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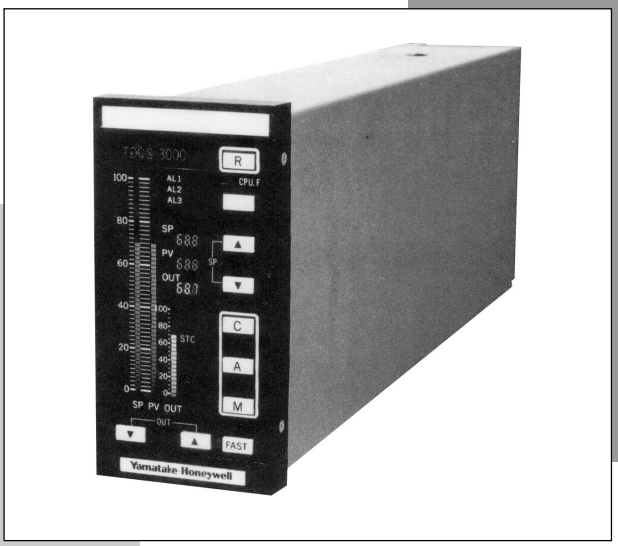
OM2-2630-0210

TDC3000 SSCII
Fixed Program Controller
Model KAS110/210
Operator's Guide



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◆◆◆◆◆ RESTRICTIONS ON USE ◆◆◆◆◆

To ensure system and equipment safety when this instrument is used in applications where safety is paramount, or with critical equipment, it should be operated in a fail-safe and redundant design environment that is subject to periodic preventive maintenance.

Use this instrument in systems which safely tolerate malfunctions, damage and slow responses.

Safety Notes

A label is attached on the instrument. Read the description on the label before you read the main part of this document.

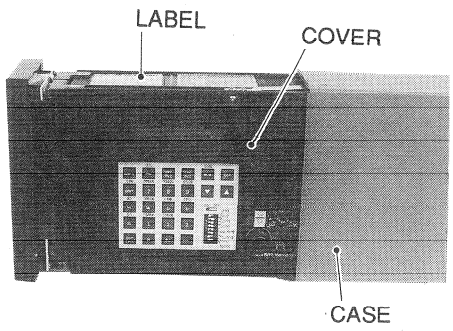
■ Label

Title: 警告 WARNING

Description: 高電圧のため、カバーは、はずさないでください。
CFL 交換時は、電源を OFF にしてください。

HIGH VOLTAGE. DO NOT TAKE OFF
COVER WHEN POWER IS ON.
TURN OFF POWER FOR EXCHANGING CFL.

(Note CFL: Cold cathode fluorescent lamp)



CONTENTS

1. OVERVIEW

The TDC3000^X Single Strategy Controller II (SSCII) Fixed Program Controller is a digital controller, with the level of distribution of functions extended to a single control loop in a distributed digital control system. Although compact in construction, it incorporates PID control functions and other various auxiliary functions such as input processing (linearization, square root extraction), alarm processing, and input abnormality detection. The KAS provides the same operability as that of conventional analog controllers as well as allowing for high accuracy setting of control parameters in the form of digital values.

The KAS controller is provided with the self-tuning function (optional) which automatically performs optimum PID parameter setting.

The TDC3000^X SSCII series provides dedicated engineering tools in the form of the Handy Communicator and Personal Computer Communicator (software package). The configuration data of the KAS are set by using these engineering tools.

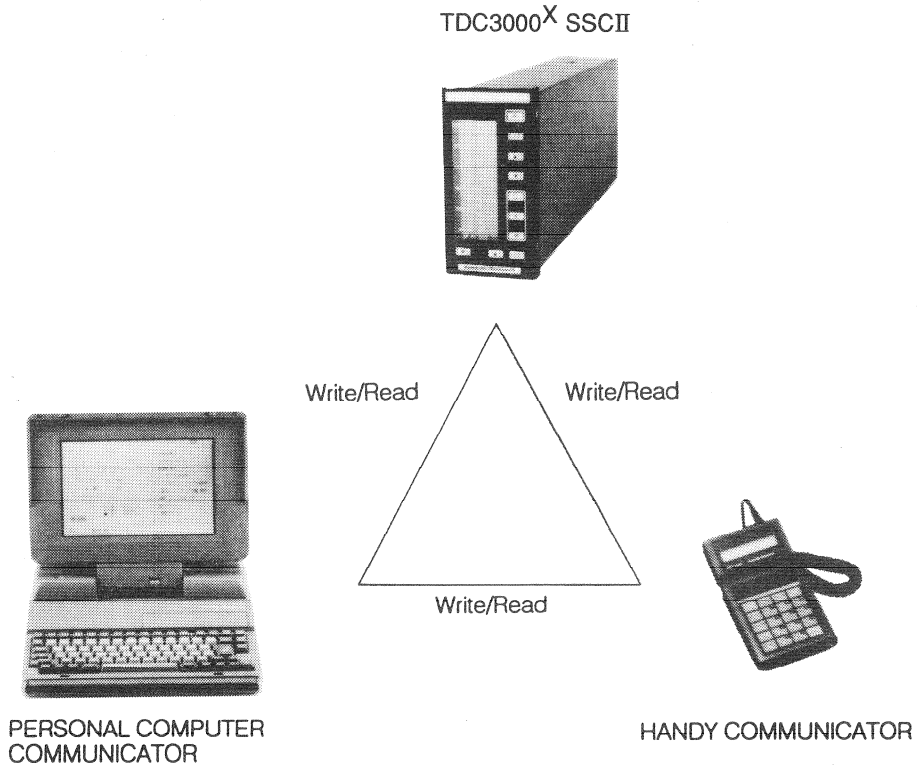


Fig. 1.1. Engineering Tools and Configuration

The SSCII having the communication function is capable of communicating with the TDC 3000^X LCN/BASIC or other higher level devices such as personal computers through S-Link and a communication interface, SSC Port or Local Communication Interface (See below). Details are described in Chapter 10.

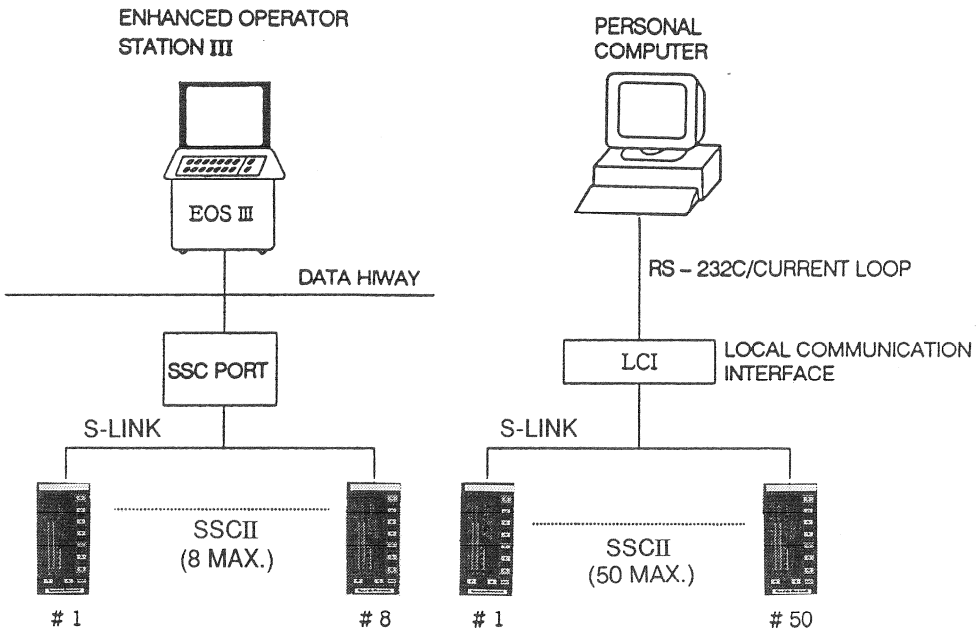


Fig. 1.2. Typical Communication Systems

Note: This operator's manual covers operating instructions, and brief maintenance instructions first. For application and instrumentation engineering, skip over these chapters to Chapter 11 of computational processings and configuration, and refer to the following document as required.

- Operator's Manual for Handy Communicator OM2-2650-0411

2. SPECIFICATION

2.1 Specification

Item				Specification
Input section	Analog input	No. of inputs		3 points (analog inputs: 2 points, standby mode input: 1 point)
		Input voltage		1 to 5V DC
		Input impedance		Power-on: 5MΩ, power-off: 60KΩ
		Receiving system		Differential receiving type, non-isolation
		Allowable input over-voltage		± 30V DC maximum
	Digital input	No. of inputs		2 points (follow inputs: 1 point, external interlock signal: 1 point)
		Input voltage		LOW: 0 to 4V, HIGH: 10 to 30V
		Input bias current		LOW: 2mA or less, HIGH: 10μA or less
		Allowable input over-voltage		± 30V DC maximum
Output section	Analog output	Voltage output	No. of outputs	1 point
			Output voltage	1 to 5V DC
			Output impedance	250Ω
			Output system	Differential output system
		Current output	No. of outputs	1 point
			Output current	4 to 20mA DC
			Output impedance	250KΩ
			Allowable load	① 500Ω (when preset type standby manual unit is installed) ② 600Ω (when follow-up type standby manual unit is installed or when no standby manual unit is installed.)
			Output system	Minus common
	Digital output	No. of outputs		4 points (alarm inputs: 3 points, standby mode output: 1 point)
		Output type		Transistor output (open-collector)
		Contact capacity		30V DC, 0.2A DC (resistive load)
Indi-cator section	Input indication	No. of indications		2 points (SP: green, PV: red)
		Indication system		Bar graph (%) display by color LCD and digital display in engineering units [Bar graph display: 53 segments, digital value display: 7 segments (4-digit)]
		Indication accuracy		Digital indication: ± 0.15%FS ± 1 digit, bar graph resolution: 2%

(cont'd)

Item			Specification
Indicator section	Output indication	No. of indications	1 point (OUT: yellow)
		Indication system	Bar graph (%) display by color LCD and digital display in engineering units [Bar graph display: 23 segments, digital value display: 7 segments (4-digit)]
		Indication accuracy	Digital display: ± 0.25%FS ± 1 digit, bar graph resolution: 5%
	Alarm indication	No. of indications	4 points (process alarms: 3 points, device alarm: 1 point)
		Indication system	Color LCD and LED lamps
	Mode indication		Character display by color LCDs
Operating section	Operating buttons		SP ADJ buttons: 2 Output ADJ buttons: 2 SP, output FAST button: 1 Mode transfer buttons: 3 Reset button: 1
	Data setting unit	Indicator	LCD (16 digits)
		No. of setting buttons	24 (including display change button)
		Parameter tuning	PID parameters: Proportional band: 0.0 to 799.9% Integration time: 0.00 to 99.99 minutes Derivative time: 0.00 to 99.99 minutes Upper and lower derivative limits, ratio-bias, dead band, output deviation, rate limit, deviation alarm, high and low PV alarms, analog input processing, digital filter, upper and lower engineering unit limits. Variable parameters: %: – 699.9 to 799.9% Time: 0.00 to 99.99 minutes Self-tuning parameters: Upper and lower proportional band limits Upper and lower derivative limits Derivative time dropout • Decision rule: Giegler-Nichols/Chien
	Bit switches		Data entry enabled: 1 Communication enabled: 1 Start-up method transfer: 1 Calibration transfer: 1 Direct/reverse transfer: 2 Communicator transfer: 1 Overwriting enabled: 1

(cont'd)

Item		Specification
General specification	Power supply	24V DC $^{+15\%}_{-10\%}$
	Current consumption	400mA maximum (24V DC, without optional)
	Signal connection	Instrument back terminal connection type, wire diameter: 1.25 mm^2 max.
	Power interruption/power down	More than 16V DC for 200 ms or less (in case of using STX power supply) Data holding at a time of power down: • User program: backup by EEPROM • Control data (SP OUT mode): RAM backup by super capacitor (72 hr) Recovery function from power down: • HOT start (starts operation with the state before power down) • COLD start (starts operation with a state of pre-defined value)
	Ambient temperature range	0 – 50°C
	Ambient humidity range	10 – 90% RH
	Installation	Panel flush mount, indoor installation
	Installation method	See "3. Installation."
	Mounting angle	Up to 60° inclined from a horizontal plane
	Paint	Case: dark beige, bezel: black
	Weight	3.0 kg (without standby manual unit)

Optional Specification

Item	Specification
Standby manual unit (preset type, follow-up type)	No. of indications: 1 point (output/PV transfer switch; type A, preset type B; without display, follow-up type B; output only) Indication type: moving coil (Type A), LED bar graph type (follow-up type B only) Indication accuracy: ± 5%FS Supply voltage: 24V DC Output impedance: 250KΩ Allowable load: ① 500Ω (when preset type standby manual unit is installed.) ② 600Ω (when follow-up type standby manual unit is installed or when no standby manual unit is installed.) Current consumption: Present type; 60mA maximum (24V DC) Follow-up type; 120mA maximum (24V DC)
Communication function	—

2.2 Model Number Table

Basic Model No.	Selections	Options			Contents
	I	I	II	III	
KAS110					Fixed program controller A/M, SP operation available
KAS210					Fixed program controller C/A/M, SP operation available
	– 0				Main power supply: 24V DC
		– 0			Without Communication Function
		– 1			With Communication Function
			0		Without self-tuning
			1		With self-tuning
				0	Without standby manual unit
				1	With standby manual unit (preset type A)
				2	With standby manual unit (follow-up type A)
				3	With standby manual unit (preset type B)
				4	With standby manual unit (follow-up type B)

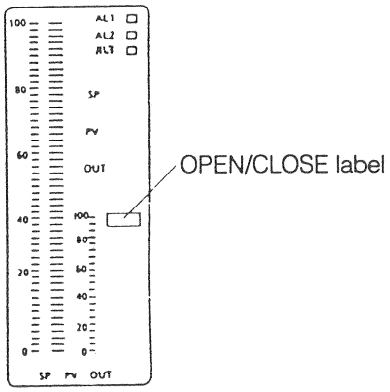
3. UNPACKING AND INSPECTION

3.1 Unpacking and Inspection

When the Fixed Program Controller is delivered to you, immediately unpack and inspect it to check that no damage has been caused during transporation. Also, check it for the items described in 3.2 through 3.4.

3.2 Accessories

Check that the following accessories are delivered accompanying the Fixed Program Controller.

Accessories	Q'ty	Use
Back lamp for LCD (liquid crystal display)	1	This lamp is for replacement spare. (Another lamp for current use is installed already in the Fixed Program Controller.)
Mounting brackets	2	To mount the Fixed Program Controller on a panel.
OPEN/CLOSE label	1	To indicate whether the controller output is of the direct type or reverse type. Post the label at the OUT section of the instrument scale board, as required. 

3.3 Removing Transportation Clamp Bolt

To prevent damage when in transportation, the controller chassis is fixed to the controller case with the clamp bolt. After the controller is delivered to you, remove the bolt.

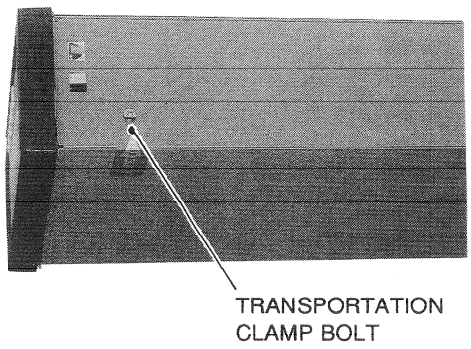


Fig. 3.1. Location of Transportation Clamp Bolt

3.4 Instrument Identification with Nameplate

Identify the controller model number and major specifications by referring to the nameplate. To gain access to the nameplate, proceed as follows:

① Pressing the latch plate located at the bottom of the front mask (see Fig. 3.2), pull out the chassis frontward while slightly raising the mask. The chassis will stop at the service position as it will be caught by the second latch.

② The nameplate is located at the position shown in Fig. 3.3. By referring to the nameplate on which the instrument model number and major specifications are indicated, identify that the controller is a correct instrument for the intended use.

Remarks: When inquiring your Yamatake-Honeywell agent of any matter related to the controller, please inform its model number and serial number.

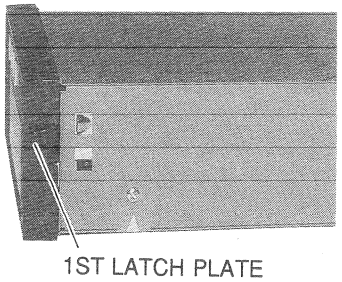


Fig. 3.2

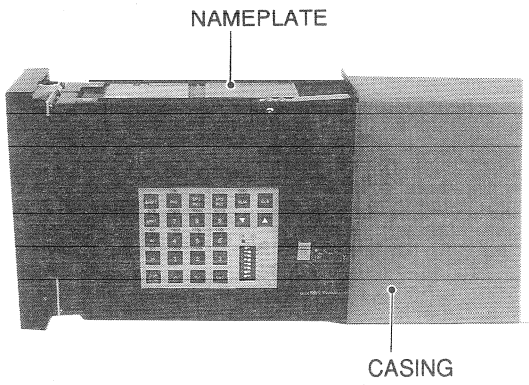


Fig. 3.3

3.5 Installation Place

The place where the Fixed Program Controller is installed should meet the following requirements:

(1) Reasonably free from dust and corrosive gases

(2) Reasonably free from mechanical vibration

(3) Reasonably free from electrostatic and electromagnetic fields

3.6 Instrument Dimensions and Panel Cutout Dimensions

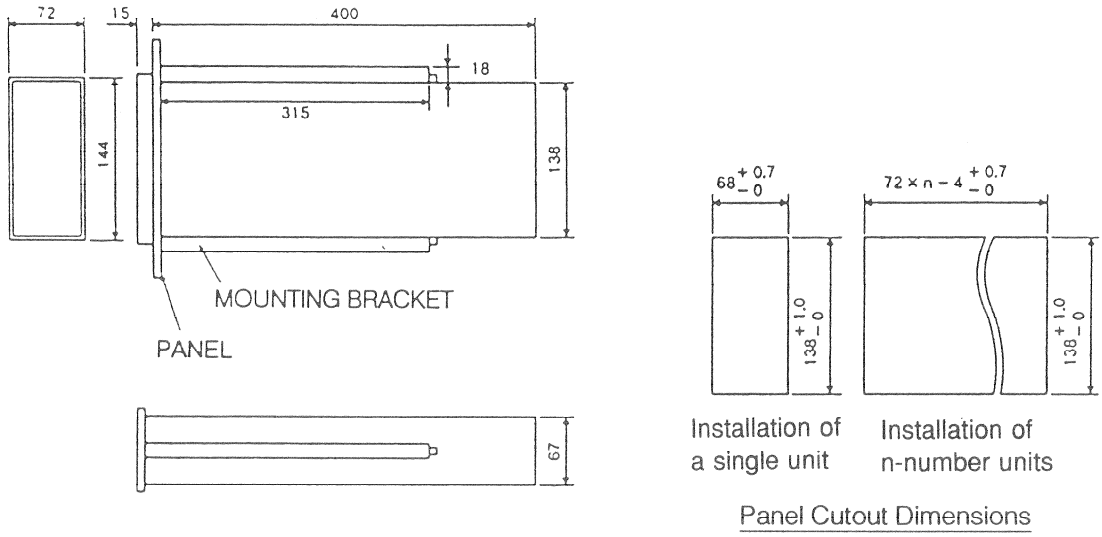


Fig. 3.4. Instrument Dimensions and Panel Cutout Dimensions

3.7 Installation Method

Insert the instrument from the front of the panel, put the mounting brackets on top and bottom of the instrument casing, and tighten the brackets with a screwdriver.

Remarks: The panel must be 3 mm or more thick.

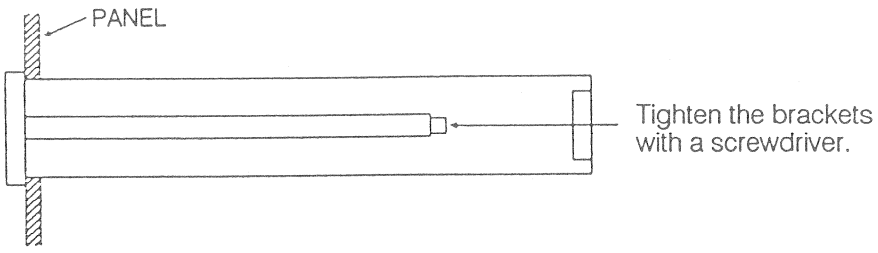


Fig. 3.5. Mounting Method

4. ELECTRICAL CONNECTIONS

4.1 Electrical Connections to Rear Terminal Block

The customer connection terminals of the instrument are located at the rear of the instrument casing. The terminal layout is shown in Fig. 4.1 and the assignment on Table 4.1.

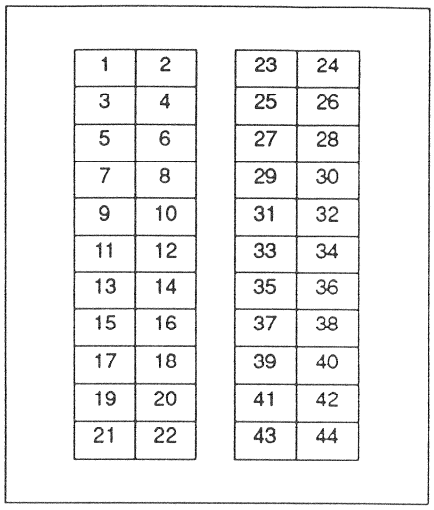


Fig. 4.1. Rear Terminal Layout

Table 4.1. Signal Assignment

Terminal No.	Symbol	Description
1	+24V	Instrument main power ⊕
2	SM + 24V	Standby manual unit power ⊕
3	AOI+	4 to 20 mA current output ⊕
4	AOI–	4 to 20 mA current output ⊖
5	AOV1+	1 to 5V voltage output ⊕
6	AOV1–	1 to 5V voltage output ⊖
7	—	Reserved
8	—	Reserved
9	—	Reserved
10	—	Reserved
11	0V	Power, ALM·H/L/DEV S common
12	0V	
13	ALM·H	Alarm contact (H)
14	ALM·L	Alarm contact (L)
15	ALM·DEV	Alarm contact (DEV)
16	—	Reserved
17	—	Reserved
18	S	Standby mode output
19	SMPV+	PV ⊕ for standby manual unit

To be cont'd

Terminal No.	Symbol	Description
20	SMPV–	PV ⊖ for standby manual unit
21	GND	Chassis ground
22	GND	Chassis ground
23	AIR1+	1 to 5V voltage input ⊕
24	AIR1–	1 to 5V voltage input ⊖
25	AIR2+	1 to 5V voltage input ⊕
26	AIR2–	1 to 5V voltage input ⊖
27	—	Reserved
28	—	Reserved
29	—	Reserved
30	—	Reserved
31	—	Reserved
32	—	Reserved
33	—	Reserved
34	—	Reserved
35	0V	FLW, INT'K common
36	0V	
37	FLW	Follow mode switching signal
38	—	Reserved
39	—	Reserved
40	—	Reserved
41	—	Reserved
42	INT'K	External interlock signal input
43	LINK+	S-LINK ⊕
44	LINK–	S-LINK ⊖

Note: Do not use the reserved terminals. Note that troubles may result if you use the reserved terminals.

4.2 Types of Input Signals

The input signals are classified into analog input signals and digital input signals.

Table 4.2. Input Signal Types

Type of Signal	Symbol of Signal	Name of Signal
Analog input signal	AIR1	1 – 5V voltage input signal #1
	AIR2	1 – 5V voltage input signal #2
Digital input signal	FLW	Follow mode switching signal
	INT'K	External interlock input signal

Note 1: The Standby Manual Unit has an additional independent input point in addition to these two points of PV input terminals.

Note 2: The follow mode switching signal is for digital input ON when the external contact signal is ON.

Note 3: The external interlock input signal is for ON when the external contact signal is OFF. When this function is not employed, connect between terminals ㊷ and ㉟ with a jumper wire.

Note 4: The current output (AOI) is subject to self diagnostics. When the current output signal is not used, jumper between terminals ③ and ④.

4.3 Types of Output Signals

The output signals are classified into analog output signals and digital output signals. The KAS has two analog signals and is able to deliver them to AO1 and AO2 simultaneously.

Table 4.3. Output Signal Types

Type of Signal	Symbol of Signal	Name of Signal
Analog output signal	AOI	4 – 20mADC current output signal
	AOV	1 – 5V voltage output signal
Digital output signal	ALM·H	Alarm output signal (HIGH)
	ALM·L	Alarm output signal (LOW)
	ALM·DEV	Alarm output signal (DEV)
	S	Standby mode output signal

Note 1: When the AOV is not used, connect the ㊀ terminal to the "0V" (zero volt) line.

Note 2: The alarm output is such that the digital output is turned ON when the transistor contact signal is turned ON.

Note 3: The standby mode output signal is such that it is turned ON when the transistor contact signal is OFF.

4.4 Grounding

Ground the KAS in either of the following two ways. (Avoid multiple-point grounding.)

① To Ground the Logic Common (0 V) and Chassis (GND)

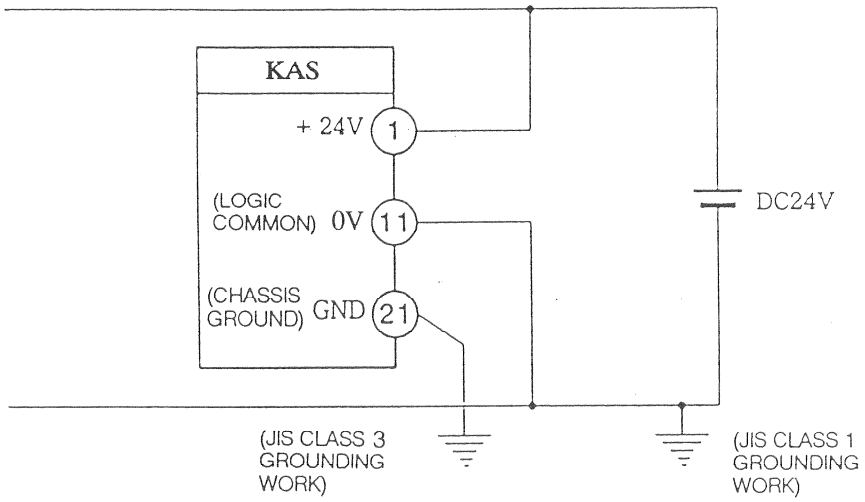


Fig. 4.2. To Ground the Logic Common and Chassis

② To Ground the Chassis Alone

Provide this grounding only when it is impracticable to ground the logic common.

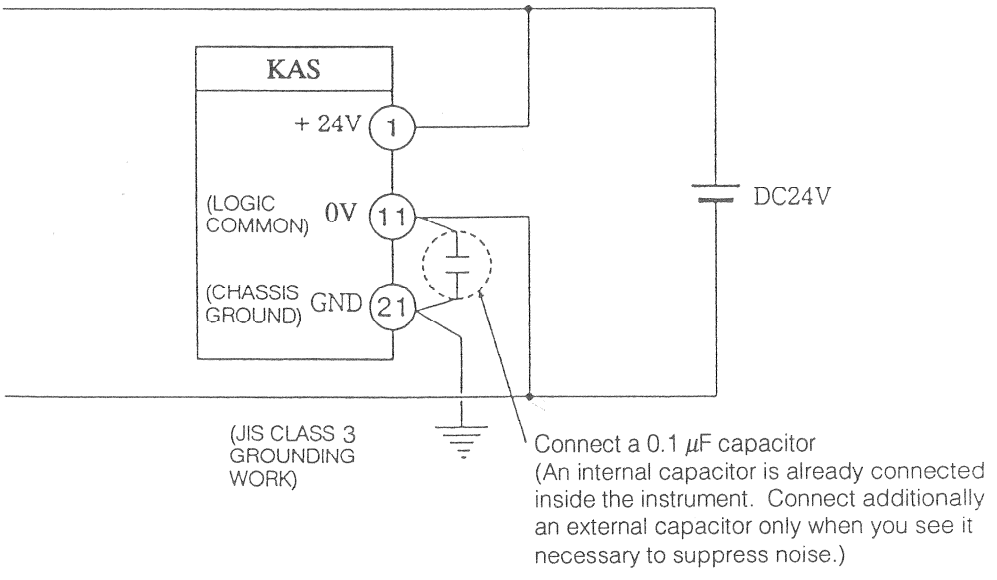
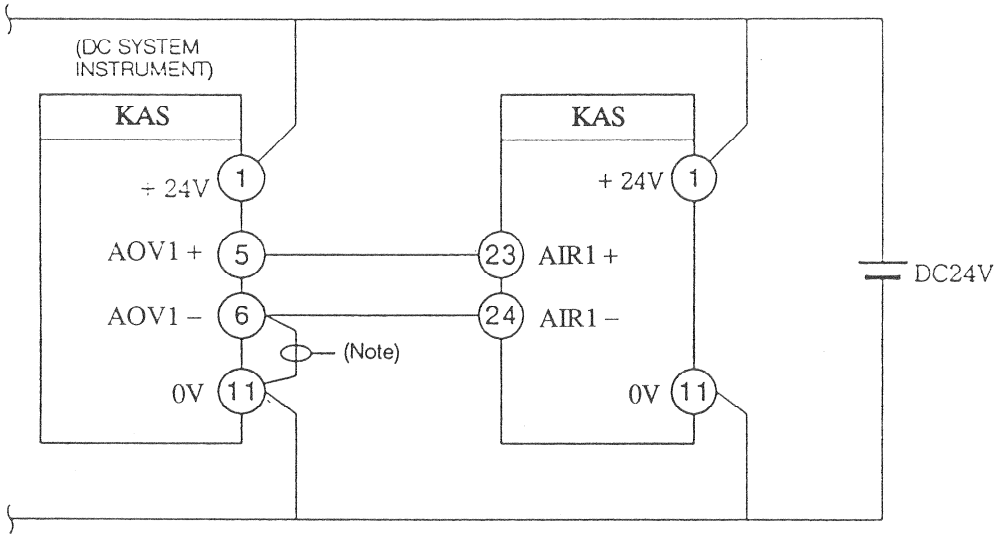


Fig. 4.3. To Ground the Chassis Alone

4.5 Connection of Analog Input Signal

The analog input signal is a voltage signal of 1 to 5V DC. The voltage input terminals are of a differential type, with a positive (+) terminal and a negative (–) terminal for each input. Connections between units are shown in the following.

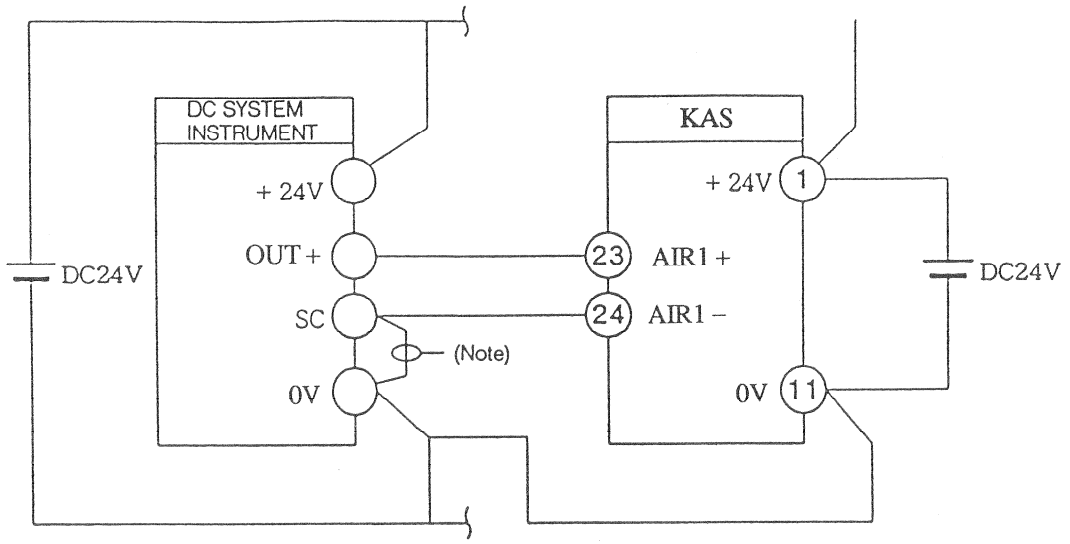
(1) Connection between KAS Instruments



* This jumper is not required if this connection is done elsewhere, such as at a Wiring Block.

Fig. 4.4. Connection between KAS Instruments

(2) Connections between KAS and Instrument of Other Power Supply (DC system)



* This jumper is not required if this connection is done elsewhere, such as at a Wiring Block.

Fig. 4.5. Connections between KAS and Instrument of Other Power Supply System (DC system)

(3) Connections between KAS and Instrument of Other Power Supply (AC system)

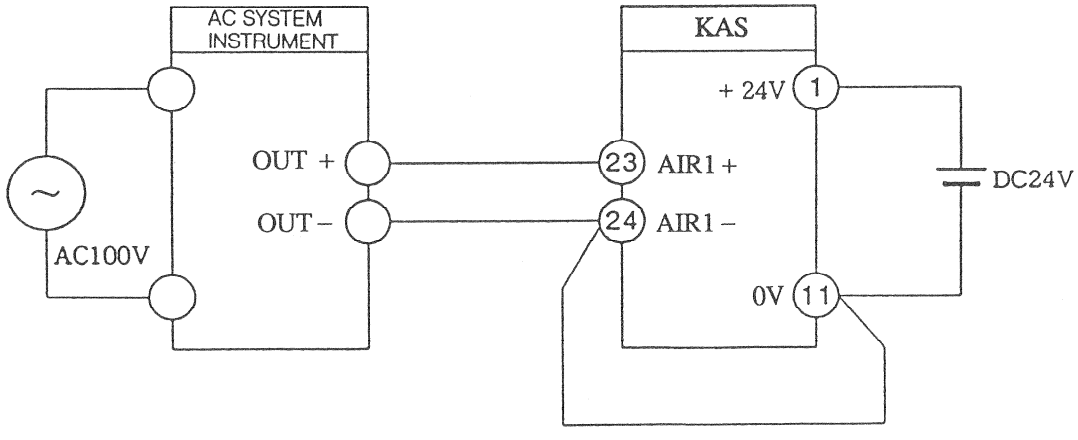
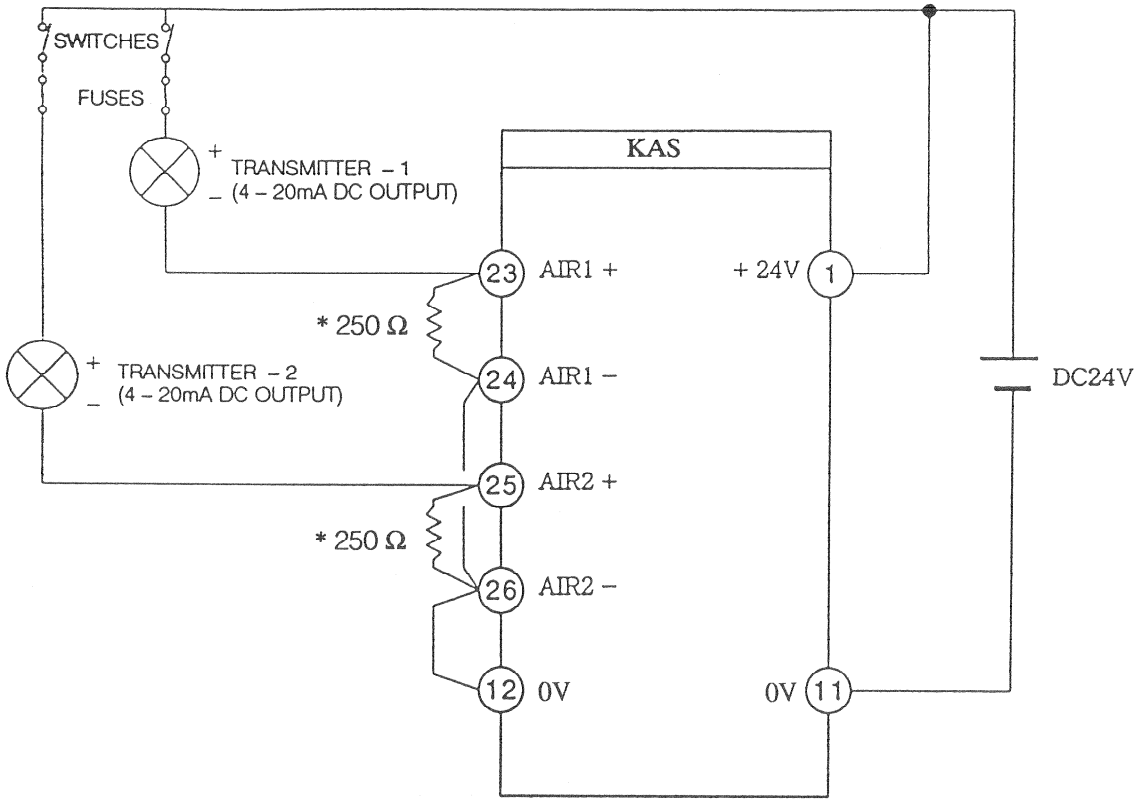


Fig. 4.6. Connections between KAS and Instrument of Other Power Supply (AC system)

(4) Connections between KAS and Transmitter



* Not required if the transmitter output is 1 to 5V DC.

Fig. 4.7. Connections between KAS and Transmitters

4.5.1 Connections for Analog Output

[1] Connections for Current Outputs

The current output is of a negative common type.

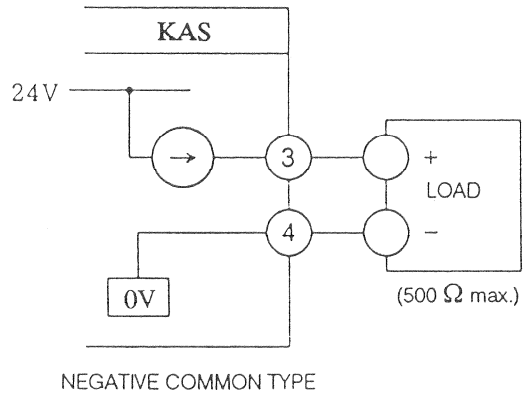


Fig. 4.8. Connections for Current Output

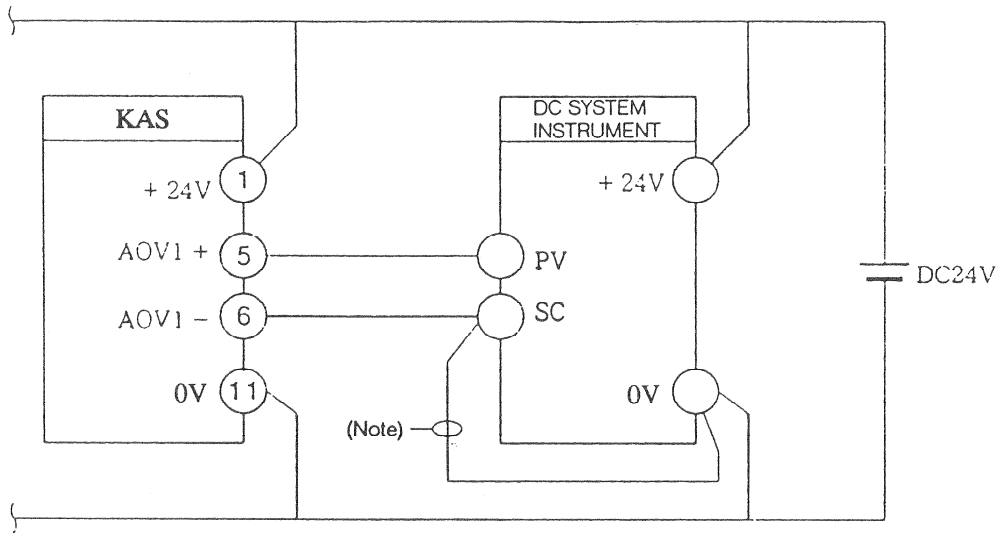
[2] Connections for Voltage Outputs

Each of the voltage outputs is a differential signal with a "+" (positive) and "–" (negative) line.

(1) Connections between KAS Instruments

Refer to Fig. 4.4.

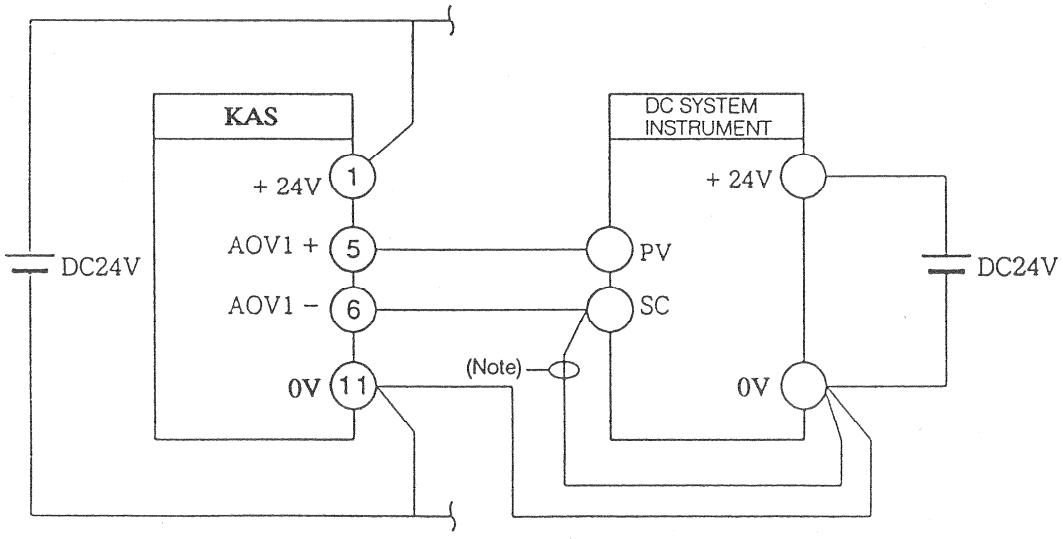
(2) Connections between KAS and Instrument which has SC (common power supply)



Note: Do not make this connection if the instrument has been connected at another point, such as at a Wiring Block. When two or more instruments are connected, use only a signal line for this connection.

Fig. 4.9. Connections between KAS and Instrument which has SC (Common Power Supply)

(3) Connections between KAS and Instrument which has SC (separate power supply)



Note: The same as that of the case of (2)

Fig. 4.10. Connections between KAS and Instrument which has SC (Separate Power Supply)

(4) Connections between KAS and an instrument of separate power supply (AC system)

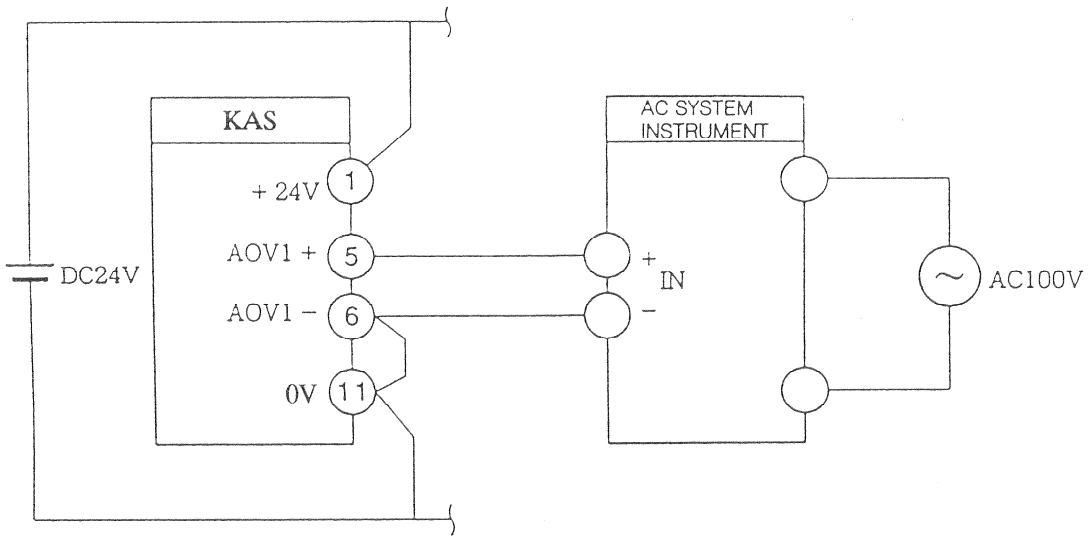


Fig. 4.11. Connections between KAS and Instrument of Separate Power Supply (AC System)

(5) Connections between KAS and an instrument which has no power supply

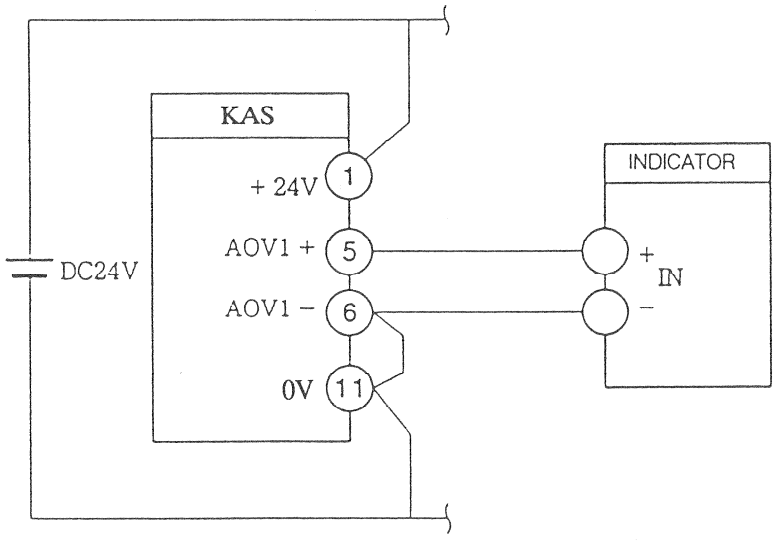


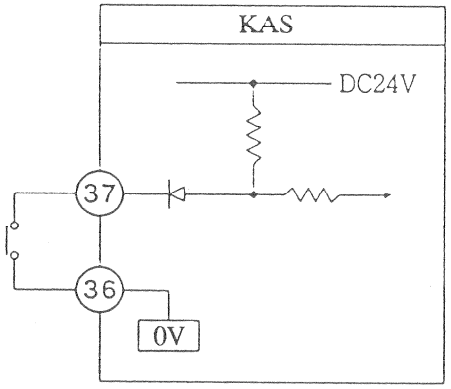
Fig. 4.12. Connections between KAS and Instrument which has No Power Supply

4.5.2 Digital Input

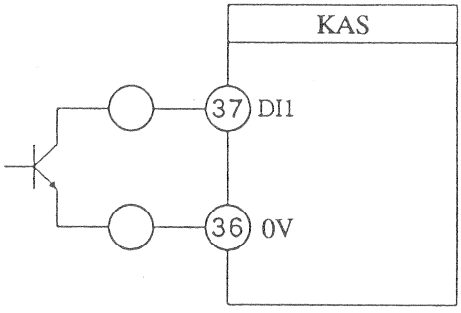
The digital input circuit accepts any of the following types of inputs.

1. Voltageless contacts (relay contact, open-collector transistor switch input, etc.)
2. Voltage inputs (semiconductor switch input, etc.)

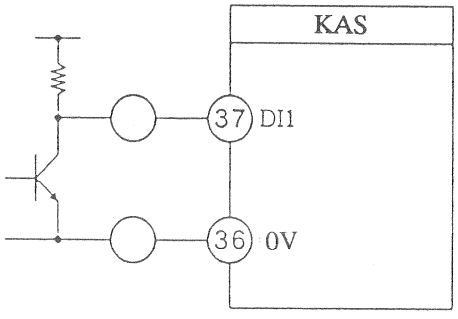
- Specifications for digital input
  - Input voltage: LOW: 0 to 4V DC
    HIGH: 10 to 30V DC
  - Input bias current: LOW: 3 mA or less
    HIGH: 10 μA or less
  - Allowable input overvoltage: 30V DC max.



(a) Relay contact



(b) Transistor switch input (open collector)



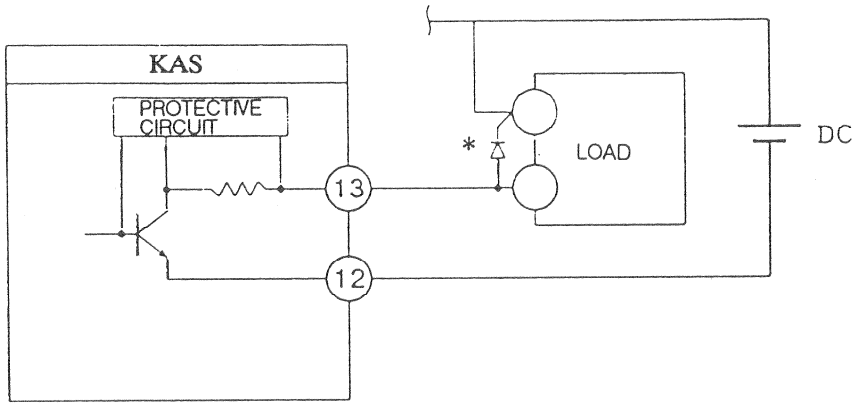
(c) Voltage input (semiconductor switch input)

Fig. 4.13. Connection Methods for Digital Input

4.5.3 Digital Output

The digital output circuit is of an open-collector transistor contact type.

- Contact rating: 30V DC, 0.2 A (resistance load)
- Protective function: When the load current has become larger than 0.3A DC, the digital output is automatically turned off to protect the output transistors.



* When an inductive load (such as relay) is used, provide a noise killer provision (such as connecting a diode in parallel to the load).

Fig. 4.14. Connections for Digital Output

5. PANEL KEYS AND INDICATORS

5.1 Front Panel

The items installed on the front panel are a color LCD (liquid crystal display), a reset key (R), control mode selector keys (M , A , C), output adjustment keys (▲ , ▼), set-point adjustment keys (▲ , ▼) and a fast setting key (FAST). The locations of the front panel items are shown in Fig. 5.1 and their functions are described in Table 5.1.

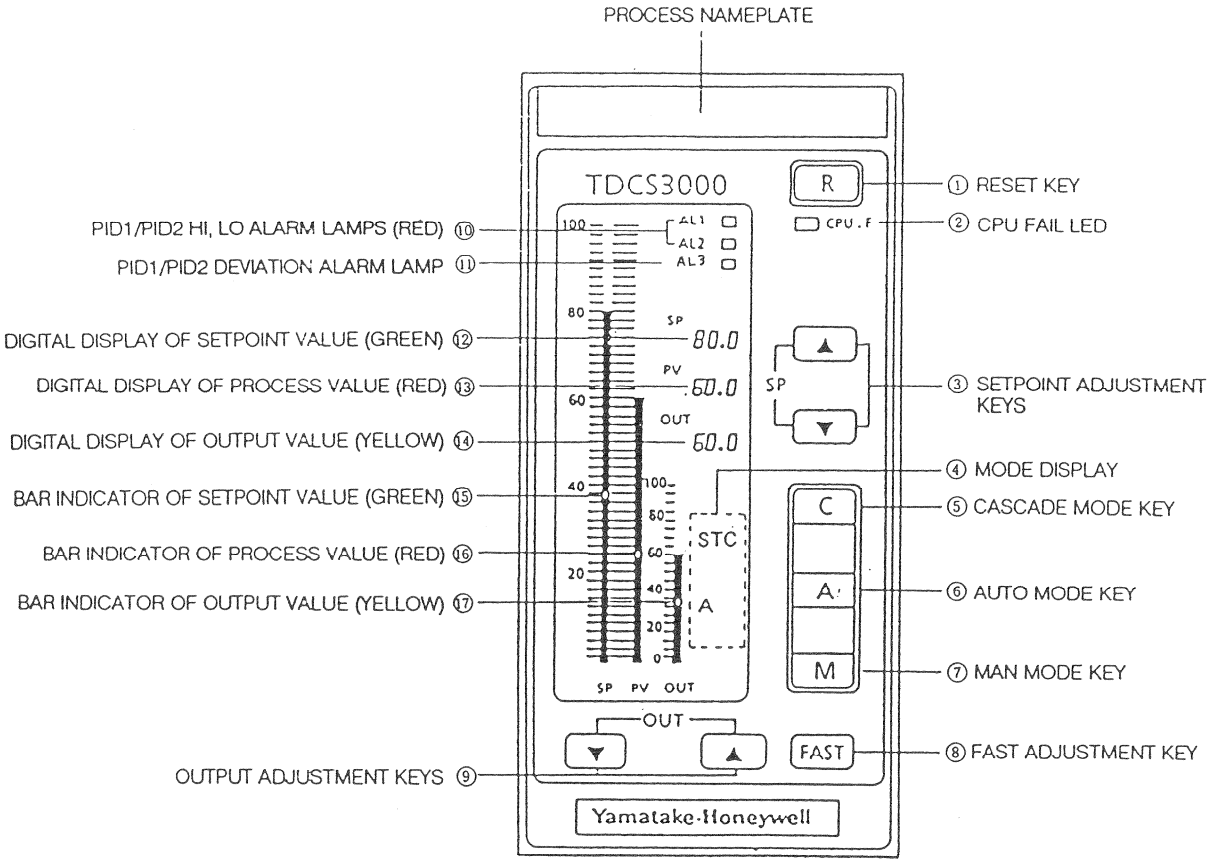


Fig. 5.1. Layout of Front Panel Items (KAS210)

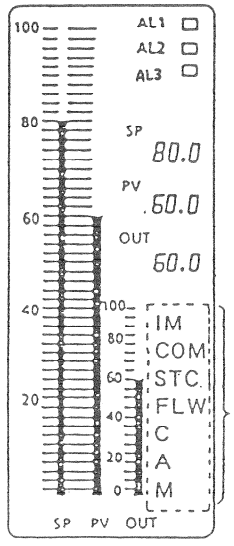
Table 5.1. Functions of Front Panel Items of KAS

No.	Item	Function
1	RESET key	The key is to reset the KAS from particular states as follows: (a) When an abnormal state (input abnormal, calculation overflow, or calculation overload) is detected by diagnosis group A, the controller is driven into the IM (interlock manual) mode and a message "IM" appears on the mode display. Also when an interlock signal (dedicated DI signal) is applied, the controller is driven into the IM mode and a blinking message "IM" appears on the mode display. As the applied signal is turned off, the message stops blinking and lights continuously. As you press the RESET key after removing the cause of the IM mode, the controller is reset from the IM mode and the "IM" message disappears. (b) As the controller is driven into the tuning state when the STC function is selected and the controller is enabled to start tuning, a blinking message "STC" appears on the mode display. When the tuning is over, the "STC" message stops blinking and lights continuously. As you press the RESET key, the controller starts the tuning operation.
2	CPU FAIL LED	The LED lights to indicate that the controller (CPU) has failed and been driven into the STANDBY mode. When in this mode the values indicated by the controller are meaningless.
3	SETPOINT ADJ keys	The keys are for increase (▲) or decrease (▼) of local setpoint value (LSP1 or LSP2). When in the PV tracking mode, the setpoint cannot be changed in the manual mode.
4	MODE display	Indicates the messages denoting the controller modes (manual, automatic, cascade, interlock manual, follow or tuning mode). See Fig. 5.2.
5	CASCADE MODE key (COMPUTER MODE key)	The key selects the CASCADE mode or COMPUTER REQUEST mode (When "Type 2"). (Model KAS 110 is wihout this key.)
6	AUTO MODE key	The key selects the AUTO mode, allowing to change the local setpoint value.
7	MAN MODE key	The key selects the MAN mode, allowing to manually control the output.
8	FAST ADJ key	The key allows to rapidly reach the required value when adjusting the local setpoint value with the SETPOINT ADJ keys or the output value with the OUTPUT ADJ keys.

To be cont'd

No.	Item	Function
9	OUTPUT ADJ keys	The keys are for increase (▲) or decrease (▼) of analog output (AOI).
10 · 11	PID1/PID2 ALARM lamps	The lamps indicate alarms detected by PVH or PVL or DEV monitors of PID computational unit. Of the 2-PID type of controller, either PID1 or PID2 can be selected.
12	Digital display of SP value	The display digitally indicates the setpoint value to be entered in the PID computational unit, in an engineering unit of measure.
13	Digital display of PV value	The display digitally indicates the PV (process variable) value to be entered in the PID computational unit, in an engineering unit of measure.
14	Digital display of output value	The display digitally indicates the analog output of the controller (AOFB feedback signal), in percentage.
15	Bar indicator of SP value	Indicates the setpoint value to be entered in the PID computational unit, in percentage.
16	Bar indicator of PV value	Indicates the PV (process variable) value to be entered in the PID computational unit, in percentage.
17	Bar indicator of output value	Indicates the analog output of the controller (AOFB feedback signal), in percentage.

Fig. 5.2. Mode Indicator Section

Item		Description	Remarks
	IM indicator (red)	Lights when in INTERLOCK MANUAL mode.	Blinks when in EXTERNAL INTERLOCK mode (when INTERLOCK DI is ON).
	COM indicator (white)	Lights when with Communication function	Blinks when in Communi-cation Error.
	STC indicator (white)	Lights when with STC function.	Blinks when in TUNING mode.
	FLW indicator (white)	Lights when in FOLLOW mode.	—
	C indicator (yellow)	Lights when in CASCADE mode.	—
	A indicator (green)	Lights when in AUTO mode.	—
	M indicator (red)	Lights when in MANUAL mode.	—

5.2 Side Panel

The items installed on the side panel are shown in Fig. 5.3 and their functions are described in Table 5.2.

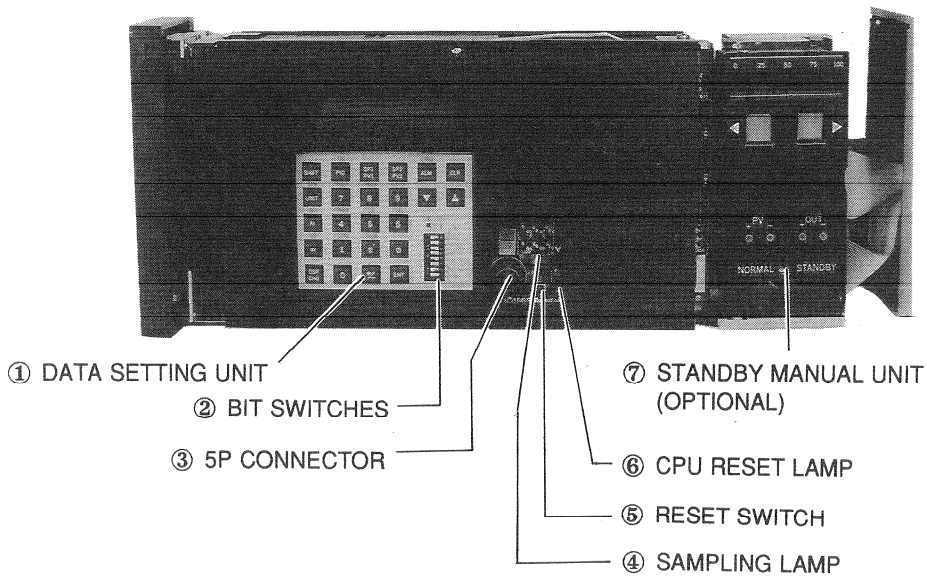


Fig. 5.3. Layout of Side Panel Items

Table 5.2. Functions of Side Panel Items of KAS

No.	Item	Description
1	Data setting unit	• To set parameters (proportional band, integration time and derivative time) for PID arithmetic, to change variable parameters, and to indicate the results of arithmetic calculation of PV and SP. • To modify the tuning parameters (when the STC function is selected). • To indicate the diagnostic results and alarms. • To perform configuration task.
2	Bit switches	To select configuration data write modes, start mode, etc. For details, see Table 5.3.
3	5P connector	For connection to a handy communicator or a personal computer communicator.
4	CPU RESET lamp	Illuminates to indicate an event of CPU reset or watchdog time out.
5	RESET switch	To reset the controller to the initial state (state identical with that which occurs when controller power is turned on).
6	SAMPLING lamp	To indicate that the controller is in the SAMPLING mode. Blinks in synchronization with the SAMPLING cycles.
7	Standby Manual Unit (optional)	To manually control the current output when in the standby mode (when the controller has failed). For details, refer to the chapters for Standby Manual functions and operation methods.

Table 5.3. Functions of Bit Switches

No.	Switch	Function	When OFF	When ON
1	[LOAD]	Selects loader mode or online mode	Online mode *	Loader mode
2	[CAL]	Selects calibration mode or online mode	Online mode *	Calibration mode
3	[C.INHB]	Enables or disables switching to computer mode for SPC or DDC.	Computer mode enabled *	Computer mode disabled
4	[W.INHB]	Enables or disables writing by host	Write enabled *	Write disabled
5	[D/R2]	Selects direct action or reverse action for PID2 output. (Direct action: If SP < PV, the output increases. Reverse action: If SP > PV, the output increases.)	Reverse action (PID2) *	Direct action (PID2)
6	[D/R1]	Selects direct action or reverse action for PID1 output. (Direct action: If SP < PV, the output increases. Reverse action: If SP > PV, the output increases.)	Reverse action (PID1) *	Direct action (PID1)
7	[H/C]	Selects HOT start or COLD start.	COLD start *	HOT start
8	[ENT]	Enables or disables data entry from the Data Setting Unit.	Data entry disabled *	Data entry enabled

*: Setting when the controller is shipped from the factory

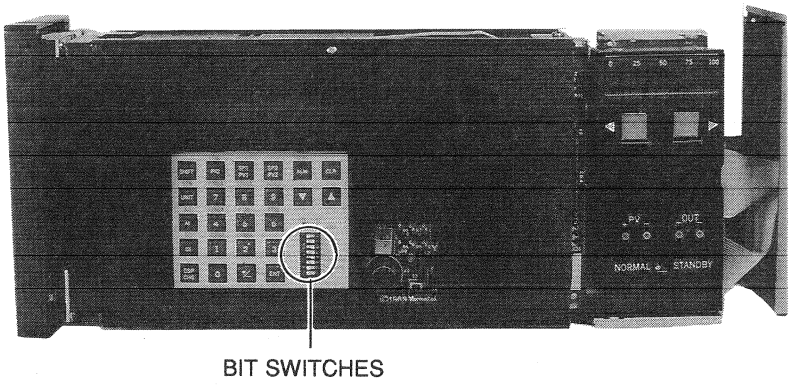
6. START-UP PROCEDURE

6.1 Preparative Procedure

The preparative procedure for starting up the controller is as follows:

① Checking the Switch Settings

(a) Be sure that the bit switches are correctly set.



BIT SWITCHES

Bit Switches

Switch		OFF Position	ON Position
[ENT]	(8)*	Data entry disabled	Data entry enabled
[H/C]	(7)	COLD start	HOT start
[D/R1]	(6)	Reverse action (PID1)	Direct action (PID1)
[D/R2]	(5)	Reverse action (PID2)	Direct action (PID2)
[W.INHB]	(4)	Write enable	Write disable
[C.INHB]	(3)	Computer mode enable	Computer mode disable
[CAL]	(2)	Online mode	Calibration mode
[LOAD]	(1)	Online mode	Loader mode

*: The numbers enclosed in the parentheses are switch numbers.

(b) If the controller has a standby manual unit (optional), set its STANDBY/NORMAL switch in the NORMAL position. If the standby manual unit is of the preset type, set also the output value by operating the output knob.

② Turning on Power

Turn on power of the controller. (Turn on power of the standby manual unit also.)

③ Checking the Operation Data

Check that the analog input values (digital input values), variable parameters, and other control data needed for operation are correctly set by means of the data setting unit.

④ Press the [R] (reset) button to release the interlock state. The controller will become the MAN (manual) mode.

6.2 Start-up Procedure

To start up the controller, observe the instructions given in this section.

Note: In this section, the start-up procedure is explained assuming rather simple PID control actions.

6.2.1 Start-up in MAN Mode

(1) MAN Mode of Operation

- Adjust the output signal with the output adjustment keys.
- Adjust the setpoint (target) value with the SP adjustment keys.

(2) Setting the Self-tuning Parameters

If the self-tuning function (optional) is selected, select the self-tuning enable/disable mode with the data setting unit. Select fixed-value control type (high gain type) or follow-up control type (low gain type) factor depending on the type of the process to be controlled and the high/low limit values of tuning parameters. (Refer to Para. 7.3.3 (2).)

6.2.2 Regular Operation

(1) Switching the Operation Mode

The operation mode buttons ([M] , [A] , [C]) on the front allow switching of the operation mode in accordance with the preprogrammed controller type.

(2) Entry of the PID Parameters

If self-tuning function is not employed, optimal proportional band, integral time and derivative time should be entered from the data setting unit.

(3) Self-tuning (optional)

① Initial Execution

If self-tuning is enabled, the initial tuning starts when either AUTO mode or CAS mode is selected for the first time after turning on power. In this case, while doing the control with the initial setting value of each PID parameter, the tuning is executed and parameters are optimized. After setting new parameters, the tuning is performed once more for more optimal parameters.

② Automatic Execution

If self-tuning is enabled, the process is constantly monitored even when it is controlled with the regular PID actions and, if parameters are found to be inadequate, self-tuning is done automatically.

If self-tuning is unnecessary, disable it.

③ Demand Execution

If self-tuning is enabled, self-tuning starts as demanded by the operator by pressing the [R] key for 1 second or more.

④ Aborted Self-tuning

When any one or more of the below-mentioned events have occurred, self-tuning is aborted and the PID parameters remain at the values which existed before the self-tuning started.

- The mode of operation is changed to MANUAL.
- The command to disable self-tuning is given from the data setting unit and the P2 input of the PID unit is set to OFF.
- The self-tuning is not completed within the specified period of time.

6.2.3 Types of Start-up Operation

Three different types — namely HOT start, COLD start, and STANDBY start — are available for restarting the controller when its power is restored. An appropriate type of start-up operation should be selected for the mode, SP and output.

Either the HOT or COLD start can be selected with the bit switches on the side panel. However, the STANDBY/NORMAL switch of the standby manual unit has a priority and, if it is set to STANDBY, the controller starts up in the STANDBY mode irrespective of setting of the bit switches.

Note: To restart the controller after changing its types, start the controller once in the COLD start mode and then set the specified start mode.

① HOT Start

The controller starts basically with the mode, SP (local setpoint), and output (current output) which existed just before the power outage. If the mode, SP or output is abnormal (impossible type or value), the controller starts up in the COLD start mode.

② COLD Start

The controller starts with the mode, SP (local setpoint) and output which have been pre-defined as basic data. [Even when the HOT start is selected, these items are desirably predefined as basic data in case RAM backup fails.

③ STANDBY Start

If the STANDBY/NORMAL switch of the standby manual unit is set to STANDBY, the controller starts up with IM for the mode, with the preset value for the output, and with the standby value for the output.

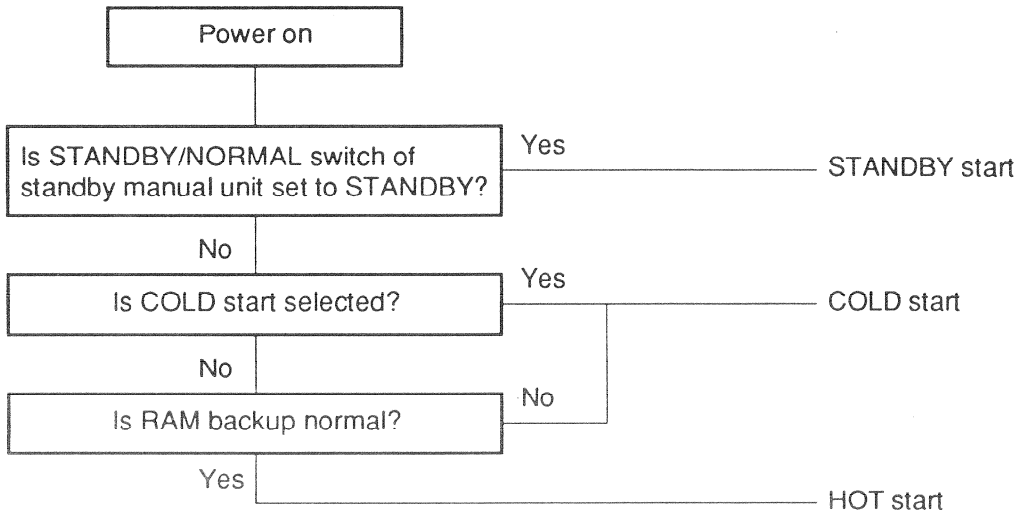


Fig. 6.1. Start-up Flow

Table 6.1. Types of Start-up, and SP/Mode/Output

Operation mode	Type of start-up selected	RAM backup	SP value (local)	Mode	Output	Actual start-up of controller
Regular mode	HOT	OK	As before power outage	As before power outage	As before power outage	HOT
					Standby value	
		NG Note 3	Preset value	Preset mode	Preset value	COLD
					Standby value	
	COLD	Any	Preset value	Preset mode	Preset value	COLD
					Standby value	
Standby mode (See Notes 1 and 2.)	Any	Any	Preset value	IM	Standby value	STANDBY

Notes 1. If the STANDBY/NORMAL switch of the standby manual unit is set to STANDBY, the controller starts in the STANDBY mode. This setting has a priority over the setting of the bit switch.

2. Before changing the switch setting from STANDBY to NORMAL, be sure that the KAS main unit is in a stably operating state (allow approximately 5 seconds of stabilization time after power is turned on).

3. The term "RAM backup NG" means a state that one or more of the mode, SP and output are abnormal (in or at an impossible state or value).

7. OPERATION METHOD

7.1 Front Section of KAS

The basic operation method of the KAS is similar to that of a regular analog controller. For the functions of the instrument front panel items, see Section 5.1.

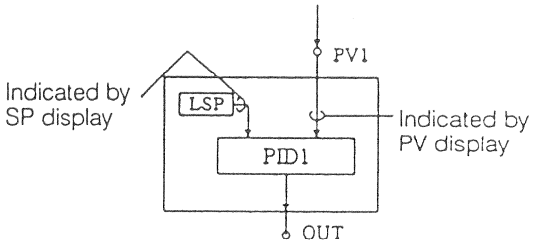
(1) SP Setting

Setting of LSP (local set point) can be done with the SP setting keys (▲ , ▼).

Signals displayed on bar indicators and digital displays differ by the type of controller (0 to 3), by the mode of operation, and by the ON/OFF state of the DSP CHG key. The set point indicated by the bar indicator or digital display can be changed by means of the SP setting keys.

Controller Type 0 (1PID Local Type)

Bar/digital display \ Mode	MAN	AUTO
PV display	PV1	PV1
SP display	LSP1*	LSP1*



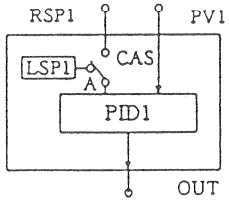
*: Can be changed with the SP setting keys. (However, it cannot be changed if the PV tracking function is selected and the controller is in the MAN mode.)

PV1: PV of PID computational unit of primary side

LSP1: Local SP of PID computational unit of primary side

Controller Type 1 (1PID Cascade Type)

Bar/digital display \ Mode	MAN	AUTO	CAS
PV display	PV1	PV1	PV1
SP display	LSP1* (RSP1)	LSP1* (RSP1)	RSP1



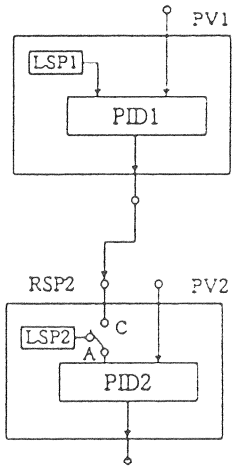
The items enclosed in the parentheses are displayed during the period the DSP CHG button is kept pressed.

*: Can be changed with the SP setting keys. (However, it cannot be changed if the PV tracking function is selected and the controller is in the MAN mode.)

RSP1: Remote SP of PID computational unit of primary side

Controller Type 2 (2PID Cascade Type)

Mode / Bar/ digital display	MAN	AUTO	CAS
PV display	PV2 (PV1)	PV2 (PV1)	PV1 (PV2)
SP display	LSP2* (RSP1)*	LSP2* (RSP1)*	LSP2* (RSP2)*



The items enclosed in the parentheses are displayed during the period the [DSP CHG] button is kept pressed.

*: Can be changed with the SP setting keys. (However, LSP1 cannot be changed if PID1 is in the PV tracking operation and the instrument is in the AUTO or MAN mode; LSP2 cannot be changed if PID2 is in the PV tracking operation and the operation is in the MAN mode.)

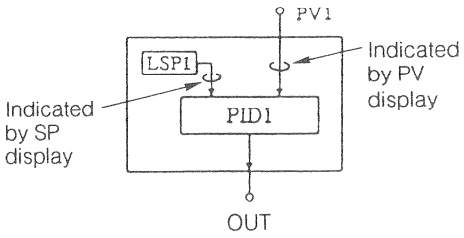
PV2: PV of PID computational unit of secondary side (AI2)

LSP2: Local SP of PID computational unit of secondary side

RSP2: Remote SP of PID computational unit of secondary side (Output of PID computational unit of primary side)

Controller Type 3 (1PID Local Type, with Follow Mode)

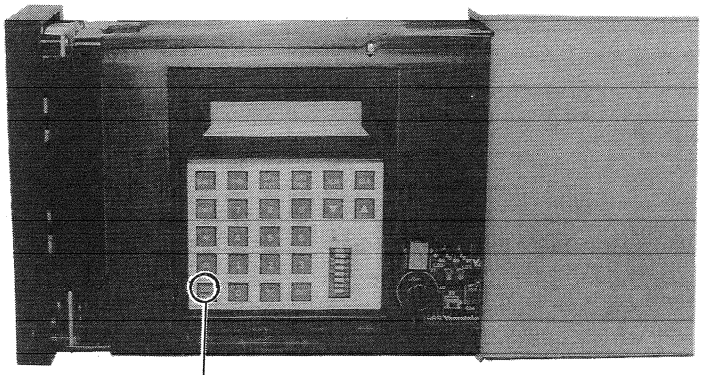
Mode / Bar/ digital display	MAN	AUTO
PV display	PV1	PV1
SP display	LSP1*	LSP1*



*: Can be changed with the SP setting keys. (However, it cannot be changed if the PV tracking function is selected and the controller is in the MAN mode.)

(2) Control of Output Current

When in the manual mode or interlock manual mode, the output current can be controlled with the output adjustment keys ([▲], [▼]).



DS P
CHG (DISPLAY CHANGE KEY)

Type / Display	Controller Type 1 (1PID, cascade type)			Controller Type 2 (2PID, cascade type)		
Mode / Bar/ digital display	MAN	AUTO	CAS	MAN	AUTO	CAS
PV display	PV1	PV1	PV1	PV2 (PV1)	PV2 (PV1)	PV1 (PV2)
SP display	LSP1 (RSP1)	LSP1 (RSP1)	RSP1	LSP2 (LSP1)	LSP2 (LSP1)	LSP1 (RSP2)

The items enclosed in the parentheses are those which are selectable with the DSP CHG key.

Fig. 7.1. Functions of DSP CHG Key

7.2 Operating Modes of KAS

The KAS has four regular operating modes (MAN, AUTO, CAS and FOLLOW modes) and two non-regular operating modes (IM and S modes).

7.2.1 Regular Operating Modes

① MAN (manual mode)

The PID computational unit operates with the integration action alone, the controller output (AOI: current output) is held, and the output can be controlled with the output control keys on the instrument front panel. When in this mode, message "M" (manual) in red appears on the instrument front panel.

② AUTO (automatic mode)

The PID computational unit performs PID arithmetic function in a fixed-values control mode with respect to the LSP (local set point) which has been set by the SP control keys (▲ and ▼) on the instrument front panel. When in this mode, message "A" (auto) in green appears on the instrument front panel.

③ CAS (cascade mode)

The PID computational unit performs its PID arithmetic function with respect to an external set point signal (an output signal of other PID computational unit or a signal external to the controller). When in this mode, message "C" (cascade) in yellow appears on the instrument front panel.

④ COMP (computer mode)

There are two modes. One is the COMP-AUTO mode (SPC) in which the PID computational unit performs PID arithmetic function with the CSP (computer SP) received from the host computer as a setpoint value. The other is the COMP-MAN mode (DDC) in which the controller delivers the COUT (computer output) received from the host computer. In either case, the "C" character (white) appears.

⑤ FOLLOW (follow mode)

The PID computational unit stops its operational function and its output signal (AOI) follows an external FOLLOW signal applied to the instrument. For this mode of operation, a FOLLOW mode switch signal (external contact signal or internal ON/OFF-type data) and an input signal (FOLLOW signal) which the output signal should follow are needed. When the instrument operation is switched to the FOLLOW mode, message "FLW" (follow) in white appears on the instrument front panel. The message which existed immediately before the switching remains displayed.

7.2.2 Non-regular Operating Modes

① IM (interlock manual mode)

Instrument operation is transferred into this mode from the regular mode (MAN, AUTO, CAS or FOLLOW mode) in response to any one or ones of the following internal or external causes: Internal causes that an analog input rangeover, arithmetic calculation result overflow or controller overload is detected by diagnosis; an external cause that by diagnosis; an external cause that an external interlock signal is input.

The apparent functions of the instrument when in the IM mode are identical with those when in the manual mode. Once the instrument has fallen into this mode, however, it cannot be changed to another mode unless the [R] (RST) key is pressed after eliminating the cause of the mode change. (As the [R] (RST) key is pressed, the instrument is reset to the manual mode.)

When in the manual mode or interlock manual mode, LSP (local set point) can be changed.

When the instrument is changed into the interlock manual mode by an external cause, the "IM" message on the front panel flickers; it appears continuously when the interlock signal is released. When the instrument is changed into this mode by an internal cause, the message appears continuously.

② S (standby mode)

The instrument operation is transferred into this mode if an abnormal state is detected by the self-diagnosis function when the instrument is in normal operation mode or in the IM mode.

When in this mode, the instrument output (AOI) can be controlled with the standby manual unit (optional). Two types of standby manual units are available and either one of them can be installed in the instrument.

1. Preset type

   When changed to the standby mode, the instrument delivers the output of a preset value. Subsequent operation can be done with the standby manual unit.

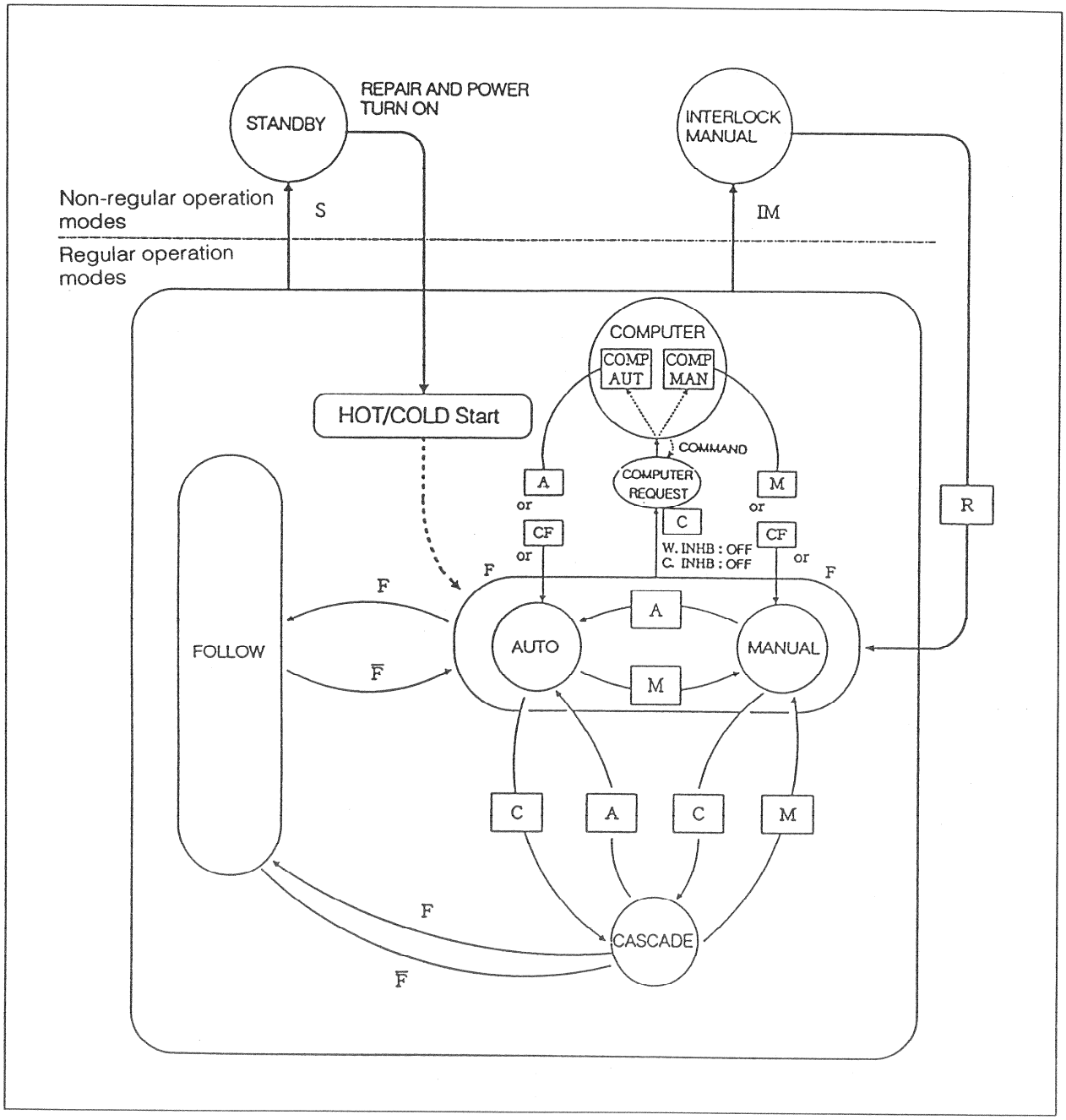
2. Follow-up type

   When changed to the standby mode, the instrument output is held at the value which existed immediately before changing to the standby mode. Subsequent operation can be done with the output control keys on the KAS front panel or with the output control buttons on the standby manual unit.

   Once the instrument has been changed to the standby mode, it cannot be changed to another mode unless the cause of the change is eliminated. (When the instrument is repaired and the power is turned on, the instrument starts up in the selected mode.)

   When the instrument is in the standby mode, the mode is displayed by the [CPU.F] lamp on the front panel.

A mode transfer chart is shown in Fig. 7.2.



C : Cascade mode key

A : AUTO mode key

M : MANUAL mode key

F : FOLLOW mode select signal

$\overline{F}$: FOLLOW mode release signal

IM : External interlock signal or internal cause

S : Instrument abnormal state detection by self diagnosis

R : Reset key

CF : Computer failure signal

Fig. 7.2. Mode Transfer Chart

7.3 Data Setting Unit (Data Entry Unit)

The data setting unit (data entry unit) of the KAS is installed on the side panel, as a standard feature. It is a digital setting and display unit which sets data for control and arithmetic operations, and which displays the required data. It also allows to modify configuration data.

(For configuration data entry, refer to the section of configuration.)

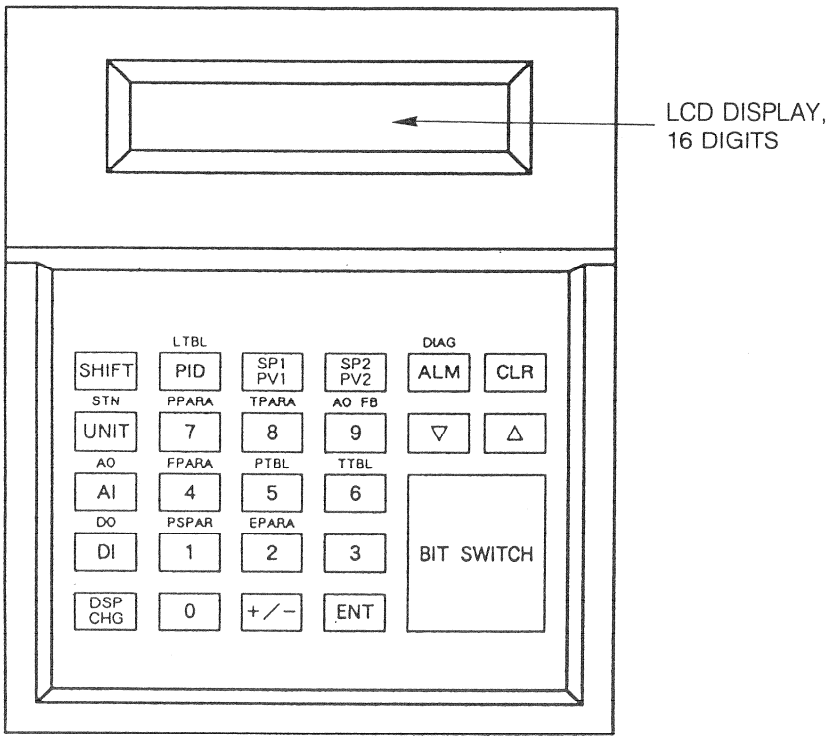


Fig. 7.3. Data Setting Unit

Table 7.1. Keys of Data Setting Unit

Name of Keys	Symbols of Keys
Function keys	PID, LTBL, AI, AO, DI, DO UNIT, STN, PPARA, TRAPA, AOFB SP1/PV1, SP2/PV2, ALM, DIAG
Numerical keys	0 to 9
Sign key	+/ −
Entry key	ENT
Increase/decrease keys	△, ▽
Shift key	SHIFT
Clear key	CLR
Display change key	DSP CHG

Table 7.2. Functions of Keys of Data Setting Unit

Key	Function
PID	To call PID arithmetic operation parameters, etc. To call PID tuning parameters (when STC function is selected.)
SP1 / PV1	To call SP1 (set point value) or PV1 (measured process variable value) of PID1
SP2 / PV2	To call SP2 (set point value) or PV2 (measured process variable value) of PID2
UNIT	To call input/output data of computational unit.
AO AI	• To call analog input data. • To call analog output data (when SHIFT key is pressed).
DO DI	• To call digital input data. • To call digital output data (when SHIFT key is pressed).
PPARA	To call variable %-type parameters (when SHIFT key is pressed).
TPARA	To call variable time-type parameter (when SHIFT key is pressed).
AOFB	To call feedback data of current output (AOI) (when SHIFT key is pressed).
LTBL	To call linearization table data (when SHIFT key is pressed).
ENT	To enter data for setting or change. This key is effective when the auxiliary "data entry enable bit switch" is kept in the "on" state.
0 to 9	Numerical data entry keys

Key	Function
+/ –	Sign key (Each time as you press the key, the signs change between "+" and " – " alternately.)
△	Increment key (to increase the data value)
▽	Decrement key (to decrease the data value)
SHIFT	To select the functions indicated at immediately above respective keys. As you press this key, a message "SHIFT" appears on the LCD. As you press the key again, the message disappears.
CLR	If you press the key when a basic item is displayed, the basic item disappears and a prompt is displayed. If you press the key when a setting data is displayed, the setting data disappears and the data which was set by the preceding procedure is displayed. If you press the key when the diagnostic result is displayed, the latched diagnostic result disappears (provided that the cause of abnormality has been eliminated).
ALM	To call the alarm status data of process.
DIAG	To call the diagnostic results (when SHIFT key is pressed).
DSP CHG	To change the displayed items.
STN	To call the station number (when SHIFT key is pressed).

7.3.1 General Notes for Operation

(1) To call out a control data item onto the data setting unit, specify the basic item with the function keys and numerical keys and data entry key, and then select the required data item with the [▲] / [▼] keys. Some of the data items are for display only; others are for both display and change.

(2) To change data, set the data entry enable switch (bit switch on the side panel) to the "ON" position.

(3) To change setting of control data, call the required data item with the set-item key, place the required value when in the state that the item to be changed is displayed, and then press the entry key to enter the data value.

(4) If you press the clear key at a halfway of control data setting, the control data of the preceding setting will appear allowing you to enter a new control data again. If you press the clear key before the basic item is set, the prompt will appear allowing you to enter a new basic item all over again.

(5) If you enter an invalid control data, the display will blink to alert you to the entry error.

(6) If you attempt to call data which does not exist, the display will indicate a bar.

(7) If you press two or more keys at the same time, the key entry becomes ineffective.

7.3.2 SP Call and Change Method

(1) Call Method of SP1/PV1

Press the key: [SP1/PV1]

Display: SP1/PV1 - - - - - - - - -

↓

S = XXXXXXP = XXXXXX [See Table 7.3.]

(SP1) (PV1)

(2) Call Method of SP1/PV2

Press the key: [SP2/PV2]

Display: SP2/PV2 - - - - - - - - -

↓

S = XXXXXXP = XXXXXX [See Table 7.4.]

(SP2) (PV2)

Note: When PID1 alone is used, data display of SP2/PV2 becomes " - - - - - - ".

(3) Change Method of SP

To change the SP value, place a required value with the numerical keys and then press the entry key.

7.3.3 Data Call and Change Method

(1) Call and Change Method of PID Arithmetic Parameters

The following procedure is applicable in common to all of the subsequent items (2) through (9).

Step No.	Procedure	Display
1	[PID] [n] [ENT] n: 1, 2	① PIDn – – – – – – ↓ ② n_PB – – – – – – – = X X X X X X (Immediately after you have pressed the ENT key, the proportional band of PIDn will be displayed as shown in ②.)
2	Select the required item with the ▲ (or ▼) key.	For the displayed item, see Table 7.5.
3	Enter a control data value.	1_PB – – – – – – = _100.0 When proportional band of PID1 is placed as 100.0 Note: At this stage of procedure, the data value is only placed on the display and has not been entered yet.
4	[ENT]	As the data is entered (changed), the data once disappears and then reappears.

(2) Call and Change Method of Self-tuning Parameters

This data setting (data entry) can be done when the STC function is selected.

Press the keys: [PID] [n] [ENT]

n: 3, 4

Display: PIDn _ _ _ _ _ _ _ _

↓

n _ PB _ LO _ _ = XXXXXX

Entry data

For the display item, see Table 7.6.

(3) Call and Change Method of Linearization Table

Press the keys: [SHIFT] [LTBL] [n] [ENT]

n: 1 or 2 (linearization table number)

Display: LINEARIZE _ TABLEn

↓

LTBLn _ XXX = XXXXXX

XXXXXX — Entry data

LTBLn _ XXX — For the display item, see Table 7.7.

(4) Call Method of Analog Input Signal

Press the keys: [AI] [n] [ENT]

n: 1 or 2 (analog input signal number)

Display: ANALOG _ IN _ No. n _ _

↓

RAW _ AI _ _ n = XXXXXX

XXXXXX — Input, entry data

RAW _ AI _ _ n — For the display item, see Table 7.8.

(5) Call and Change Method of Variable Parameter

** %-type **

Press the keys: [SHIFT] [PPARA] [n] [ENT]

n: 1 to 6 (%-type parameter number)

Display: PPARAMETER _ No. _ n

↓

PPARA _ _ n _ = XXXXXX

XXXXXX — Entry data

PPARA _ _ n _ — For the display item, see Table 7.9.

(6) Call Method of Computational Unit

Press the keys: [UNIT] [n] [ENT]

n: 1 to 5 (Computational unit number)

Display: UNIT _ n _ _ _ _ _ _ _ _ _

↓

U _ n _ H1 _ % = XXXXXX

Display data

For the display item, see Table 7.10.

(7) Call Method of Digital Input Signal

Press the keys: [DI] [n] [ENT]

n: 1 (digital input signal number)

Display: DIGITAL _ IN _ _ No. n

↓

DIN _ _ No. n = XXXXXX

Display data

For the display item, see Table 7.11.

(8) Call Method of Digital Output Signal

Press the keys: [SHIFT] [DO] [n] [ENT]

n: 1 to 3 (digital output signal number)

Display: DIGITAL _ OUT _ No. n

↓

DOUT _ No. n = XXXXXX

Display data

For the display item, see Table 7.12.

(9) Call Method of Analog Output Signal

Press the keys: [SHIFT] [AO] [n] [ENT]

n: 1 or 2 (analog output value)

Display: ANALOG _ OUT _ No. n _

↓

AOUT _ AOI _ = XXXXXX

Display data

For the display item, see Table 7.13.

(10) Check Method of Feedback of Current Output (AOI)

Press the keys: [SHIFT] [FB AO]

Display: FEEDBACK _ AO _ _ _ _ _

↓

FD _ BCK _ AO = XXXXXX

Display data

For the display item, see Table 7.14.

(11) Call Method of Station Number of Communication System

Press the keys: [SHIFT] [STN]

Display: STATION _ No. n _ _ _ _

↓

STATION _ No. n _ _ _ _

Display data

For the display item, see Table 7.15.

7.3.4 Tables of Display Items

In the following tables, symbols " ○ " and " x " denote:

○ : Item which can be changed with the data setting unit
x : Item which cannot be changed with the data setting unit

Table 7.3. SP1/PV1

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
S=XXXXXXP=XXXXXX	SP1/PV1	Display in engineering unit	Engineering unit	○ for SP only	

Table 7.4. SP2/PV2

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
S=XXXXXXP=XXXXXX	SP2/PV2	Display in engineering unit	Engineering unit	○ for SP only	

Table 7.5. PID Arithmetic Parameters

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Default Value	Remarks
1XXXXXXXX=	PID1	—	—	○	—	
2XXXXXXXX=	PID2	—	—	○	—	
X-PB-----=	Proportional band	0.0 to 799.9	%	○	100.0	
X-TI-----=	Integration time	0.00 to 99.99	Minute	○	1.00	
X-TD-----=	Derivative time	0.00 to 99.99	Minute	○	0.00	
X-R.LMTLO=	Integration limit (low limit)	−200.0 to 200.0	%	○	0.0	
X-R.LMTHI=	Integration limit (high limit)	−200.0 to 200.0	%	○	100.0	
X-RATIO--=	Ratio	− 699.9 to 799.9	%	○	100.0	
X-BIAS---=	Bias	− 699.9 to 799.9	%	○	0.0	
X-GAP----=	Dead zone	− 699.9 to 799.9	%	○	0.0	
X-DMV-LMT=	Output change rate	− 699.9 to 799.9	%	○	100.0	
X-DEV-ALM=	Deviation alarm	− 699.9 to 799.9	%	○	10.0	
X-PVALMLO=	PV alarm (low limit)	(Engineering unit display)	Engineering unit	○	0.0	
X-PVALHMI=	PV alarm (high limit)	(Engineering unit display)	Engineering unit	○	100.0	
X-PV-----=	PV	− 6.9 to 106.9	%	x	—	
X-RMT-SP-=	RSP (remote SP)	− 6.9 to 106.9	%	x	—	
X-LCL-SP-=	LSP (local SP)	− 6.9 to 106.9	%	x	—	
X-CAL-SP-=	SP (SP for arithmetic operation)	− 6.9 to 106.9	%	x	—	
X-DEV----=	Deviation (SP − PV)	− 6.9 to 106.9	%	x	—	
X-PID-OUT=	PID arithmetic operation output	− 6.9 to 106.9	%	x	—	

Table 7.6. Parameter Codes for PID Self-tuning

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Default Value	Remarks
3XXXXXXXX=	PID1	—	—	○	—	
4XXXXXXXX=	PID2	—	—	○	—	
X-PB-LO--=	Proportional band low limit	0.0 to 799.9	%	○	10.0	
X-PB-HI--=	Proportional band high limit	0.0 to 799.9	%	○	799.9	
X-TI-LO--=	Integral time low limit	0.00 to 99.99	Minute	○	0.01	
X-TI-HI--=	Integral time high limit	0.00 to 99.99	Minute	○	99.99	
X-TD-LO--=	Derivative time low limit	0.00 to 99.99	Minute	○	0.01	
X-TD-HI--=	Derivative time high limit	0.00 to 99.99	Minute	○	10.00	
X-DROPOUT=	Derivative time drop out	0.00 to 99.99	Minute	○	0.01	
X-TUNING-=	Tuning enable/ disable	0: disable 1: enable	—	○	0	
X-CTL-TYP=	Control type	0: Fixed-value type 1: Follow type	—	○	0	

Notes 1) Display and setting are not conducted when STC function is not selected.

2) Setting to tuning enable/disable can be done by OR (boolean ADD) between P2 of PID unit as configuration data and the setting value in the data setting unit.

3) Control type 0 (fixed value type) is with a factor of Zeigler-Nichols for a high gain. Control type 1 (follow type) is with a factor of delay and, since it is of a low gain type, it is used often for processes which do not tolerate overshoots.

Table 7.7. Linearization Data

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
LTBL1-XXX=	Linearization (No. 1)	—	—	○	
LTBL2-XXX=	Linearization (No. 2)	—	—	○	
LTBLX-x01=	X-axis (X_1)	0.0 to 799.9	%	○	
I	I	I	I	I	
I	I	I	I	I	
LTBLX-x11=	X-axis (X_{11})	0.0 to 799.9	%	○	
LTBLX-y01=	Y-axis (Y_1)	0.0 to 799.9	%	○	
I	I	I	I	I	
I	I	I	I	I	
LTBLX-y11=	Y-axis (Y_{11})	0.0 to 799.9	%	○	

Table 7.8. Analog Inputs

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
XXXXXXXX1=	Analog input No. 1	—	—	—	
XXXXXXXX2=	Analog input No. 2	—	—	—	
RAW-AI--X=	Raw input value	– 6.9 to 106.9	%	x	
NRMLZ-AIX=	Value after input processing	Engineering unit display	Engineering unit	x	
D.FILTERX=	Digital filter value	0.0 to 999.9	Second	○	
ENG.-LO-X=	Engineering unit display (low limit)	– 9999 to 9999	Engineering unit	○	
ENG.-HI-X=	Engineering unit display (high limit)	– 9999 to 9999	Engineering unit	○	

Table 7.9. Variable Parameters (%-type)

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
PPARA-01-=	Output lower limit value	– 699.9 to 799.9	%	○	
PPARA-02-=	Output upper limit value	– 699.9 to 799.9	%	○	
PPARA-03-=	AI1 Dropout value	– 699.9 to 799.9	%	○	
PPARA-04-=	AI2 Dropout value	– 699.9 to 799.9	%	○	
PPARA-05-=	PID1 Alarm hysteresis	– 699.9 to 799.9	%	○	
PPARA-06-=	PID2 Alarm hysteresis	– 699.9 to 799.9	%	○	

Table 7.10. Computational Units

Display item	Contents			Display (Setting) Range	Unit	Setting Change	Remarks
	Type 0, 1	Type 2	Type 3				
U-1-XXXXX=	PID1	PID1	Mode select	—	—	—	
U-2-XXXXX=	Low limiter	PID2	PID1	—	—	—	
U-3-XXXXX=	High limiter	Low limiter	Low limiter	—	—	—	
U-4-XXXXX=	MAN	High limiter	High limiter	—	—	—	
U-5-XXXXX=	—	MAN	MAN	—	—	—	
UXX-H1XXX=	Input value (H1)			– 699.9 to 799.9 (%)	% *1	X	
UXX-H2XXX=	Input value (H2)			or	min *1	X	
UXX-P1XXX=	Input value (P1)			0.00 to 99.99 (minute)	*1	X	
UXX-P2XXX=	Input value (P2)			or		X	
UXX-OUT-X=	Computational unit output value			0: OFF, 1: ON	*2	X	
UXX-NO--X=	Algorithm number			11, 13, 19, 20, 21	—	—	

*1: Displayed together with three columns before "=" of display item or with data.

Example:

```
UXX-H1--%=-100.0
UXX-H2min=-10.00
UXX-P1---=0:OFF-
UXX-P2---=1:ON--
```

*2: Displayed together with one column before "=" of display item or with data.

Example:

```
UXX-OUT-%=-100.0
UXX-OUT--=-10.00
UXX-OUT--=0:OFF-
```

* Of the KAS, the functions of the computational units of respective controller types are as follows:

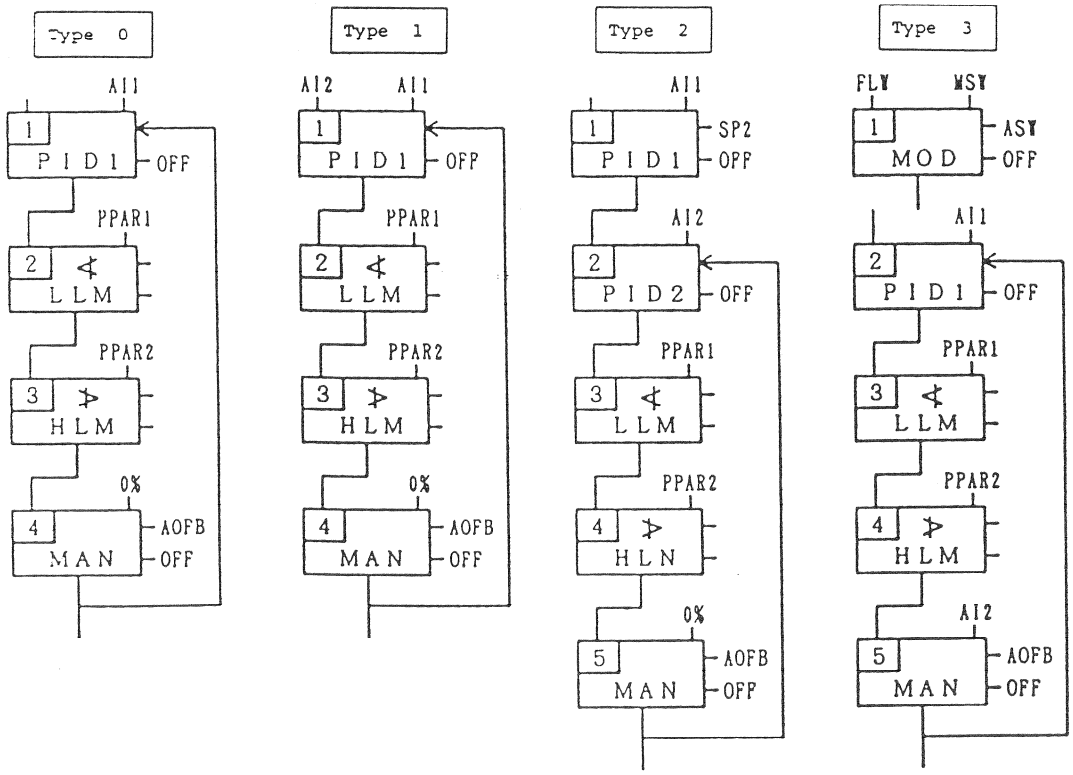


Table 7.11. Digital Inputs

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
DIN-NO.1=	Digital input (No. 1)	0: OFF, 1: ON	—	x	

Table 7.12. Digital Outputs

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
DOUT-NO.1=	Digital output (No. 1)	0: OFF, 1: ON	—	x	
DOUT-NO.2=	Digital output (No. 2)	0: OFF, 1: ON	—	x	
DOUT-NO.3=	Digital output (No. 3)	0: OFF, 1: ON	—	x	

Table 7.13. Analog Outputs

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
AOUT-AOI-=	Analog output (No. 1)	– 6.9 to 106.9	%	x	
AOUT-AOV1=	Analog output (No. 2)	– 6.9 to 106.9	%	x	

Table 7.14. Analog Output Feedback Check

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
FD-BCK-AO=	Feedback value of current output (AOI)	– 6.9 to 106.9	%	x	

Table 7.15. Communication System Station Number

Display item	Contents	Display (Setting) Range	Unit	Setting Change	Remarks
STATION-NO.XX	Station number	0 to 50	Absolute number	x	

7.3.5 Alarm Display and Diagnostic Display

(1) Alarm Display

The alarms detected by the PID computational units (alarms for PV high limit, PV low limit, and deviation) are displayed on the data setting unit as follows:

Operation: Press the [ALARM] key.

Display: ALARM_____

↓

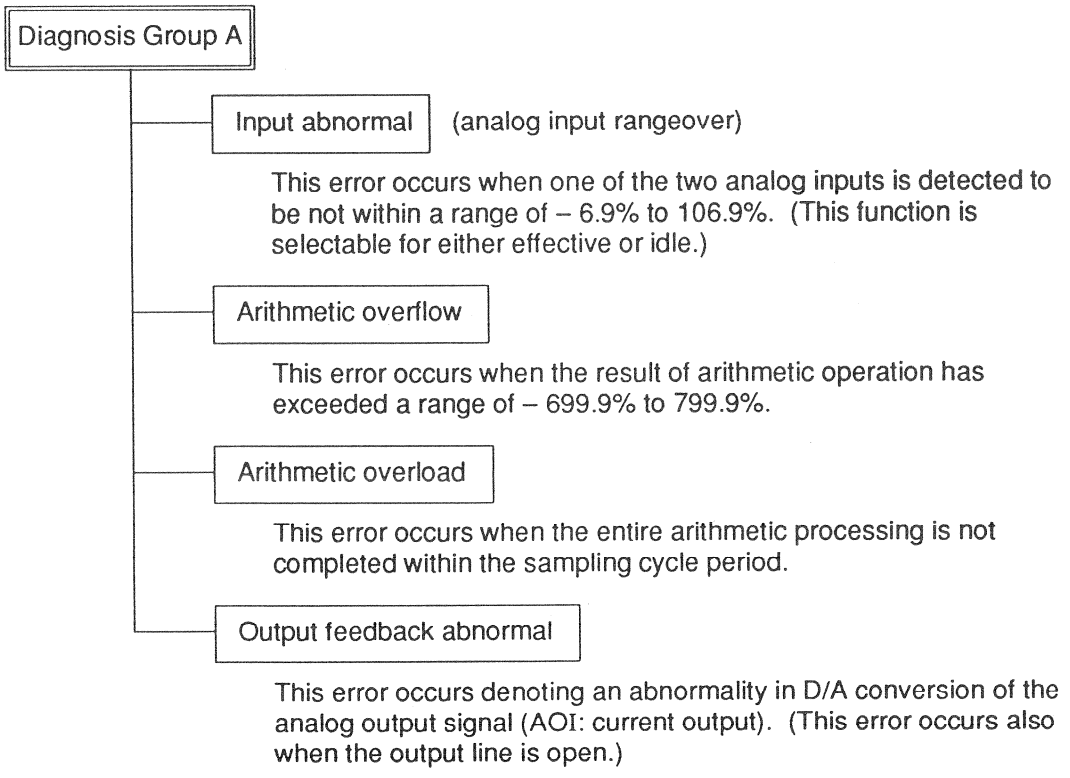
1=LODEV-2=LODEV-

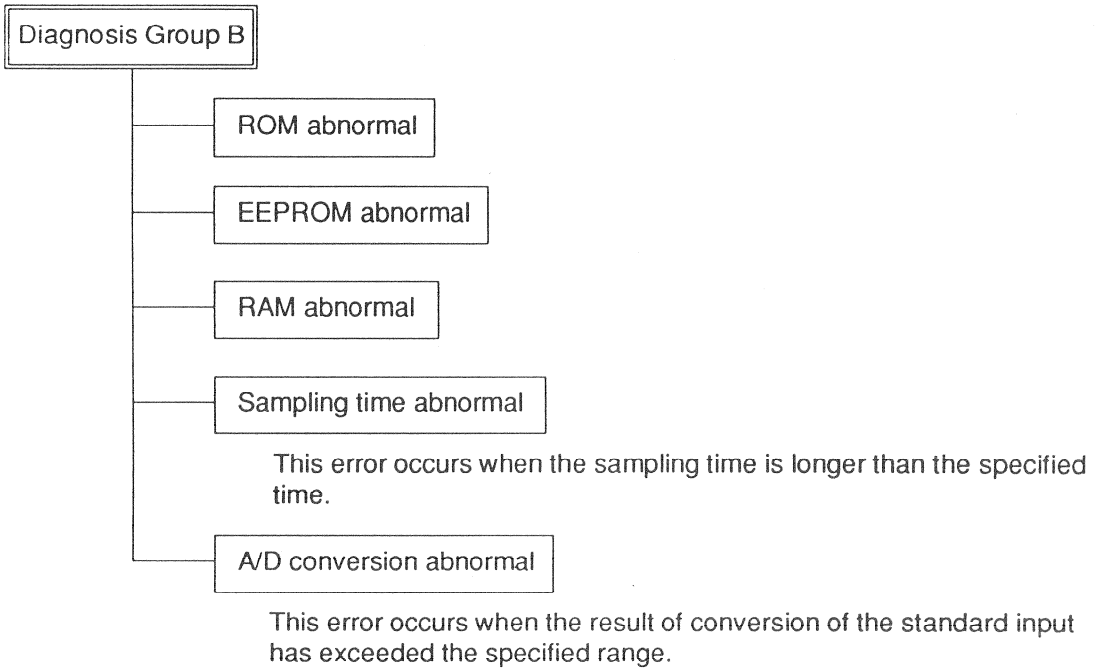
(1=HIDEV-2=HIDEV-)

- PID2 deviation alarm
- PID2 low limit alarm
- PID2 high limit alarm
- PID1 deviation alarm
- PID1 low limit alarm
- PID1 high limit alarm

(2) Diagnostic Display

The Fixed Program Controller is incorporated with diagnostic functions and checks its circuits at each sampling cycle. If an error state is found by the diagnosis, an error message in the form of a code is displayed on the data setting unit. The diagnostic items are classified as follows:





Initial Configuration Abnormal

This error occurs if no data exists in the configuration data area of the controller memory (EEPROM) when the controller power is turned on.

When a B Group error or an initial configuration error has occurred, the Controller is reset to the standby mode. It is reset also when a CPU error or a power supply error has occurred (no diagnostic codes are displayed).

■ Call Method and Format of Diagnostic Messages

The diagnostic messages are displayed on the data setting unit with codes in a format as shown below.

Operation: Press the keys [SHIFT] [DIAG].

Display: DIAGNOSIS-------

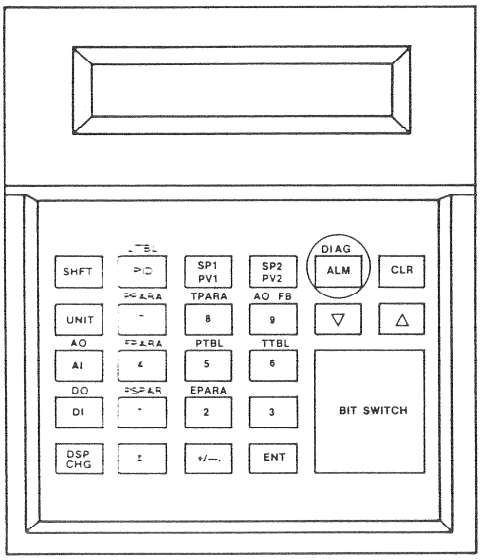
↓

CONF. ERROR: Initial configuration error

XXXXOFXXAIXAOIOL

- AOIOL: Arithmetic overload error
- AOI: Current output (AOI) feedback error
- AIX: Input-error analog input signal number (1 or 2)
- OFXX: Overflow-error computational unit number
- XXXX:
  - ROM: ROM error
  - EERM: EEPROM error
  - RAM: RAM error
  - SMPL: Sampling time error
  - A/D: A/D conversion error

■ Display and Reset



① Diagnosis Group A

The diagnostic message of Group A can be called out onto the data setting unit by pressing the keys ([SHIFT + DIAG [ALM]]). If the message is of an error, it does not disappear unless the cause of the error is eliminated and then the clear key of the data setting unit or the ([R]) key of the controller front panel is pressed.

② Diagnosis Group B

When an error of Group B is detected, an error message is displayed on the data setting unit and the instrument stops operating.

③ Initial Configuration Error

This error occurs if no data exists in the configuration data area of the EEPROM when the instrument power is turned on. When this error has occurred, it is necessary to write a configuration data on the EEPROM of the instrument by employing an engineering tool (a handy communicator or a personal computer communicator).

8. MAINTENANCE

The KAS Controller requires no particular routine maintenance. However, since the KAS employs a color LCD (liquid crystal display), its back lamp (cold cathode fluorescent lamp) must be replaced when its life expectancy has expired. When an electronics card has failed, it must be replaced. (The failure will be detected by the diagnostic function and will be indicated on the data setting unit.)

This section describes the replacement procedures of the back lamp and cards, and general handling procedures of the controller.

8.1 Replacement of Back Lamp (Cold Cathode Fluorescent Lamp/CFL)

The life expectancy of the back lamp is 2 years. When the life expectancy of the back lamp has expired or the intensity of the bar indicators and digital displays have become weak, replace the back lamp with a new one. The lamp can be replaced online.

- Life expectancy of back lamp: 2 years
- Parts number of back lamp: 83973418-001

① The back lamp may be replaced with a new one at a regular preventive maintenance.

② For online replacement of the back lamp, please inquire your Yamatake-Honeywell agent.

■ Replacement Procedure

(1) Switch off power of this instrument, or switch the mode to Standby and detach the main unit if the Standby Manual Unit is applicable.

(2) Pull out the chassis from the casing. (See Subsection 8.3.1.)

(3) Remove the cover of the right hand side of the chassis. (See Subsection 8.3.2.)

(4) Remove the cover of the front mask top by pushing it upward from the right or left hand side employing a pointed tool (such as a " – " screwdriver).

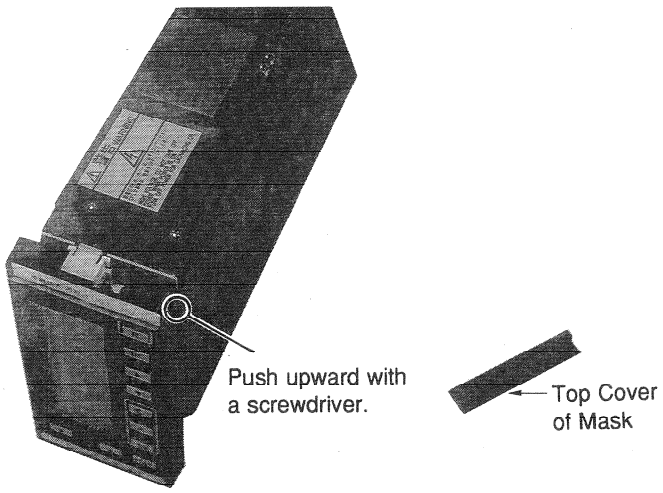


Fig. 8.1

(5) To gain access to the lamp electrodes, securely hold both ends of the lamp cover with your fingers and pull it out upward. (See Fig. 8.2.)

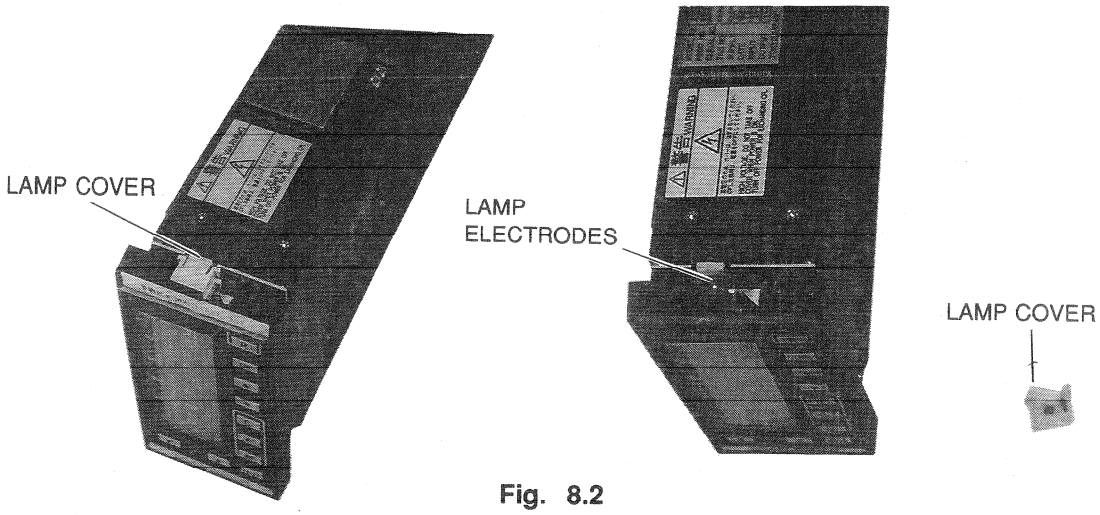


Fig. 8.2

(6) The lamp electrodes are of a spring type. A spring is located at the bottom also. To remove the lamp, press the electrode end against the bottom and throw down the lamp toward the indent of the electrode.

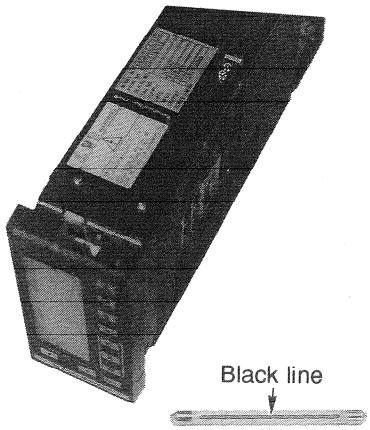


Fig. 8.3

(7) To install a new lamp, follow the above procedure in the reverse order. When inserting the lamp, be sure that the black line of the side plane of the lamp is positioned rearward.

⚠ **Warning: Turn off the power supply to the instrument before removing or installing the lamp. Note that the lamp operates on a high voltage.**

8.2 Replacement of Card

When a failed card is detected (a failure of diagnosis group B denotes a card failure), replace the card. The failure of diagnosis group B is displayed on the data setting unit in the following format.

[Message on data setting unit]

ROM: ROM failure
EERM: EEPROM failure
RAM: RAM failure
SMPL: Sampling time abnormal
A/D: A/D conversion abnormal

■ Replacement Procedure

Note: Before replacing a card, be sure that the power is turned off. Note that the two PCB's (CPU board and I/O board) are connected together with a cable. Do not twist the cable unreasonably.

(1) Pull out the chassis from the casing. (See Subsection 8.3.1.)

(2) Detach the standby manual unit from the chassis. (See Subsection 8.3.5.)

(3) Remove the cover of the right hand side of the chassis. (See Subsection 8.3.2.)

(4) Remove the bracket by removing screw ①, and then remove screw ②. (See Fig. 8.4.)

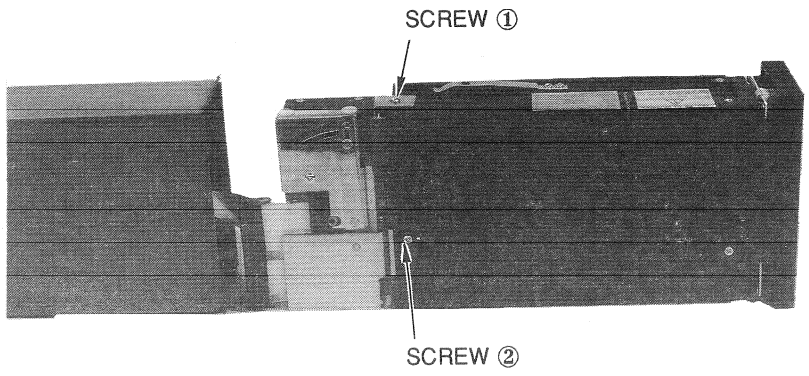


Fig. 8.4

(5) Remove the two connectors which connect the front mask section to the boards, using tweezers or other tools. Disconnect the connector J3. (See Fig. 8.5.)

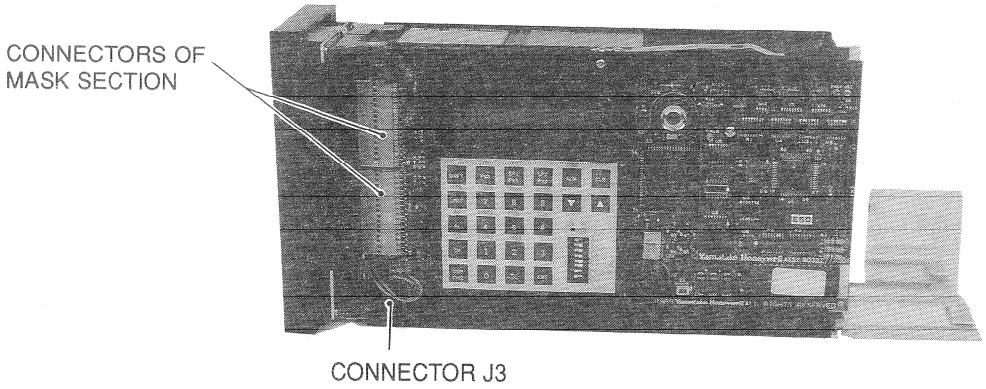


Fig. 8.5

(6) Pull out the two printed circuit boards aligned together, to rearward.

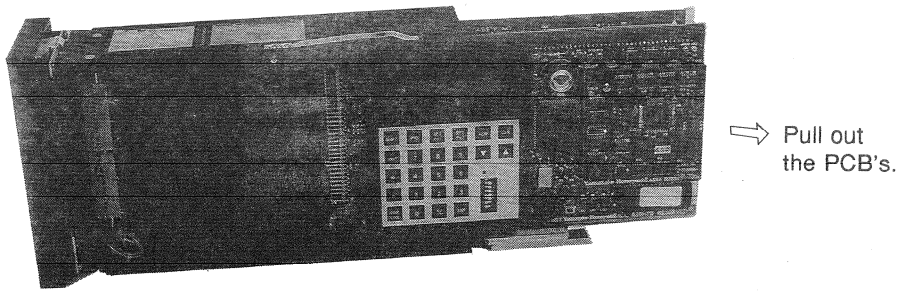


Fig. 8.6

(7) To install a new card, follow the above procedure in the reverse order.

8.3 Handling Methods of Controller

8.3.1 To Pull Out the Chassis from the Casing

(1) Be sure that the clamping screw for transportation has been removed. (The screw should have been removed when the controller was delivered to you.)

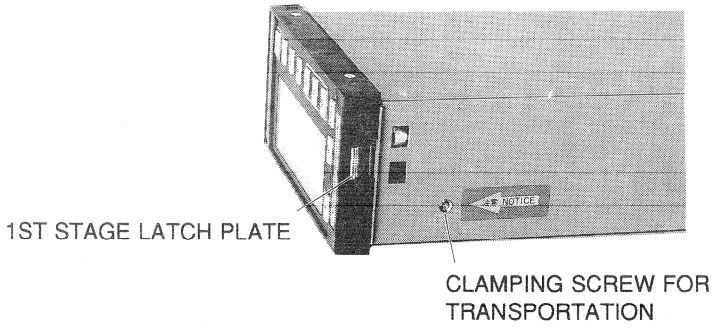


Fig. 8.7

(2) Pressing the latch plate at the bottom section of the front mask, pull the mask frontward while raising it slightly.

(3) The chassis will stop as it will be caught by the 2nd latch at the service position. (The service position is for operating the data setting unit, for connecting the RS232C cable for the Handy Communicator, etc.)

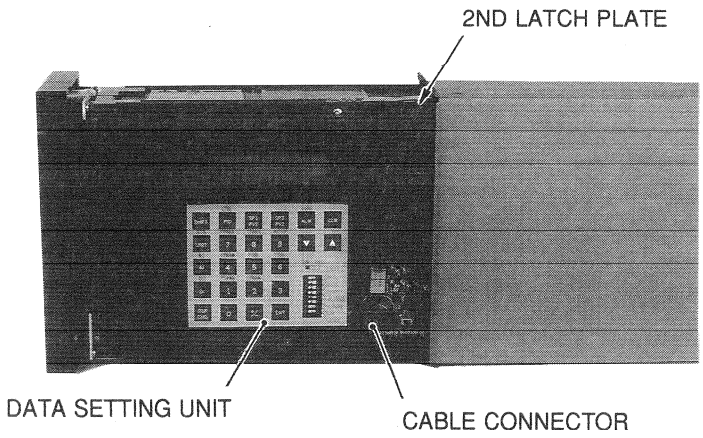


Fig. 8.8

(4) Pressing the 2nd latch plate at the top section of the chassis, pull the chassis frontward. The chassis will be detached from the casing.

8.3.2 To Remove the Right Side Cover of Chassis

(1) The cover can be removed by removing its screw after pulling out the chassis to the 2nd latch position and by moving the cover vertically. If the standby manual unit has been detached, the cover can be removed also by sliding it rightward.

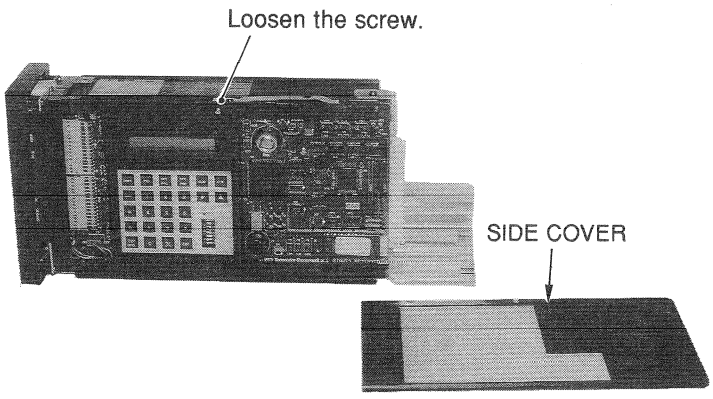


Fig. 8.9

8.3.3 To Remove/Install the Tag Number Plate

(1) To remove the tag number plate, push the cover at the top section of the front mask upward from the right or left side employing a pointed tool (such as a "–" screwdriver). The cover will come off and the tag number plate can be removed.

(2) To install the cover, apply it to the top section of the front mask and set it by pressing downward.

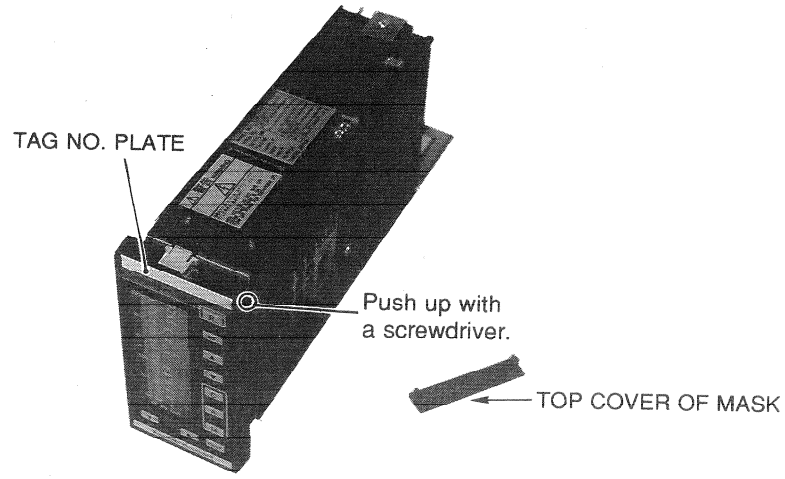


Fig. 8.10

8.3.4 To Remove/Install the Scale Plate

(1) The scale plate can be removed upward by removing the cover in a similar procedure as in the case of Subsection 8.3.3.

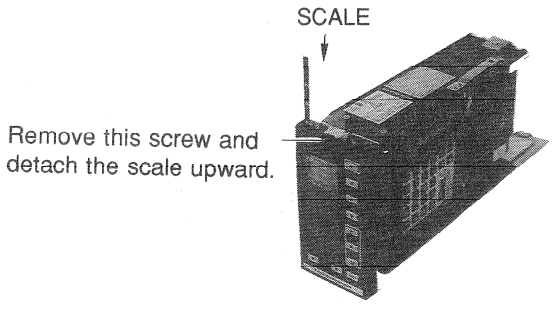


Fig. 8.11

8.3.5 To Detach the Standby Manual Unit from the Chassis

(1) Pull out the chassis. (See Subsection 8.3.1.) The standby manual unit can be detached from the chassis by raising the button of the standby manual unit and moving it arcwise toward the casing.

Note: Note that, when in the above state, the standby manual unit is connected to the rear terminal block of the controller via a cable.

(2) Direct the standby manual unit to its front. Hang the bottom latch of the standby manual unit onto the latch hole at the bottom end of the casing. The instrument can be operated in the manual mode in a setup as shown in Fig. 8.13.

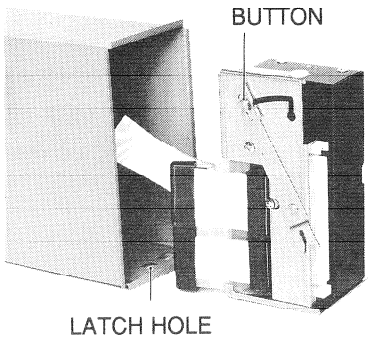


Fig. 8.12

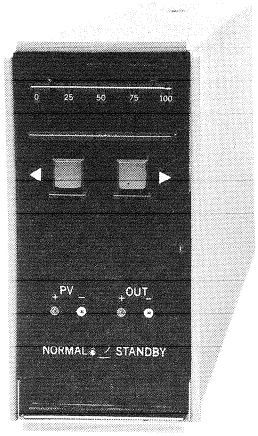


Fig. 8.13

9. OPTIONAL FUNCTIONS

9.1 Standby Manual Unit

When an abnormal state of diagnosis B group (which causes CPU stop) is detected by the self-diagnosis function of KAS, the instrument is automatically switched into the standby mode and the output current of KAS can be controlled with the standby manual unit. Two types of standby manual units are available as follows:

(1) Preset type: Delivers the preset output value.

(2) Follow-up type: Maintains the output value which existed immediately before switching.

9.1.1 Operation of Preset Type Standby Manual Unit

(1) Normal Operation

① Set the STANDBY/NORMAL switch of the standby manual unit in the NORMAL state (KAS output state)

Note: Before switching from the STANDBY mode to the NORMAL mode, be sure that the controller (main unit) is in the operating state and the analog output (AOI) value is normally read (the output value of the main unit is identical with that of the standby manual unit).

② Set the desired preset value with the output control knob.

③ Even when the controller (main unit) has no abnormality, the STANDBY/ NORMAL switch may be set to the STANDBY state so that the analog output (AOI) is unconditionally set to that of the standby manual unit.

In this case, the controller (main unit) becomes the IM mode (interlock manual mode) and the output of the controller (main unit) follows that of the standby manual unit. Due to this, no bumps are caused in the output even when the switch is returned to the normal mode.

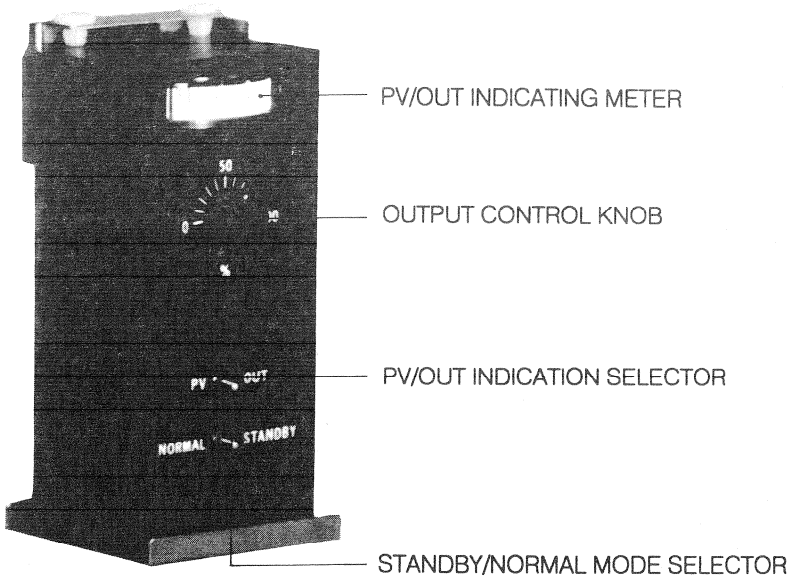


Fig. 9.1. Preset A Type Standby Manual Unit

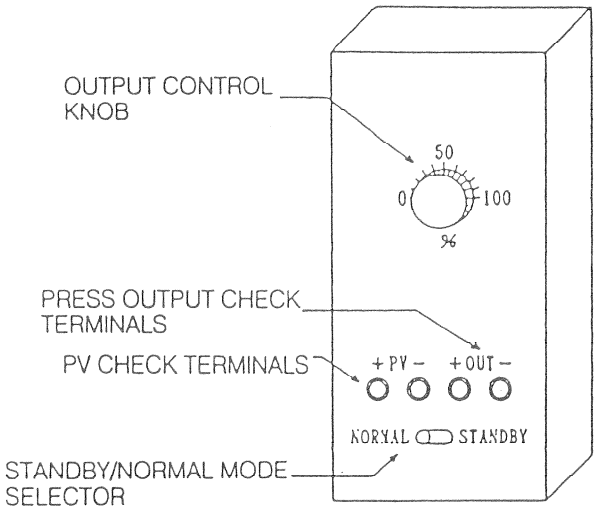


Fig. 9.2. Preset B Type Standby Manual Unit

(2) Operating Procedure when Abnormal State is Caused

① When an abnormal state is detected, the instrument is automatically switched into the standby mode and it delivers the preset output value. The CPU.F lamp on the front panel of the instrument indicates that the operation has been changed to the standby mode.

② Pull out the KAS main unit, pushing upward the bracket at the front bottom of the instrument. The main unit will stop at a half-way position as it is caught by the latch. Release the latch and pull out the KAS main unit. (See Subsection 8.3.)

③ For repair or replacement of the KAS main unit, set the STANDBY/NORMAL selector switch to the STANDBY state, turn off the controller power switch (external switch), and detach the standby manual unit from the chassis.

■ Detaching the Standby Manual Unit from the Chassis

(a) Pull out the chassis. (See Subsection 8.3.1) Detach the standby manual unit from the chassis by raising the button of the standby manual unit and moving it arcwise toward the casing.

Note: Note that, when in the above state, the standby manual unit is connected to the rear terminal block of the controller via a cable.

(b) Direct the standby manual unit to its front. Hang the bottom latch of the standby manual unit onto the latch hole at the bottom end of the casing. The instrument can be operated in the manual mode in a setup as shown in Fig. 9.3.

④ For operation with the standby manual unit, throw the PV/OUT indication selector switch to the PV side (the raw analog input is displayed) and control the output with the output control knob. (The Preset A Type Standby Manual Unit has a PV/OUT indicator selector switch.)

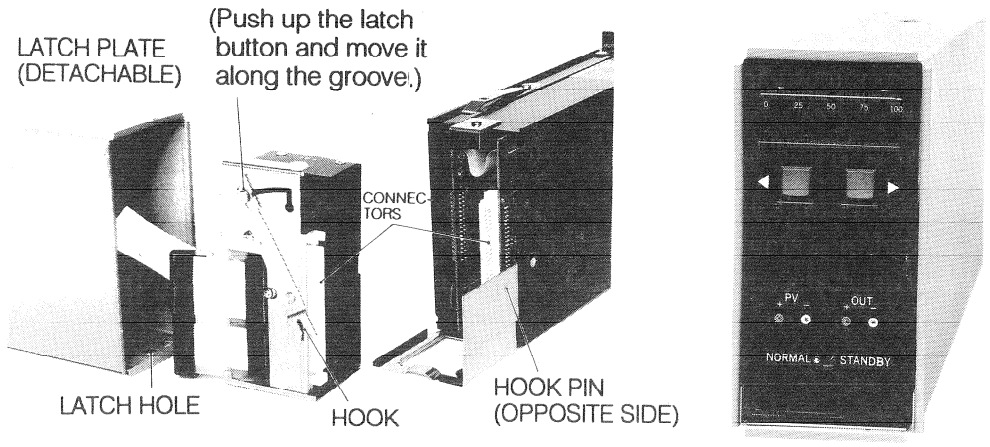


Fig. 9.3. Detaching the Standby Manual Unit

(3) Restoring the Instrument to the Original State

① After repairing the controller (main unit) with respect to the error message displayed on the data setting unit, restore the instrument to the original state by installing the standby manual unit onto the controller (main unit) as explained below.

■ Installing the Standby Manual Unit onto the Main Unit

(a) To install the standby manual unit onto the controller (main unit), follow the detaching procedure in the reverse order. When doing this, apply the indent at the bottom of the hook of the standby manual unit to the pin for the hook (see Fig. 9.3) and, checking that the connectors are accurately aligned, erect the hook vertically.

(b) Fix the unit by setting down the hook button by moving it along the groove.

② Return the STANDBY/NORMAL switch to the NORMAL position.

③ The controller (main unit) in this case will be in the interlock manual mode. Reset it to the normal operation mode by pressing the [R] (RESET) key on the front panel of the controller.

9.1.2 Operation of Follow-up Type Standby Manual Unit

(1) Normal Operation

① Set the STANDBY/NORMAL switch of the standby manual unit to the NORMAL state (controller output state).

Note: Before switching from the STANDBY mode to the NORMAL mode, be sure that the controller (main unit) is in the operating state and the analog output (AOI) value is normally read (the output value of the main unit is identical with that of the standby manual unit).

② Even when the controller (main unit) has no abnormality, the STANDBY/NORMAL switch may be set to the STANDBY state so that the analog output (AOI) is unconditionally set to that of the standby manual unit.

In this case, the controller (main unit) becomes the IM mode (interlock manual mode) and the output of the controller (main unit) follows that of the standby manual unit. Due to this, no bumps are caused in the output even when the switch is returned to the normal mode.

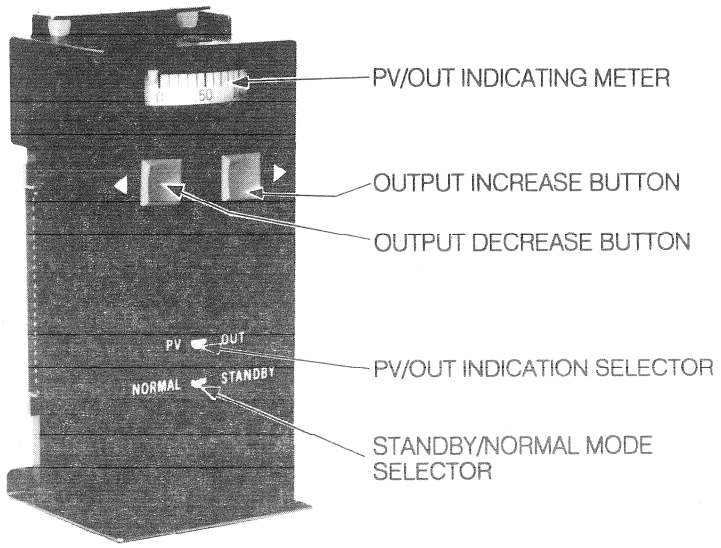


Fig. 9.4. Follow-up A Type Standby Manual Unit

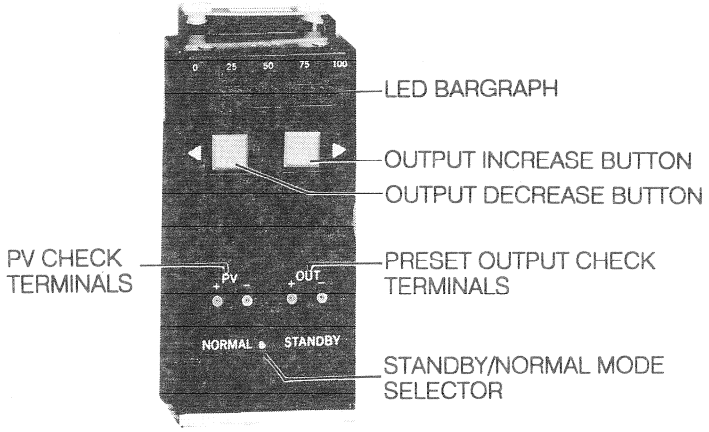


Fig. 9.5. Follow-up B Type Standby Manual Unit

(2) Operating Procedure When Abnormal State is Caused

① When an abnormal state is detected, the instrument is automatically switched into the standby mode and it delivers the controller output which existed immediately before the abnormal state has occurred. The CPU.F lamp on the front panel of the instrument indicates that the operation has been changed to the standby mode.

② The output of the standby manual unit can be adjusted with the output control buttons ◁ □ □ ▷ of the standby manual unit.

③ Pull out the KAS main unit, pushing upward the latch plate at the front bottom of the instrument. The main unit will stop at a half-way position as it is caught by the 2nd latch. Release the latch and pull out the KAS main unit. (See Section 8.3.)

④ For repair or replacement of the KAS main unit, set the STANDBY/ NORMAL selector switch to the STANDBY state, turn off the controller power switch (external switch), and detach the standby manual unit from the chassis.

■ Detaching the Standby Manual Unit from the Chassis

(a) Pull out the chassis. (see Subsection 8.3.1.) Detach the standby manual unit from the chassis by raising the button of the standby manual unit and moving it arcwise toward the casing.

Note: Note that, when in the above state, the standby manual unit is connected to the rear terminal block of the controller via a cable.

(b) Direct the standby manual unit to its front. Hang the bottom latch of the standby manual unit onto the latch hole at the bottom end of the casing. The instrument can be operated in the manual mode in a setup as shown in Fig. 9.3.

⑤ For operation with the standby manual unit, throw the PV/OUT indication selector switch to the PV side (the raw analog input is displayed) and control the output with the output control knob. (The Preset A Type Standby Manual Unit has a PV/OUT indicator selector switch.)

(3) Restoring the Instrument to the Original State

① After repairing the controller (main unit) with respect to the error message displayed on the data setting unit, restore the instrument to the original state by installing the standby manual unit onto the controller (main unit) as explained below.

■ Installing the Standby Manual Unit onto the Main Unit

(a) To install the standby manual unit onto the controller (main unit), follow the detaching procedure in the reverse order. When doing this, apply the indent at the bottom of the hook of the standby manual unit to the pin for the hook (see Fig. 9.3) and, checking that the connectors are accurately aligned, erect the hook vertically.

(b) Fix the unit by setting down the hook button by moving it along the groove.

② Return the STANDBY/NORMAL switch to the NORMAL position.

③ The controller (main unit) in this case will be in the interlock manual mode. Reset it to the normal operation mode by pressing the [R] (RESET) key on the front panel of the controller.

9.1.3 Replacement of Standby Manual Unit

(1) Power Supply

① Whenever possible, provide a separate power supply line (with a dedicated fuse and switch) for the standby manual unit separately from that of the main unit.

② If it is unavoidable to use the same power supply line for both main unit and standby manual unit, provide a dedicated fuse and a switch for the standby manual unit.

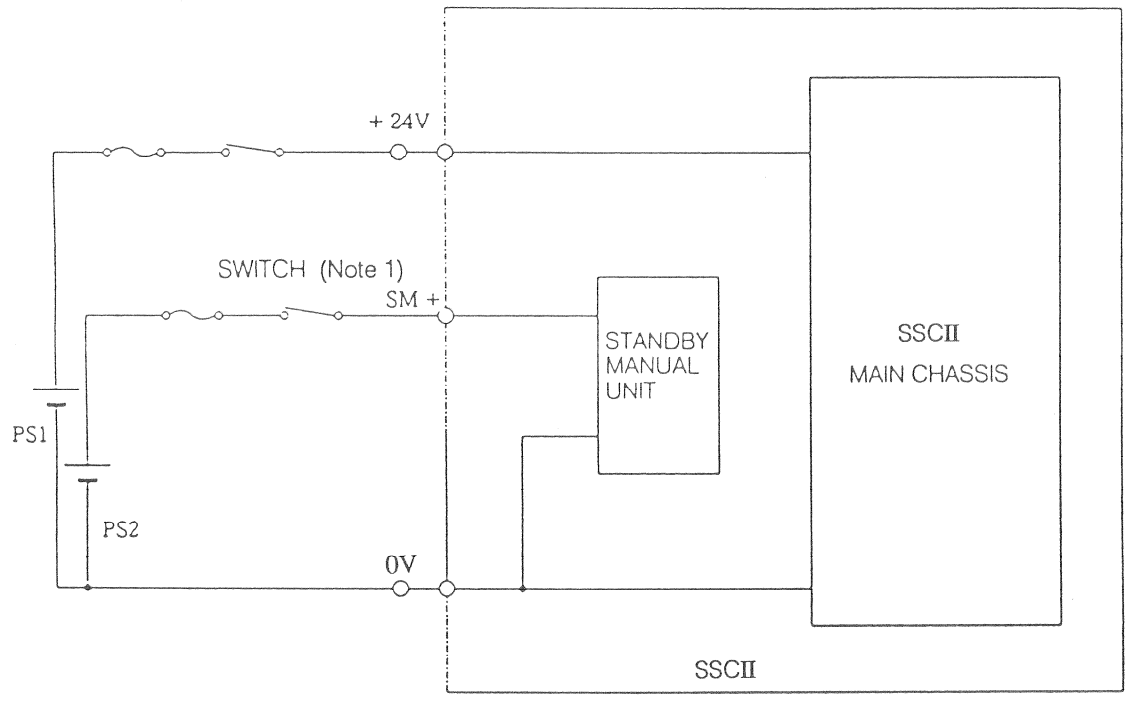


Fig. 9.6. Power Supply for Standby Manual Unit

Note 1: Provide an external switch. When installing or removing the standby manual unit, turn off the external switch.

(2) To connect or disconnect the standby manual unit while the standby manual unit is in operation, be sure to turn off the power switch of the standby manual unit. To detach the standby manual unit, loosen the fixing-screw shown in Fig. 9.7. After replacing the unit, tighten the screw.

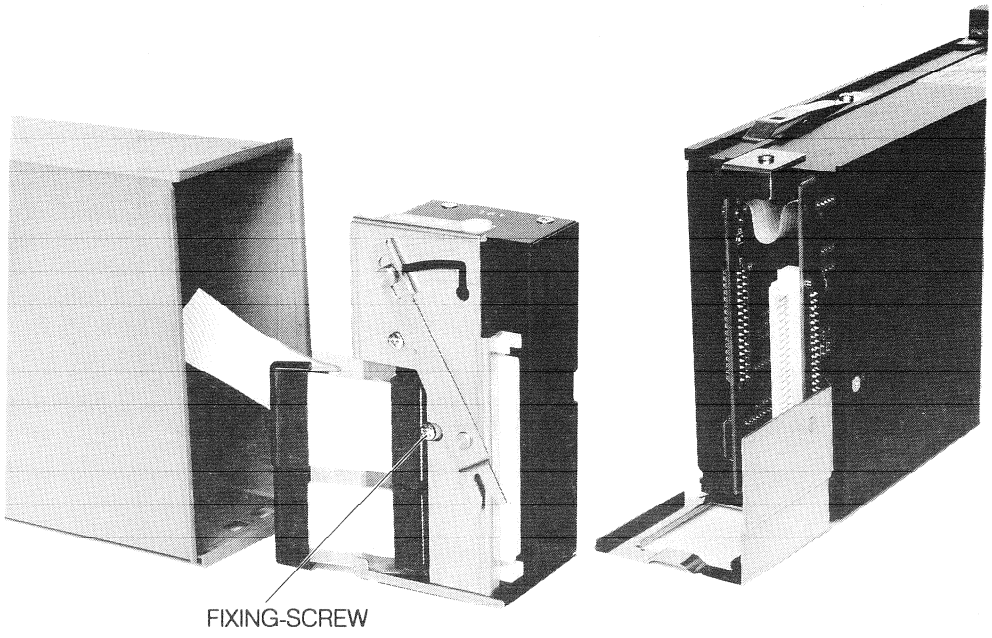


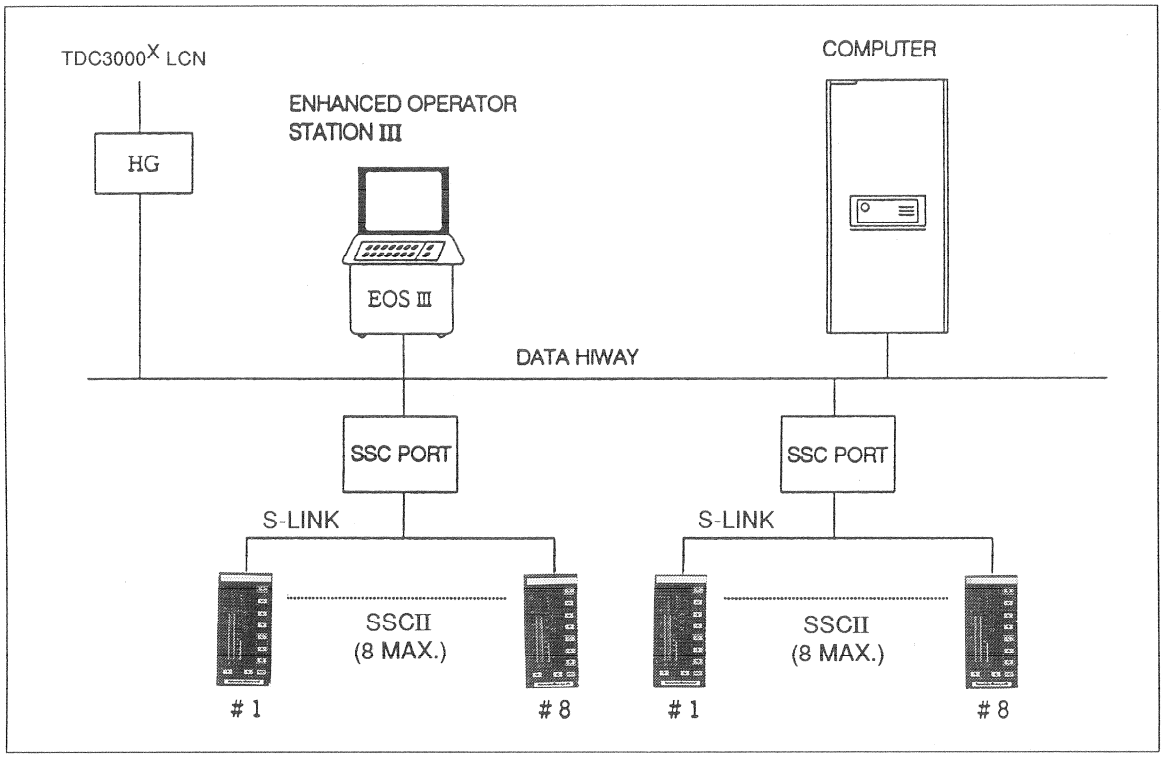
Fig. 9.7. Screw for Fixing the Standby Manual Unit

10. COMMUNICATIONS FUNCTIONS (Optional)

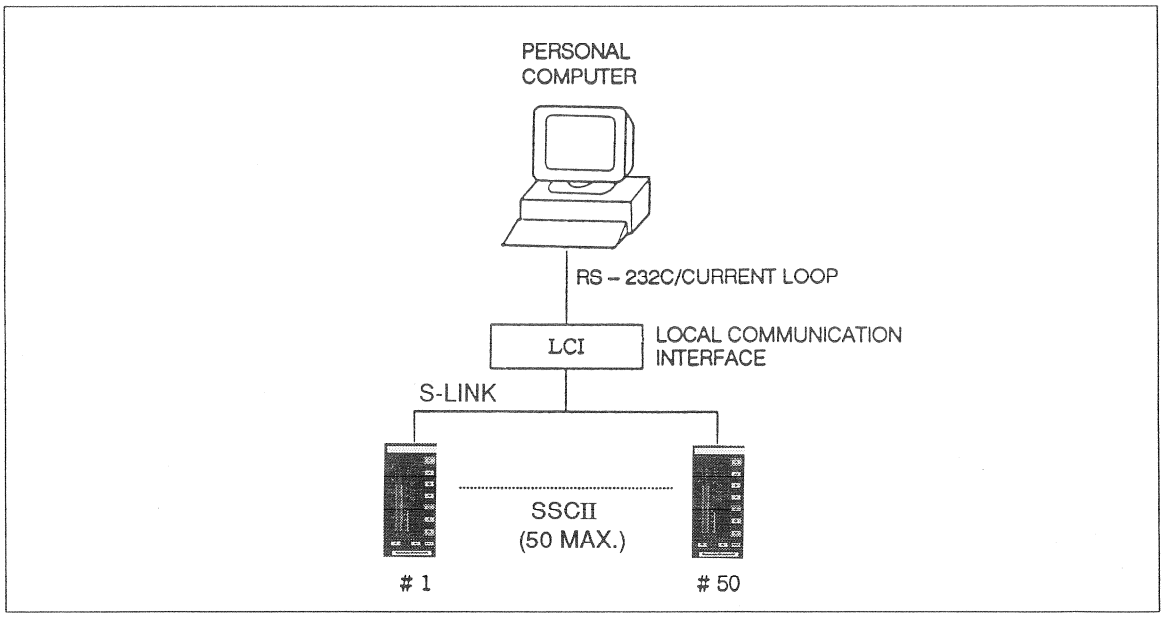
By adding the communications interface card, the KAS can be linked to an upper-hierarchy device.

10.1 System Configuration with Optional Communications Functions

■ System Configuration for Linkage to TDC3000X



■ System Configuration for Linkage to Personal Computer



10.2 Types of Communications

To link the KAS to a communications system, the type of communication must be specified. Specify it in the basic data by using the PC Communicator or the Handy Communicator when generating the cofiguration data.

Type	Function	Host equipment
0	without communications	none
1	with communications (without SPC DDC)	SSC PORT, LCI
2	with communications (with SPC DDC)	SSC PORT, LCI, COMPUTER (SPC, DDC)

For the controller which is connected to the communications system, set a station number (SSC Port: 1 – 8, LCI: 1 – 50) for each unit of controller.

10.3 Controller Types and Applicable Communication Types

Controller types and applicable communication types are as shown below.

Communication type \ Controller type	0	1	2	3
without communication: 0	○	○	○	○
with communication (w/o COMP): 1	○	○	○	○
with communication (w COMP): 2	○	○	×	○

○ : Compatible
× : Incompatible

10.4 Computer Mode

When operating in the SPC DDC mode with computer by specifying Communications Type 2, the KAS is capable of a computer mode and a request mode in addition to regular modes of operation.

(1) Turning into Computer Mode

① Turning from the manual mode or auto mode

Step No.	Procedure	Remarks
1		In case of communication type 2, [C.INHB] switch is for switching over to: OFF: Computer mode ON: Cascade mode
2	Set the side-panel bit switch [W.INHB] to OFF.	Communications link with upper-hierarchy equipment is enabled.
3	Press the [C] button on the instrument front panel.	• A computer mode request is sent to the computer. • This state is called "request mode" and both the [C] lamp on the instrument front panel and the current mode lamp ([A] or [M]) turn on. ⇓ • The computer accepts the request and turns the controller into the computer mode. • It sends a command. ⇓ • As the controller receives the command, it becomes the computer mode and the mode lamp ([A] or [M]) which has thereto been lighted goes off.

- There are two types of commands for turning the instrument into the computer mode: One is COMP-AUTO (SPC) and the other is COMP-MAN (DDC). The computer selects either SPC or DDC. (In either case, the [C] lamp turns on.)
- To know whether the computer mode of operation is with SPC or DDC, press the DSP CHG button on the side panel of the instrument. If in the SPC mode, the [A] lamp will light in addition to the [C] lamp. If in the DDC mode, the [M] lamp will light.
- When in the SPC mode, the controller performs its PID operation as its setpoint the CSP (computer SP) received from the computer. In this case, the LSP (local SP) follows the CSP.
- When in the DDC mode, the COUT (computer OUT) received from the computer is used as the output of the "MAN" computational unit of the controller.

② Turning from the cascade mode

<table>
<tr><th>Step No.</th><th>Procedure</th><th>Remarks</th></tr>
<tr><td>1</td><td>SIDE-PANEL BIT SWITCH
[ENT] (8)
[H/C] (7)
[D/R1] (6)
[D/R2] (5)
[W.INHB] (4)
[C.INHB] (3) ← Set to OFF
[CAL] (2)
[LOAD] (1)</td><td>The controller is transferred to a preselected backup mode (auto mode or manual mode).</td></tr>
<tr><td>2</td><td colspan="2">The further procedures are identical with those of ① Turning from the manual mode or auto mode.</td></tr>
</table>

10.4.1 Operations When in Computer Mode

- In case of computer error (TOG is time-out) when in computer mode, the communication lamp blinks and the controller is switched to the mode which has been specified to be switched over to when the host computer has failed.
- If an external FOLLOW signal is received, the controller is released from the computer mode and is driven into the FOLLOW state of the mode (AUTO or MAN) which has been specified to be switched over to when the host computer has failed, and the "FLW" or "A" or "M" message appears. When the FOLLOW signal is removed, the controller returns to the mode which has been specified to be switched over to when the host computer has failed.

  Note: However, if modes are changed (M → A, A → M) when in the FOLLOW mode, the controller returns to the newly selected mode.

- Even when in the COMPUTER mode, if the controller detects an error of "A" group of diagnostics, the controller is driven into the IM mode (interlock manual mode). If it detects an error of "B" group, it is taken to be of a device failure and the controller is driven into the S mode (standby mode).

10.4.2 Operations When in Request Mode

- If the COMP-AUTO (SPC) or COMP-MAN (DDC) command is received from the computer when in the request mode, the controller is transferred into the computer mode.
- If the AUTO, MAN, FOLLOW, IM or S mode is commanded when in the request mode, the request mode is released.

10.5 Data which Can be Changed from Communications System

Mode \ Equipment of upper hierarchy		EOS III Operator station	Computer
COMP mode	COMP-AUTO	Control constant Mode (AUTO, MAN)	CSP Control constant Mode (COMP-M, AUTO, MAN)
	COMP-MAN	LSP1 Control constant Mode (AUTO, MAN)	COUT Control constant Mode (COMP-A, AUTO, MAN)
CAS		LSP1 *4 Control constant Mode (AUTO, MAN)	Control constant Mode (AUTO, MAN)
AUTO		LSP1, LSP2 Control constant Mode (CAS *1, MAN, REQ *2)	Control constant Mode (CAS *1, MAN, REQ *2)
MAN		LSP1, LSP2 OUT Control constant Mode (CAS *1, AUTO, REQ *2)	Control constant Mode (CAS *1, AUTO, REQ *2)
IM		LSP1, LSP2 OUT Control constant Mode (MAN *3)	Control constant Mode (MAN *3)
FOLLOW		LSP1, LSP2 Control constant	Control constant
REQ		LSP1, LSP2 Control constant Mode (AUTO, MAN)	Control constant Mode (COMP-A, COMP-M, AUTO, MAN)

REQ: Request mode

*1: Possible when C.INHB bit switch is on.

*2: Possible when C.INHB bit switch is off.

*3: Possible by pressing the [R] (RST) button or by sending the reset command.

*4: For Controller Types 1, 2 and 3 only.

11. FUNCTIONS AND CONFIGURATION

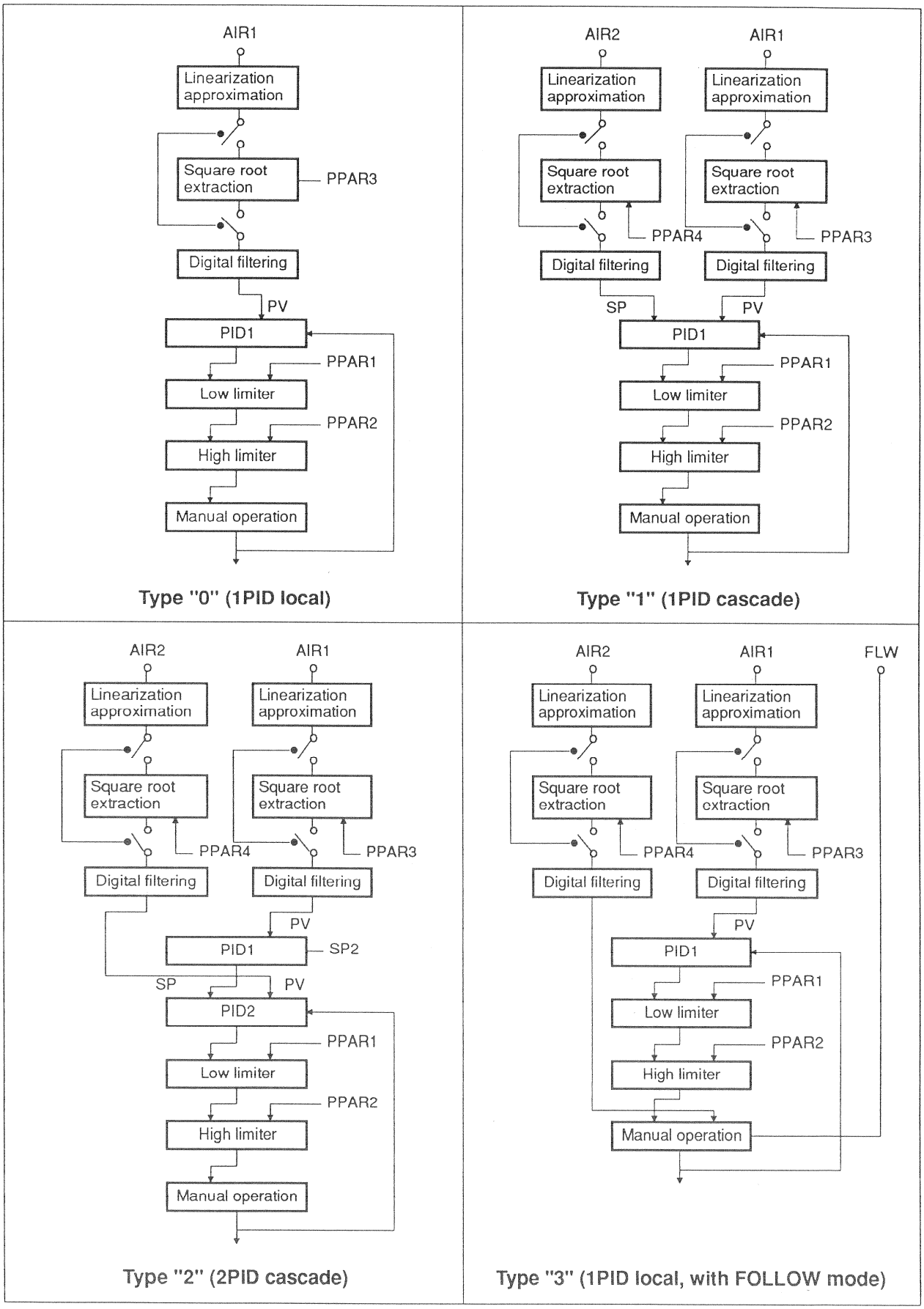
The Fixed Program Controller provides four types (Controller types, "0" to "3") of computational unit combinations as shown in Fig. 11.1.

The Fixed Program Controller has functions divided into input processing, arithmetic operations, and output processing. The desired arithmetic operations can be varied according to your application. The selection data for which arithmetic operation is used is called "configuration data", and classified as shown in Fig. 11.2.

Configuration data can be entered into the memory (EEPROM) of the Fixed Program Controller from its Data Setting Unit. It can be entered also from the Handy Communicator or the Personal Computer Communicator.

The "data sheet" for writing the configuration data is provided in the Appendix attached to this manual.

Fig. 11.1. Controller Type



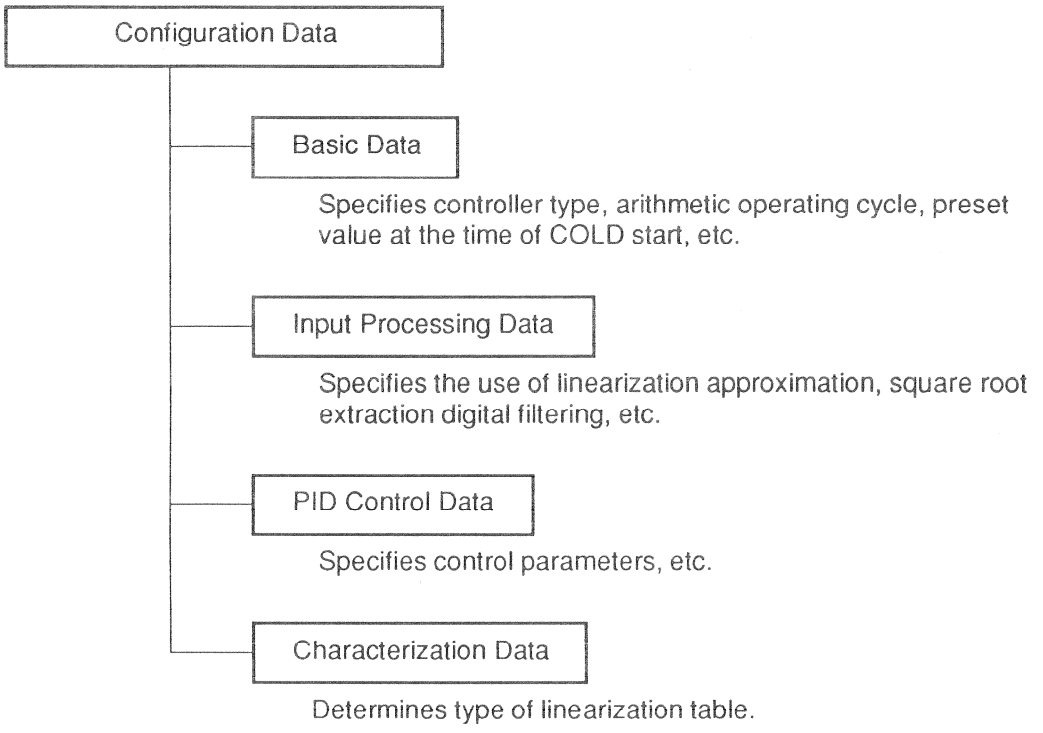


Fig. 11.2. Configuration Data

■ Controller Type and Arithmetic Operating Cycle

The arithmetic operating cycles for the Fixed Program Controller can be set to those as shown in Table 11.1 according to the control types.

Table 11.1. Arithmetic Operating Cycle

Controller type	Arithmetic operating cycle	
	100 ms (See Note 1)	200 ms (See Note 1)
0	○	○
1	○	○
2	×	○
3	○	○

Note 1: If the communication function is involved, when entering cycle period as an item of "basic data," add 100ms to the operating cycle time (100ms or 200ms) shown in the above table — that is, enter 200ms or 300ms, respectively.

Note 2: When the self-tuning function (optional) is used, 100 ms is automatically added to the calculation frequency.

11.1 Theory of Operation

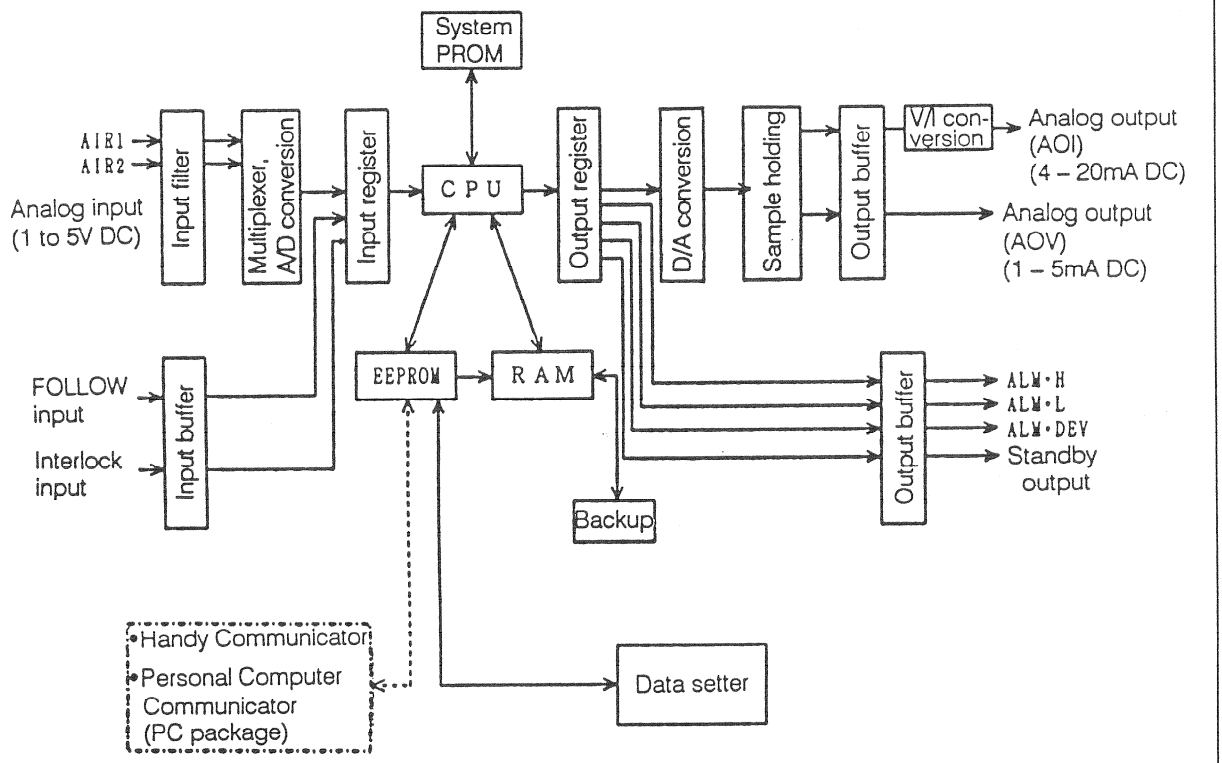
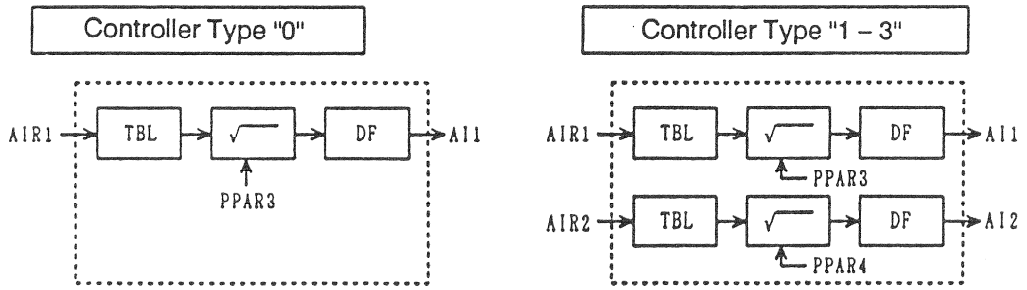


Fig. 11.3. Theory of Operation

An analog input signal is fed to the filter circuit for noise removal and stored in the input register through the multiplexer and A/D conversion circuits. A digital input signal is fed to the input buffer circuit for noise removal and stored in the input register after wave shaping. Arithmetic operation is performed by the system program in the system PROM and the configuration data in the EEPROM to specify the system program. The result is stored in the output register. The output signal from the output register is fed to the D/A conversion circuit and the output buffer circuit through the sample holding circuit to obtain an analog output of 1 to 5V DC. A current output of 4 to 20mA DC is gained through the V/I conversion circuit.

11.2 Input Processing Function

The analog inputs (AIR1, AIR2) from the controller terminals at the back of the instrument require the following input processing after A/D conversion:



- TBL ..... Table with 11 segments maximum (for input linearization)
- √ ..... Square root extraction (PPAR3, 4: dropout values)
- DF ..... Digital filtering

Fig. 11.4. Input Processing Block Diagram

Since these input processing functions are a standard provision, you can only set information on usage to the "Input Processing Data" which relates to a corresponding arithmetic operation.

① TBL (Linearization approximation)

The analog input (for AIR1 or AIR2) can be linearized by using the broken line approximation technique. Since two kinds of linearization table (TBL1, TBL2) are provided in the input processing section, up to eleven segments can be assigned. Two tables can be combined to produce a hybrid with greater accuracy. These segment coordinates (X: input, Y: output) can be changed by the Data Setting Unit after operation. The segments for TBL1 and TBL2 can also be changed after operation.

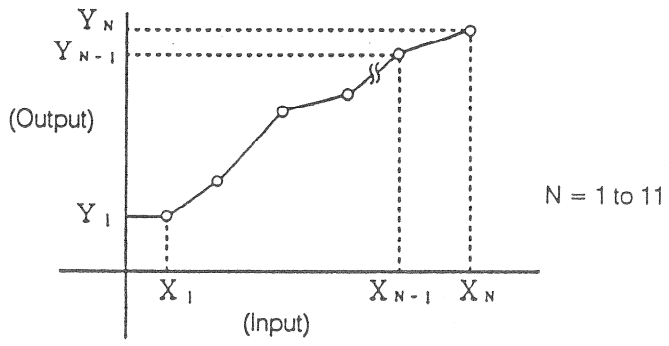


Fig. 11.5. Linearization Approximation

② Square root extraction

If a linearization (square root extraction) process is required for the input signal (AIR) detected by an orifice plate, etc. in the flow measurement, it is assigned to the "Input Processing Data".

The square root extraction process incorporates a dropout function. With an input value below this dropout value, this function enables the output to be set to 0%. The dropout value is given by the variable parameters (PRAR3, PRAR4) and can be changed by the data setter after operation.

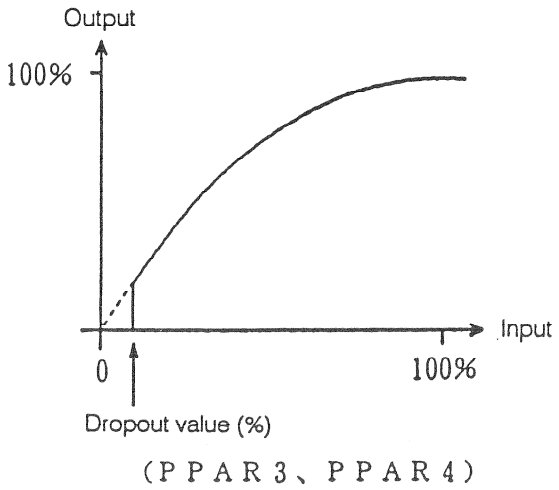


Fig. 11.6. Square Root Extraction Processing

③ Digital filter

The digital filter is used to remove noise in the input signal. The digital filter employs a first order lag operation as shown in the following equation:

$$OUT = \frac{1}{1 + T \cdot S} \cdot IN$$

T: Filter constant (0.0 to 999.9 sec)

S: Laplace operator

T specifies a filter constant (0.0 to 999.9: 0.1 sec increments) to the "Input Processing Data". The filter constant "0.0" effects no filtering.

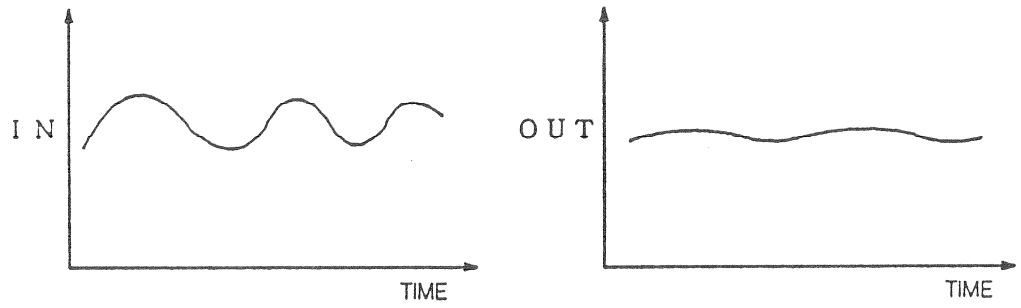


Fig. 11.7. Effect of Digital Filter

11.3 Controller Type and Computational Unit

The Fixed Program Controller has, built-in, four combinations (Controller types, "0" to "3") of computational units. The desired combination is selected from four controller types in the "Basic Data" configuration data. The four kinds of combinations are as follows:

Controller types
- 0: Local type
- 1: Cascade type
- 2: 2 PID type
- 3: Local type with FOLLOW mode

11.3.1 Controller Type "0" (Local)

In this type, the controller has a (PID1) algorithm as well as "low limiter", "high limiter" and "MAN" algorithms assigned to four computational units. This type performs control on a local setpoint (LSP). It provides no cascade mode, and the PV and SP indications on the instrument front become PV1 and LSP1, respectively, regardless of the modes being set.

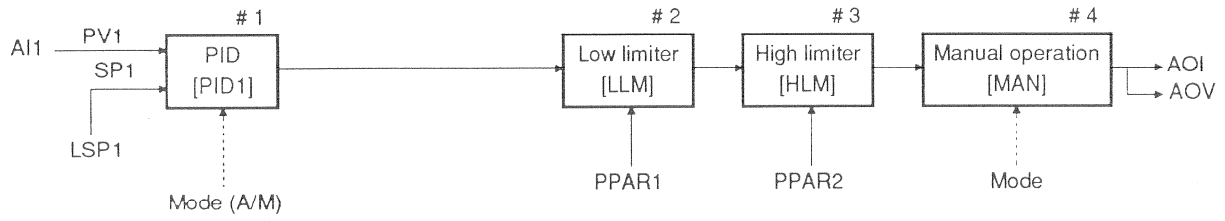


Fig. 11.8. Controller Type "0" and Computational Unit

11.3.2 Controller Type "1" (Cascade)

In this type, the controller employs cascade mode in conjunction with the controller type "0". This type performs the same operation as the controller type "0"; otherwise, control is performed on a remote setpoint (RSP) in cascade mode.

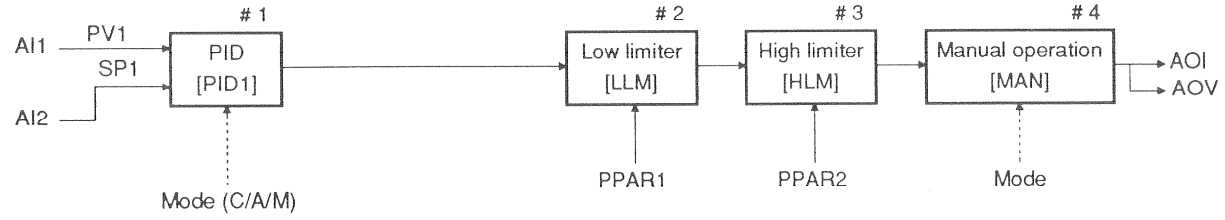


Fig. 11.9. Controller Type "1" and Computational Unit

11.3.3 Controller Type "2" (2 PID)

In this type, the controller employs algorithm [PID 2] in conjunction with the controller type "0", providing two analog controllers. The PV and SP indications on the front of the instrument become PV1/SP1, or PV2/SP2 depending on the mode selected (C/A/M). Therefore, if reverse indication is required, press the DSP CHG key on the front of the instrument.

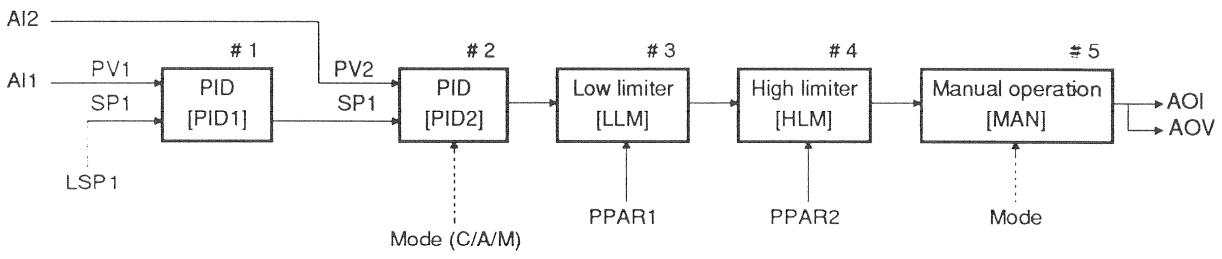


Fig. 11.10. Controller Type "2" and Computational Unit

11.3.4 Controller Type "3" (Local type with FOLLOW mode)

In this type, the controller employs follow mode in conjunction with the controller type "0" (Local). The external follow mode transfer signal (FLW) switches the controller to "follow mode". The output in the follow mode becomes a follow input (AI2).

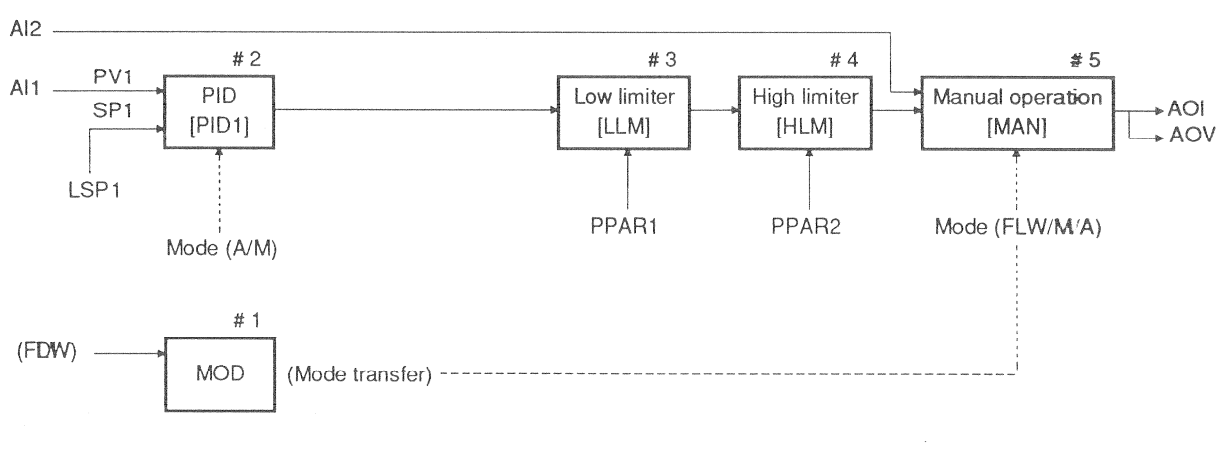


Fig. 11.11. Controller Type "3" and Computational Unit

11.4 Computational Processing

Computational processing is executed according to the definitions (controller type, PV alarm indication) in the "Basic Data" and those (PID algorithm, PV tracking) in "PID Algorithm Data". Fig. 11.12 illustrates overall functions and the following describes these items.

(1) Computation of [PID1], or [PID1] and [PID2] (controller type "2")

① [PID algorithm] is defined by the configuration data:

0: Normal PID (deviation derivative)

1: Derivative forwarding PID (measured value derivative)

② Control mode

SP input selection (RSP, LSP) on (PID) algorithm.

③ Output deviation rate limit (executed for the result of PID operation)

④ Upper integration limiter/lower integration limiter

When the result of PID operation reaches the upper or lower integration limit, it stops the integration (I) operation only.

(2) Control Mode

SP input selection (RSP, LSP) on (PID) algorithm.

(3) Ratio and Bias Operation on the RSP

This operation is performed on < AI2 for the controller type "1" (execution in cascade mode).

(4) PV Tracking

The PV tracking function follows the SP in MAN or INTERLOCK MAN to the PV value. In the case of "2 PID", the PV tracking function is simultaneously selected. The PV tracking activates in AUTO, MAN, or INTERLOCK MAN mode for [PID1], and in MAN, or INTERLOCK MAN mode for [PID2].

(5) Alarm Checking

This function performs alarm checking of the DEV monitor, PV upper limit monitor, or PV lower limit monitor for the [PID1] or [PID2] which is defined by the PV alarm indication PID number.

Setting of alarm hysteresis width can be entered as PPAR5, or PPAR6 by the data setter.

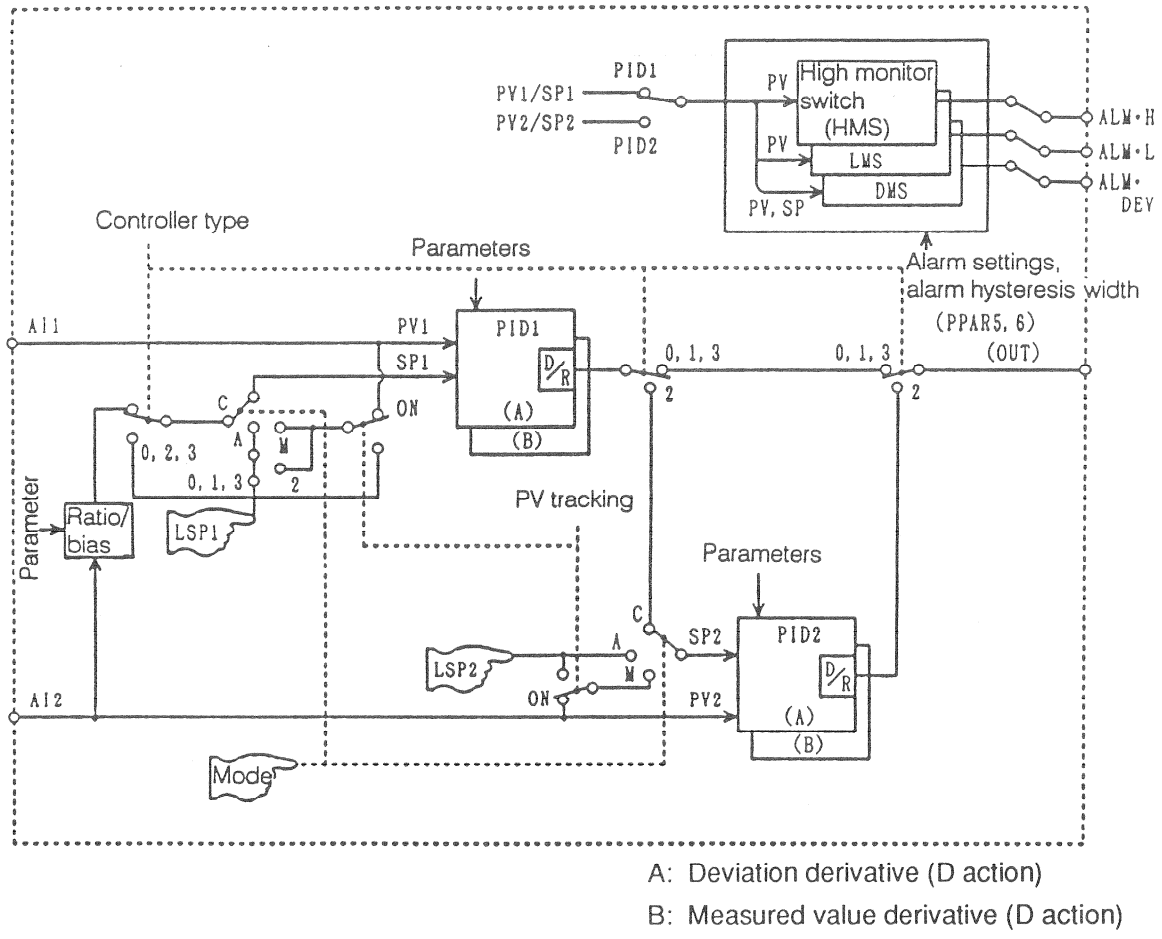


Fig. 11.12. Computational Functions (Example of Controller Type "1")

(6) Others

Relation between [PID1] and [PID2] of the controller type is shown in Fig. 11.13. The following functions are provided to prevent a bump during mode switching.

LSP1	Controller types "0" and "3"	Follows the SP1 in MAN mode.
	Controller type "1"	Follows the SP1 in CAS, or MAN mode.
	Controller type "2"	Follows the SP1 in AUTO, or MAN mode (when PV tracking on).
LSP2	Controller type "2"	Follows the SP2 in CAS, or MAN mode.
[PID1] output	Controller types "0" and "3"	Follows the output from the MAN unit in those modes excluding AUTO.
	Controller type "1"	Follows the output from the MAN unit in those mode excluding CAS and AUTO.
	Controller type "2"	Follows the SP2 in those modes excluding CAS.
[PID2] output	Controller type "2"	Follows the output from the MAN unit in those modes excluding CAS and AUTO.

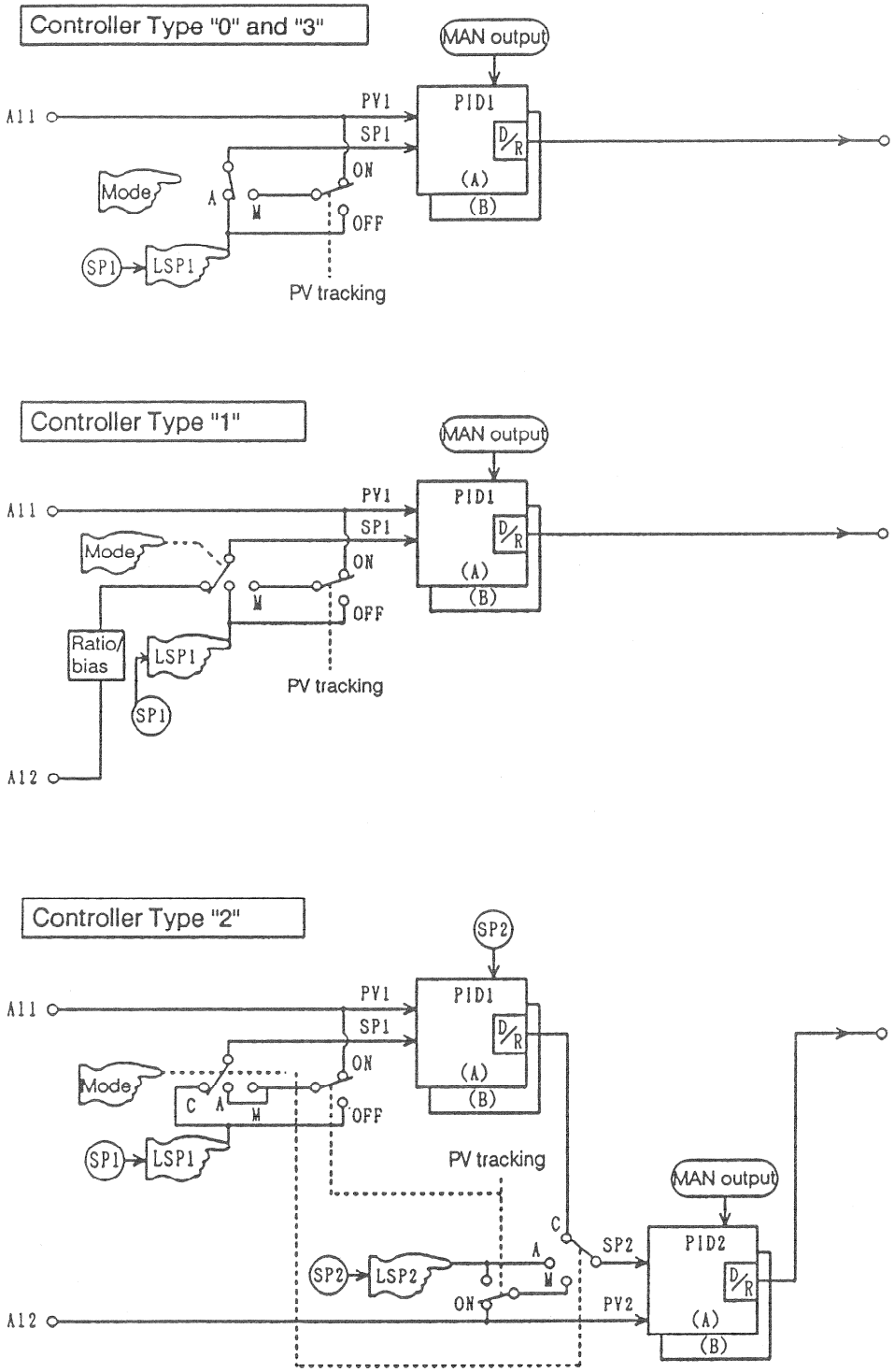


Fig. 11.13. Controller Types and PID Operation Flow

11.5 Variable Parameter

In the case of the Fixed Program Controller, the following 6 types are defined as % variable parameters. These parameters can be displayed and entered by the data setter.

(1) PPAR1: Low output limit value. A value setting to the algorithm [LLM (low limiter)] in Fig. 11.8.

(2) PPAR2: High output limit value. A value setting to the algorithm [HLM (high limiter)] in Fig. 11.8.

(3) PPAR3: Dropout value for square root extraction on analog input (AI1). Setting a value in % of input value as shown in Fig. 11.6.

(4) PPAR4: Dropout value for square root extraction on analog input (AI2). Setting a value in % of input value as shown in Fig. 11.6.

(5) PPAR5: Sets an alarm hysteresis width of DEV alarm, or PV alarm (upper, lower) on [PID1].

(6) PPAR6: Sets an alarm hysteresis width of DEV alarm, or PV alarm (upper, lower) on [PID2].

11.6 Output Processing

The Fixed Program Controller outputs two analog signals (AOI, AOV) and four digital signals (ALM-H, -L, DEV, S). The same signal is outputted to two analog signals (AOI, AOV). In STANDBY mode, the "OFF" ("ON" in normal mode) is outputted from the digital signal (S). The alarm outputs of the ALM-H, ALM-L and ALM-DEV are the transistor contact output (open-collector).

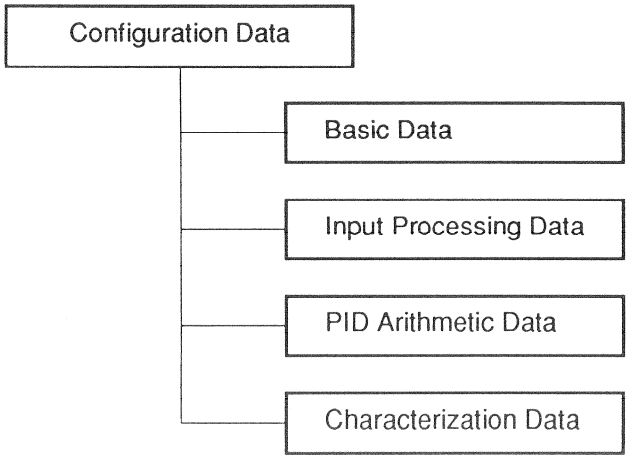
Table 11.2. Output Signal Types

Signal	Signal name	Functions
Analog output signal	AOI	4 to 20mA, current output
	AOV	1 to 5V, voltage output
Digital output signal	ALM · H	Alarm output (HIGH)
	ALM · L	Alarm output (LOW)
	ALM · DEV	Alarm output (DEV)
	S	Standby mode output

12. CONFIGURATION

12.1 General

Configuration data for the TDC3000^X SSCII Fixed Program Controller (KAS) can be entered from its Data Setting Unit on its side or from an engineering tool (a Handy Communicator or a Personal Computer Communicator). The entered configuration data is stored in the memory (EEPROM) of the KAS. The major items of configuration data for the KAS are as shown below (for details, refer to Chapter 11). The configuration task is straightforward and can be done without requiring any programming knowledge.



As shown in the engineering configuration in Fig. 12.1, data exchange is available from the configuration data generated by the Data Setting Unit, the Handy Communicator or the Personal Computer Communicator. This realizes optimum engineering work suited to the system scale.

The on-line configuration data being written in the memory (EEPROM) of the Fixed Program Controller can read from the Data Setting Unit, the Handy Communicator or the Personal Computer Communicator.

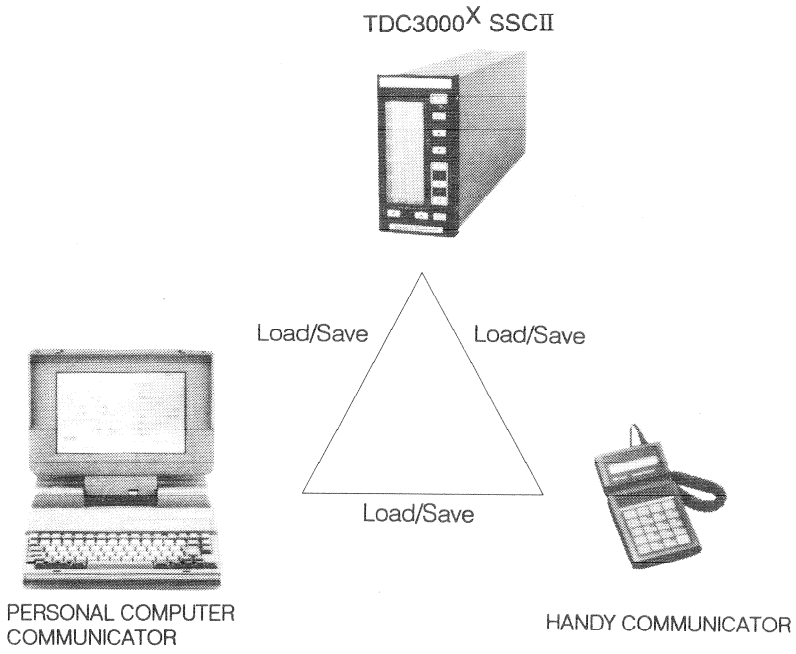


Fig. 12.1. Engineering Tools and Configuration

Fig. 12.2 shows methods (A to D) of using the Handy Communicator and Personal Computer Communicator. The adaptors for dedicated cables and AC adaptor are used as requried.

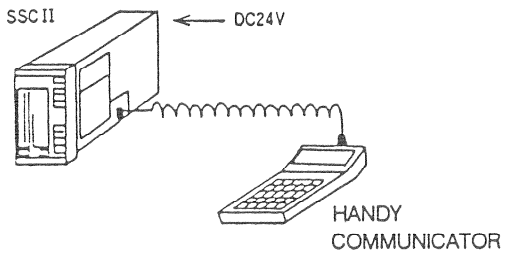
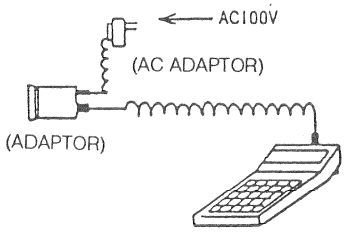
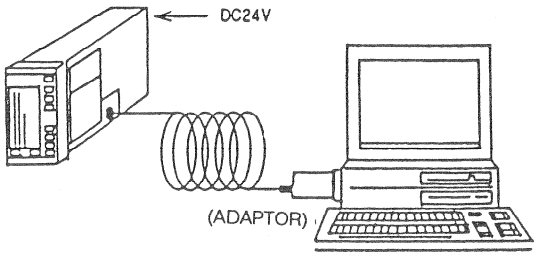
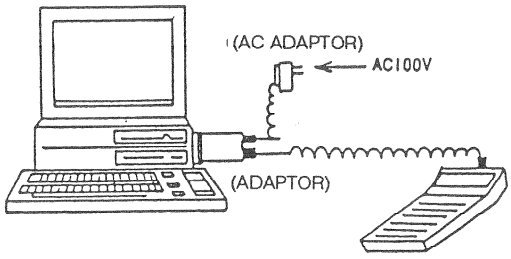
A		Data read/write between Handy Communicator and SSCII Controller
B		Configuration Data are generated only by Handy Communicator.
C		Data read/write between Personal Computer Communicator and SSCII Controller
D		Data read/write between Personal Computer Communicator and Handy Communicator

Fig. 12.2. Communicator System Configurations

12.2 Data Setting Unit

The Data Setting Unit allows you to work out configuration data for the Fixed Program Controller (KAS) and enter the data into the memory (EEPROM) of the KAS. The configuration items and procedures are as introduced in the following.

(1) Configuration Data

Item	KAS	Remark
SSCII management number	×	
Arithmetic operation cycle time	△	
Type of controller	△	
PV alarm display PID number	△	
Controller number	×	
Host computer control system	×	
Back-up mode	×	
Preset mode	×	
Preset output	×	
1 Preset local SP	×	
2 Preset local SP	×	
Place of decimal point of engineering quantity	△	
Low limit of engineering quantity	○	
High limit of engineering quantity	○	
Linearization table number	△	
Square root extraction	△	
Dropout value	○	
Digital filter time constant	○	
Sensor diagnosis	△	
Type of PID operation	△	
PV tracking	△	
Alarm hysteresis	○	
Proportional band	○	
Integral time	○	
Derivative time	○	
Low limit of integral operation	○	
High limit of integral operation	○	
Ratio	○	
Bias	○	
Dead zone	○	
Output deviation rate limit	○	
Deviation alarm	○	
Low limit of PV alarm	○	
High limit of PV alarm	○	
Linearization table data	○	
Connected broken line No.	×	

Note 1)

○ : Configurable at operation mode

△ : Configurable at loader mode

× : Not configurable, but possible to configure via engineering tools.

(2) Configuration Data and Setting Display

Item	Setting Range	Set Data	Default	Setting Display	Remark
Cycle	1, 2, 3	1: 100ms, 2: 200ms, 3: 300ms	2	SAMPLE TIME= X	Note 1
Controller type	0, 1, 2, 3	0: 1PID (A/M), 1: 1PID (C/A/M) 2: 2PID (C/A/M), 3: 1PID (A/M/FLW)	0	CNTL.TYPE = X	Note 2
PV alarm PID No.	1, 2	PV alarm PID No.	1	ALARM NO. = X	
AI1 engineering quantity decimal point place	0, 1, 2, 3	0: XXXX, 1: XXX.X, 2: XX.XX, 3: X.XXX	1	1_ENG.DP = X	
AI2 engineering quantity decimal point place	0, 1, 2, 3		1	2_ENG.DP = X	
AI1 broken line No.	0, 1, 2	0: disable linearization 1: enable #1 linearization table 2: enable #2 linearization table	0	1_LIN.TABLE= X	Note 3
AI2 broken line No.	0, 1, 2		0	2_LIN.TABLE= X	Note 3
AI1 square root extraction	0, 1	0: disable square root extraction 1: enable square root extraction	0	1_SQR.ROOT = X	Note 3
AI2 square root extraction	0, 1		0	2_SQR.ROOT = X	Note 3
AI1 sensor check	0, 1	0: disable sensor check 1: enable sensor check	1	1_SEN.CHECK= X	
AI2 sensor check	0, 1		1	2_SEN.CHECK= X	
#1 PID operation	0, 1	0: normal PID 1: differential advanced PID	0	1_PID TYPE = X	
#2 PID operation	0, 1		0	2_PID TYPE = X	
#1 PID PV tracking	0, 1	0: disable PV tracking 1: enable PV tracking	0	1_PV TRACK = X	
#2 PID PV tracking	0, 1		0	2_PV TRACK = X	

Note 1: If the communication function is involved, 3 (300ms) alone is selectable. If the Controller Type is 2, 1 (100ms) cannot be selected.

Note 2: If the cycle time is 1 (100ms), 2 (2PID C/A/M) cannot be selected.

Note 3: If the cycle time is 1 (100ms), both of broken line table and square root extraction cannot be selected.

(3) Read and write configuration data

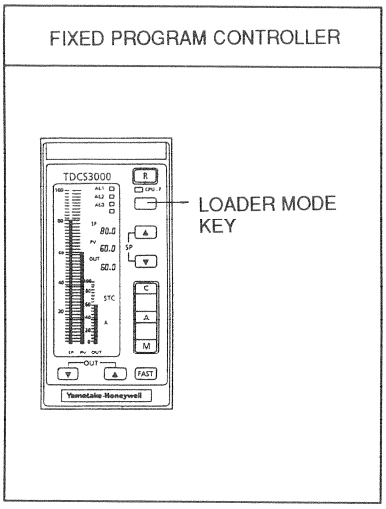
The Data Setting Unit configures data in the loader mode. The following procedure leads to the loader mode.

① Switch on the power of SSCII.

② Switch on the bit switches of [ENT] and [LOAD] on the side panel. (See Fig. 12.4.) The other bit switches besides [ENT] and [LOAD] are insensitive to ON and OFF.

③ Hold down the loader mode key (Fig. 12.3), and press the reset switch (Fig. 12.4). Press the load mode key only until the Data Setting Unit displays [SAMPLE TIME=X].

④ The loader mode has been selected.



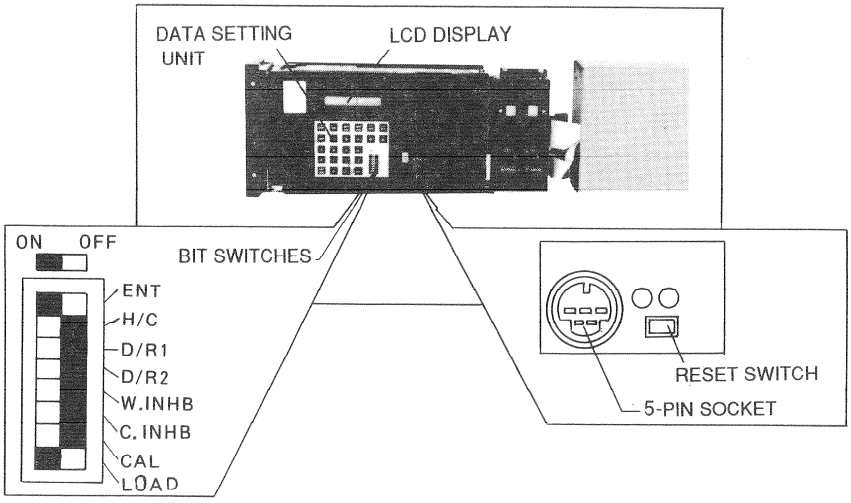


Fig. 12.3. Loader Mode Key

Fig. 12.4. SSCII Side View

(Note) The following table shows SSCII outputs, a mode and internal values when moving to the loader mode and running mode. And the cold start moves back to the running mode.

Item	SSCII states	
	To loader mode	To running mode
Output		
1. AOI	Previous value	Preset value
2. AOV1–3	Previous value	Initial processing output value
3. DOI1–5	Previous value	Initial processing output
Control mode	—	Preset mode
Local SP	—	Preset value

Enter configuration data by selecting items using [△] and [▽] keys and enter values using numerical keys. Given below is an example of AI1 engineering quantity decimal point place setting.

〈Example to set AI1 engineering quantity decimal point place〉

Step	Key	Display	Remark
1	[△]	SAMPLE TIME= X	Initial display
2	[△]	CNTL.TYPE = X	Select next item.
3	[△]	ALARM NO. = X	Select next item.
4	[2] [ENT]	1_ENG.DP = 2	Enter data.

12.3 Handy Communicator System

The Handy Communicator configures the configuration data (control data for control algorithm) of the Fixed Program Controller by the code entry method. It loads (writes) the configured data in the memory (EEPROM) of the Fixed Program Controller, or saves the data from the Fixed Program Controller. Fig. 12.5 illustrates the structure of the Handy Communicator.

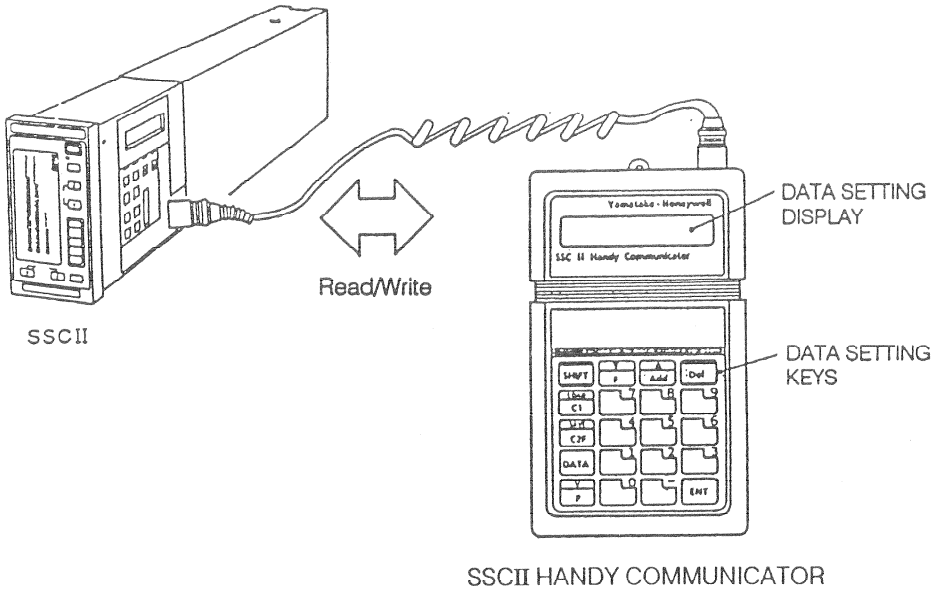


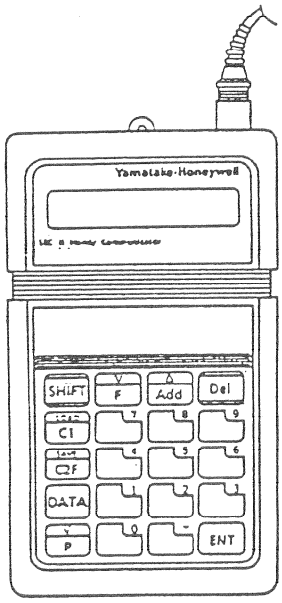
Fig. 12.5. Handy Communicator System

(1) Structure of Handy Communicator

- Handy Communicator
  - Display Unit
    - Code/data display and LCD (16 digits 2 lines) display of items
  - Keyboard
    - Function keys, numerical keys, and code keys (See Table 12.1.)
  - Dedicated connection cable
    - Connects between Handy Communicator and SSCII Controller
  - Others
    - Adaptor/AC adaptor

Note: These adaptors are for the Handy Communicator and a personal computer.

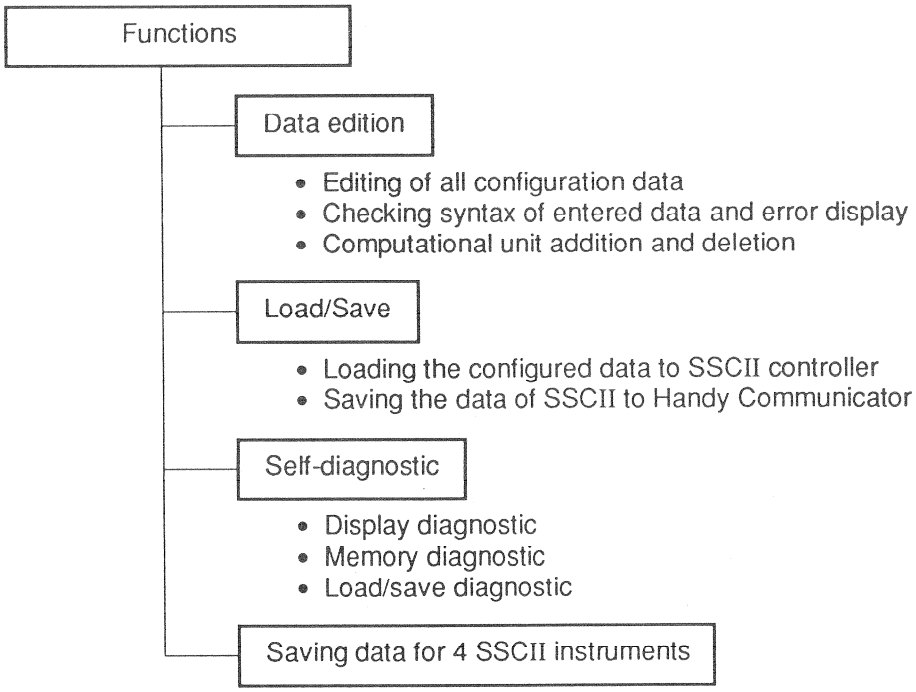
Table 12.1. Functions of Keys

Handy Communicator	Key	Description
	[F]	Control data assignment function selection
	[C_1]	Calls up code 1 of each item
	[C_2F]	Calls up code 2 of each item
	[DATA]	Calls up data section
	[Add]	Computational unit assignment addition selection
	[Del]	Computational unit assignment deletion selection
	[ENT]	Data entry
	[0] – [9] [–]	Numerical keys for code and data sections
	(U) (P)	For data setting of Computational Unit
	(△) (▽)	Computational unit number forward/backward
	(LOAD)	Program data write (load) selection
	(SAVE)	Program data read (save) selection
	[SHIFT]	Shift key selection

Note: Keys with ( ) are used in conjunction with the SHIFT key.

(2) Handy Communicator Functions

The Handy Communicator provides the configuration data edition function and data load/save function necessary for configuring the functions of the Fixed Program Controller. It also provides the self-diagnostic function for the Handy Communicator itself. The following describes these functions:



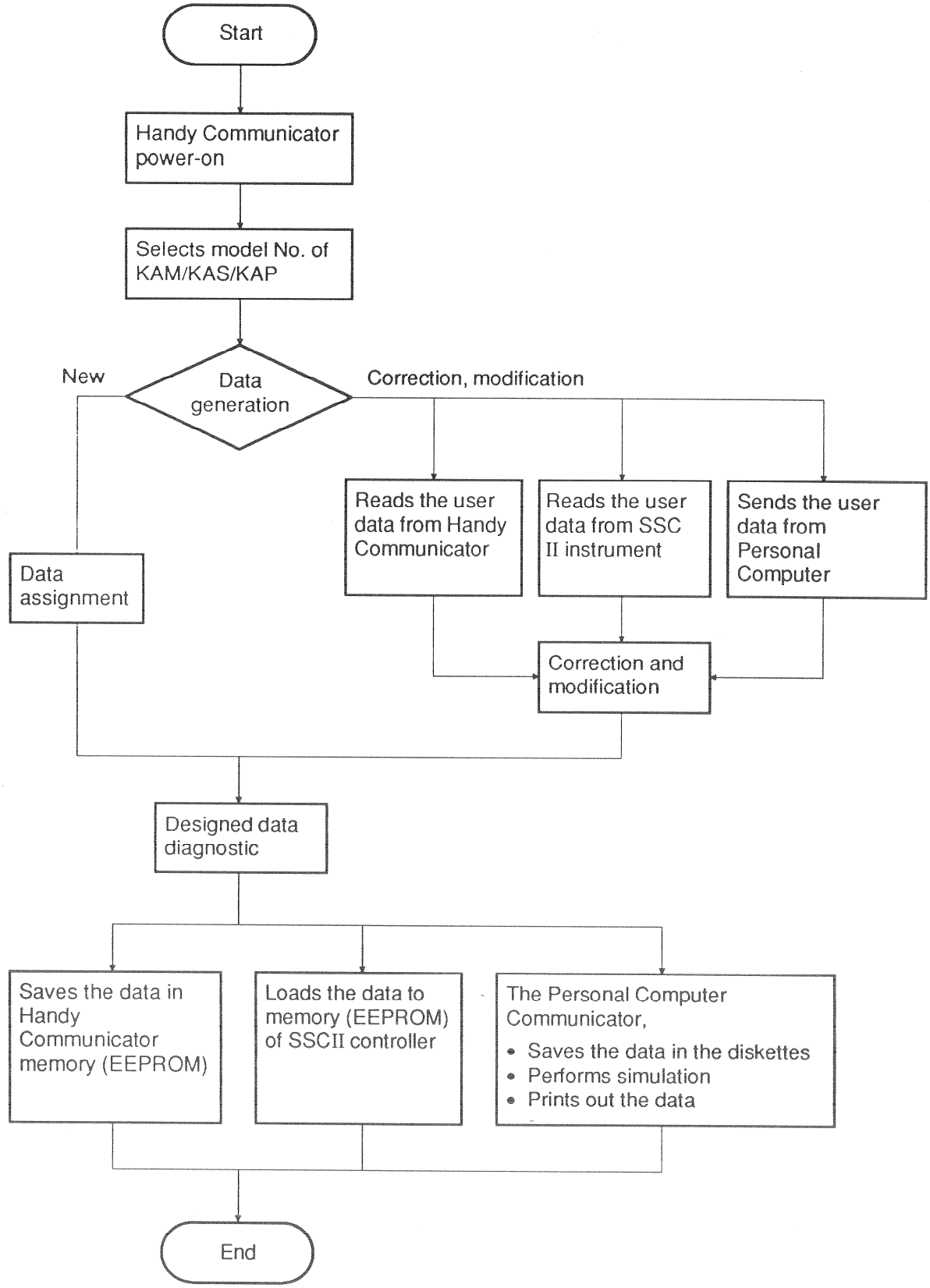


Fig. 12.6. Data Generation Flow

12.4 Personal Computer Communicator System

The Personal Computer Communicator is a software package which runs on MS-DOS (Ver 3.30) of the NEC personal computer, PC-98 Series.

The Personal Computer Communicator uses the different method of generating the configuration data (control algorithms and control data) from that of the code entry method used in the Handy Communicator. This method allows the user to easily perform engineering work by the interactive configuration with the Personal Computer according to the design sheets/data sheets.

This is a software package to load (write) the data configured by the Personal Computer Communicator to the memory (EEPROM) of the Fixed Program Controller or to save (read) the data from the Fixed Program Controller. The following describes the structure of the Personal Computer Communicator.

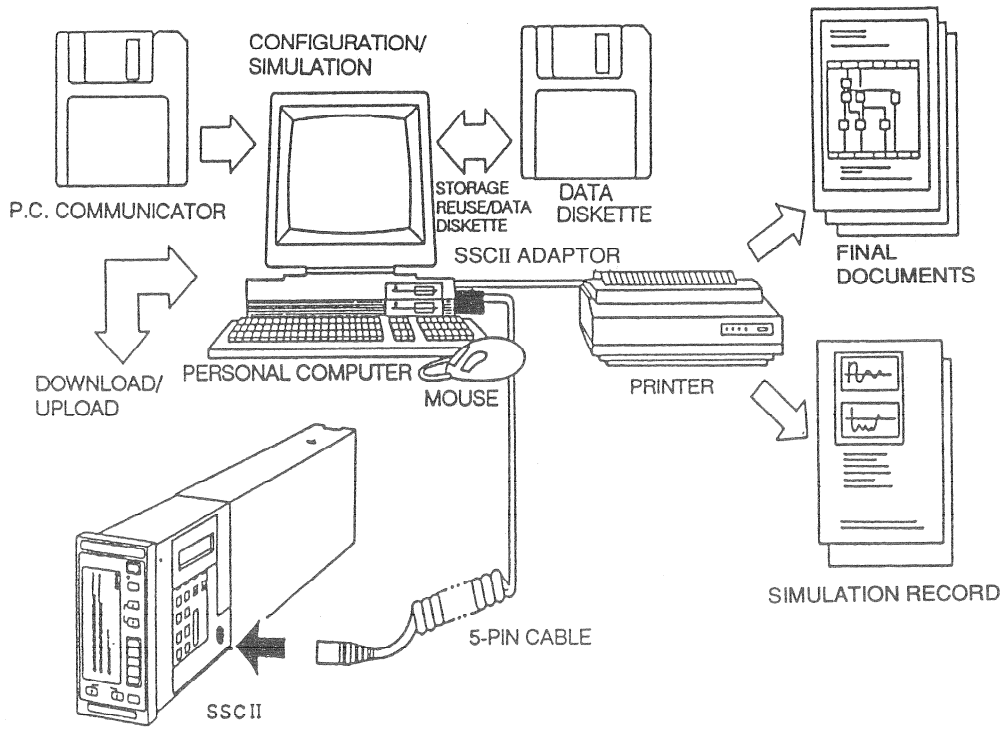
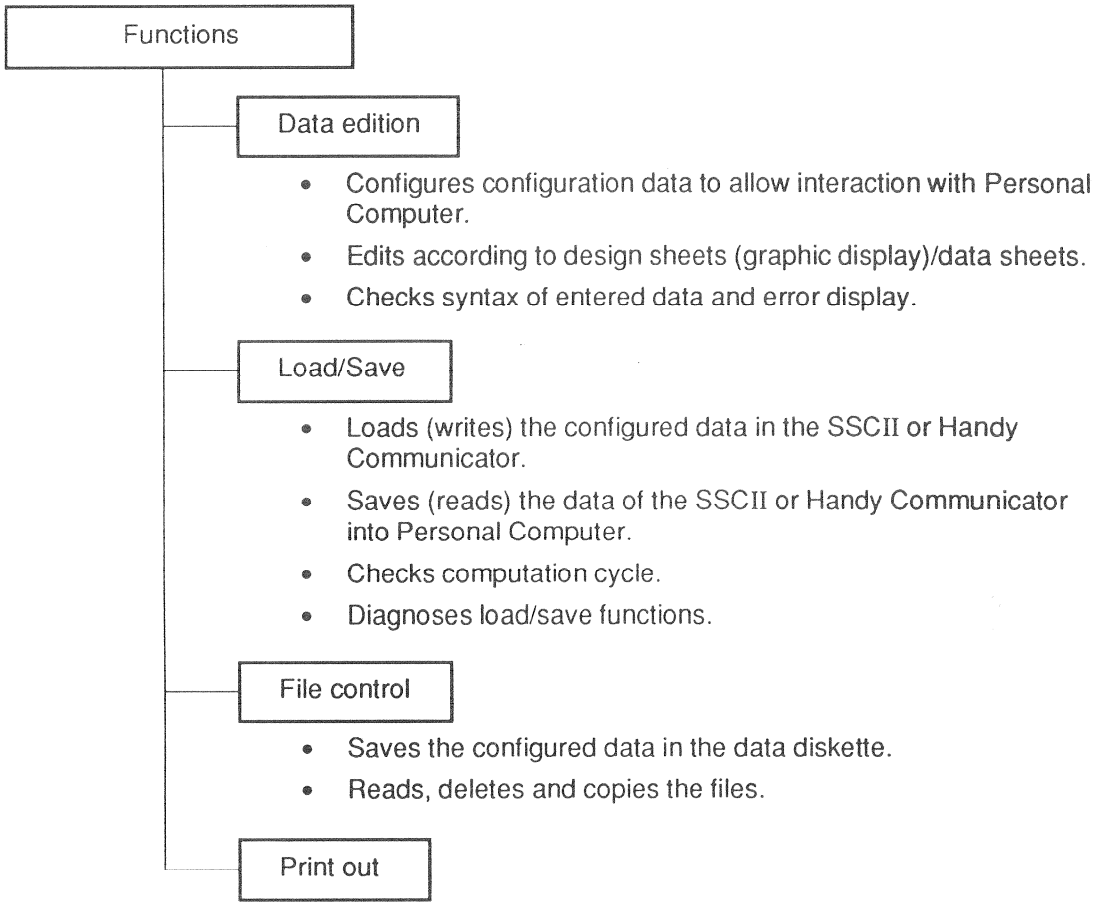


Fig. 12.7. Personal Computer Communicator System

■ Personal Computer Communicator Functions

The Personal Computer Communicator provides functions requried for configuring the Fixed Program Controller functions such as configuration data edition, data load/save, file control, and simulation (optional). It also tests the configured data. These functions are described below:



Fixed Program Controller (KAS) Data Sheet

Customer

User

Engineer	
Salesperson	
Date	

Production No.	Sub No.	Tag No.	Name	Model	Scale

I. Basic Data (F001 – 01 – □□ –)

Code (01 to 11)

Item	Range of setting codes	Code	Data	Default value
PROM management number	(*1)	01		0
Arithmetic operation cycle time	1, 2, 3 (*2)	02	*	2
Type of controller	0, 1, 2, 3 (*3)	03	*	0
PV alarm display PID number	1, 2	04	*	1
Controller number	1 to 50	05		1
Host computer control system	0, 1, 2 (*4)	06		0
Destination of transfer when host computer failed	0, 1 (*5)	07		0
Preset mode	1, 2, 3, 4 (*6)	08		1
Preset output	– 6.9 to 106.9	09		0.0
1 Preset local SP	– 6.9 to 106.9	10		0.0
2 Preset local SP	– 6.9 to 106.9	11		0.0

(*1) 0 to 9999
(*2) 1: 100 ms (1PID), 2: 200 ms (1PID, 2PID)
3: 300 ms (with COMMUNICATION)
(*3) 0: 1PID (A/M-Mode)
1: 1PID (C/A/M-Mode)
2: 2PID (A/M-Mode)
3: 2PID (C/A/M-Mode)
(*4) 0: Without COMMUNICATION
1: With COMMUNICATION (without COMP)
2: With COMMUNICATION (with COMP)
(*5) 0: MAN
1: AUTO
(*6) 1: IM
2: MAN
3: AUTO
4: CAS
* : Configurable data by Data Setting Unit

II. Input Processing Data (F002 – □□ – □□ –)

Code (01 to 15)
Analog input data (01, 02)

Item	Range of setting codes	Code	Analog input data		Default value
			01	02	
———	—	01	—	—	—
Position of decimal point for value displayed in engineering unit of measure	0, 1, 2, 3 (*1)	02	*	*	1
Low limit (0%) of value in engineering unit of measure	– 9999 to 9999	03	*	*	0.0
High limit (100%) of value in engineering unit of measure	– 9999 to 9999	04	*	*	100.0
Linearization table number	0, 1, 2 (*2)	05	*	*	0
———	—	06	—	—	—
———	—	07	—	—	—
———	—	08	—	—	—
———	—	09	—	—	—
———	—	10	—	—	—
———	—	11	—	—	—
Square-root extraction processing	0, 1 (*3)	12	*	*	0
Square-root extraction processing dropout	0.0 to 100.0 (%)	13			0.0
Digital filter constant	0.0 to 999.9 (sec)	14	*	*	0.0
Sensor abnormality diagnosis	0, 1 (*4)	15	*	*	0

(*1) 0: XXXX 1: XXX.X 2: XX.XX 3: X.XXX
(*2) 0: Linear
*: Configurable data by Data Setting Unit
(*3) 0: Linear 1: Square-root extraction processing
(*4) 0: Without diagnosis

* Data which can be varied after system has started operating.

III. PID Arithmetic Data (F003 – □□ – □□ –)

Code (01 to 16)
PID data (01, 02)

Production No. and Sub No.

Item	Range of setting codes	Code	Analog input data 01	Analog input data 02	Default value
Type of PID operation	0, 1 (*1)	01	*	*	0
——	——	02	——	——	——
PV tracking	0, 1 (*2)	03	*	*	0
Alarm hysteresis	0.0 to 100.0 (%)	04			1.0
Proportional band	0.0 to 799.9 (%)	05	*	*	100.0
Integral time	0.00 to 99.99 (min)	06	*	*	1.00
Derivative time	0.00 to 99.99 (min)	07	*	*	0.00
Low limit of integral operation	– 200.0 to 200.0 (%)	08	*	*	0.0
High limit of integral operation	– 200.0 to 200.0 (%)	09	*	*	100.0
Ratio	– 699.9 to 799.9 (%)	10	*	*	100.0
Bias	– 699.9 to 799.9 (%)	11	*	*	0.0
Dead zone	0.0 to 100.0 (%)	12	*	*	0.0
Output deviation rate limit	0.0 to 100.0 (%)	13	*	*	100.0
Deviation alarm	0.0 to 100.0 (%)	14	*	*	10.0
Low limit of PV alarm	– 6.9 to 106.9 (%)	15	*	*	0.0
High limit of PV alarm	– 6.9 to 106.9 (%)	16	*	*	100.0

(*1) 0: Regular PID
1: Derivative-precedented PID

(*2) 0: Without
1: With

* Data which can be varied after the system has started operating.

* Configurable data by Data Setting Unit.

IV. Characterization Data (F004 – □□ – □□ –)

Code (01 to 23)
Linearization table data (01, 02)

Segment		Code	Linearization table data (*1) 01	Linearization table data (*1) 02
X-axis	X1	01		
	X2	02		
	X3	03		
	X4	04		
	X5	05		
	X6	06		
	X7	07		
	X8	08		
	X9	09		
	X10	10		
	X11	11		
Y-axis	Y1	12		
	Y2	13		
	Y3	14		
	Y4	15		
	Y5	16		
	Y6	17		
	Y7	18		
	Y8	19		
	Y9	20		
	Y10	21		
	Y11	22		
Connected Broken line No. (*2)		23		

(*1)
- Default value is 0.0%
- Setting range is 0.0 to 799.9%
- Must be Xi < Xi +1 [i = 1 to 10]
- All linearization table data can be varied after the system has started operating.

(*2) • Set the connected linearization table number. If not applicable, set 0.

V. Variable Parameters

Cannot be entered from a personal computer or a handy communicator.

% PARA code	Item	Data
1	Output low limit value	* (Default value: 0.0%)
2	Output high limit value	* (Default value: 100.0%)
3	AI1 dropout value	* (Setting of data for input processing)
4	AI2 dropout value	
5	PID1 alarm hysteresis	* (Setting of data for PID algorithm)
6	PID2 alarm hysteresis	

* Can be entered from the Data Setting Unit after the system has started operating.

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