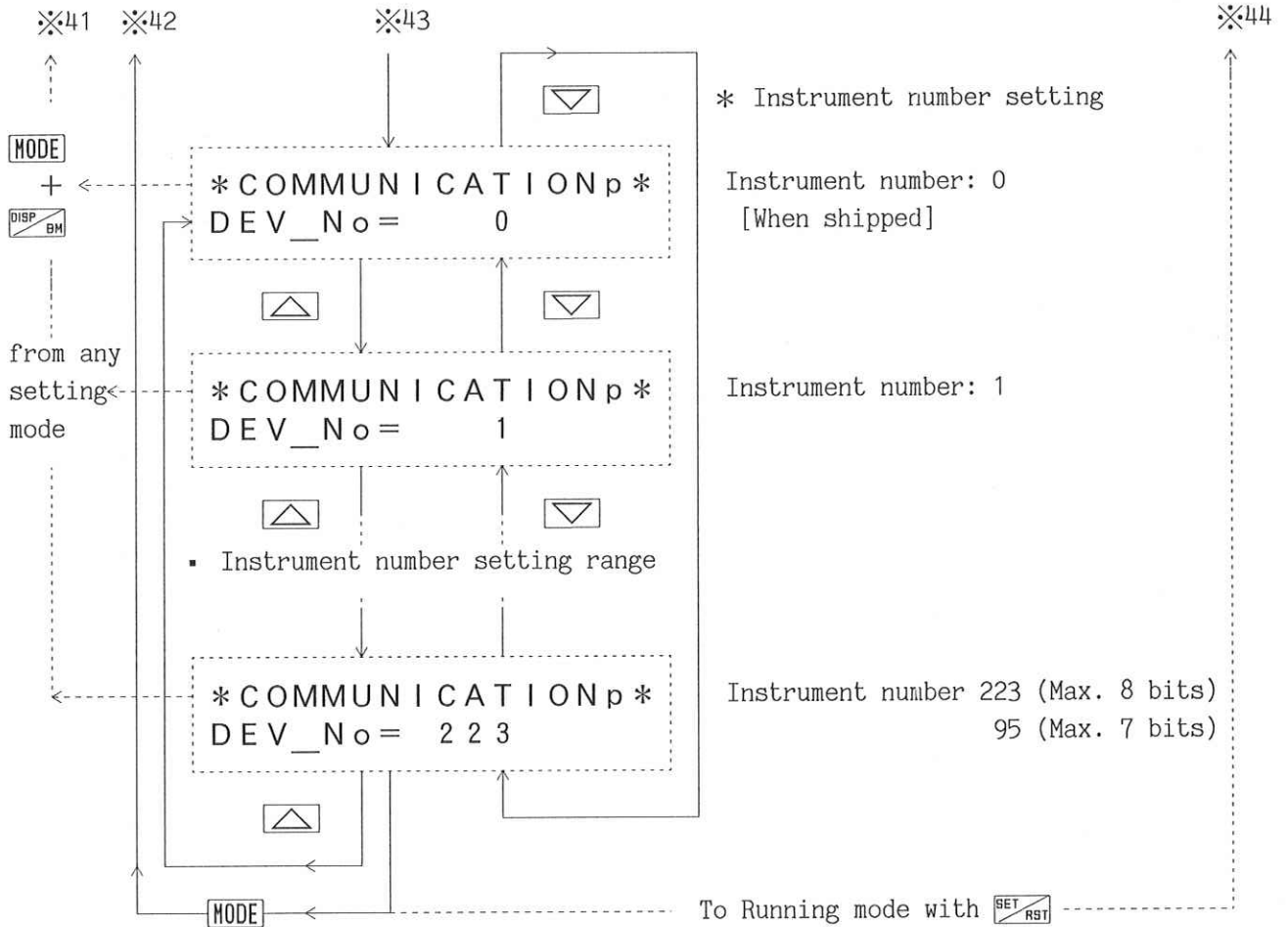and "▽" key backwardly.

1-11 Communication parameter setting (Option: C, C5)

- Set the communication parameters (Transfer rate, Data length, Parity, Stop bit and Instrument number) in this item.

- With this mode, set the parameters in the status the running mode [Stopping].

- Refer to the "Key functions" (page 10) for the key operation such as the setting value setting.
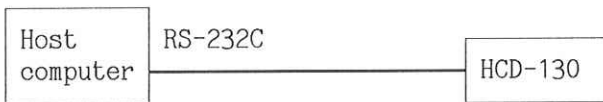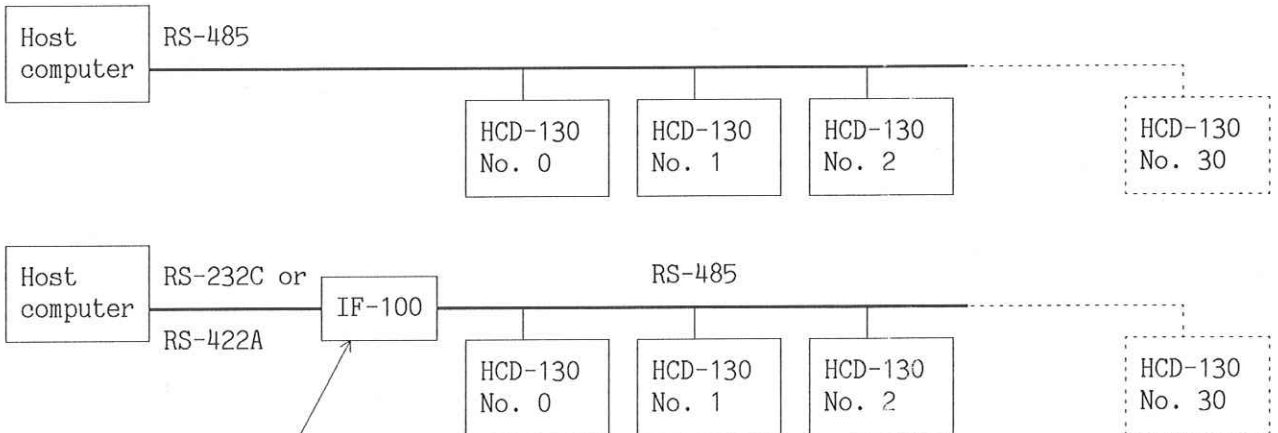
● Communication parameter setting

```
┌─────────────────────┐
│ Instrument power ON │
└─────────────────────┘
           │
           ▼
┌──────────────────────────┐
│ LCD shows no indication  │◄┄┄┄┄┄  [Stopping] in running mode
│ PV displays "OFF"        │
└──────────────────────────┘
        SET/RST
           │
           ▼
┌──────────────────────────┐
│ *Select  Group*          │
│ (MAIN  SET)              │
└──────────────────────────┘
        MODE    Press this key as many times as the Communication
                           parameter setting is called.
           ▼
   *Select  Group*
   (COMMUNICATIONp)      * Communication parameter
                           setting initial display
        ENT
           ▼
   *COMMUNICATIONp*       * Transfer rate setting
   SPEED=300bps             Transfer rate: 300bps.

   *COMMUNICATIONp*        Transfer rate: 1200bps.
   SPEED=1200bps

   *COMMUNICATIONp*        Transfer rate: 2400bps.
   SPEED=2400bps

   *COMMUNICATIONp*        Transfer rate: 4800bps.
   SPEED=4800bps

   *COMMUNICATIONp*        Transfer rate: 9600bps.
   SPEED=9600bps                 [When shipped]
```

MODE + DISP/BM   from any setting mode

SET/RST selects Running mode

※37 ※38   ※39   ※40

※37 ※38   ※39   ※40

MODE
 +   ←------   *COMMUNICATIONp*   * Data length setting
DISP BM   DATA=7bits   Data length: 7 bits
                                                          [When shipped]

from any
setting ←------ *COMMUNICATIONp*   Data length: 8 bits
mode   DATA=8bits

MODE   To Running mode with SET RST   ------→

                  MODE   * Parity check setting
             ←------ *COMMUNICATIONp*   Even number
                      PARITY=EVEN   [When shipped]

             ←------ *COMMUNICATIONp*   Odd number
                      PARITY=ODD

             ←------ *COMMUNICATIONp*   None
                      PARITY=none

                                            To Running mode with SET RST   ------→

                  MODE   * Number of stop bit setting
             ←------ *COMMUNICATIONp*   1 bit
                      STOP=1bit   [When shipped]

             ←------ *COMMUNICATIONp*   2 bits
                      STOP=2bits

                                            To Running mode with SET RST   ------→

                  MODE

※41 ※42   ※43   ※44

※41 ※42　　　　　　※43　　　　　　　　　　　　　　　　　　　　　　　　　　　※44

[MODE]
+ <-----> *COMMUNICATIONp* 　　　* Instrument number setting
[DISP/BM]　　　　DEV_No =　　　0
　　　　　　　　　　　　　　　　　　　　　　　　　Instrument number: 0
　　　　　　　　　　　　　　　　　　　　　　　　　[When shipped]

from any
setting <----- *COMMUNICATIONp* 　　Instrument number: 1
mode　　　　　　　DEV_No =　　　1

　　　　　　　　　　■ Instrument number setting range

　　　　　　　　　　COMMUNICATIONp 　Instrument number 223 (Max. 8 bits)
　　　　　　　　　　DEV_No =　2 2 3　　　　　　　　95 (Max. 7 bits)

[MODE] <----- 　　　　　　　　To Running mode with [SET/RST] -----

Note: When controlling by the communication line, the instrument numbers of the HCD-130s
　　　are settable from 0 to 223, however, it does not mean connectable number of units,
　　　but the settable instrument numbers. Connectable HCD-130s are maximum 31 units.

■ RS-232C communication line

| Host computer | RS-232C | HCD-130 |

■ RS-485 multiple-down connecting communication line

Host computer — RS-485 — HCD-130 No. 0 | HCD-130 No. 1 | HCD-130 No. 2 | ... | HCD-130 No. 30

Host computer — RS-232C or RS-422A — IF-100 — RS-485 — HCD-130 No. 0 | HCD-130 No. 1 | HCD-130 No. 2 | ... | HCD-130 No. 30

Communication converter [IF-100-C5] is available, separately sold.

1-12 Cascade parameter setting (Option: CC)
- Set the parameters on the cascade slave side [Proportional band (P), Integral time (I), Derivative time (D), Anti-reset windup (ARW), PID auto-tuning and PID auto-tuning bias]. Set the only necessary items.
- To set the Integral time (I) and Derivative time (D), the proportional band (P) must be set.
- To set the Anti-reset windup (ARW), the Proportional band (P) and Integral time (I) must be set.
- When the proportional band is set to the value excepting 0.0, it can adjust the offset only when the integral time (I) is set to 0. (*1)
- Refer to the "Key functions" (page 10) for the key operation such as the setting value setting.

● Cascade PID parameter setting

```
┌─────────────────────────────┐
│ Instrument power ON         │
└─────────────────────────────┘
               │
               ▼                        Running mode
┌─────────────────────────────┐
│ MV (main)          5 0 %    │ ← - - - - - - - - - - - - - - - - - -
│ [ ▊▊▊▊▊▊▊▊        ]          │      * [Running] or [Stopping]
└─────────────────────────────┘
          [SET/RST]
               │
               ▼
┌─────────────────────────────┐
│ *Select  Group*             │
│ (MAIN  SET)                 │
└─────────────────────────────┘
          [MODE]    Press this key as many times as the cascade PID
               │               parameter setting is called.
               ▼
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *Select  Group*             │   * Cascade PID parameter setting
│ (CASCADE  PARAs)            │     initial display.
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
       [ENT]        [DISP/BM]
```

[MODE]
+
[DISP/BM]

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *CASCADE  PARAs*            │
│ P =    2 . 5 %              │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
       [MODE]       [DISP/BM]
```

Set the Slave proportional band with "[△], [▽] and [◀FAST▶]" keys.
When the setting value is "0", it is indicated as P = - - -.
[Settable: 0.1 to 999.9%]
[Factory adjusted as 0 (0.0)]

from any setting mode

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *CASCADE  PARAs*            │
│ I =   1 5 0 s               │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
       [MODE]       [DISP/BM]
```

Set the Slave integral time with "[△], [▽] and [◀FAST▶]" keys.
When the setting value is "0", it is indicated as I = - - -.
[Settable: 1 to 9999sec.]
[Factory adjusted as 0]

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *CASCADE  PARAs*            │
│ D =   2 5 0 s               │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
       [MODE]       [DISP/BM]
```

Set the Slave derivative time with "[△], [▽] and [◀FAST▶]" keys.
When the setting value is "0", it is indicated as D = - - -.
[Settable: 1 to 9999sec.]
[Factory adjusted as 0]

※45 ※46   ※47   ※48   ※49   ※50

※45   ※46   ※47   ※48   ※49   ※50

```
        ↑                 ↓                ↑
     [MODE]  ←---   *CASCADE  PARAs*              Set the Slave Anti-reset windup (ARW)
        +            ARW=    55%                  with "[△], [▽] and [◀FAST▶]" keys.
     [DISP/BM]                                    [Settable: 0 to 100%]
                                                  [Factory adjusted as 30%]
                          [MODE]    [DISP/BM]
     from any                                     Specify the STOP or START of Slave PID
     setting ←---  *CASCADE  PARA  *              auto-tuning with "[△] or [▽]" key.
     mode          AT=START  STOP                 [Setting method: Refer to below *2]
                                                  [Factory adjusted as STOP]
                          [MODE]    [DISP/BM]
                                                  Set the Slave PID auto-tuning bias with
        ↓     ←---  *CASCADE  PARAs*              "[△] or [▽]" keys.
                    AT_BS=        2.3             [Settable: ±20% of full scale]
                                                  The unit is selected as Slave unit
                  [MODE]                          selection. [Factory adjusted as 0(0.0]
```

   ┈→ Press [SET/RST] in any mode to go to Running mode ┈┈┈┈┈┈┈┈┈┈┈┈┈┈

▪ Offset adjustment (*1)

  [Derivative time (D) setting mode]
              ↓
```
 *PID  PARAMETERs*          Adjust the slave Proportional band offset
 POFFS=        1.5℃         (difference between SV and PV) with "[△],
                            [▽] and [◀FAST▶]" keys.
                            [Settable from − Prop. band to + Prop.
              ↓              band] [Factory adjusted as 0]
```
  [Sub-proportional band (P) setting mode]

▪ Slave PID auto-tuning designating method (*2)

  [Slave Anti-reset windup (ARW) setting mode]
              ↓
```
 *CASCADE  PARAs*          Select "START" or "STOP" with
 AT=START  STOP            "[△] or [▽]" key.
```
              ↓
       [Selected side flashes.]
              ↓
  [Slave PID auto-tuning bias setting mode]

1-13 Cascade scale setting (Option: CC)

- Set the Cascade slave side scale setting [Input range, Unit, Scaling low limit, Scaling high limit, Setting value low limit, Setting value high limit].

- All items are not required to set, set the only necessary items.

- Refer to the "Key functions" (page 10) for the key operation such as the setting value setting.

● Cascade scale setting

```
┌─────────────────────────┐
│   Instrument power ON   │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ LCD shows no indication │ ← - - - - - - - - - - - - - - - - - - - ┐
│ PV displays "OFF"       │        [Stopping] in Running mode
└─────────────────────────┘
            │
          [SET/RST]
            ▼
┌─────────────────────────┐
│ *Select   Group*        │
│ (MAIN  SET)             │
└─────────────────────────┘
```

[MODE] Press this key as many times as the Cascade scale setting is called.

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *Select   Group*          │     * Cascade scale setting
│ (CASCADE  SCALEs)         │       initial display
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```

[ENT]   [DISP/BM]

[MODE]
  +
[DISP/BM]

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *CASCADE   SCALEs*        │
│ TYPE=0~10mV               │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
Specify the Slave input (sensor) selection with "[△] or [▽]" key.
[Setting method: See page 40]
[Factory adjusted as specified]

from any setting mode

[MODE]   [DISP/BM]

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *CASCADE   SCALEs*        │
│ UNIT=none                 │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
Specify the Slave unit selection with "[△] or [▽]" key.
[Setting method: See page 43]
[Factory adjusted as none]

[MODE]   [DISP/BM]

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *CASCADE   SCALEs*        │
│ SCALE_L= -100.0           │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
Set the Slave scaling low limit setting with "[△], [▽] and [FAST]" keys.
[Setting method: See page 41]
[Factory adjusted as low limit of rating]

[MODE]   [DISP/BM]

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ *CASCADE   SCALEs*        │
│ SCALE_H= 1200.0           │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```
Set the Slave scaling high limit setting with "[△], [▽] and [FAST]" keys.
[Setting method: See page 41]
[Factory adjusted as high limit of rating]

[MODE]   [DISP/BM]

※51   ※52   ※53   ※54   ※55   ※56

※51 ※52 ※53 ※54 ※55 ※56

```
[MODE]
  +        <---    *CASCADE  SCALEs*
[DISP/BM]          LMT_L=      -100.0

                      [MODE]     [DISP/BM]

from any           *CASCADE  SCALEs*
setting            LMT_H=      1200.0
mode
          <---
        [MODE]
```

Set the Slave setting value low limit
with "[△], [▽] and [◄FAST►]" keys.
[Setting range: See below   (*1)]
[Factory adjusted as Notes: (*2)]

Set the Slave setting value high limit
with "[△], [▽] and [◄FAST►]" keys.
[Setting range: See below   (*1)]
[Factory adjusted as Notes: (*3)]

⌐--> Press [SET/RST] in any mode to go to Running mode ----------------

- (*1) Slave setting value low or high limit settable range

From $-$[(Slave scaling high limit setting value) $-$(Slave scaling low limit
        setting value)] $\times 10$ $+$ (Slave scaling low limit setting value)
  to   [(Slave scaling high limit setting value) $-$(Slave scaling low limit
        setting value)] $\times 10$ $+$ (Slave scaling high limit setting value)

Notes: • The unit is selected as specified in the slave unit selection.

        • (*2) Low limit setting value of slave side rated input

        • (*3) High limit setting value of slave side rated input

1-14 Other functions

＊In this item, the basic functions to use the HCD-130 are selected, adjusted or set. The functions are: "Running mode selection Running or Stopping", "Remote/Local selection", "Setting value lock selection (When Security function [Option: SE] is applied, selection by the function)", "LCD multi-display contrast adjustment", "PID auto-tuning bias value setting", "Remote bias value setting", "Display contents when stopping status is selected", "Instrument power supply frequency selection" and "Control mode, Direct/Reverse selection".

Notes: 1. If the option Security setting (Option: SE) is applied, the Setting value lock function selection is not called. In that case, set the Setting value lock function by the Security setting (Option: SE).
2. All items are not required to select, adjust or set, however, the functions ["Selection of running mode, Running or Stopping", "Instrument power frequency selection, 50Hz or 60Hz" and "Control action, Direct or Reverse selection"] should be confirmed.

・Refer to the "Key functions" (page 10) for the key operation such as the setting value setting.

■ Setting flow chart

        ※57 ※58   ※59   ※60   ※61   ※62

※57 ※58   ※59   ※60   ※61   ※62

*1

```
*Other  FUNCTION*
LOCK=free
```
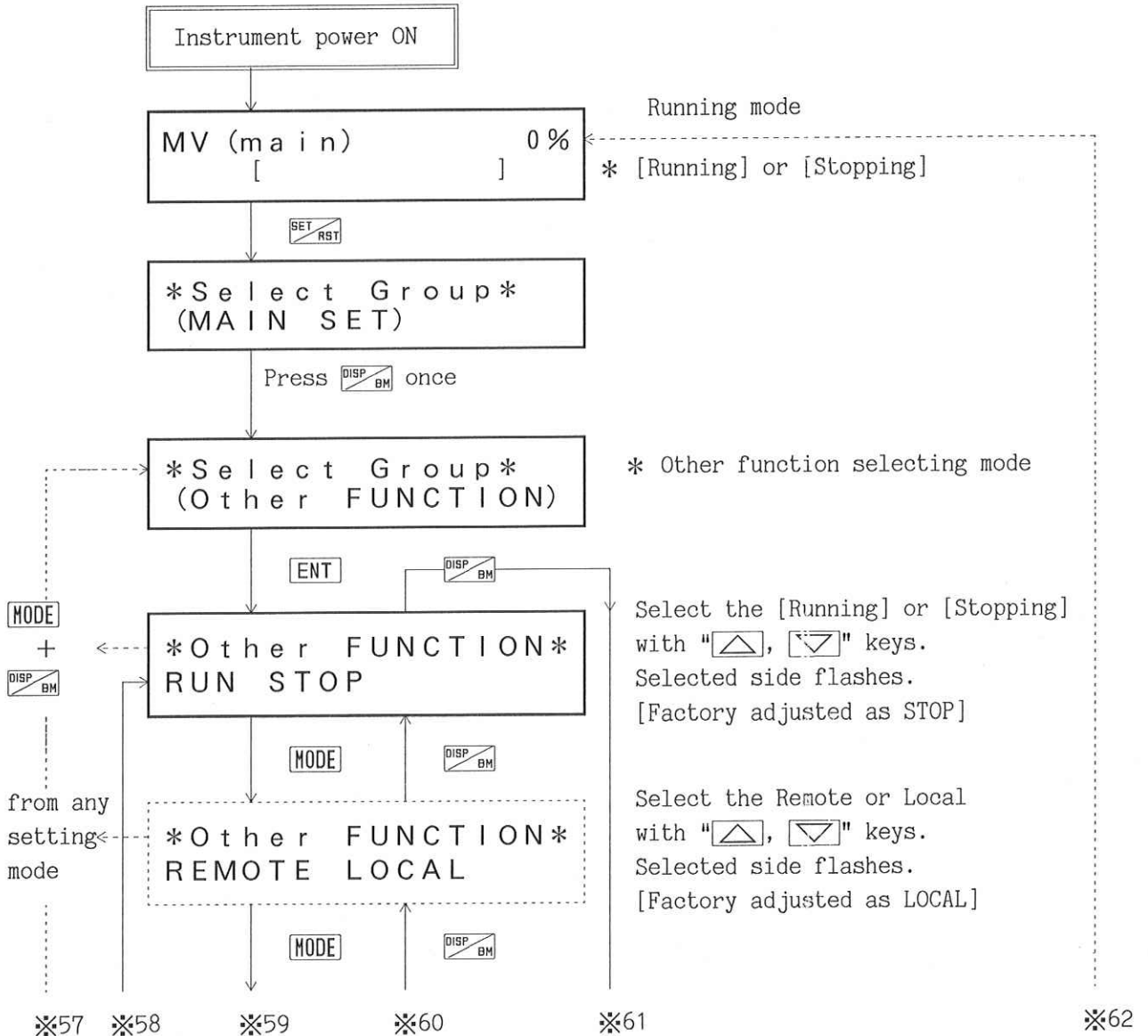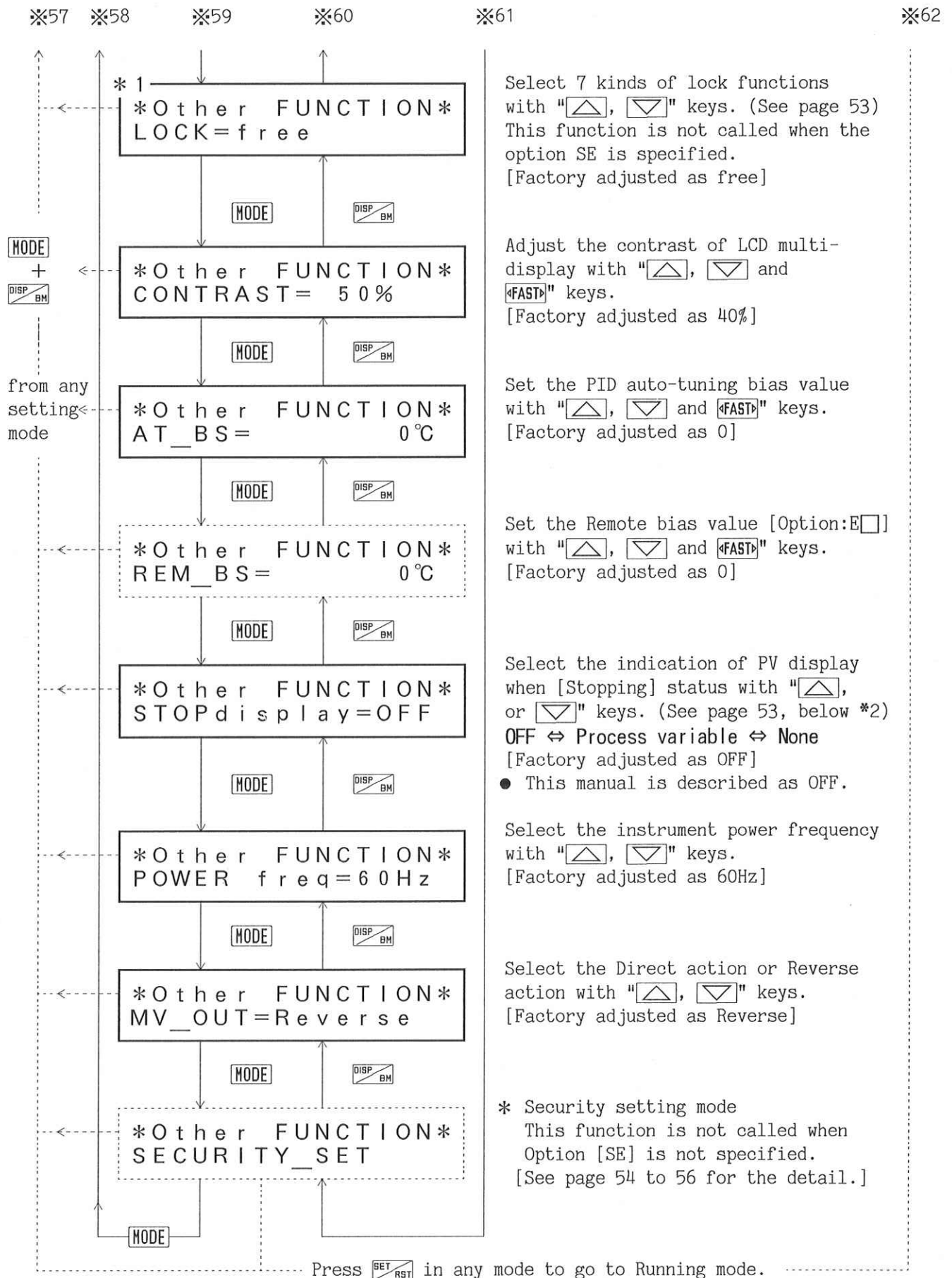
Select 7 kinds of lock functions with "△, ▽" keys. (See page 53) This function is not called when the option SE is specified.
[Factory adjusted as free]

[MODE]   [DISP/BM]

MODE
+
[DISP/BM]

```
*Other  FUNCTION*
CONTRAST= 50%
```

Adjust the contrast of LCD multi-display with "△, ▽ and ◁FAST▷" keys.
[Factory adjusted as 40%]

[MODE]   [DISP/BM]

from any setting mode

```
*Other  FUNCTION*
AT_BS=        0℃
```

Set the PID auto-tuning bias value with "△, ▽ and ◁FAST▷" keys.
[Factory adjusted as 0]

[MODE]   [DISP/BM]

```
*Other  FUNCTION*
REM_BS=        0℃
```

Set the Remote bias value [Option:E☐] with "△, ▽ and ◁FAST▷" keys.
[Factory adjusted as 0]

[MODE]   [DISP/BM]

```
*Other  FUNCTION*
STOPdisplay=OFF
```

Select the indication of PV display when [Stopping] status with "△, or ▽" keys. (See page 53, below *2)
OFF ⇔ Process variable ⇔ None
[Factory adjusted as OFF]
● This manual is described as OFF.

[MODE]   [DISP/BM]

```
*Other  FUNCTION*
POWER  freq=60Hz
```

Select the instrument power frequency with "△, ▽" keys.
[Factory adjusted as 60Hz]

[MODE]   [DISP/BM]

```
*Other  FUNCTION*
MV_OUT=Reverse
```

Select the Direct action or Reverse action with "△, ▽" keys.
[Factory adjusted as Reverse]

[MODE]   [DISP/BM]

```
*Other  FUNCTION*
SECURITY_SET
```

* Security setting mode
  This function is not called when Option [SE] is not specified.
  [See page 54 to 56 for the detail.]

[MODE]

Press [SET/RST] in any mode to go to Running mode.

● Setting value lock function selecting mode (*1)

```
┌──────────────────────────────┐   ┌─▽─┐
│                              │
│  *Other  FUNCTION*           │        ① All setting items are changeable. (No lock)
│  LOCK=free                   │
│                              │
├─△─┤        ┌─▽─┐
│                              │        ② All setting items are temporarily
│  *Other  FUNCTION*           │           changeable. (When operating, it is
│  LOCK=temporary              │           changeable, however, it becomes
│                              │           former value if the power turned
├─△─┤        ┌─▽─┐                         off and on again.)
│                              │
│  *Other  FUNCTION*           │        ③ All setting items are unchangeable.
│  LOCK=all                    │
│                              │
├─△─┤        ┌─▽─┐
│                              │        ④ 1-1 Main setting value setting to 1-14
│  *Other  FUNCTION*           │           Other function are unchangeable.
│  LOCK=main                   │           (excepting 1-2 Setting value memory No.
│                              │           selection.)          (Refer to page 14)
├─△─┤        ┌─▽─┐
│                              │        ⑤ 1-3 PID parameter setting to 1-14
│  *Other  FUNCTION*           │           Other function are unchangeable.
│  LOCK=PID--                  │                              (Refer to page 14)
│                              │
├─△─┤        ┌─▽─┐
│                              │        ⑥ 1-4 Alarm setting value setting to
│  *Other  FUNCTION*           │           1-14 Other function are unchangeable.
│  LOCK=AlarmSET--             │                              (Refer to page 14)
│                              │
├─△─┤        ┌─▽─┐
│                              │        ⑦ 1-5 Alarm output parameter setting
│  *Other  FUNCTION*           │           to 1-14 Other function are unchangeable.
│  LOCK=AlarmFUNC--            │                              (Refer to page 14)
│                              │
└─△─┘
```

Control output OFF function (*2)

    OFF : It stops the control output, and indicates "OFF" on PV display.

    PV : It stops the control output, and indicates the process variable on
           PV display.

  None: It stops the control output, and PV display indicates nothing.
          Only the back-light is lit on LCD.

● Security function (Option: SE)

It is the setting value lock function to change the lock status applying the registered security code (4-digit numerals).

With this function, 10 kinds of security code and 6 kinds of lock status (hereafter security level) can be registered at will. Therefore, the operation to meet the level of the security code holder can be performed, and setting contents are secured from wrong operation.

▪ How to set the security code.
  Call the security setting mode by 1-14 Other functions.
  Then, set the security level and security code respectively to the Set No. 0 to 9 in security setting mode.

▪ After the power is turned on, the security level will be as registered by security code 0000. If security code 0000 is not set, after the power turned on, the security level will be selected as 0.

▪ When different security level is registered to the same code, the level of the smaller Set number has priority.

▪ In case the option [SE] is not specified, this mode will not be indicated.

```
┌─────────────────────────┐
│ *Other  FUNCTION*       │  * Security setting mode
│ SECURITY_SET            │
└───────────┬─────────────┘
          [ENT]
            │                          Set number
┌───────────▼─────────────┐  ╱
│ SECURITY  setNO. 0 ◄────╱
│ LV=5  CODE=0000 ◄───────
└─────────────────────────┘          Security code
                                     [4-digit numeric value]
```

Security level ──────╱

Every pressing [MODE] key changes the flash [LV] → [CODE] → Set No.[0 to 9]
[DISP/BM] key changes them backward.

```
┌─────────────────────────┐
│ SECURITY  setNO. 0      │
│ LV=5  CODE=0001         │
└─────────────────────────┘
```
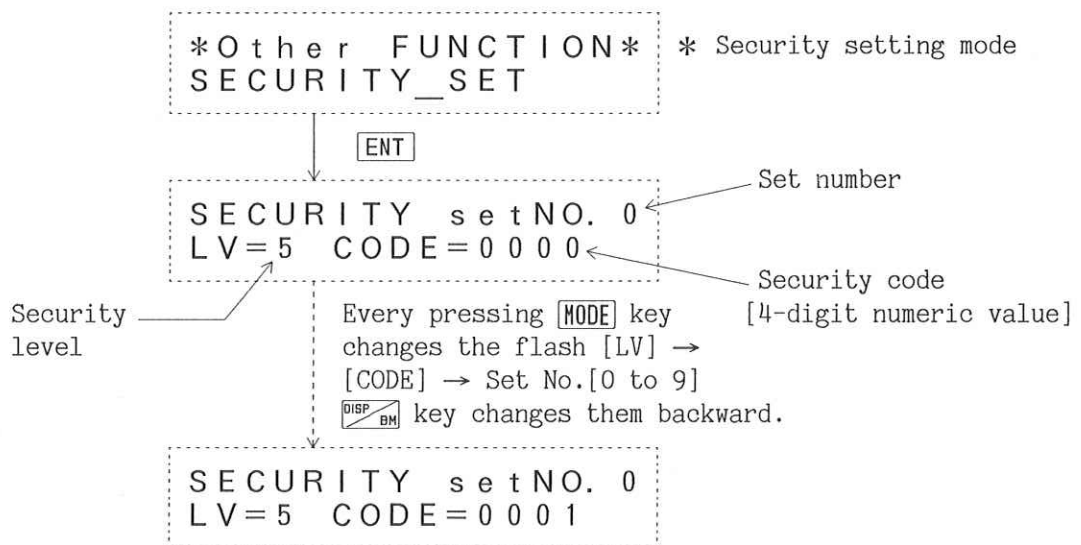
Notes: 1. Move the flash and set to the Set No. with "[MODE] or [DISP/BM]" key.

2. The setting is registered if pressed "[ENT]" key, or when moved to another item.

3. Set the security level and security code with "[△] and [▽]" keys.

4. Registered security code and the level should be kept a record for the memory without fail.

┌──┐
│ CAUTION: WHEN SETTING THE SECURITY LEVEL, 1 OR MORE OF LEVEL 5 MUST BE SET AT LEAST. │
│   IF THE SECURITY LEVEL 5 IS NOT SET, ANY LOCK STATUS (SECURITY LEVEL 0 TO 4, │
│   DIFFERENT FROM THE SECURITY CODE SETTING STATUS) WILL BE APPLIED AND THE │
│   LOCK CANNOT BE RELEASED. │
└──┘

● Factory adjusted as follows:

Set No.	Security level	Security code
0	5	0000
1 to 9	0 to 0	9999 to 9999

● Security level

Security level No.	Lock status (Refer to page 14 for the items 1-1 to 1-14)
0	All setting items are unchangeable.
1	1-1 Main setting value setting to 1-14 Other function are unchangeable. (Excepting 1-2 Setting value memory No. selection.)
2	1-3 PID parameter setting to 1-14 Other function are unchangeable.
3	1-4 Alarm setting value setting to 1-14 Other function are unchangeable.
4	1-5 Alarm output parameter setting to 1-14 Other function are unchangeable.
5	All setting items are changeable.

● How to operate the Security function
In [Running] or [Stopping] mode, if [MODE] key is pressed for approx. 3 seconds, LCD multi-display turns to Security code input mode.

· Security code input mode display

```
Your  Security
Code=0000
```

In this display, input the code registered in Security code setting mode with "[△], [▽]" and "[◄FAST►]" keys, and if "[ENT]" key is pressed, LCD multi-display changes to [Running] or [Stopping] mode.

After selected the level and code, the level is applied to the code, and the operation to meet the level of the security code holder can be performed.

If the security code not registered is selected, the security level becomes 0. When the Security code input mode is called, the security code is always displayed as 0000.

The security levels changed by security code input mode are maintained until the level is changed in the security code input mode or the power is turned on again.

[Setting example]

When the setting is assumed as follows:

Set No.	Security level	Security code
0	5	1993
1	3	0202
2	3	1791
3	2	1791
4	4	4571
5	2	5000
6	1	0000
7	0	9999
8	0	9999
9	0	9999

In this case, the security code 0000 is set to the security level 1, therefore, after the security setting is completed or the power is turned on, the security level becomes 1.

To make the security level to 4, input the security code 4571.

If the code not registered to the security code setting mode is input, the security level becomes 0.

Further, if input the code to 1791, the level 3 registered in Set No. 2 will be selected (Smaller Set No. has priority).

(2) Running mode

2-1 PID auto-tuning designation

- It designates start or stop of the PID auto-tuning.

- During running mode [Running], if "AT" key is pressed for approx. 1 sec., the PID auto-tuning indicator (Yellow LED) blinks, and the controller starts tuning. When the tuning is completed, the indicator turns to unlit.

  To cancel the PID auto-tuning on its halfway, press "AT" key again for approx. 1 sec., then, the indicator (Yellow LED) turns to unlit, and releases the tuning.

  * If the PID auto-tuning is cancelled on its halfway, proper PID parameters cannot be set, but returns to their former parameters.

  * The front key setting cannot be performed during auto-tuning, however, remote setting [option code: E] or Setting value memory number [option code: SM] must not be changed during auto-tuning, or proper PID parameters will not be set.

2-2 Manipulating value manual setting

- It sets the manipulating value by manual.

- During running mode [Running], if "AUTO/MAN" key is pressed for approx. 1 second, the mode is changed to manipulating value manual setting (*1), and the manipulating value can be set with "△, ▽" and "◄FAST►" keys.
  If pressed "AUTO/MAN" key again for approx. 1 second, the mode turns to running mode [Running].

- Settable range:

        0   to 100.0%
     -5.0 to 105.0%   (Current output)
   -100.0 to 100.0%   (Heating and Cooling control output (Option: D□))
                      In case the main output is DR (relay) or DS (SSR drive).
   -105.0 to 105.0%   (Heating and Cooling control output (Option: DA)
                      In case the main output is DA (current).

Notes:
- It has bidirectional balanceless bumpless function, and when changed the control from automatic to manual (vice versa) it prevents the manipulating value from sudden change. If the dead band is set, the balanceless bumpless function at Sub-output (Cooling) side does not work, during Heating and Cooling control and when changed the control from automatic to manual.

- When changed the control from automatic to manual, it makes the manipulating value at which automatic control is operated to the initial value of manual operation.

- When changed the control from manual to automatic, it makes the manipulating value at which manual control is operated to the initial value of automatic operation.

● Manual manipulating value setting (LCD multi-display)

```
MV (main)          5 0 %
    [ ▮▮▮▮▮▮▮ ]
```
* [Running] in Running mode

Press AUTO/MAN key for approx. 1sec.

*1
```
MANUAL              %
MANIPULATE=         0
```
* Manual manipulating value setting
Set the manipulating value with "△, ▽ and ◄FAST►" keys.

Press AUTO/MAN key for approx. 1sec.
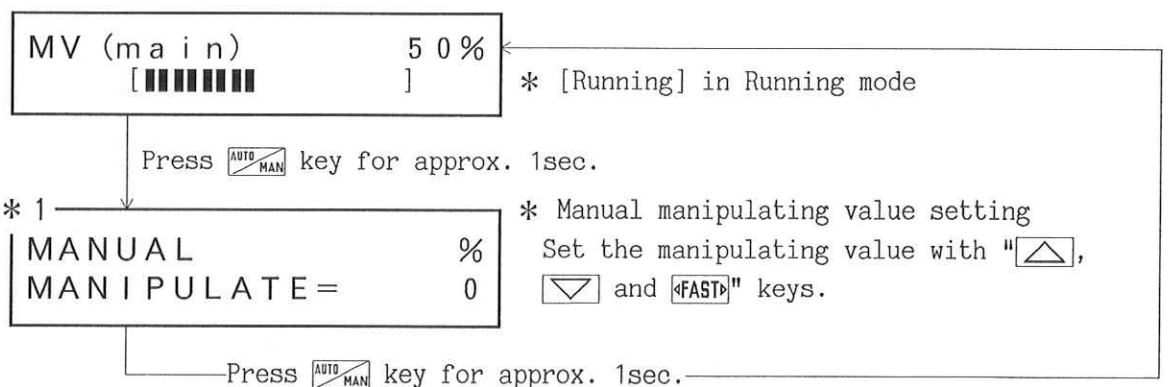
2-3 Manipulating value indication change (LCD multi-display)

• During running mode [Running], LCD multi-display can be changed with "[DISP/BM]" Key.

1. Change of manipulating value indication (Main and Sub). (Option code: D☐)

```
┌────────────────────────────┐              ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
│ MV (main)        50%       │  ⟷           ╎ MV (sub)         30%       ╎
│  [███████       ]          │ [DISP/BM]     ╎  [█████          ]          ╎
└────────────────────────────┘              └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```

Main control output (C1)   Sub-control output (C2)
manipulating value (MV)   manipulating value (MV)

2. When cascade control

```
  ┌─────────────────────────────┐
  ╎ MV (master)       60%       ╎   Master manipulating value
  ╎  [███████        ]          ╎
  └─────────────────────────────┘
              │ [DISP/BM]
  ┌─────────────────────────────┐
  ╎ MV (slave)        30%       ╎   Slave manipulating value
  ╎  [█████          ]          ╎
  └─────────────────────────────┘
              │ [DISP/BM]
  ┌─────────────────────────────┐
  ╎ PV (m)       250.0          ╎   Master process variable (PV)
  ╎ SV           200.0          ╎   and setting value (SV)
  └─────────────────────────────┘
              │ [DISP/BM]
  ┌─────────────────────────────┐
  ╎ PV (s)       260.0          ╎   Slave process variable (PV)
  ╎ SV           250.0          ╎   and setting value (SV)
  └─────────────────────────────┘
         [DISP/BM]
```
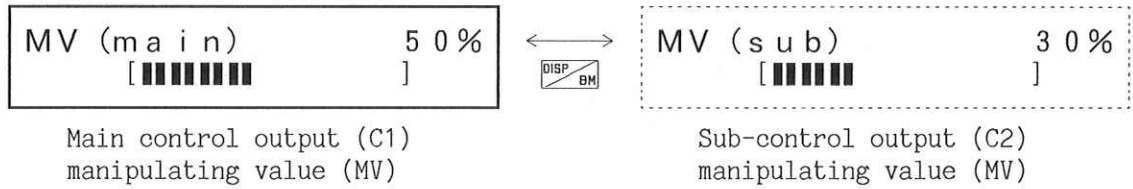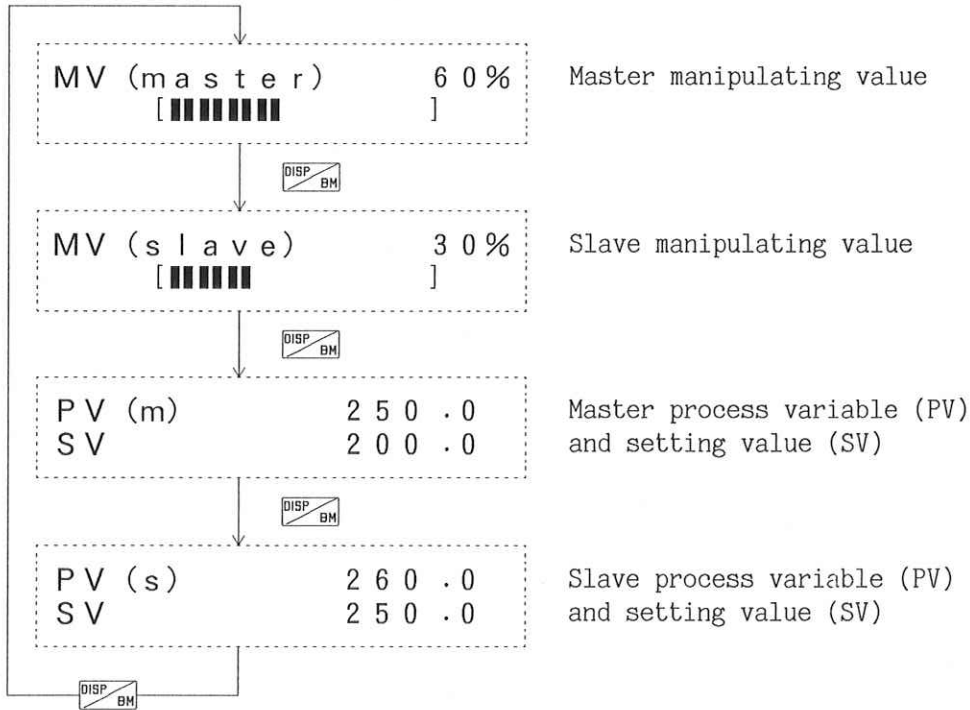
2-4 Delayed starting timer setting

▪ It does not start the control instantly after the power supply is turned on, but it starts the control after the preset time has elapsed.

▪ In running mode, if "[SET/RST]" key is pressed for approx. 3 seconds, delayed starting timer will be selected. Set the delayed starting time with "[△], [▽] and [◀FAST▶]" keys. Then, if "[ENT]" key is pressed, the timer starts. LCD multi-display shows the rest time to start the control. Settable from 00:00 to 99.59 (maximum, 99hours 59minutes) [To interrupt the time, press "[SET/RST]" key again, then it returns to running mode.] Indications of the Process variable (PV) and Setting value (SV) are the same as the indication [Stopping] status.

```
┌────────────────────────────┐
│ MV (main)        50%       │ ←───────   * Running mode
│  [███████      ]           │
└────────────────────────────┘
         │
   Press [SET/RST] key for approx. 3 seconds.
         │
┌────────────────────────────┐
│ It will  RUN               │          * Delayed starting timer setting
│ after      00:00           │            Set the delayed starting time
└────────────────────────────┘            with "[△], [▽] and [◀FAST▶]" keys.
              │  │
             hr. min.
         │
         └──────────────── [SET/RST]
```
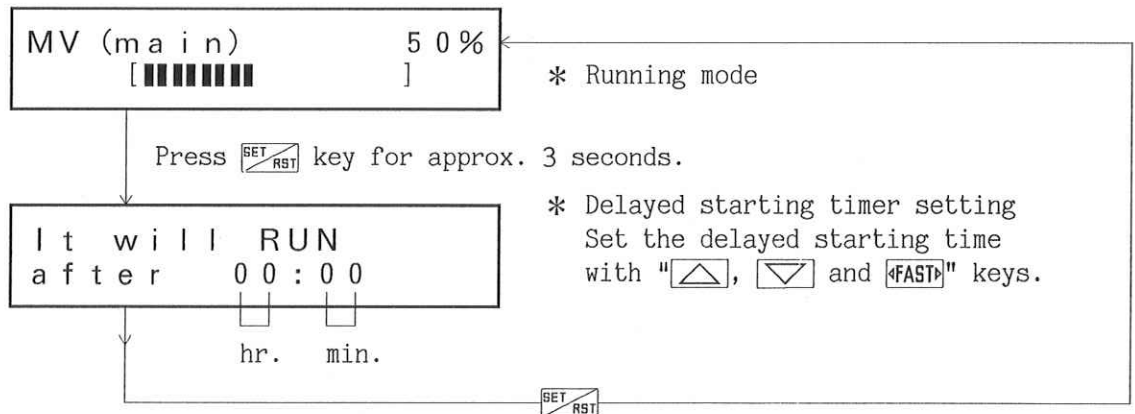
7. Running

After completion of the mounting to the control panel and wiring connections, start running in the following manners:

① Confirm that the conditions to use the HCD-130 (Item 1-14 Other function) are set correctly.

② Set the necessary items to control, referring to the section "6. Operation".

③ Turn the control circuit power ON.

④ Controller starts the control action so as to maintain the controlled object at the setting value. However, if the control action is set to [Stopping], it does not start the control action. To start the control, select [Running] in the item 1-14 Other function (page 51).

■ Displays and indicators when Running

Setting value memory number display
It displays the setting value memory number during running.

Process variable display
It displays the measuring value of the process.

Setting value display
It displays the setting value.

Liquid crystal display[LCD]
It displays the manipulating value with numeric value and bar-graph.
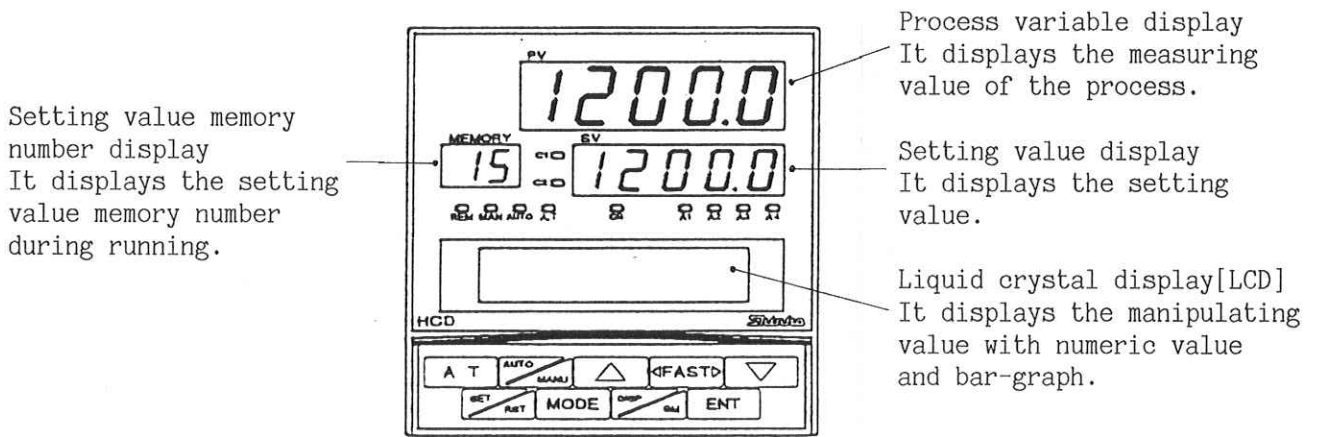
● Each indicator is lit or unlit according to the controlling status.

● Indication of LCD multi-display

```
MV (main)        5 0 %
   [ ▌▌▌▌▌▌▌▌ ]
```

Indicates the manipulating value in numeric.

Indicates the manipulating value with bar-graph.
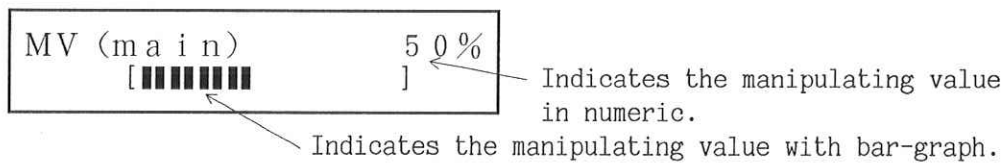
Note: Indicating contents of the LCD differ from the option applicating status. See page 57 to 58 for the detail.

■ Battery change for the memory-card (Option: DM)

- Memory-card is equipped with a battery for test, and it may have been consumed. Therefore, it has to be exchanged to the attached one when unpacked.
- Unscrew the battery cover screws with small phillips screwdriver enclosed, and remove the cover to take the old battery off.
- Set the new battery (Lithium battery, CR1616) setting + side up into the memory-card, and put the battery cover fastening with the screws. 《Make the battery polarity sure.》

Notes: 1. Battery life is approx. 2 years at room temperature. (Old battery must be removed from the memory-card.)
2. IF THE BATTERY IS REMOVED FROM THE MEMORY-CARD, ALL OF THE DATA MEMORIZED INTO THE MEMORY-CARD WILL BE GONE OUT, WHEN CHANGING THE BATTERY, THE DATA SHOULD BE MEMORIZED TO THE HCD-130, AND THEN CHANGE THE BATTERY.
3. Do not bend the card, and avoid from shock.
4. Avoid the card from high temperature, high humidity and the location exposed to direct sunlight.
5. Do not touch the terminal of the card, and do not put the things into the terminal.

Battery cover   ⊕ Screws

Terminal

+
CR1616   Memory-card
rear side

Lithium battery
(CR1616)
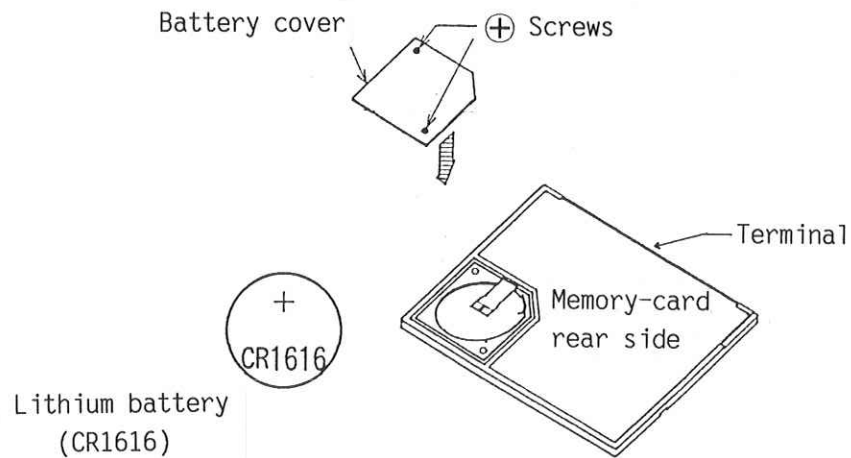
● Set the battery making the + side up into the memory-card battery holder.

2. Running (Cascade control [Option code: CC])

One unit of HCD-130 allows to perform the cascade control.
Two systems (Input 1 for the primary controller [master] and input 2 for the secondary controller [slave]) are provided to control one process, and higher control can be achieved.

● Cascade control

H C D − 1 3 0
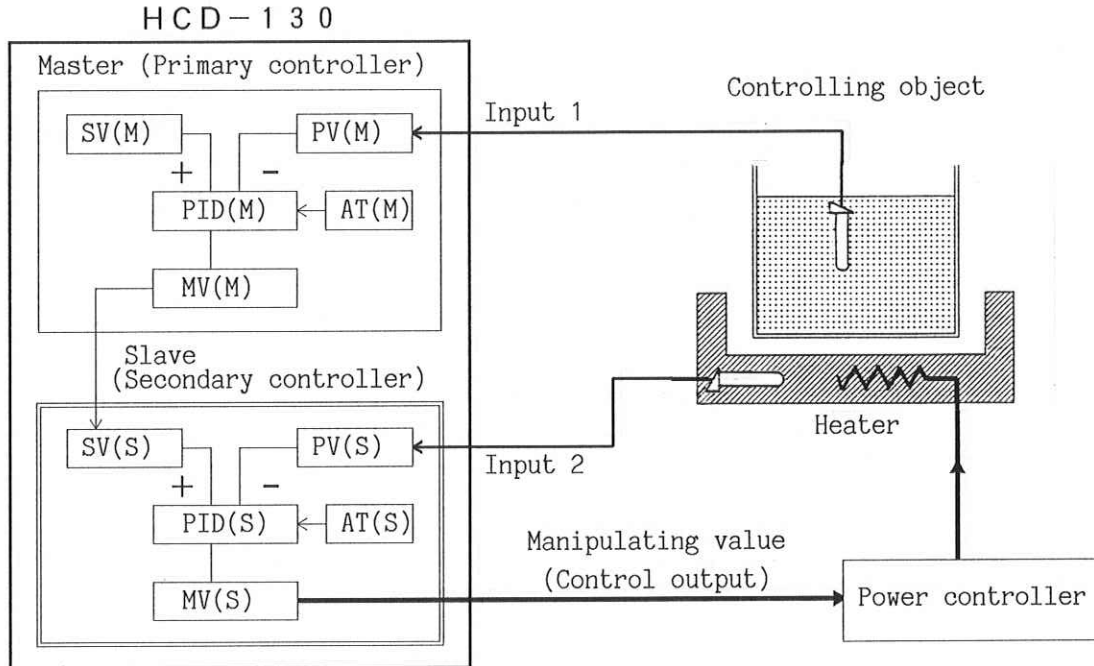
SV (M): Master main setting value
PV (M): Master input value (input 1)
PID (M): Master PID value
AT (M): Master PID auto-tuning
MV (M): Master manipulating value
　　　　(The slave setting value corresponds
　　　　to 0 to 100% of this value.)

SV (S): Slave main setting value
PV (S): Slave input value (input 2)
PID (S): Slave PID value
AT (S): Slave PID auto-tuning
MV (S): Slave manipulating value

● Operations by auto-tuning

1. Decision of slave side PID value

1.1 Set the slave high and low limit setting values to the same value as desired to control.

1.2 Perform the slave PID auto-tuning. (See page 48)

2. Decision of master side PID value

2.1 Set the slave high and low limit setting values to each desired value.
(Above range corresponds to 0 to 100% of the master manipulating value. This range is required to decide examining the disturbance effects.)

2.2 Set the master main setting value (desired value).

2.3 Press ⌈AT⌋ key to perform the master PID auto-tuning. (See page 47 to 50)

8. Specifications

8.1 Rating

① Rated scale

Input	Scale range		Resolution
K	0 to 1370.0℃	0 to 2500.0℉	0.1℃ (℉) *1
J	0 to 1000.0℃	0 to 1800.0℉	0.1℃ (℉) *1
R	0 to 1760.0℃	0 to 3200.0℉	0.1℃ (℉) *1
S	0 to 1760.0℃	0 to 3200.0℉	0.1℃ (℉) *1
PL−Ⅱ	0 to 1390.0℃	0 to 2500.0℉	0.1℃ (℉) *1
B	0 to 1820.0℃	0 to 3300.0℉	0.1℃ (℉) *1
E	0 to 1000.0℃	0 to 1800.0℉	0.1℃ (℉) *1
T	-270.0 to 400.0℃	-450.0 to 750.0℉	0.1℃ (℉) *1
W/Re5-26	0 to 2315.0℃	0 to 4200.0℉	0.1℃ (℉) *1
N	0 to 1300.0℃	0 to 2300.0℉	0.1℃ (℉) *1
Pt100	-200.0 to 850.0℃	-200.0 to 1500.0℉	0.1℃ (℉) *1
DC	-1999.9 to 2000.0		1 *2

*1: Changeable to 1

*2: Decimal point position
   is changeable

② Input Thermocouple K, J, R, S, PL-Ⅱ, B, E, T, W/Re5-26 and N (JIS, IEC)
         Input impedance   : 1MΩ or greater
         Signal source resistance effect: $0.5\mu V/\Omega$
         When input burns out : Upscale
                 (Downscale is applicable as well)

     RTD   Pt100 3-wire system (JIS, IEC)
           Allowable input lead wire resistance: Per wire 5Ω or less
           When input burns out : Upscale

     DC current   0 to 20mAdc, 4 to 20mAdc
           Input impedance   : 250Ω
           When input burns out : Downscale

     DC voltage   -10 to 10mVdc, 0 to 10mVdc, 0 to 100mVdc, 0 to 1Vdc, 0 to 10Vdc,
           -1 to 1Vdc and 1 to 5Vdc
           Input impedance   : 1MΩ
           Allowable input voltage: 15V or less
           When input burns out : mV input, Upscale
                   (Downscale is applicable as well)
                  V input, Downscale

③ Supply voltage   100 to 240 (85 to 264)Vac, 50/60Hz

8.2 General structure

① External dimension   96(H)×96(W)×177(D)mm
② Mounting method   Flush
③ Case   Incombustible resin, Color: Black
④ Panel   Incombustible resin, Color: Black

8.3 Indicating structure

① Display   Process variable(PV): 7-segment red LED   display 5 digits
                                          size 14.3(H)×8(W)mm

                   Setting value   (SV): 7-segment green LED display 5 digits
                                          size 10(H)×5(W)mm

                   Setting value memory
                   number indication : 7-segment green LED display 2 digits
                                          size 8(H)×4(W)mm

                   Character indication: 16-digit×2-line LCD with Backlight

② Action indicator When main control output ON : Green LED (C1)   lights
                   When sub-control output ON   : Yellow LED (C2)   lights (Option)
                   When alarm 1 action output ON: Red LED   (A1)   lights
                   When alarm 2 action output ON: Red LED   (A2)   lights (Option)
                   When alarm 3 action output ON: Red LED   (A3)   lights (Option)
                   When alarm 4 action output ON: Red LED   (A4)   lights (Option)
                   When sensor burns out   : Red LED   (SB)   lights
                   When remote operation   : Red LED   (REM) lights (Option)
                   When manual control   : Red LED   (MAN) lights
                   When automatic control   : Green LED (AUTO) lights
                   When auto-tuning performing : Yellow LED (AT)   blinks

8.4 Setting items

① Main setting   : Main setting.

② Setting value
   memory selection: Setting value memory number selection.

③ PID parameter
   setting   : Proportional band   *3   Integral time   *3
                     Derivative time   *3   Anti-reset windup (ARW) *3
                     Proportional band offset *3
                     Sub-proportional band (Option)   Sub-derivative time (Option)

④ Alarm setting   : Alarm 1, Alarm 2 (Option), Alarm 3 (Option) and Alarm 4 (Option)

⑤ Alarm action
   parameter
   setting   : A3 action method selection (Option)
                     A4 action method selection (Option)
                     Alarm 1 hysteresis setting
                     Alarm 2 hysteresis setting
                     Alarm 3 hysteresis setting
                     Alarm 4 hysteresis setting