

**Smart MagneW3000  
Electromagnetic Flowmeter  
Converter  
Model: KIX18B  
(FM Approved)  
User's Manual**

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The KIX Converter comes to you with its adjustments and parameter settings completed to your order specifications. (When there are no order specifications, see Section 6.3) When the Converter is installed and its electrical connections are made, it is ready to operate. If adjustments are needed, see 6.4 and subsequent sections.

# CONTENTS

	<u>Page</u>
<b>1. UNPACKING AND PRECAUTIONS</b> .....	1
1.1 Unpacking and Inspection .....	1
1.2 Model No. and Instrument Specifications .....	1
1.3 Environments for Storage .....	2
1.4 Environments for Use .....	2
<b>2. GENERAL DESCRIPTION AND SPECIFICATIONS</b> .....	3
2.1 Description .....	3
2.2 Specifications .....	4
<b>3. MODEL NUMBERS</b> .....	6
3.1 Details of Optional Item "Communication" .....	8
3.2 Details of Optional Item "Ranging Function" .....	9
3.3 Details of Optional Item "Internal Counter Function" .....	12
3.4 Details of Optional Item "Contact Input Function" .....	12
3.5 Details of Optional Item "Contact Output Function: .....	13
<b>4. DIMENSION DRAWINGS</b> .....	15
<b>5. INSTALLATION</b> .....	16
5.1 Installation Method .....	16
5.2 Notes for Electrical Connection .....	17
5.3 Cable Connections .....	23
5.4 Check of Electrical Connections .....	27
<b>6. OPERATION DESCRIPTION</b> .....	28
6.1 Nomenclature of Cards .....	28
6.2 Functions of Cards .....	29
1) Main Card .....	29
2) Pulse Cards .....	30
3) Display Card .....	31
4) Local Setting Card (LSC) .....	32
6.3 Data Setting with LSC (Local Setting Card) .....	37
1) Description of Mode .....	37
2) Configuration of Displays .....	38
6.4 Simple Operation Examples .....	39
6.5 Operating Procedure .....	40
1) To set to the MEASURING MODE .....	40
2) To set to the OPERATING MODE .....	41
3) To set or change the damping time constant .....	42

4)	For automatic zero adjustment .....	43
5)	To reset the internal counter .....	44
6)	To set or change the counter preset value .....	46
7)	To set or change the flow display .....	48
8)	To set to the ENGINEERING MODE .....	49
9)	To set ID (identification) code .....	50
10)	To set or change functions .....	51
11)	To set or change excitation current (EX), detector model (MODEL), and detector diameter (DIA) .....	52
12)	To set or change the number of dummy submerged detectors used in conjunction with submerged detector (Model NNK) .....	53
13)	To set or change the range of a single range instrument .....	54
14)	To set or change the range of a dual range instrument .....	55
15)	To set or change the ranges of a direct/reverse range instrument .....	57
16)	To set or change the hysteresis of transfer between ranges .....	59
17)	To set or change pulse weight .....	60
18)	To set or change pulse width .....	61
19)	To set or change dropout point of pulse output signal .....	62
20)	To set or change high/low alarm points .....	63
21)	To select the low flow cutoff function .....	64
22)	To select the state burnout for the analog output signal when in emergency .....	65
23)	To select the state for the pulse output signal when in emergency .....	66
24)	To select the state for the contact output signal when in emergency (NC/NO) .....	67
25)	To set to the MAINTENANCE MODE .....	68
26)	To check the analog output loop .....	69
27)	To check the pulse output loop .....	70
28)	To check the contact input/output loop .....	71
29)	To check the excitation current output .....	72
30)	To calibrate the excitation current output 250 mA and 350 mA .....	74
31)	To calibrate the analog current output 4 mA and 20 mA .....	76
32)	To calibrate the internal gain coefficient .....	78
33)	To check PROM version .....	83
34)	To recover the shipping data .....	84
35)	Mode for emergency (data broken, etc.) .....	85
6.6	Diagnostic Functions .....	86
1)	H/W Check .....	86
2)	Check for Setting Errors .....	87
<b>7.</b>	<b>CALIBRATION</b> .....	<b>88</b>
7.1	Calibration of Converter with Calibrator KIZ006 .....	88
7.2	Turning-off Converter Power .....	89
<b>8.</b>	<b>ACCESSORIES</b> .....	<b>90</b>

## 1. UNPACKING AND GENERAL PRECAUTIONS

The Model KIX18B converter has been approved by Factory Mutual Research (FM) as "Nonincendive" (for Class I, Division 2) and "Suitable" (for Classes II, III, Division 2 Groups F and G) device.

Immediately upon receipt of the instrument, unpack and inspect it for the items mentioned in this section. Note that the environments of the place of storage or use of the instrument should meet the requirements mentioned in this section.

### 1.1 Unpacking and Inspection

Immediately upon receipt of the instrument, unpack and check it for any signs of damage which might have been sustained when in transportation. If such signs are found, immediately notify the bearer and/or the dealer. Check that the accessories as shown in Table 1.1 accompany the instrument. If any of them are missing, immediately notify your dealer.

Table 1.1. Accessories in Packing

Item	Parts No.	Q'ty
Fuse (3.15 A)	83957018-009	1
Mounting bracket		
For Wall Mount	80279935-001	1 set*
For 2-inch Pipe Mount	80279935-002	1 set**
		Either one of these sets
Unit sticker	80354323-001	1 sheet

\* Four mounting brackets, and four sets of bolts and washers

\*\* Two larger mounting brackets, two smaller mounting brackets, four through-bolts, four sets of short bolts and washers, four sets of nuts and washers

### 1.2 Model No. and Instrument Specifications

Check that the model number indicated on the nameplate conforms with the instrument specifications ordered, referring to the model number table. The nameplate is as shown in Fig. 1.1 and is posted on the side of the instrument. The DETECTOR MODEL column is left blank.

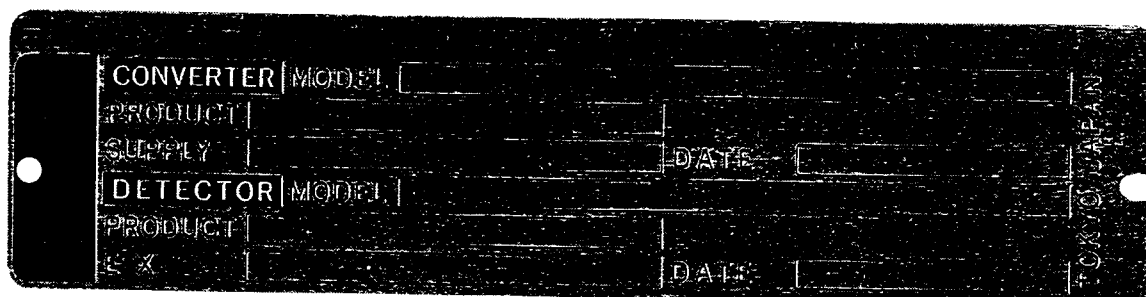


Fig. 1.1. Nameplate

### 1.3 Environments for Storage

To store the instrument for a long period of time, note the following:

- (1) It is best to store the instrument to be repacked in the box in which it was delivered.
- (2) The environmental conditions of the place of storage should meet the following requirements:
  - Should be well protected against adverse weather.
  - Should be well protected against mechanical vibration.
  - Ambient temperature should be  $-40$  to  $+70^{\circ}\text{C}$  ( $25^{\circ}\text{C}$  is ideal) [ $-40$  to  $158^{\circ}\text{F}$  ( $77^{\circ}\text{F}$  is ideal)].
  - Ambient humidity should be 5 to 95% RH (60% RH is ideal).

### 1.4 Environments for Use

The environmental conditions of the place of use of the instrument should be as follows:

- The ambient temperature and humidity should be
  - Temperature:  $-10$  to  $50^{\circ}\text{C}$  ( $14$  to  $122^{\circ}\text{F}$ )
  - Humidity: 10 to 90% RH
- Should be apart from heavy duty electrical apparatus (such as power transformers).
- Should not be exposed to direct sunlight or other adverse weather.
- Should not be exposed to dusty atmosphere.
- Should not be exposed to corrosive atmosphere.
- Should be easily accessible for maintenance service.

## 2. GENERAL DESCRIPTION AND SPECIFICATIONS

### 2.1 Description

Model KIX Converter is a microprocessor-based instrument, whose parameters can be remote-configured from Smart Field Communicator (SFC).

A typical structure of an electromagnetic flow metering system is shown in Fig. 2.1.

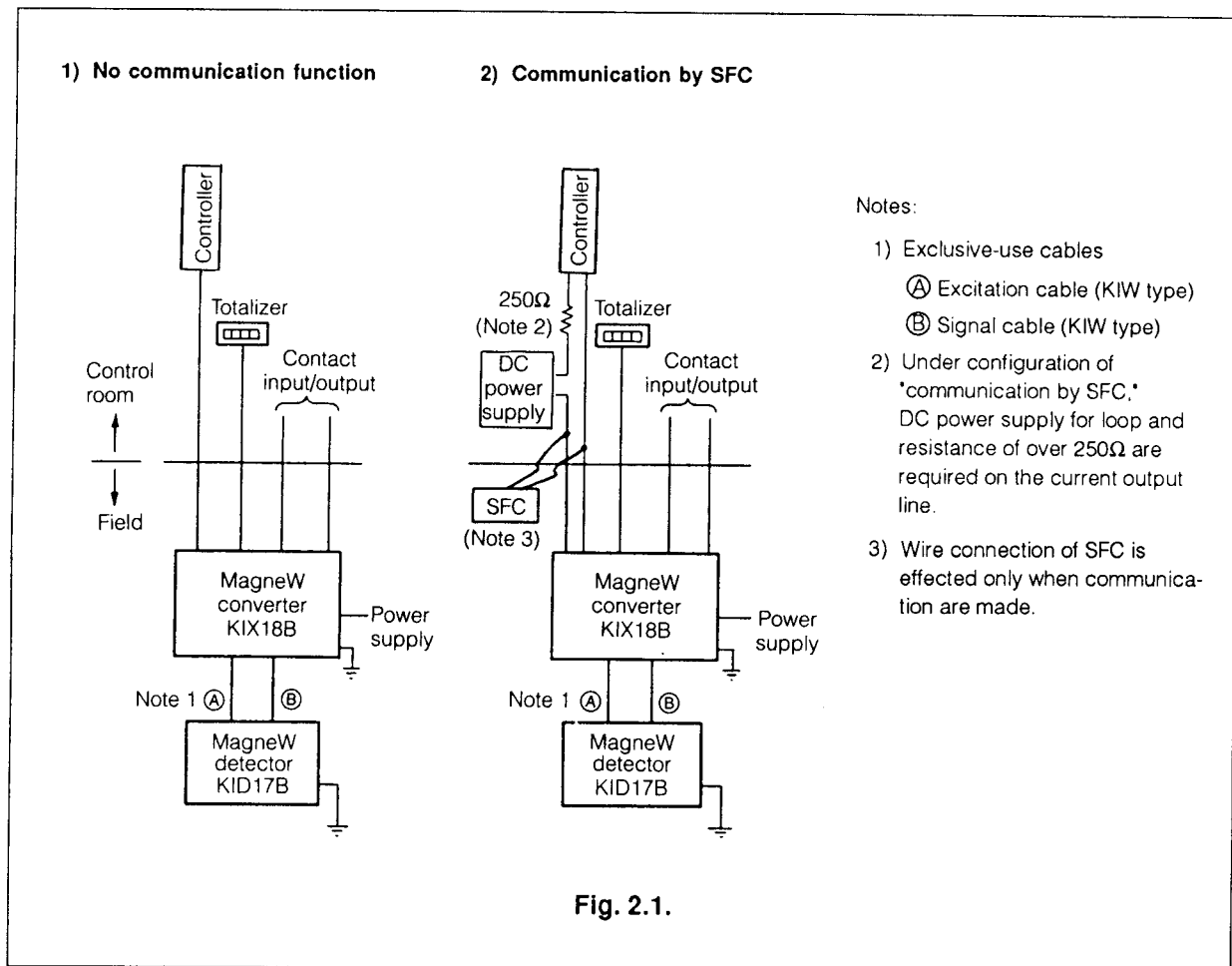


Fig. 2.1.

## 2.2 Specifications

Item	Specifications		
<b>Power requirement</b>	AC 100, 110, 120, 200, 220, 240V $\pm$ 10%, 50 or 60 Hz $\pm$ 2 Hz DC 24V $\pm$ 10%		
<b>External power supply for SFC communications</b>	Refer to the figure. (Load resistance of 250 ohms minimum is required to enable communications with SFC. When SFC communication function is not used, external power supply is not required. In this case, load resistance of current output is 0 to 600 ohms.) <div style="text-align: right;"> </div>		
<b>Power consumption</b>	14W (22VA) (Including detector and converter)		
<b>Output signal</b>	Current output: 4 to 20mA DC Load resistance: 0 to 600Ω Contact output: Any 1 point among the following under open collector external load of DC 30V max. 200mA max. (in case of resistance load) <ul style="list-style-type: none"> <li>• Upper/lower limit alarm, self-diagnosis alarm, empty-status detection</li> <li>• Direct/reverse flow direction discrimination signal output</li> <li>• Dual range discrimination signal output</li> <li>• Preset counter output</li> </ul> Pulse output: <ul style="list-style-type: none"> <li>• Open collector output 0 to 2,000 Hz, pulse widths 0.3, 0.5, 1, 7, 10, 15, 30, 50, 100 ms External load 30V max., 200mA max.</li> <li>• Electromagnetic counter drive output 0 to 20 Hz, pulse widths 30, 50, 100 ms External load DC 24V, 210Ω</li> <li>• Mercury relay contact output 0 to 20 Hz, pulse width 30, 50, 100 ms External load DC 30V max., 300mA max. (Mounting angle: <math>\pm</math> 15° or less)</li> </ul>		
<b>Display</b>	Display card: 7-segment LED, 6 digits Local setting card: 7-segments LED, 6 digits, 16 digits LCD 2 lines Continuous flow rate percentage display: % Continuous flow rate display in engineering units: Cubic-volume unit: m <sup>3</sup> /l, cc, B (barrel), KG (kilogallon), G (gallon), mG (milligallon) Time units; day, hour, min., sec. Built-in totalizer, m <sup>3</sup> /p, l/p, cc/p, B/p, KG/p, G/p, mG/p		
<b>Setting method</b>	Local setting card: 5 key-switches Remote setting by SFC		
<b>Flow velocity range</b>	0 – 0.1 m/sec. to 0 – 10 m/sec.		
<b>Damping time constant</b>	0, 0.5, 1, 2, 3, 4, 5, 10, 50, 100 sec. (min. response: 0.5 sec. 63.2% response)		
<b>Drop out</b>	2 to 10% FS of pulse output (variable integers)		
<b>Low flow cut-off</b>	0 to 10% FS of current output (variable integers)		
<b>Reference condition accuracy (Combination with KID17B detector)</b>	Max. measuring span (Vs)	Flow rate $\geq$ 25%	Flow rate < 25%
	Vs = 1.0 to 10 m/s	$\pm$ 0.5% of rate	$\pm$ 0.125% of full scale
	Vs = 0.1 to less than 1.0 m/s	$\pm \left( \frac{0.1}{Vs} + 0.4 \right)$ % of rate	$\pm \frac{1}{4} \left( \frac{0.1}{Vs} + 0.4 \right)$ % of full scale
<b>Installation location</b>	Class I, Division 2, Groups A, B, C, D Class II, III, Division 2, Groups F, G Note: Class I: flammable gases Class II: combustible dusts Class III: ignitable fibers For details, refer to NFPA No. 70 – National Electrical Code (NEC).		
<b>Ambient temperature</b>	–10 to +50°C		
<b>Ambient humidity</b>	10 to 90% RH		

Item	Specifications
<b>Cables (Between detector and converter)</b>	Signal cable: 2-core individually-double-shielded cable (Yamatake-Honeywell standard KIW, 0.75 mm <sup>2</sup> , outside dia. 11.4 mm) or equivalent cable (CVVS, CEEV, etc.) Cables for excitation current: Chloroprene cable 2RNCT, JIS C 3327 (2 mm <sup>2</sup> , outside dia. 11.4 mm) or equivalent cable (Vinyl-sheathed cable CVV, JIS C 3401, etc.).
<b>Cable length</b>	Max. 300 m
<b>Mounting</b>	Wall or 2" pipe mounting
<b>Case material</b>	Aluminum alloy
<b>Case structure</b>	Watertight
<b>Case finish</b>	Acryl finish
<b>Case finish color</b>	Light beige (Munsell 4Y7.2/1.3)
<b>Cable inlet</b>	1/2 NPT thread
<b>Weight</b>	3.9 kg

### Semi-standard Specifications

<b>Corrosion-resistant finish (Y 138A, B)</b>	Corrosion-resistant finish (Y138A): Baked acryl finish Corrosion-proof finish (Y138B): Baked epoxy finish
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### 3. MODEL NUMBERS

• Model Number Table of KIX Converter

Basic model No.	Selections							Options				Description
	Power supply	Output signal			Terminal box Lightning arrester	Mounting	Conduit connection	Watertight gland	Communication	Function designation		
		Analog	Display	Pulse								
I	II	III	IV	V	VI	VII	VIII	IX	X			
KIX 18B											FM approved explosion-protected converter	
	- A										100V AC, 50/60 Hz	
	- C										110V AC, 50/60 Hz	
	- E										120V AC, 50/60 Hz	
	- G										200V AC, 50/60 Hz	
	- I										220V AC, 50/60 Hz	
	- K										240V AC, 50/60 Hz	
	- M										24V DC	
		1									4 to 20mA DC	
			X								Without display card	
			1								With display card	
			2								With digital operator panel	
				X							None	
				O							Open collector pulse output	
				P							Electromagnetic counter drive output	
				Q							Mercury relay contact output	
					2						Terminal box with lightning arrester	
						S					Wall mounting	
						T					2" pipe mounting	
							Y				1/2 NPT internal thread	
								- X			None	
								X			Communication function not used	
								S			Communication by SFC	
									X		Default value (Note 2)	
									F□□□□		Designated (used according to function designation table)	

Notes: 1) Because data cannot be set or changed with display card, effect data setting or changes under communication mode by SFC or MCI.  
 2) Functions (default value)  
 • Ranging function → Single range  
 • Built-in totalizer → Not provided  
 • Contact input function → Not used  
 • Contact output function → Not used  
 FOXXX: When pulse card is not provided.  
 FOAXX: When pulse card is provided.

## Function Designation Table (F)

Designate the device type number according to the following tables. The converter will be shipped by incorporating the designated functions. Also, changes of designated functions can be achieved by the "Local Setting Card" or by communications.

### 1) In case of single range

Function designation	Function designation				Description
	Ranging	Built-in totalizer (Note 1)	Contact input	Contact output	
F	I	II	III	IV	
	0				Single range
	X				None
	A				Built-in totalizer (Note 1)
	B				Built-in totalizer with preset (Note 1)
	X				None
	1				External 0% lock
	2				External auto zero adjustment
	4				Built-in totalizer, external reset
	X				None
	1				Alarm output (including empty-status detection)
	3				Preset counter output (Note 2)

Note: 1) Condition for selecting

- In Model No. Table, "With display card" or "With local setting card" is selected, and any one for item "Pulse output" is selected.

2) Condition for selecting

- Automatically selected only when B "Built-in totalizer with preset" is selected for item "Built-in totalizer".

### 2) When using by direct/reverse automatic range switching

Function designation	Function designation				Description
	Ranging	Built-in totalizer (Note 1)	Contact input	Contact output	
F	I	II	III	IV	
	3				Direct/reverse automatic range switching
	X				None
	A				Built-in totalizer (Note 1)
	C				Built-in totalizer with direct/reverse differential flow rate integration (Note 1)
	X				None
	1				External 0% lock
	2				External auto zero adjustment
	4				Internal totalizer reset
	2				Range discrimination signal output

### 4) In case of automatic-switching dual range

Function designation	Function designation				Description
	Ranging	Built-in totalizer (Note 1)	Contact input	Contact output	
F	I	II	III	IV	
	1				Automatic-switching dual range
	X				None
	A				Built-in totalizer (Note 1)
	X				None
	1				External 0% lock
	2				External auto zero adjustment
	4				Internal totalizer reset
	2				Range discrimination signal output

### 3) In case of direct/reverse external switching range

Function designation	Function designation				Description
	Ranging	Built-in totalizer (Note 1)	Contact input	Contact output	
F	I	II	III	IV	
	4				Direct/reverse external switching range
	X				None
	A				Built-in totalizer (Note 1)
	B				Built-in totalizer with preset (Note 1)
	C				Built-in totalizer with direct/reverse differential flow rate integration (Note 1)
	3				External range switching
	X				None
	1				Alarm output (including empty-status detection)
	2				Range switching discrimination signal output
	3				Preset counter output (Note 2)

### 5) In case of external-switching dual range

Function designation	Function designation				Description
	Ranging	Built-in totalizer (Note 1)	Contact input	Contact output	
F	I	II	III	IV	
	2				External-switching dual range
	X				None
	A				Built-in totalizer (Note 1)
	B				Built-in totalizer with preset (Note 1)
	3				External range switching
	X				None
	1				Alarm output (including empty-status detection)
	2				Range switching discrimination signal output
	3				Preset counter output (Note 2)

### 3.1 Details of Optional Item "Communication"

Basic model No.	Selections								Options		
	Power supply		Output signal			Terminal Box/ Lightning Arrester	Installation	Electrical Connection	Watertight Gland	Communication	Ranging Function
			Analog	Display	Pulse						
	-	I	II	III	IV	V	VI	VII	VIII	IX	X
KIX 18B											



**X:** No communication function

- No 24 VDC supply for analog output is needed.
- The allowable external load range is 0 to 600 ohms.

**S:** Communication by SFC

- The 24 VDC external power supply for analog output is needed. See Fig. 2.1.
- The allowable external load resistance is 250 ohms or more. See Fig. 2.1.
- For details, refer to Instruction Manual for SFC.

**Note:** Data setting for the Converter which has the Data Setting Unit can be done locally as well as remotely. When local setting is done, this operation has a priority.

### 3.2 Details of Optional Item "Ranging Function"

#### 0: Single range

For flow measurement in the direct flow direction with a single range. When the flow direction is reverse, the outputs are as follows:

Analog output: Down to approximately - 22.5% (0.4 mA)

Pulse output: Not delivered

Display: Minus sign (-) is displayed

	Function Selection			
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function
F	I	II	III	IV



#### 1: Direct direction, auto dual ranges

Measurement is with two ranges (1st range and 2nd range). When the measured value has exceeded 100% of the low range, measurement is automatically transferred to the higher range. Transfer between the two ranges can be with hysteresis as illustrated in Fig. 3.1. The flow signal must always be accompanied by the range status signal.

Analog output

1st range: 4 – 20 mADC

2nd range: 4 – 20 mADC

When pulse output is provided

The pulse weights of both 1st and 2nd ranges are the same.

Contact output

Range status signal

The instrument comes from the factory with its range status signal set as follows.

1st range: Closed

2nd range: Open

Setting in the reverse of the above also is available.

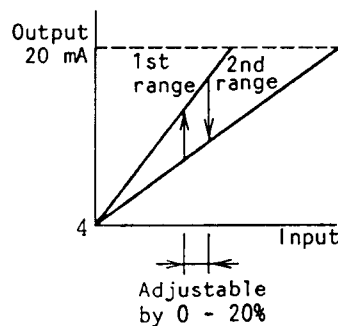


Fig. 3.1. Direct Direction, Automatic Dual Range Transfer Hysteresis

## 2: Direct direction, external select dual ranges

The ranges can be changed with an external range select command signal (contact signal). It also is possible to deliver a range status signal in synchronization to the range select signal.

Analog output

1st range: 4 – 20 mADC

2nd range: 4 – 20 mADC

When pulse output is provided

The pulse weights of both 1st and 2nd ranges are the same.

Contact input

Range select command signal

1st range: Open

2nd range: Closed

Contact output (optional)

Range status signal

The instrument comes from the factory with its status signal set as follows.

1st range: Closed

2nd range: Open

Setting in the reverse of the above also is available.

## 3: Auto direct/reverse range select

As the flow directions change, the measuring ranges are automatically changed. The transfer sections of the two ranges can be overlapped to provide a hysteresis feature as illustrated in Fig. 3.2.

Analog output

Direct direction: 4 – 20 mADC

Reverse direction: 4 – 20 mADC

When pulse output is provided

This signal is delivered irrespective of flow direction. The pulse weight remains the same irrespective of flow direction.

When display is provided

For the flow in the reverse direction, a minus sign ( – ) appears on the readout.

When the pulse output is provided, the direct/reverse differential flow totalization function is also available.

## Contact output

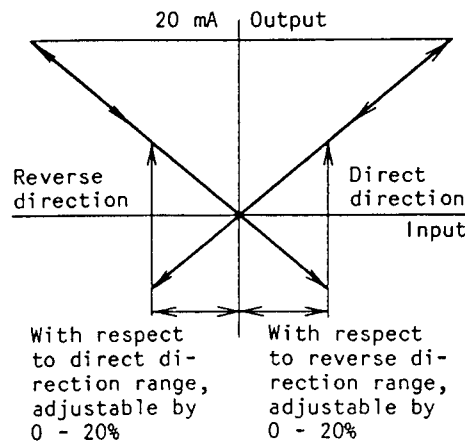
### Direct/reverse flow direction status signal

The instrument comes from the factory with its status signal set as follows.

Direct direction: Closed

Reverse direction: Open

Setting in the reverse of the above is also available.



**Fig. 3.2. Direct/Reverse Transfer Hysteresis**

#### 4: External direct/reverse range select

The direct/reverse ranges can be selected by means of an external direct/reverse range select command signal. It also is possible to deliver a direct/reverse range status signal (contact signal) is synchronization to the select command signal.

#### Analog output

Direct direction: 4 – 20 mADC

Reverse direction: 4 – 20 mADC

#### When pulse output is provided

This signal is delivered irrespective of flow direction. The pulse weight remains the same irrespective of flow direction.

#### When display is provided

For the flow in the reverse direction, a minus sign (–) appears on the readout.

When the pulse output is provided, the direct/reverse differential flow totalization function also is available.

## Contact input

### Range select command signal

Forward direction: Open

Reverse direction: Closed

## Contact output (optional)

### Direct/reverse status signal

The instrument comes from the factory with its status signal set as follows.

Direct direction: Closed

Reverse direction: Open

Setting in the reverse of the above also is possible.

### 3.3 Details of Optional Item "Internal Counter Function"

X: Not used (no pulse output)

A: Totalizing counter

Of the direct/reverse types of instruments, each of the direct and reverse direction flow signals is totalized.

B: Totalizing counter with preset function

The preset table range is 000000 to 999999.

Of the direct/reverse types of instruments, each of the direct and reverse direction flow signals is totalized.

C: Direct/reverse differential flow totalized value readout

This readout displays the difference between the totalized values of flows in the direct and reverse direction.

	Function Selection			
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function
F	I	II	III	IV



### 3.4 Details of Optional Item "Contact Input Function"

X: Not used

1: External 0% lock input

This signal is used to lock the flow signal (display, analog output, pulse output) perfectly at 0%.

2: External auto zero input

	Function Selection			
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function
F	I	II	III	IV



This signal is used for remote adjustment of the zero point. Zero adjustment is accomplished when this signal is ON for 0.3 sec or more. If it is held in the ON state for more than 15 sec, zero adjustment is repeated. (Make certain that the detector is filled with stationary fluid when zero adjustment is being performed.)

3: External range select input

1st range or direct direction: Open

2nd range or reverse direction: Closed

4: Internal counter reset input

This signal is available when the pulse output is provided. The counter is reset when this signal is held in the ON state for 0.2 sec or more. The counter starts counting when this signal is set to the OFF state (contact is open).

**3.5 Details of Optional Item "Contact Output Function"**

X: Not used

1: Alarm contact output

This signal is delivered when one of the below-mentioned abnormal states has occurred. The one is question can be identified with the internal display of the converter or with the SFC or the personal computer via MCI.

	Function Selection			
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function
F	I	II	III	IV



(1) Flow value alarm

(2) Self diagnosis

- Coil open
- ROM error
- RAM error
- NVM error
- V/F error

Output Select

Mode Select	Burnout up	Hold	Burnout down
Analog output 4 – 20 mADC	Burnout up	Hold	Burnout down
Pulse output	—	Hold	Burnout down
Contact output	State representing abnormality (Open/closed statuses are selectable as required.)		

(3) Empty

When the detector has become empty, the output signals become as shown in the following table.

Output signal \ State	When detector is empty
Analog output (4 – 20 mADC)	4 mADC
Pulse output	0%
Contact output	State identical with that when in emergency. (Selectable for open or closed state)

This alarm is available only when the electrical conductivity of the liquid is larger than that of water (150  $\mu\text{S}/\text{cm}$ ).

Notes: Pay attention that the empty function cannot be available under the following conditions.

- 1) When the electrode material of the converter is tantalum or titanium.

The potential between the electrodes is changed due to the reaction of the tantalum or titanium material with some kinds of liquids (hydrochloric acid, for example). This results in mis-detecting the empty state.

- 2) When the electrical conductivity of the liquid to be measured is less than 150  $\mu\text{S}/\text{cm}$  (equivalent to water).

Low electric conductivity may cause mis-detecting of empty state.

2: Range select output

The instrument comes from the factory with its contact signal set as follows.

1st range or direct direction: Closed

2nd range or reverse direction: Open

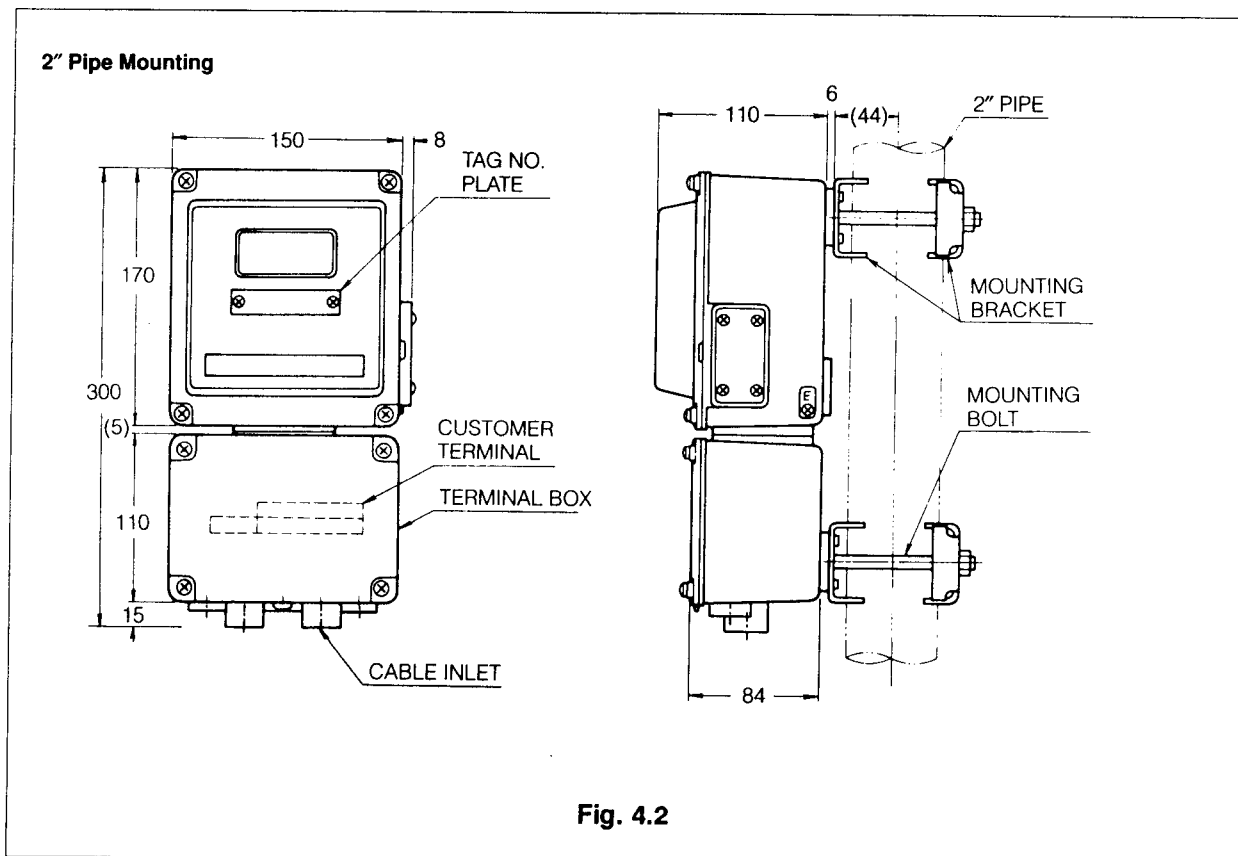
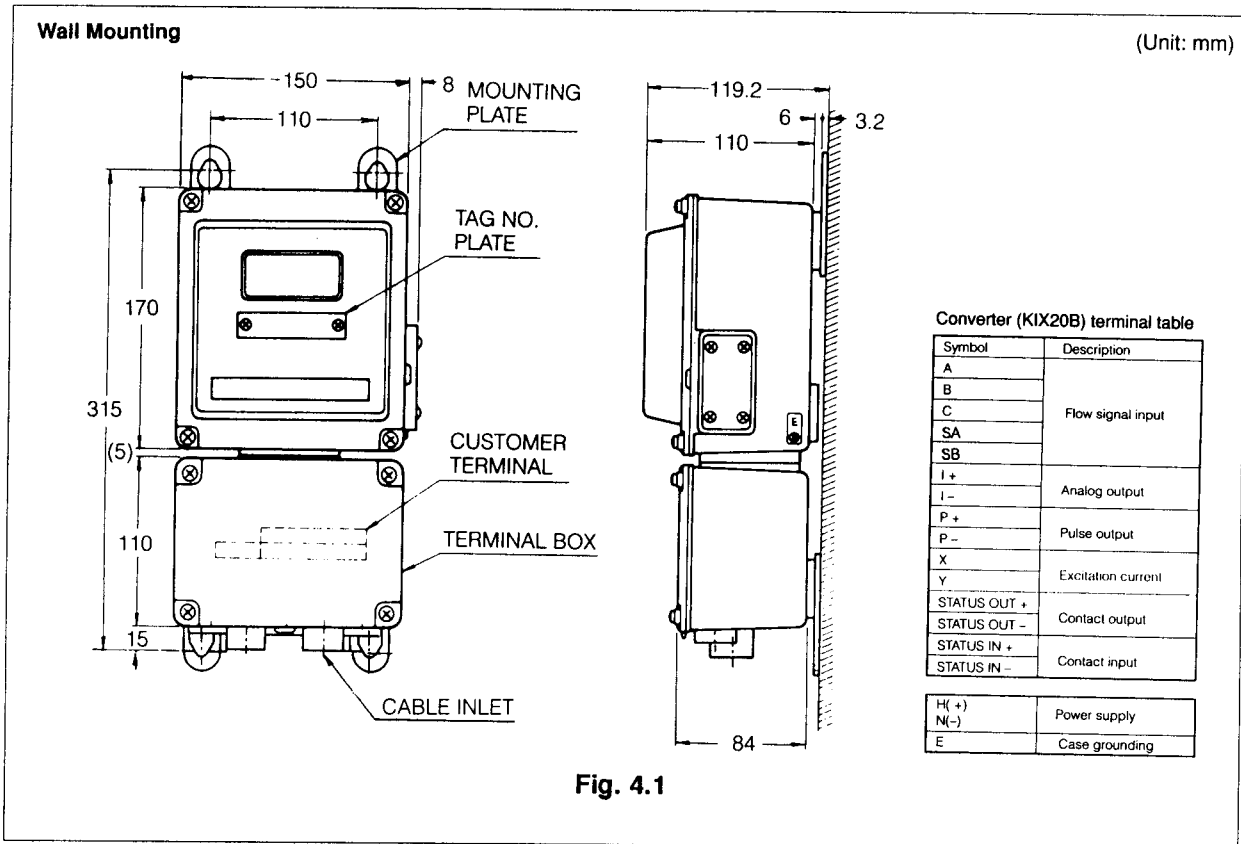
Setting in the reverse of the above also is available.

3: Counter preset status output

This signal is delivered when the counter has reached the preset value.

The EMPTY function can be employed or not employed as selected by the EMPTY FUNCTION SELECTOR switch as shown in Fig. 6.2. (The instrument is delivered to you with the switch set in the "EMPTY FUNCTION EMPLOYED" state.)

## 4. DIMENSION DRAWINGS



## 5. INSTALLATION

This section covers the installation instructions. Refer also to Section 1.4 "Environments for Use".

### 5.1 Installation Methods

The Converter can be mounted either on a wall or a 2-inch pipe.

#### Mounting Procedure

- (1) Fix the hour mounting brackets to the converter with bolts.
- (2) Hang the converter on a wall by means of the holes of the mounting brackets.

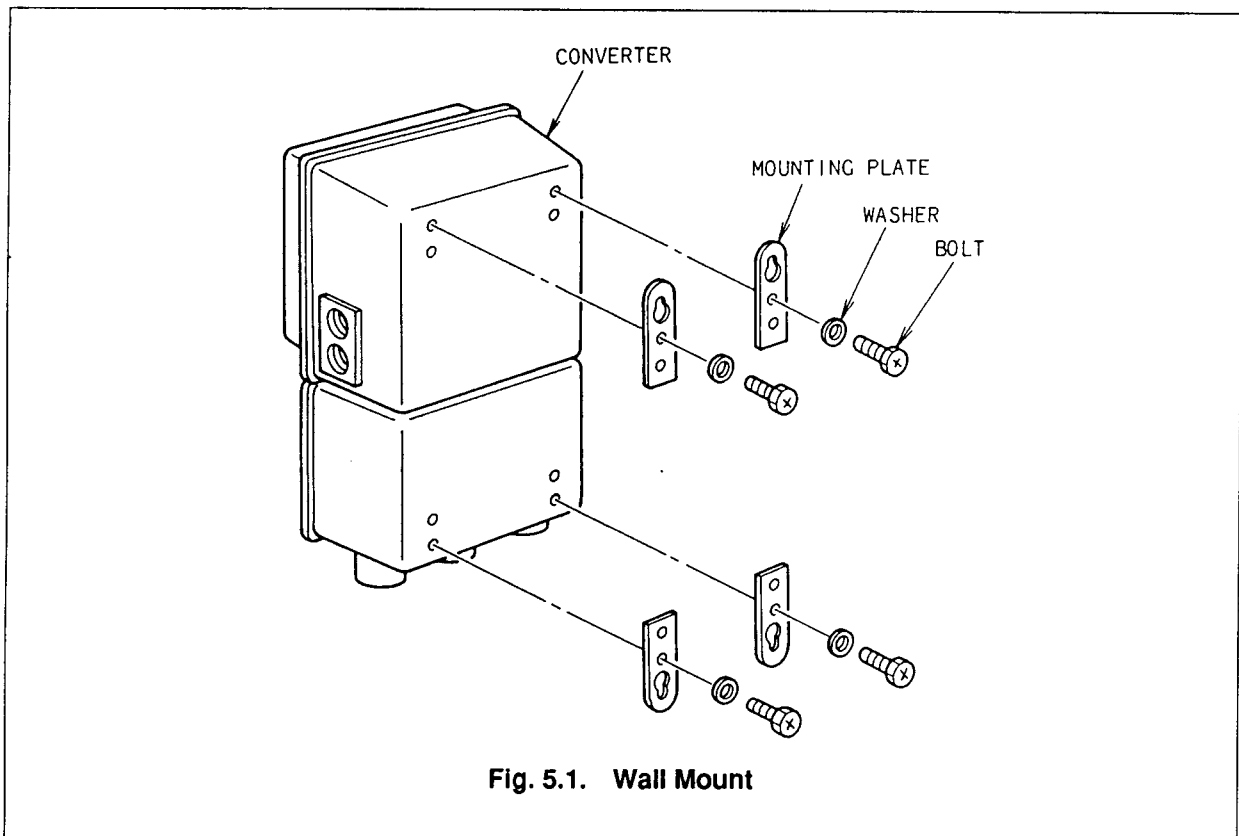
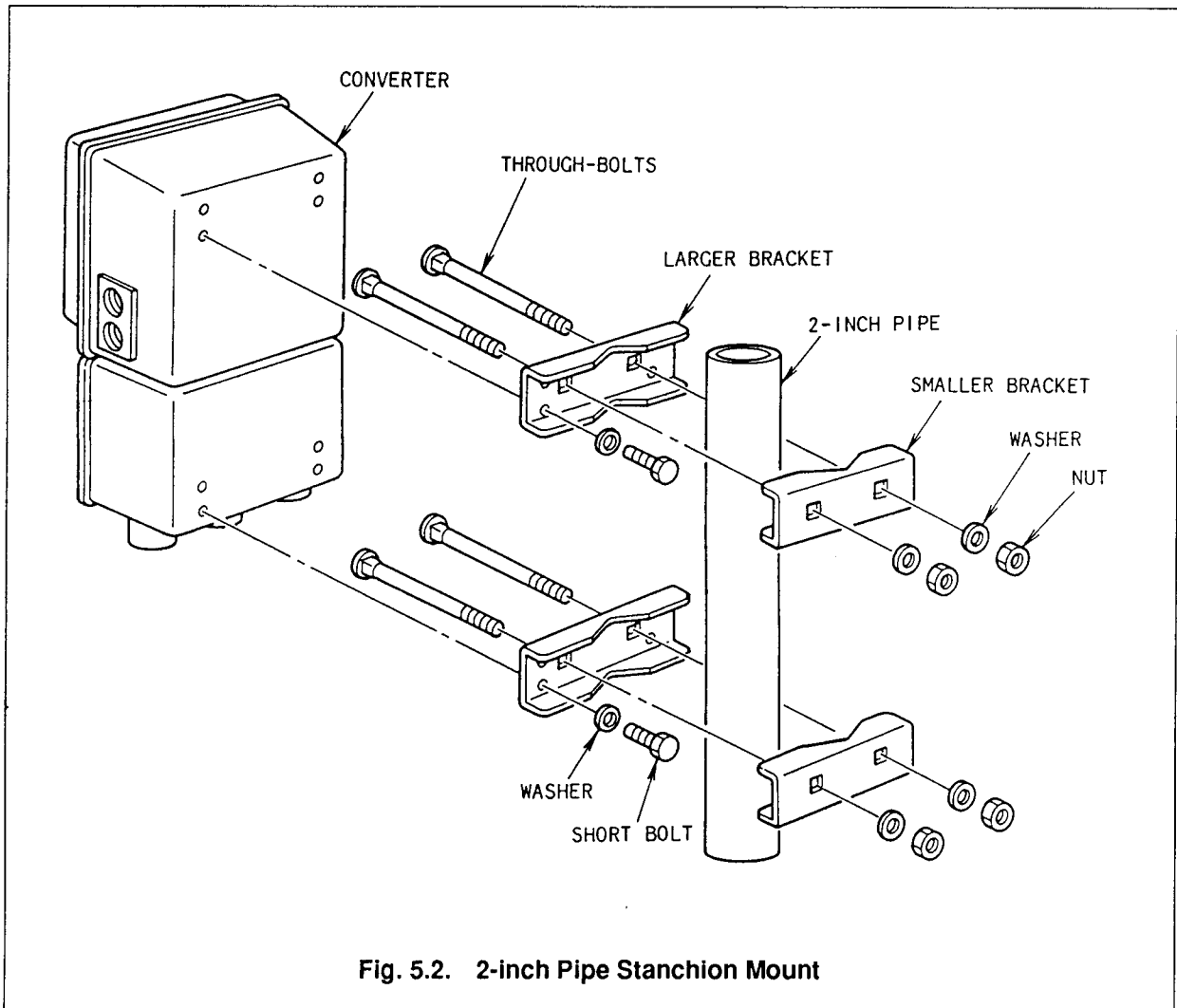


Fig. 5.1. Wall Mount

#### Mounting Procedure

- (1) Pass the through-bolts through the larger brackets and then fix the brackets to the converter with the short bolts
- (2) Set the converter to the 2-inch pipe stanchion, with the four through-bolts extending at both sides of the pipe.
- (3) Pass the smaller brackets onto the through-bolts and fix the brackets with the nut and washers.



## 5.2 Notes for Electrical Connections

### 1) Types of Cables

#### (a) Model KIW Cables Dedicated to MagneW

Model KIW signal cable and excitation current cable are ones dedicated to MagneW flowmeters and MagneW 3000 flowmeters. The signal cable connects the emf output signal of the detector to the converter and the excitation current cable feeds the excitation current to the detector.

Model KIX converter is incorporated with a shield drive circuit as a standard feature, which compensates for signal waveform degradation (which may result in measuring accuracy degradation) caused by the use of shielded cables. The shield drive feature need or need not be used depending on the detector size, electrical conductivity of measured fluid, and cable length as shown in Fig. 5.3. Note that processing of cable terminals differs depending on whether the shield drive feature is made use of or not.

(1) Standard Specifications

Signal cable: 2-core individually-double-shielded cable (nominal cross section  $0.75 \text{ mm}^2$ , OD 11.4 mm)

Weights: Signal cable ..... Approx. 2 kg per 10 meters

Excitation current cable ..... Approx. 1.5 kg per 10 meters

(2) Charts to Find Out Whether Shield Drive is Needed or Not

Whether the shield drive need or need not be employed depends on the detector size, electrical conductivity of measured fluid and cable length as shown in Fig. 5.3, where the clear sections are the areas which call for the shield drive and the shaded sections are the areas which do not call for shield drive.

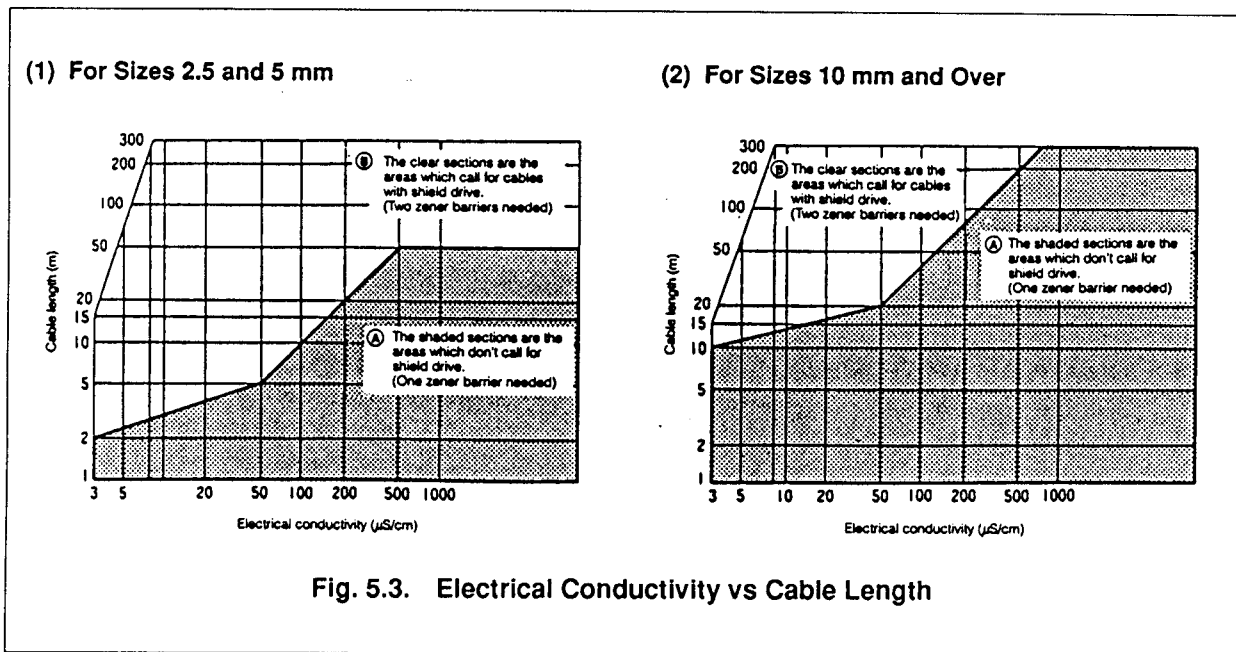
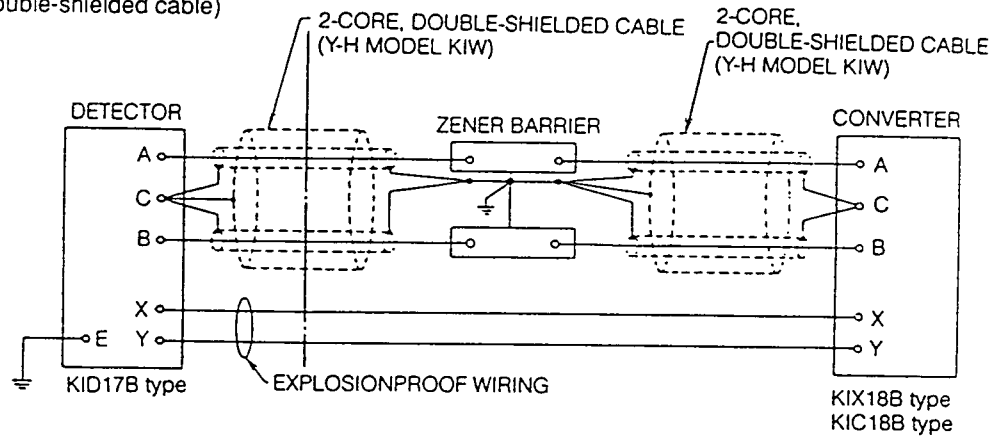


Fig. 5.3. Electrical Conductivity vs Cable Length

## 2) Connection Diagram for Division 1 Installation

- Example with Yamatake Corporation standard cable KIW Type  
(Signal cable: 2-core, double-shielded cable)



- Example with a cable on the market  
(Signal cable: 2-core, single-shielded cable)

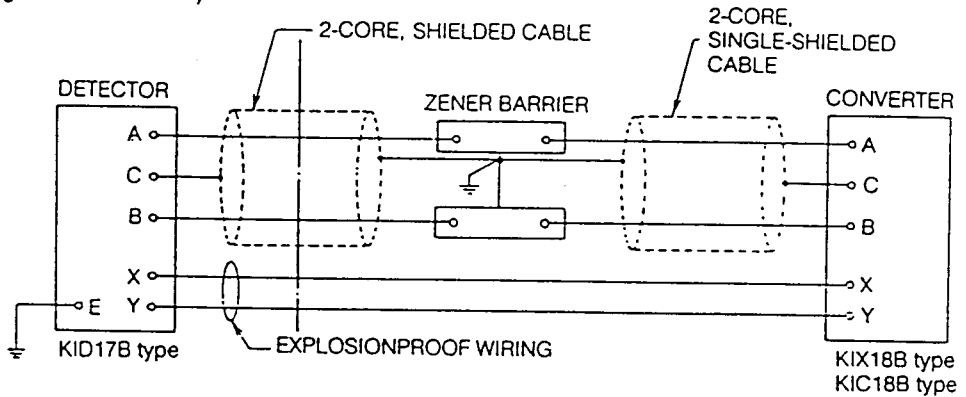


Fig. 5.4. ④ Section of Fig. 5.3

- Example with Yamatake Corporation standard cable KIW Type  
(Signal cable: 2-core, double-shielded cable)

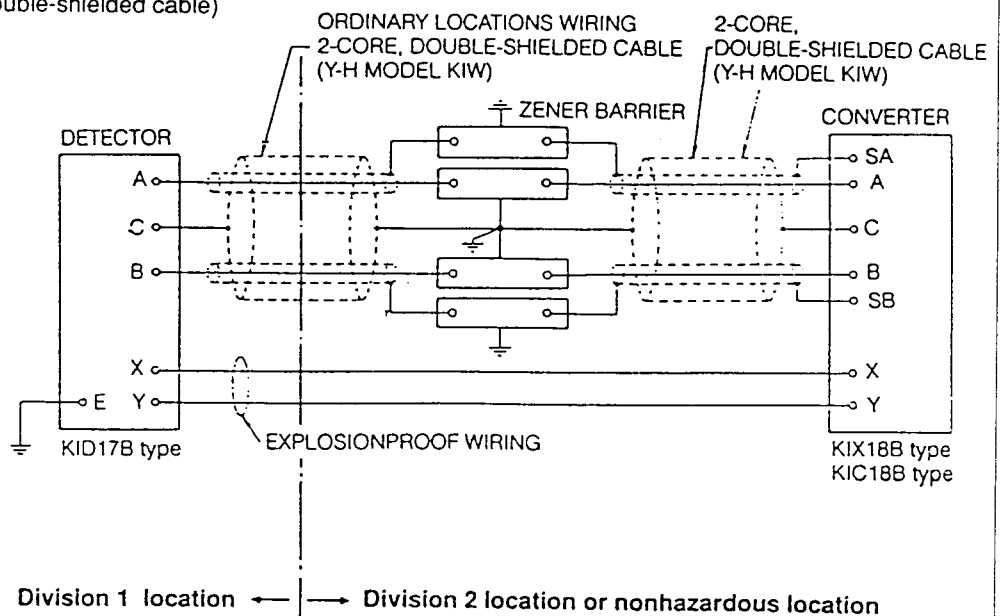
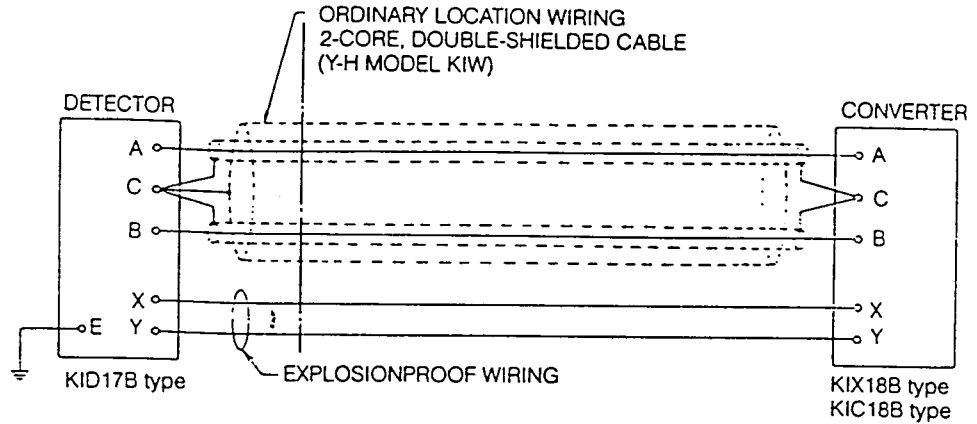


Fig. 5.5. ④ + ⑤ Section of Fig. 5.3

### 3) Connection Diagram for Division 2 where the measured fluid is not flammable

- Example with Yamatake Corporation standard cable KIW Type  
(Signal cable: 2-core, double-shielded cable)



- Example with a cable on the market  
(Signal cable: 2-core, single-shielded cable)

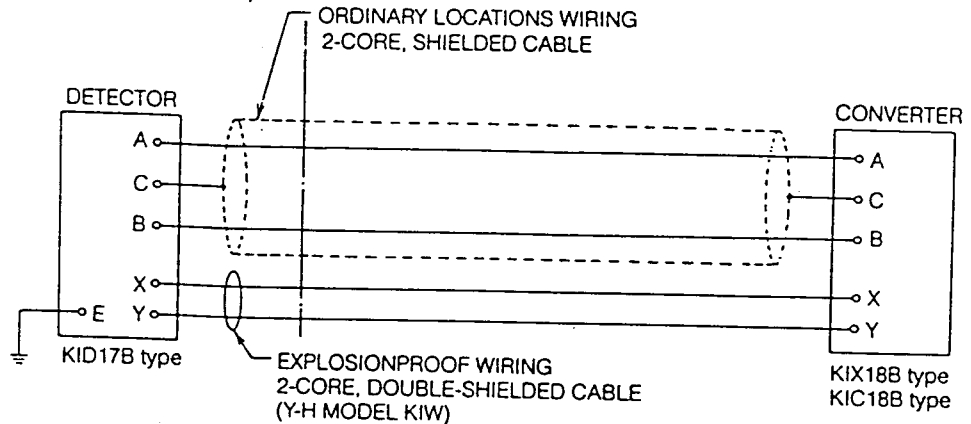
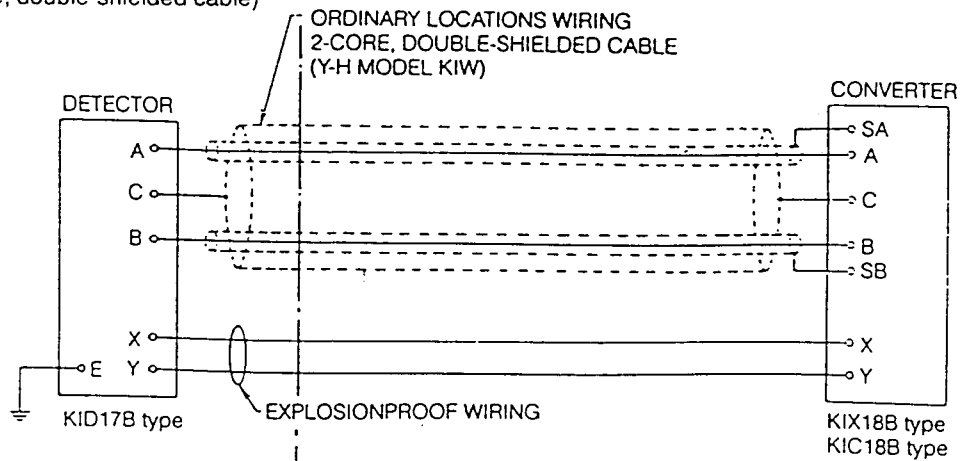


Fig. 5.6. (A) Section of Fig. 5.3

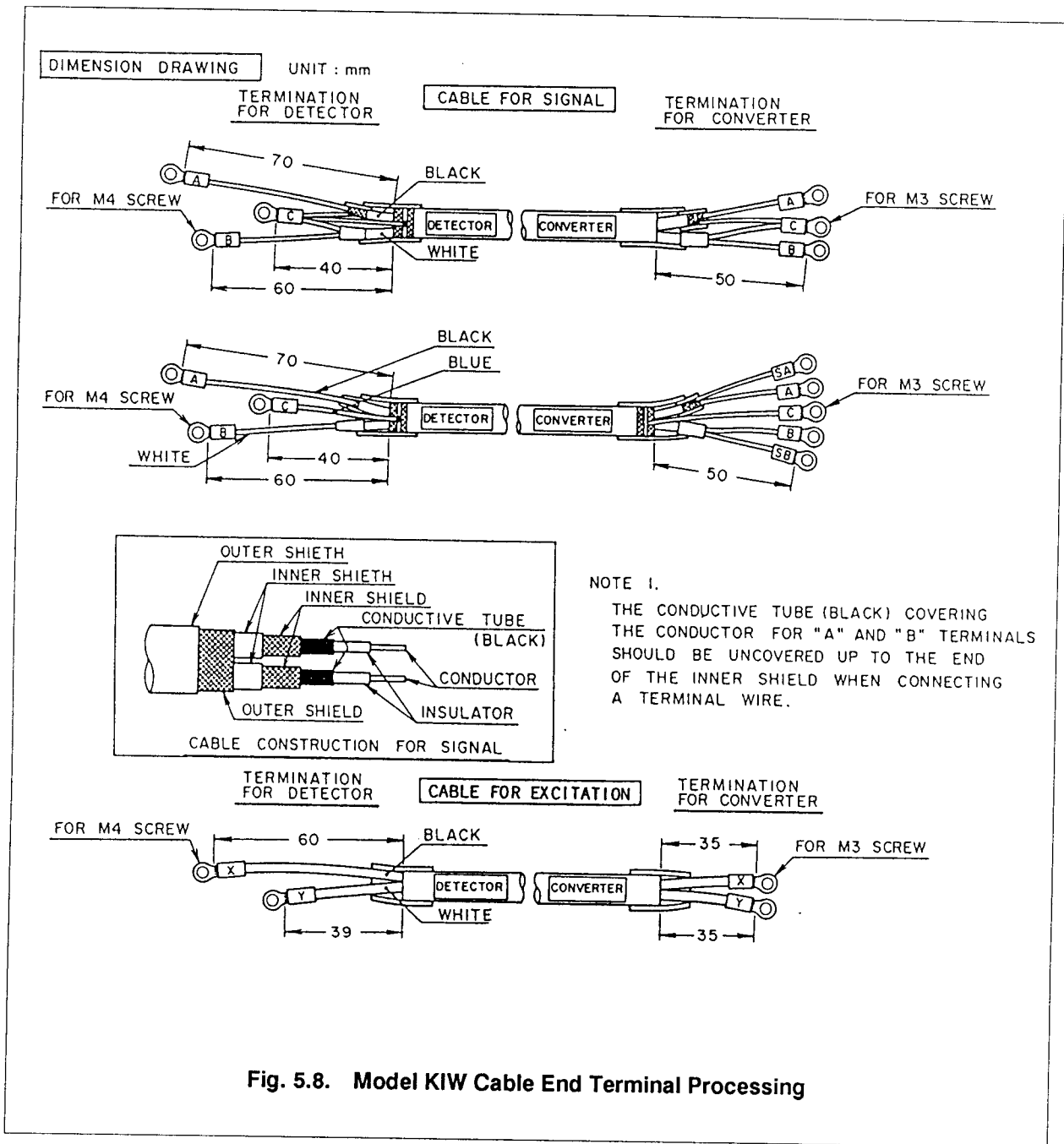
- Example with Yamatake Corporation standard cable KIW Type  
(Signal cable: 2-core, double-shielded cable)



Div. 2 location ← → Div. 2 location or nonhazardous location

Fig. 5.7. (A) + (B) Section of Fig. 5.3.

#### 4) Model KIW Cable End Terminal Processing



**Fig. 5.8. Model KIW Cable End Terminal Processing**

5) Types of Regular Cables Available on Market

When using cables other than Model KIW dedicated to MagneW, use equivalent ones shown in Table 5.1 in the condition that they meet the requirements of the shaded sections shown in Fig. 5.3.

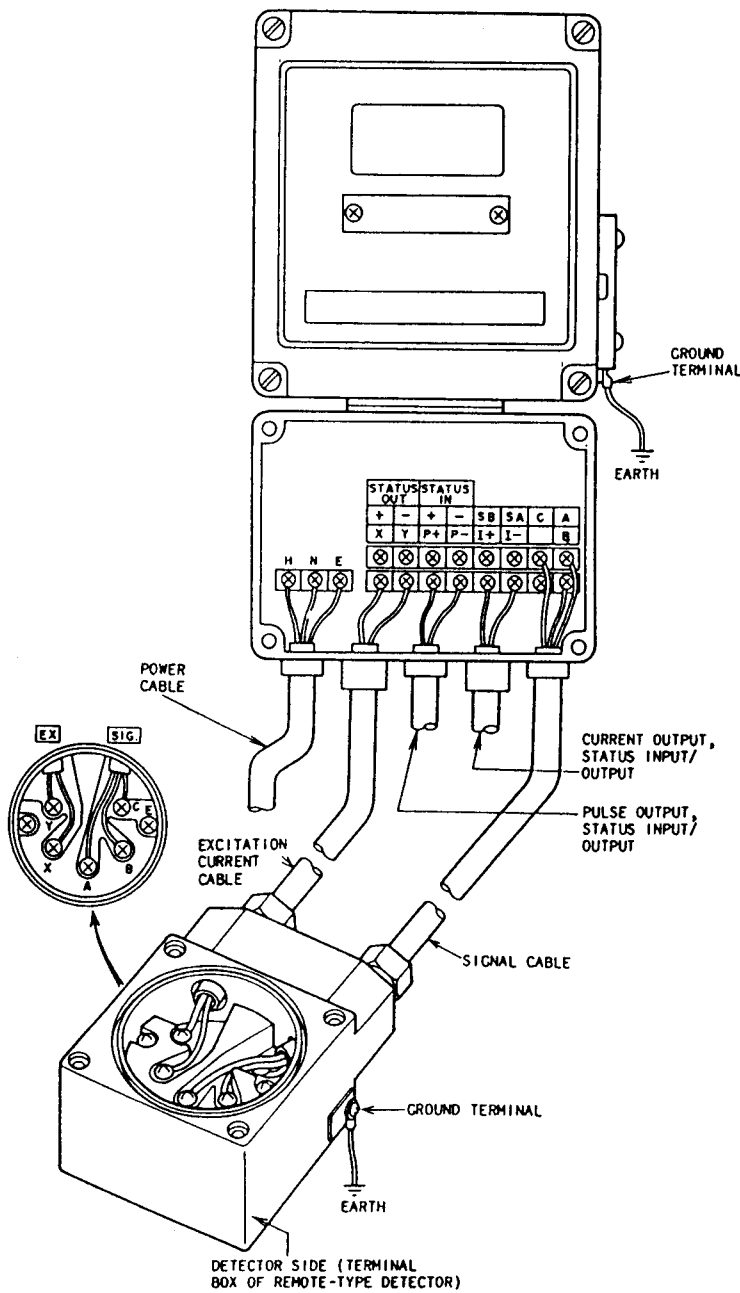
Table 5.1

Use	Type of cable (example)		Symbol (example)	Normal cross section	Finished OD
Signal cable	2 cores, shielded	Control cable, polyethylene insulated, polyethylene sheathed, copper braid shielded	CEE-SB 2□ - 2 <sup>C</sup>	2 mm <sup>2</sup>	11.4 mm
		Control cable, polyethylene insulated, vinyl sheathed, copper braid shielded	CEV-SB 2□ - 2 <sup>C</sup>		
Excitation current cable	2 cores	Control cable, polyethylene insulated, polyethylene sheathed	CEE 2□ - 2 <sup>C</sup>	2 mm <sup>2</sup>	11.4 mm
		Control cable, polyethylene insulated, vinyl sheathed	CEV 2□ - 2 <sup>C</sup>		
Power cable (within 500 meters)	2 cores or 3 cores*	Control cable, vinyl insulated, vinyl sheathed	CVV 2□ - 2 <sup>C</sup>	2 mm <sup>2</sup>	11.4 mm
		Cross-linked polyethylene insulated and vinyl sheathed cable	CV		
Current output cable	2 cores (Shielded)	Control cable, vinyl insulated, vinyl sheathed (copper tape shielded)	CVV-S 2□ - 2 <sup>C</sup> CVV 2□ - 2 <sup>C</sup>	2 mm <sup>2</sup>	11.4 mm
Pulse output cables	2 cores (Shielded)	Instrumentation cable, polyethylene insulated vinyl sheathed, copper braid shielded	KPEV-SB 1.25□ - 1 <sup>P</sup>	1.25 mm <sup>2</sup>	11.4 mm
Contact input/output cables	2 cores (Shielded)	Instrumentation cable, polyethylene insulated vinyl sheathed, copper braid shielded			11.4 mm

\* The 3-core cable should be used when grounding with the GND terminal of the converter case is unavailable.

### 5.3 Cable Connections

#### 1) Cable Connections for Detector and Converter



Converter (KIX18B) Terminals and Connections

Symbol	Connection
A	Flow signal input
B	
C	
SA	
SB	Current output
I+	
I-	Pulse output
P+	
P-	Excitation current output
X	
Y	Contact output
STATUS OUT+	
STATUS OUT-	Contact input
STATUS IN+	
STATUS IN-	

H(+)	Power supply
N(-)	
E	Chassis

Detector (KID) Terminals and Connections

Symbol	Connection
A	Flow signal output
B	
C	
X	Exciting current input
Y	

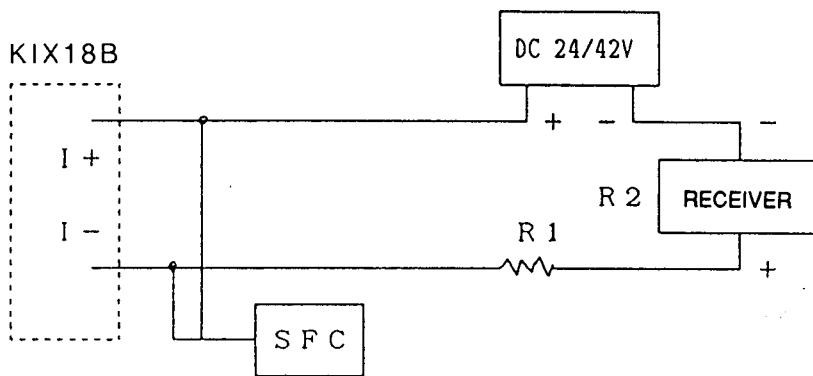
Fig. 5.9. Cable Connections for Detector and Converter

## 2) Electrical Connection for Current Output

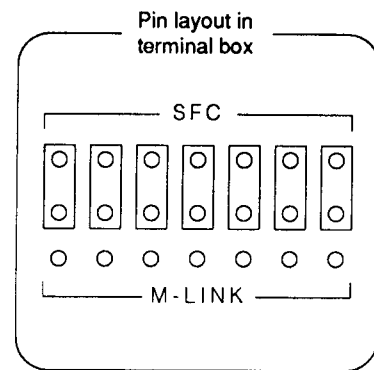
Note that an external power supply is needed for communication by SFC. (Be sure to turn off the power before changing pin setting in the terminal box.)

- When communication by SFC is employed

\* External DC power supply is needed.

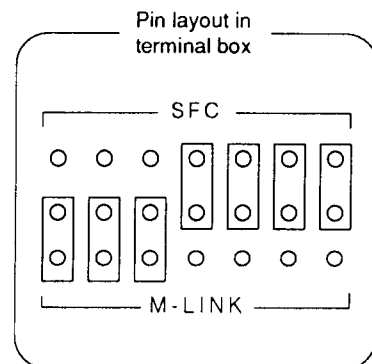
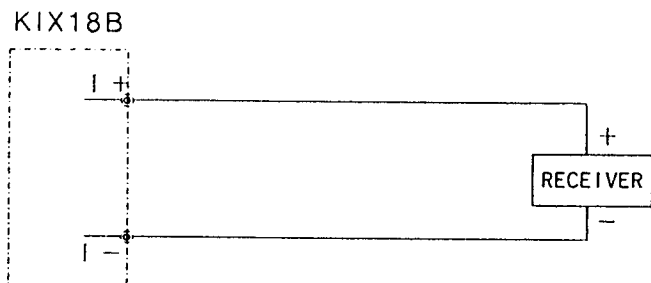


Note: External load resistors:  
 $R1 + R2 = 250 \Omega$  or more



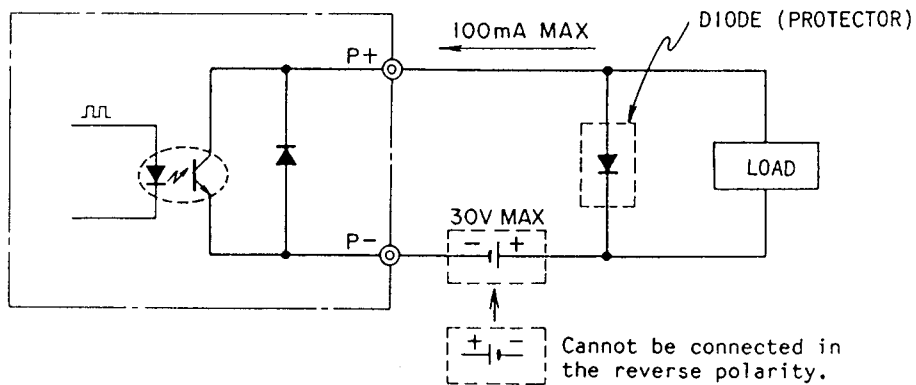
- When no communication by SFC is employed

Note: External load resistors:  
 $0 - 100 \text{ ohms}$

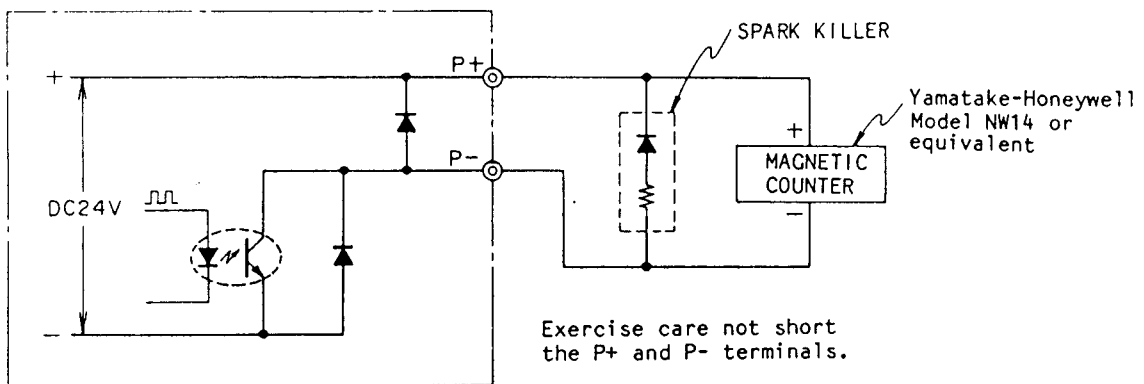


### 3) Pulse Output Connection

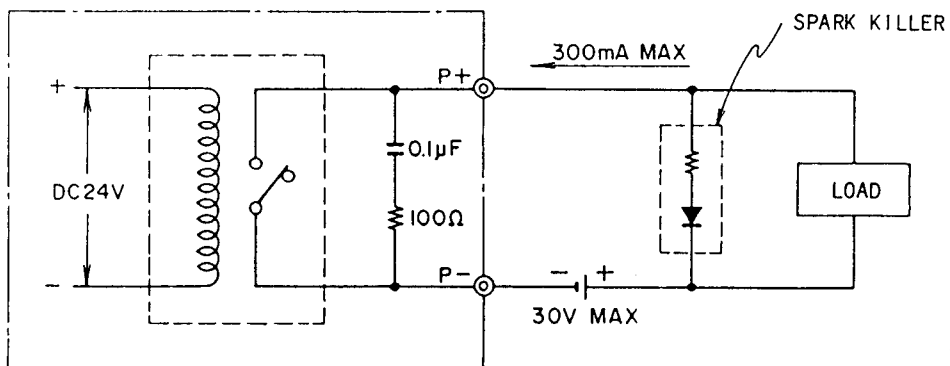
- Open-collector Pulse Output



- Magnetic Counter Drive Pulse Output



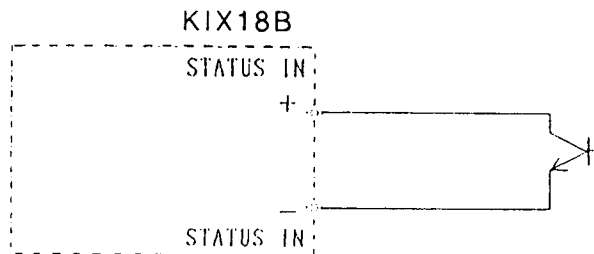
- Mercury Relay Contact Pulse Output



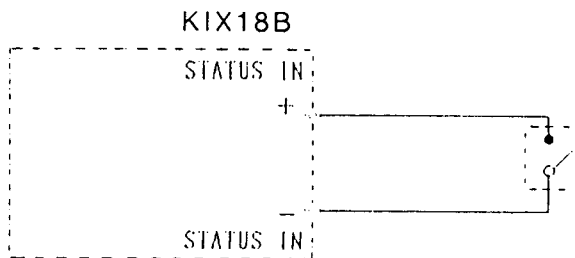
#### 4) Electrical Connections for Contact Input

A semiconductor contact signal or voltageless contact signal can be applied as illustrated below.

- Semiconductor Contact Input



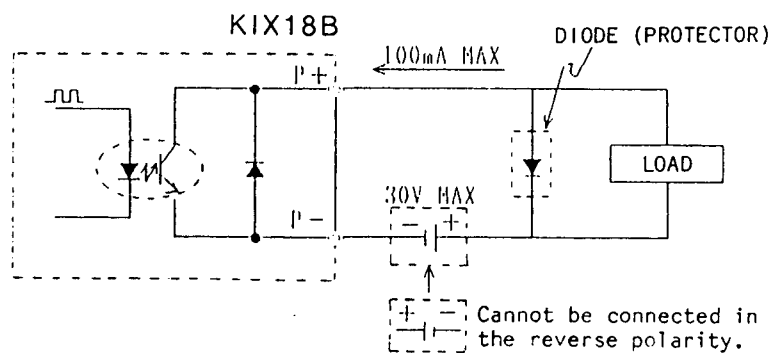
- Voltageless Contact Input



#### 5) Connections for Contact Output

The signal is of the open collector of a transistor. Pay attention to the voltage and polarity.

Note: 30 VDC max.  
100 mA max.  
(Resistive load)



## 5.4 Check of Electrical Connections

When the electrical connections are complete, check them once more to make sure that they are correct. Loop check functions are available as shown below.

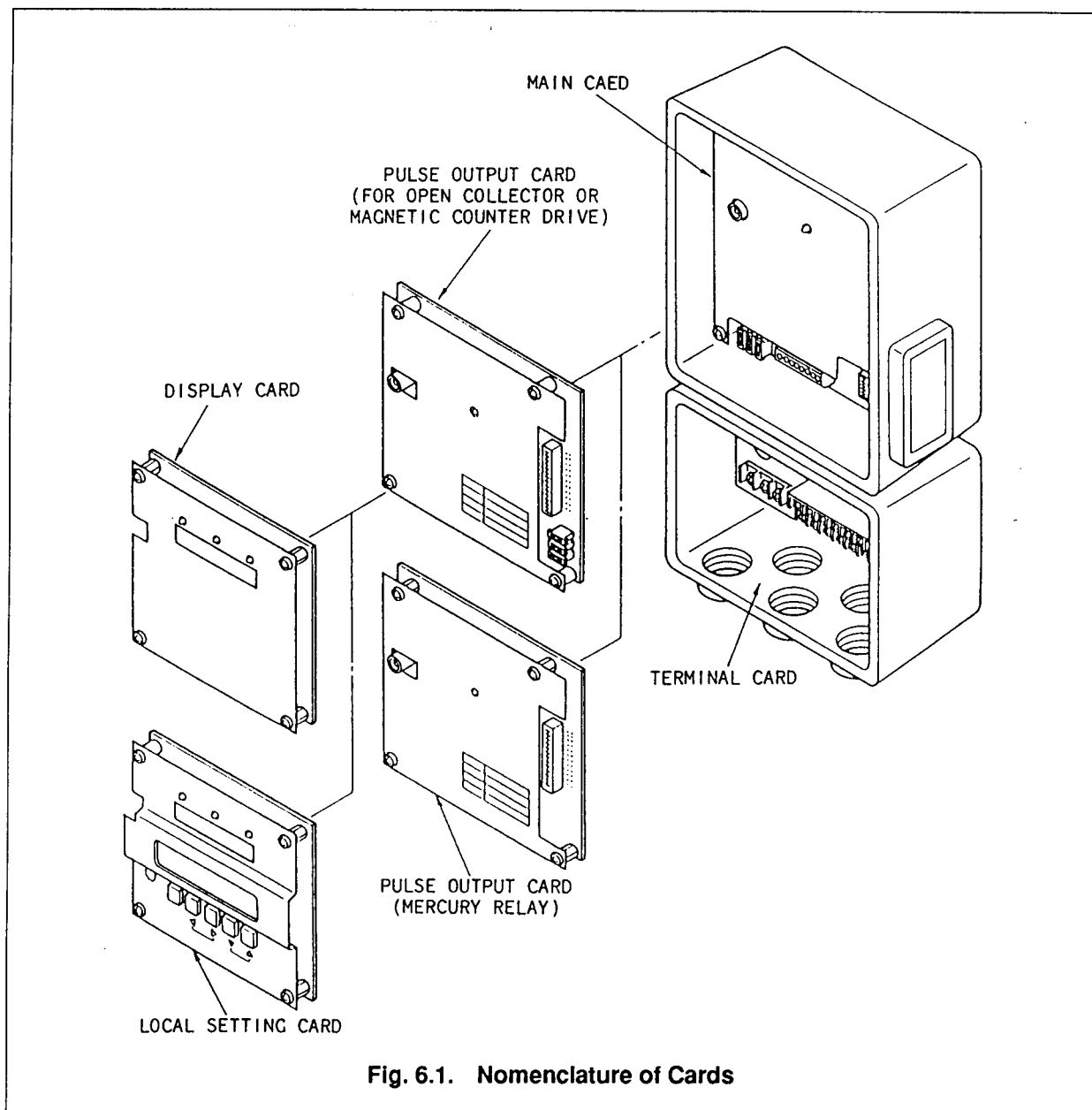
Loop Check Item	To Effect the Check Function
<p>To check that the connections for the receiver are correctly done.</p> <p>The converter has a function as a constant-current source and can deliver a current within a range of 0 – 125%.</p>	<p>OUTPUT CHECK MODE (See 6.5.26)</p>
<p>To check that the connections for the receiving counter (pulse output) are correctly done.</p> <p>The converter has a function as a pulse generator and can deliver a range of 0 – 125%.</p>	<p>OUTPUT CHECK MODE (See 6.5.27)</p>
<p>To check that the connections for the contact input (STATUS IN) are correctly done.</p> <p>It can be confirmed that the contact input signal is being correctly received.</p>	<p>OUTPUT CHECK MODE (See 6.5.28)</p>
<p>To check that the connections for the device to which the contact output (STATUS OUT) is fed are correctly done.</p> <p>The contact output can be ON/OFF-operated.</p>	

## 6. OPERATION DESCRIPTION

Normally, you may start operating the Converter when you have read up to Section 6.4 "Simple Operation Examples." As the Converter is delivered to you, its parameters are set as mentioned in the KIX Setting Data List, in conformity with your order specifications. If further adjustments are needed, see Sections 6.5 and 6.6.

### 6.1 Nomenclature of Cards

The nomenclature of the componential cards are as shown in Fig. 6.1.



**Fig. 6.1. Nomenclature of Cards**

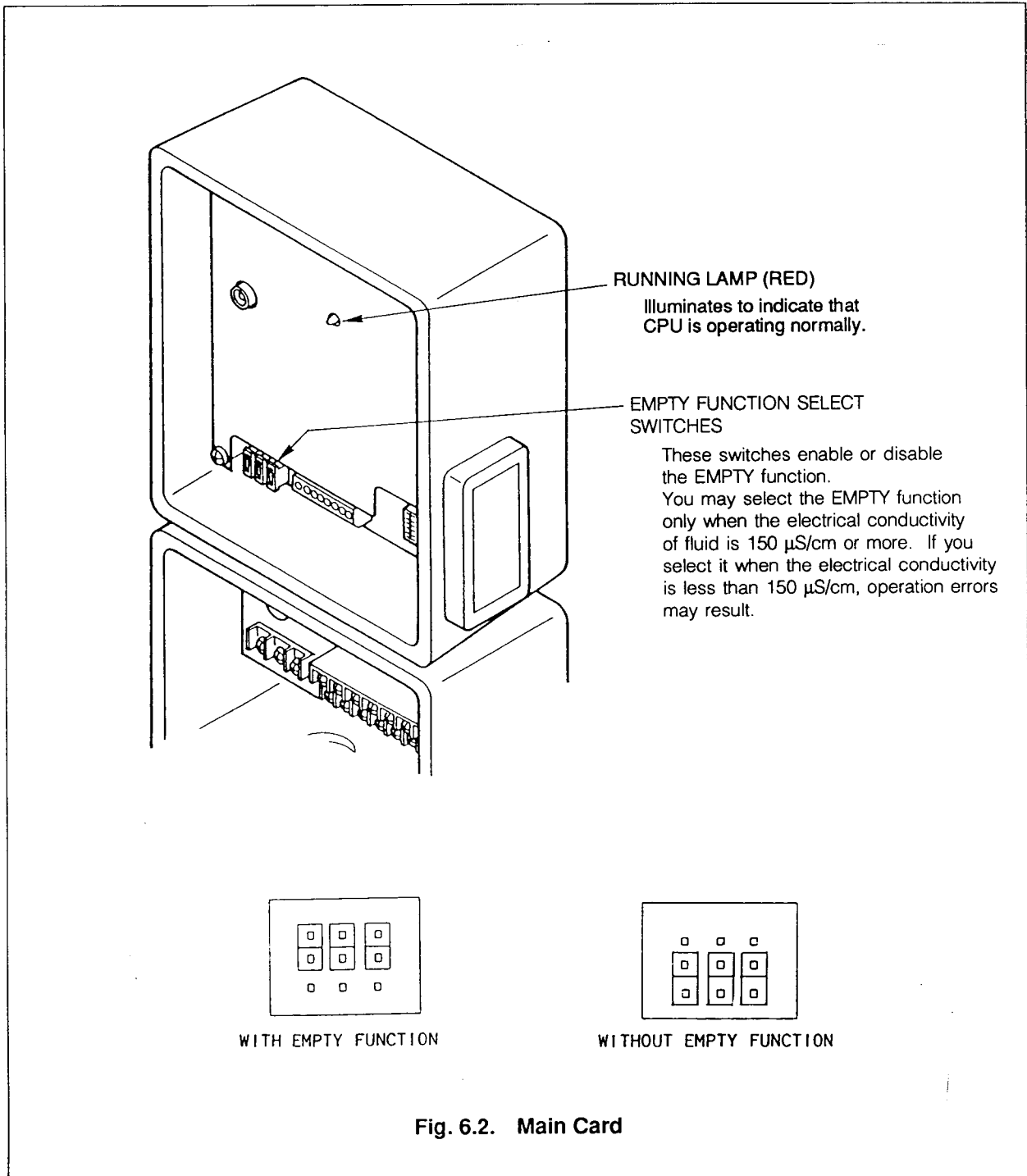
The main card, pulse output cards, display card and local setting card are completely unit structured and can be readily installed or removed.

**Note:** Be sure to turn off power before installing or removing a card(s) or changing jumper pins.

## 6.2 Functions of Cards

### 1) Main Card

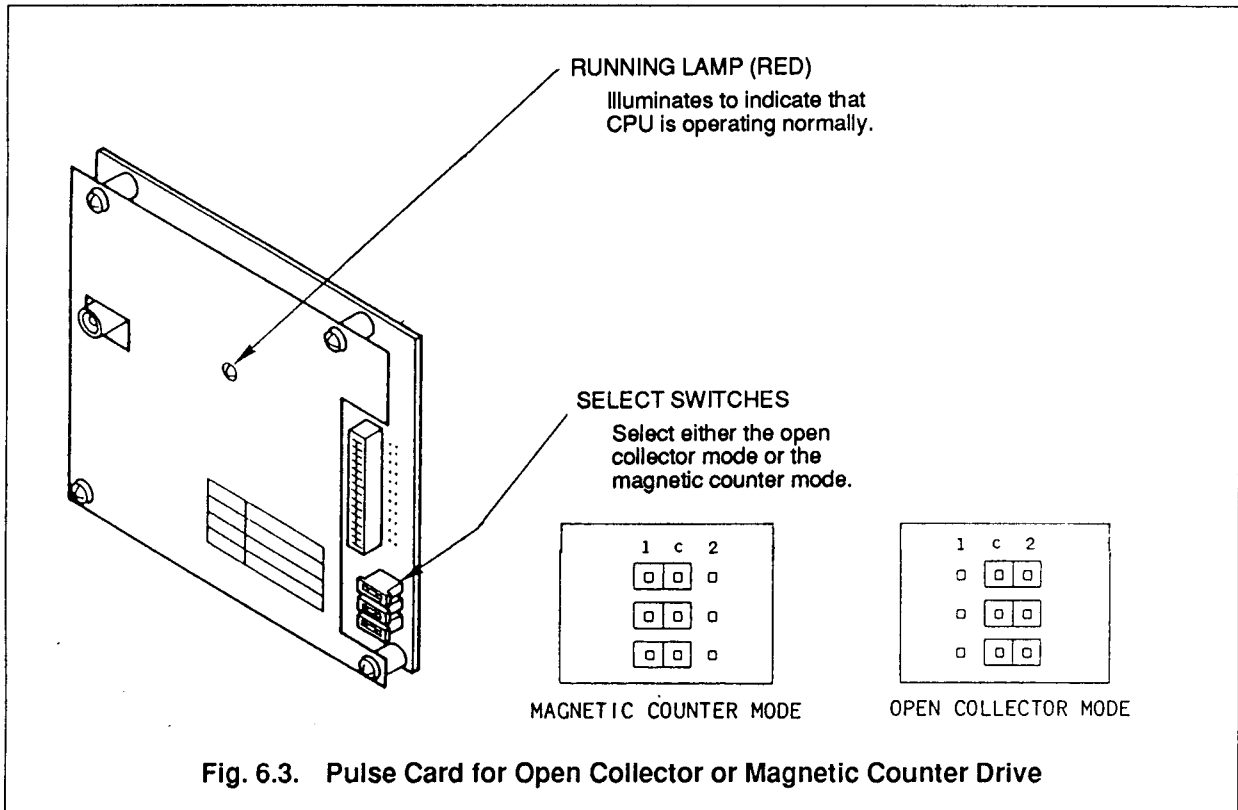
This card has the basic converter circuits and current output circuit, and allows the converter to operate without other functional cards (namely, pulse cards, display card, and local setting card). When this card alone is used, the available signals are the 4 – 20 mA DC output signal and status input/output signal.



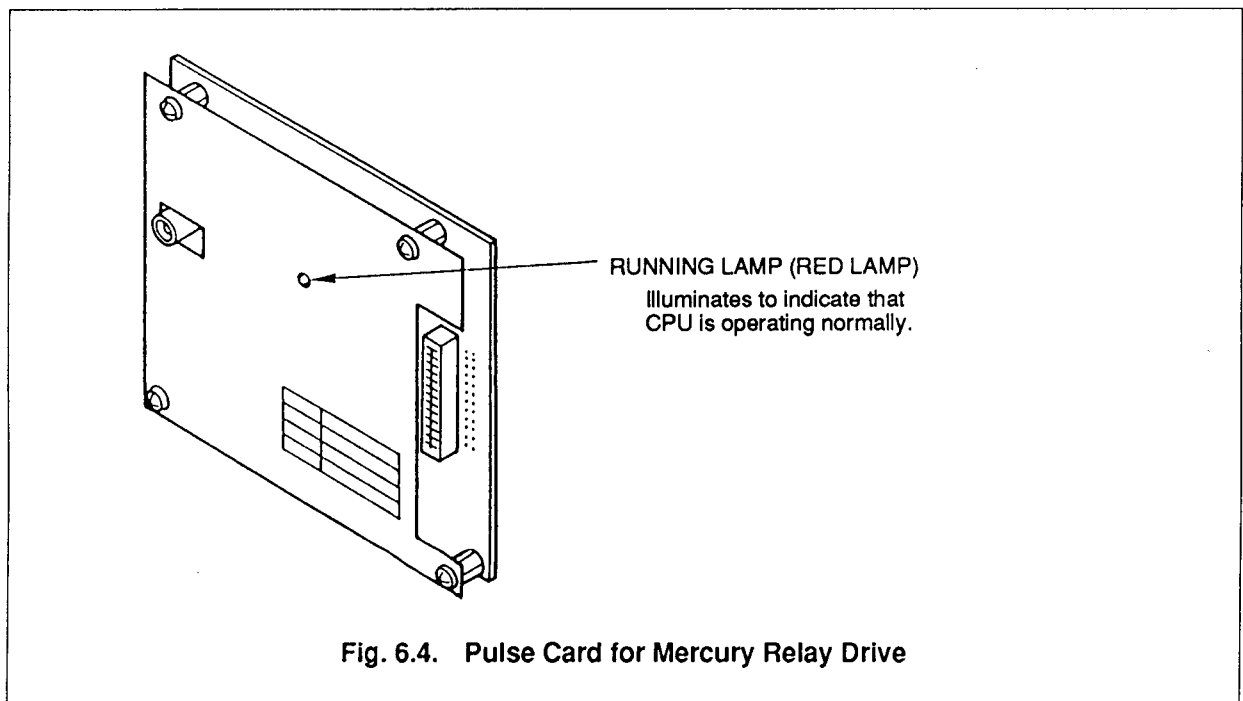
## 2) Pulse Cards

There are two types of pulse cards, namely, pulse card for open collector or magnetic counter drive and pulse card for mercury relay drive. These cards deliver pulse output signals.

- Card for open collector or magnetic counter drive



- Card for mercury relay drive



### 3) Display Card

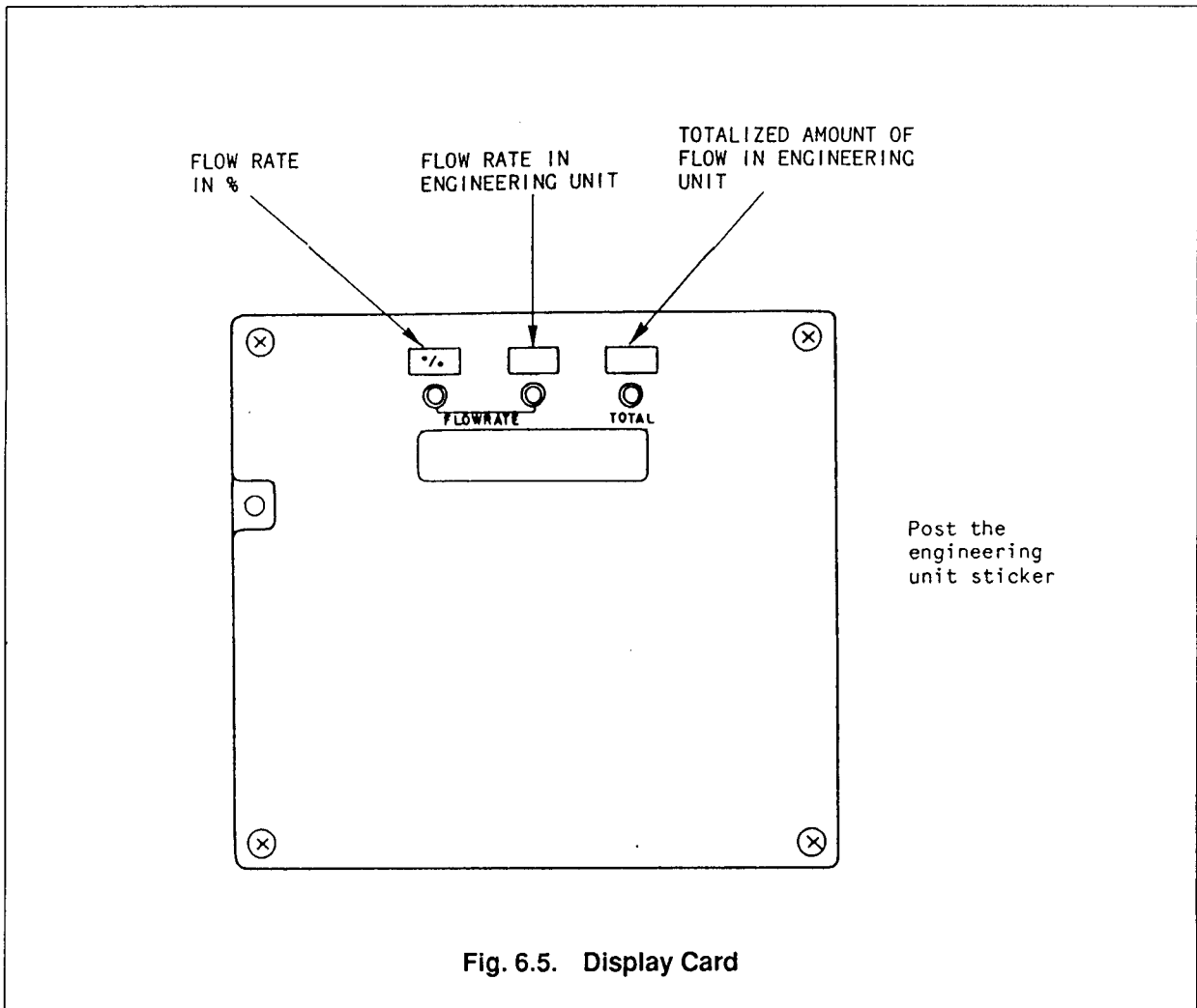
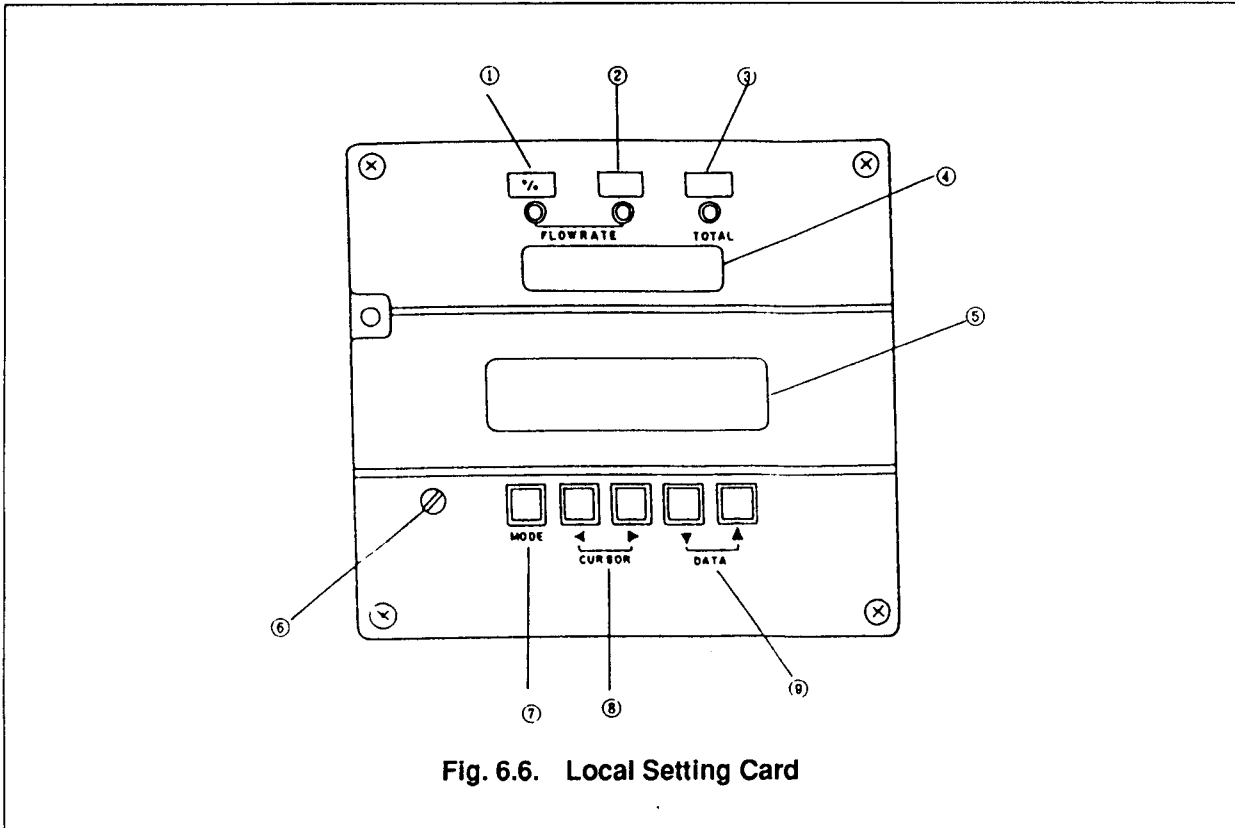


Fig. 6.5. Display Card

#### 4) Local Setting Card (LSC)

This card has a flow display section and data setting section as shown in Fig. 6.6 below.



**Fig. 6.6. Local Setting Card**

(1) Flow rate display select lamp [%] (red lamp)

Illuminates to indicate that flow (%) is displayed on the readout.

(2) Flow rate display select lamp [ENGINEERING UNIT] (green lamp)

Illuminates to indicate that flow (in engineering units) is displayed on the readout.

(3) Totalized flow display select lamp [TOTAL] (yellow lamp)

Illuminates to indicate that totalized flow (in engineering units) is displayed on the readout.

(4) Readout

This is a 6-digit 7-segment LED readout which displays the flow rate or total flow.

(5) Data setting display

This is a 16-column 2-line LCD which displays the various parameters to be set as data.

(6) Viewing angle control

Allows to adjust the LCD to an optimal viewing angle.

(7) MODE key

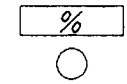
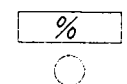
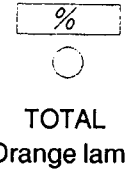
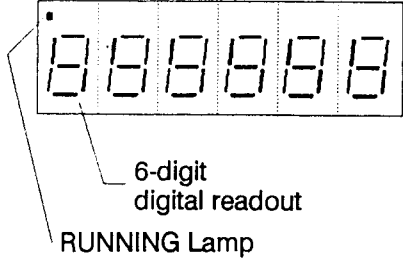
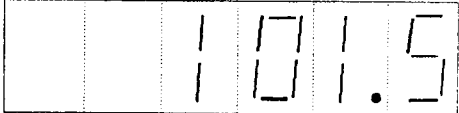
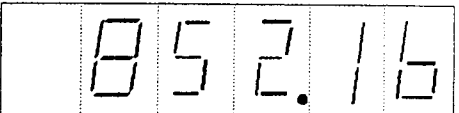
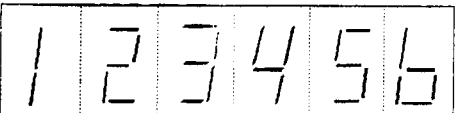
Selects either the MEASURING mode or the SETTING mode. The set data is store in NVM (non-volatile memory).


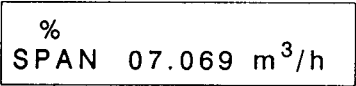


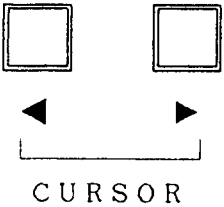
(8) CURSOR keys

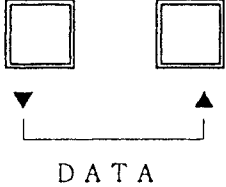

Move the cursor to the required position on the data setting display.

(9) DATA keys

These keys are used to set or modify data or to change displays. When the cursor is at the uppermost left (\*, #, >), the display is changed to the next one if you press the  (▲ key) or to the preceding one if you press the  (▼ key). When the cursor is not at the above position, the  (▲ key) and  (▼ key) can be used to set or modify data.

	Display	Description
①	 <p>(Red lamp)</p>	<p>Illuminates to indicate that the readout value is the flow rate measured in %.</p>
②	 <p>(Green lamp)</p>	<p>Illuminates to indicate that the readout value is the flow rate measured in an engineering unit. The available engineering units are Volume unit: m<sup>3</sup>, l, cc, gallon, Kilogallon, miligallon Time unit: d, h, m, s.</p>
③	 <p>TOTAL (Orange lamp)</p>	<p>Illuminates to indicate that the readout value is the totalized flow in an engineering unit. The available engineering units are m<sup>3</sup>/p, l/p, cc/p, B/P, G/P, mG/P, KG/P</p>
④	<p>Readout</p>  <p>6-digit digital readout RUNNING Lamp</p>	<p>The readout section has a 6-digit digital readout. The RUNNING lamp blinks when in measurement; it illuminates continuously when in the setting mode.</p> <p>Example of readout when in flow rate measurement in %.</p>  <p>Example of readout when in flow rate measurement in engineering unit.</p>  <p>Example of readout when in totalized value measurement.</p> 

	Display	Description
⑤	 <p>Data Setting Display</p>	<p>This is a 16-column 2-line LCD which displays the various parameters to be set at data.</p> <p>Example of display when in measurement</p> 
⑥	 <p>Viewing Angle Control</p>	<p>Allows to adjust the LCD to an optimal viewing angle.</p>
⑦		<p>Selects the MEASURING mode or the SETTING mode.</p>
⑧		<p>Move the cursor to the required position on the data setting display.</p>

	Display	Description
⑨		<p>Modify or change data setting display.</p> <p>When the cursor is at the uppermost left (*, #, &gt;), displays are changed.</p> <div data-bbox="757 432 1169 517" style="border: 1px solid black; padding: 5px;">       * OPERATING MODE     </div> <p style="margin-left: 40px;">CURSOR</p> <p>When the cursor is under a numeral, the numeral is changed.</p> <div data-bbox="757 685 1169 770" style="border: 1px solid black; padding: 5px;">       * DAMPING 01 s     </div> <p style="margin-left: 40px;">CURSOR</p> <p>When the cursor is under a decimal point, the decimal point is shifted.</p> <div data-bbox="757 943 1169 1028" style="border: 1px solid black; padding: 5px;">       # SPAN 07.069 1,000 m/s        m<sup>3</sup>/h     </div> <p style="margin-left: 40px;">CURSOR</p> <p>When the cursor is under the READY, operation will start as you press the  key.</p> <div data-bbox="757 1218 1169 1303" style="border: 1px solid black; padding: 5px;">       * AUTO ZERO READY     </div> <p style="margin-left: 40px;">CURSOR</p>

### 6.3 Data Setting with LSC (Local Setting Card)

#### 1) Description of Mode

Refer to the next page.

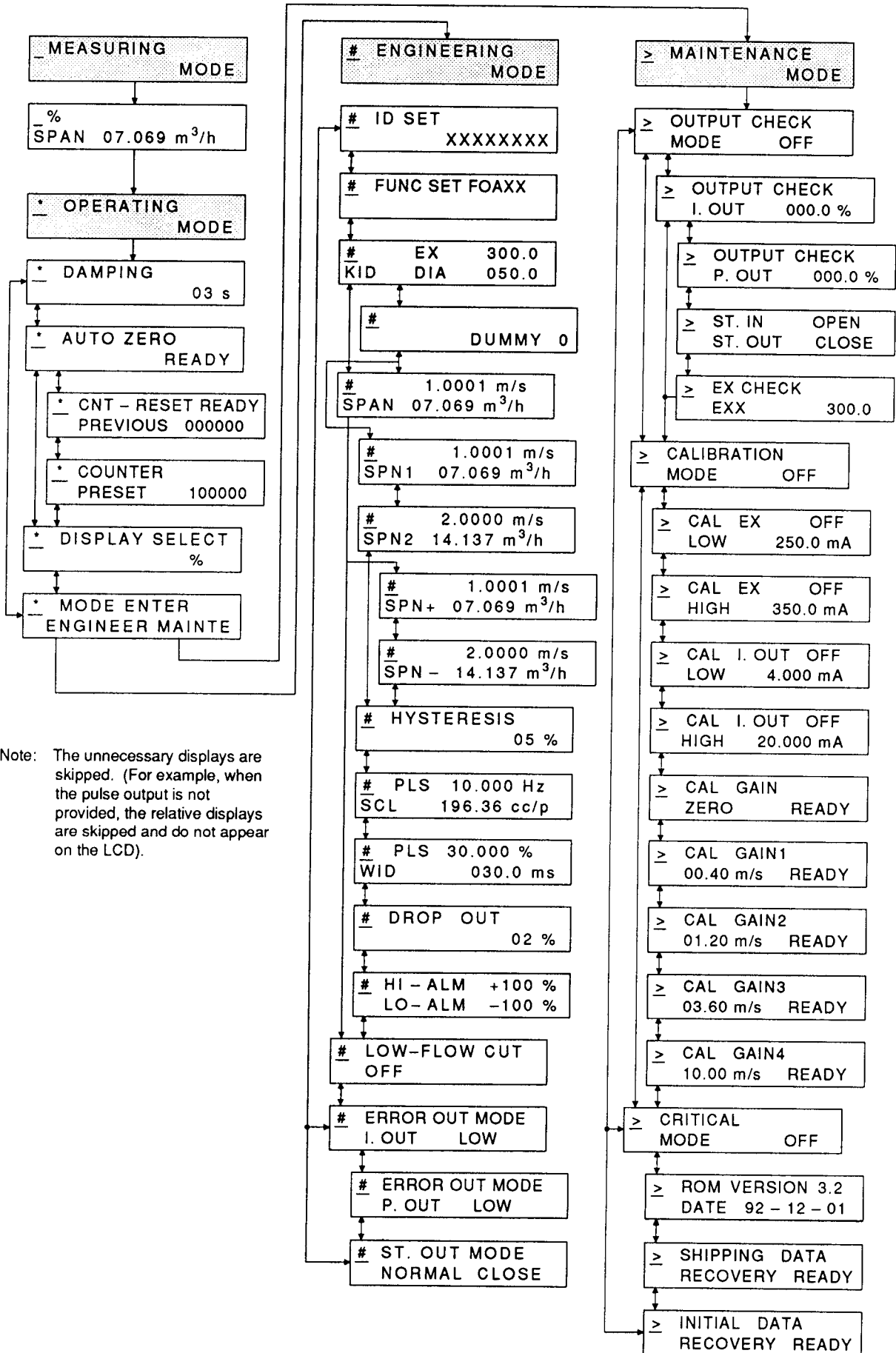
**MEASURING MODE** : The mode that the instrument is measuring the flow.

**OPERATING MODE** : The mode which allows the operator to set or change data items which frequently need to be set or changed (such as damping time constant, auto zero adjust, counter reset, counter preset value, and display) when in start up operation for example.

**ENGINEERING MODE** : The mode which allows the engineer to set or change data items which less frequently need to be set or changed (such as ID, specified functions, detector data, flow span, hysteresis width, pulse data, low flow cut off, and error output etc.)


**MAINTENANCE MODE** : This mode is for servicing the KIX20 when in routine maintenance or instrument failure, and allows check and adjustment functions (such as loop check, output calibration, and gain calibration).

## 2) Configuration of Displays



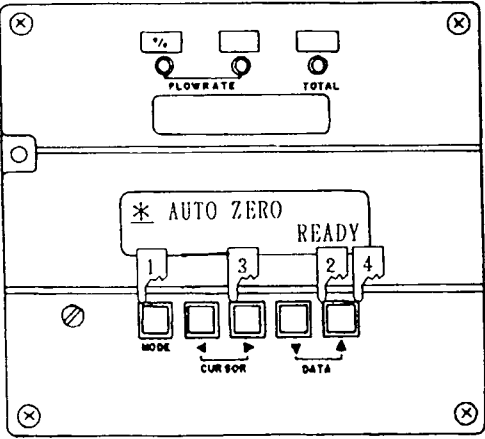
## 6.4 Simple Operation Examples (Basic Examples)

### Procedure






- Step 1. Fill the detector with stationary liquid.
- Step 2. Turn on the converter power. Allow a stabilization period of approximately 10 minutes.
- Step 3. Check the exciting current (EX) and the range.  
When the detector and converter are purchased in conjunction, the above items are set at the manufacturer's factory before shipment. The setting data at the factory before shipment are indicated in the instruction **KIX SECTION DATA** on the back surface of the converter cover. Check the items referring to the data.
- Step 4. Zero Adjustment  
For automatic zero adjustment with the local setting card (LSC), press the keys as indicated with the  marks in the below illustration.

### AUTOMATIC ZERO ADJUSTMENT PROCEDURE

(Data is written on memory after zero adjustment is complete.)



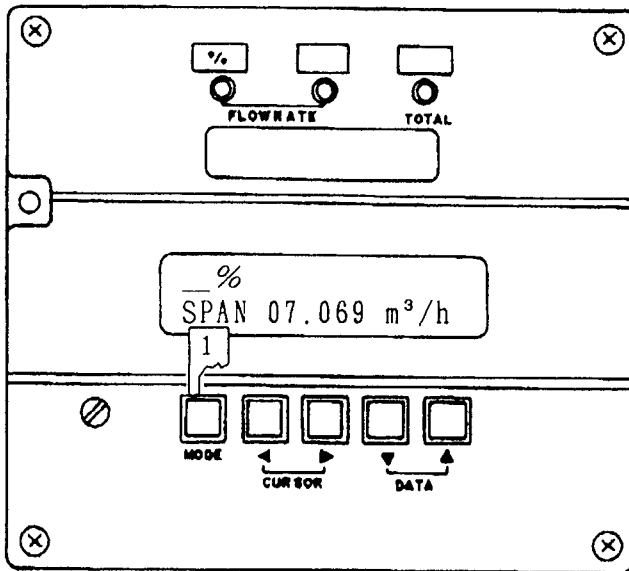
Preparation: Fill the detector with stationary liquid. Zero adjustment can be made only when the flow velocity is less than  $\pm 0.2$  m/s.

Step	Display	Description
 1	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">% SPAN 10.000 m<sup>3</sup>/h</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">* OPERATING MODE</div> <div style="text-align: center; margin-bottom: 5px;">2 sec late ↓</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">* DAMPING 03 s</div>	<p>Example of display when in measurement (MEASURING MODE)</p> <p>Move the cursor to the READY position. (Make the fluid stationary.)</p> <p>With step  4, start automatic zero adjustment.</p> <p>Zero adjustment is complete.</p>
 2	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">* AUTO ZERO READY</div>	
 3	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">* AUTO ZERO READY</div>	
 4	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">* AUTO ZERO ON</div> <div style="text-align: center; margin-bottom: 5px;">After ON-OFF (about 20 sec) ↓</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">* AUTO ZERO READY</div>	
<div style="border: 1px solid black; border-radius: 10px; padding: 5px; display: inline-block;">                     To reset to the measuring mode, press the MODE key.                 </div>		

- Step 5. By the above procedure, the preparation for operation is complete. Start operating the instrument.

## 6.5 Operating Procedure

- 1) To set to the MEASURING MODE



Comments: For span setting of 7.069 m<sup>3</sup>/h, for example.

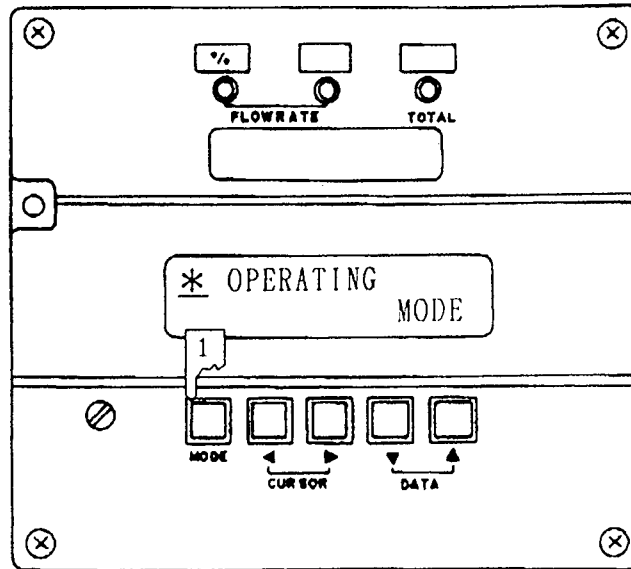
- As you turn on power of the instrument (converter), it is automatically set to the MEASURING MODE.

Procedure	Display	Comments
Turn on power	<div style="border: 1px solid black; padding: 5px; text-align: center;">_ SELF CHECK MODE</div> <p style="text-align: center;">↓ 5 sec later</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">_ MEASURING MODE</div> <p style="text-align: center;">↓ 1 sec later</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">% SPAN 07.069 m<sup>3</sup>/h</div>	

- To change to the MEASURING MODE from other mode

Procedure	Display	Comments
<div style="border: 1px solid black; padding: 5px; display: inline-block;">1</div>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Other display</div> <p style="text-align: center;">↓ 1 sec later</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">_ MEASURING MODE</div> <p style="text-align: center;">↓ 1 sec later</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">% SPAN 07.069 m<sup>3</sup>/h</div>	

2) To set to the OPERATING MODE




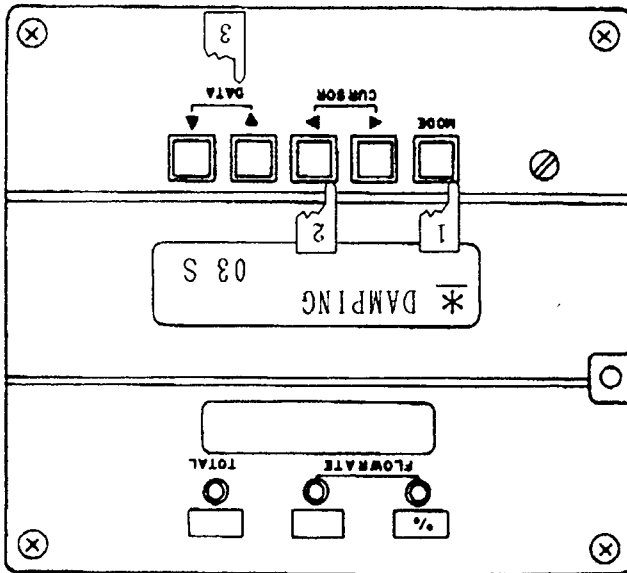
Procedure	Display	Comments
<p data-bbox="279 1391 341 1473">1</p>	<div data-bbox="514 1285 906 1357" style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">                     % SPAN 10.000 m<sup>3</sup>/h                 </div> <div data-bbox="514 1384 906 1456" style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">                     * OPERATING MODE                 </div> <p data-bbox="738 1464 837 1487" style="text-align: center; font-size: small;">↓ 2 sec later</p> <div data-bbox="514 1496 906 1568" style="border: 1px solid black; padding: 2px;">                     * DAMPING 04 s                 </div>	<p data-bbox="989 1272 1313 1352">Example of display when in measurement (MEASURING MODE)</p> <p data-bbox="989 1391 1266 1449">Set to the OPERATING MODE</p>

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Select other displays with the ▼ and ▲ keys.

3) To set or change the damping time constant

(The data which is set by  is stored in memory.)






Comments: Employed when the output is pulsating and must be smoothed.

Default value : 3 sec

Setting range : 0 sec\*, 4 sec  
0.5 sec\*, 5 sec  
1 sec, 10 sec  
2 sec, 50 sec  
3 sec, 100 sec

\*: For setting "0 sec" or "0.5 sec", press the DATA keys for more than three seconds.

Example: To change 3 sec. to 4 sec.

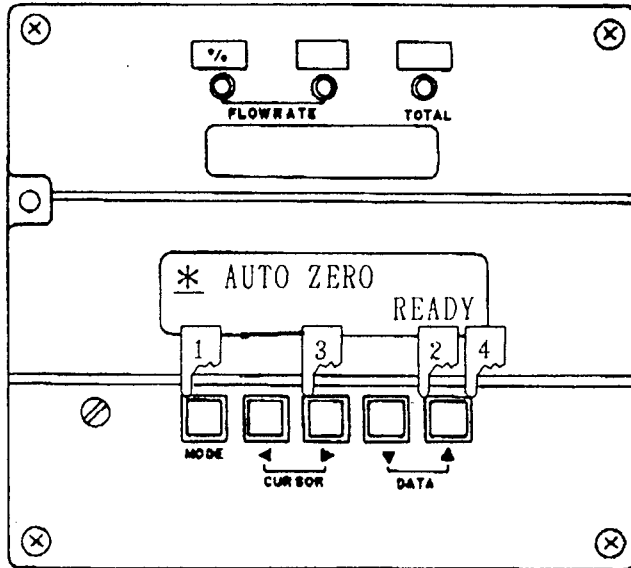
Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">% SPAN 10.000 m<sup>3</sup>/h</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* OPERATING MODE</div> <div style="text-align: center; margin-bottom: 5px;">↓ 2 sec later</div> <div style="border: 1px solid black; padding: 5px;">* DAMPING 03 s</div>	Example of display when in measurement (MEASURING MODE).
	<div style="border: 1px solid black; padding: 5px;">* DAMPING 03 s</div>	Move the cursor to the numeral to be changed.
	<div style="border: 1px solid black; padding: 5px;">* DAMPING 04 s</div>	Change the numeral to the required value with the ▼▲ keys.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to \* with the ► key and then select other displays with the ▼ and ▲ keys.

4) For automatic zero adjustment

(Data is stored in memory when zero adjustment is completed.)



(Preparation)

Fill the detector with stationary liquid.



For zero adjustment flow velocity of within  $\pm 0.2$  m/s can be regarded as the flow is stationary.

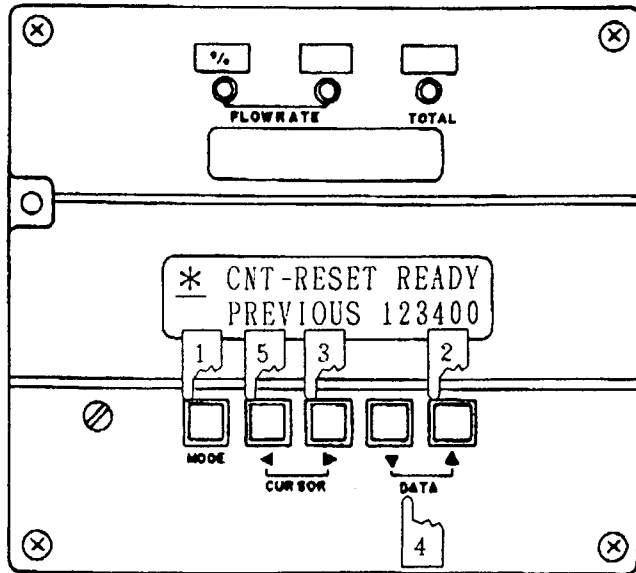
Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">% SPAN 10.000 m<sup>3</sup>/h</div>	Example of display when in measurement (MEASURING MODE).
1	<div style="border: 1px solid black; padding: 5px; text-align: center;">* OPERATING _ MODE</div> <p style="text-align: center;">↓ 2 sec later</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">* DAMPING _ 04 s</div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">* AUTO ZERO _ READY</div>	Move the cursor to <u>READY</u> .  After checking that fluid is stationary, start automatic zero adjustment with  key.  Automatic zero adjustment is complete.
3	<div style="border: 1px solid black; padding: 5px; text-align: center;">* AUTO ZERO _ <u>READY</u></div>	
4	<div style="border: 1px solid black; padding: 5px; text-align: center;">* AUTO ZERO _ ON</div> <p style="text-align: center;">↓ nearly 20 sec later</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">* AUTO ZERO _ <u>READY</u></div>	

To return to the MEASURING MODE: Press the MODE key.






To continue setting: Move the cursor to \* with the ► key and then select other displays with the ▼ and ▲ keys.

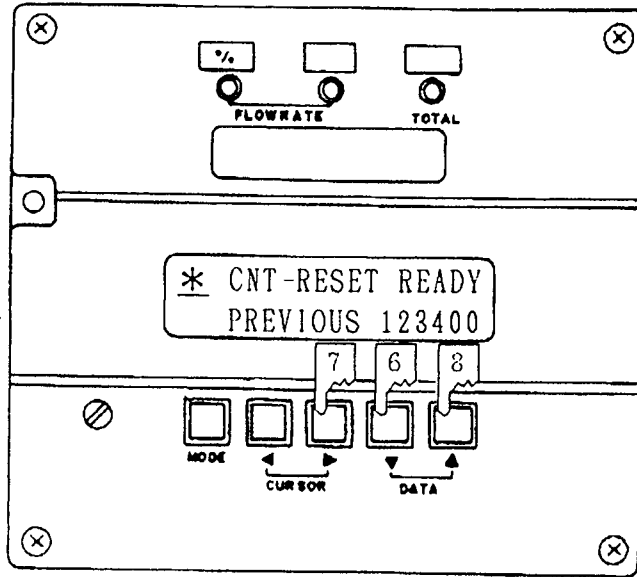
5) To reset the internal counter

(Data is stored in memory by the procedures of  and  .)



Note: To reset the internal counter, specify a count with the DISPLAY SELECT of Item 7).

Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">% SPAN 10.000 m<sup>3</sup>/h</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* OPERATING MODE</div> <p style="text-align: center; margin: 0;">↓ 2 sec later</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DAMPING 04 s</div>	Example of display when in measurement (MEASURING MODE).
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT %</div>	Required number of times
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT %</div>	Move the cursor to %.
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT COUNT</div>	Set the COUNT with the ▼▲ keys.
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT COUNT</div>	Return the cursor to the asterisk (*).
	↓ (to be continued)	





Example: The counter is reset when the totalize value is 123456.

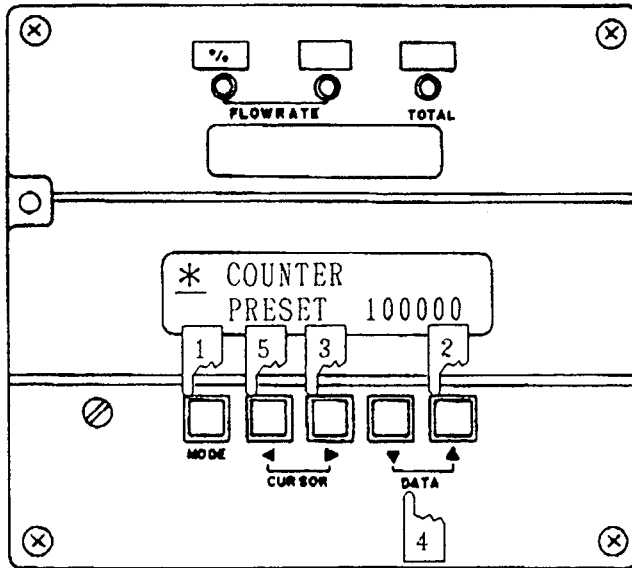
Procedure	Display	Comments
	* CNT - RESET READY PREVIOUS 123400	A counter reset message will appear.
	* CNT - RESET READY PREVIOUS 123400	Move the cursor to the <u>READY</u> .
	* CNT - RESET <u>ON</u> PREVIOUS 123456 ↓ 1 sec later * CNT - RESET READY PREVIOUS 123456	Reset the internal counter by pressing the  key.  The numerical value is that existing when the counter was reset.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to \* with the ► key and then select other displays with the ▼ and ▲ keys.

6) To set or change the counter preset value

(Data is stored in memory at the procedure of  and  .)








Notes: To set or modify the counter preset value, specify a count with the DISPLAY SELECT of Item 7).

When F0B13, F2B33 or F4B33 is selected for the function in the ENGINEERING MODE, a display with the counter preset value will appear.

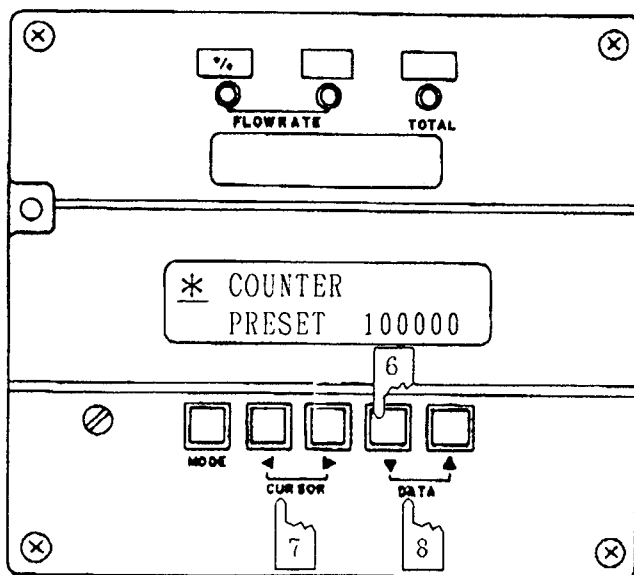
Default value : 100000

Setting range : 1 – 999999

Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">% SPAN 10.000 m<sup>3</sup>/h</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* OPERATING MODE</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DAMPING 04 s</div>	<p>Example of display when in measurement (MEASURING MODE).</p> <p>Required number of times</p> <p>Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.</p> <p>Return the cursor to the asterisk (*).</p>
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT %</div>	
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT %</div>	
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT COUNT</div>	
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DISPLAY SELECT COUNT</div>	

to be continued

To set or change the counter preset value



Default value : 100000


Setting range : 1 - 999999

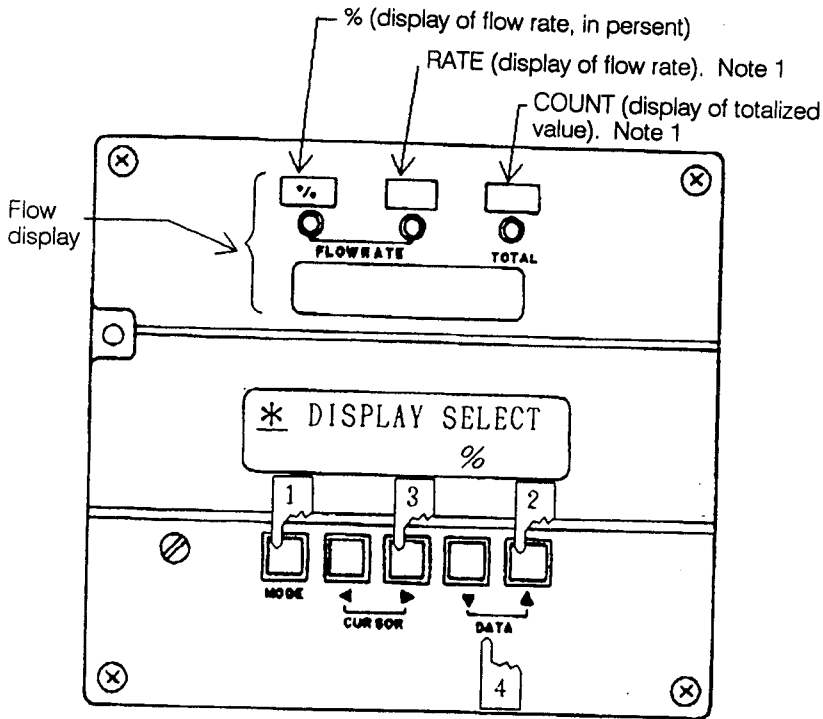
Procedure	Display	Comments
6	* COUNTER PRESET 100000	} Change the numeral to the required value with the ▼ ▲ keys.
7	* COUNTER PRESET 100000	
8	* COUNTER PRESET 200000	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to \* with the ► key and then select other displays with the ▼ and ▲ keys.

7) To set or change the flow display

(Data is stored in memory by the procedure of  .)







Note 1:

Enter the required engineering unit of measure, using the sticker provided.

Default value : %

Setting : %

RATE (Flow rate, in engineering unit)  
TOTAL (Totalized value)

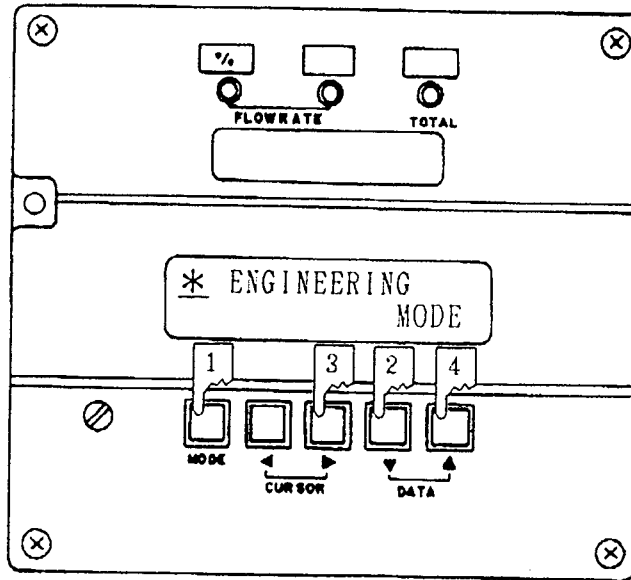
Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">% SPAN 10.000 m<sup>3</sup>/h</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ OPERATING MODE</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ DAMPING 04 s</div>	The mode that the instrument is measuring the flow.
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ DISPLAY SELECT %</div>	Required number of times
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ DISPLAY SELECT %</div>	Move the cursor.
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ DISPLAY SELECT _ COUNT</div>	Change the numeral to the required value with the ▼▲ keys. (The selected LED will illuminate as illustrated in the above.)

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to \* with the ► key and then select other displays with the ▼ and ▲ keys.

8) To set to the ENGINEERING MODE

(The data items set when in the ENGINEERING MODE are stored in memory when the mode is changed to the MEASURING MODE.)

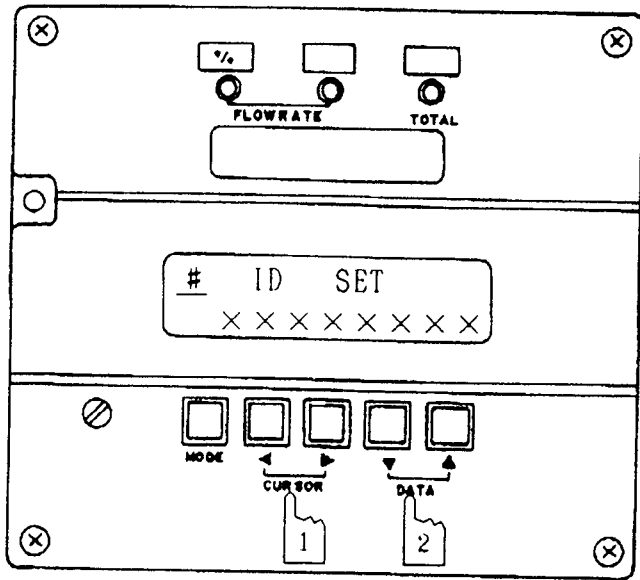


Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">% SPAN 10.000 m<sup>3</sup>/h</div>	Example of display when in measurement (MEASURING MODE)
1	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ OPERATING _ _ _ _ _ MODE</div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ DAMPING _ _ _ _ _ 04 s</div>	
2	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ MODE ENTER _ _ _ _ _ ENGINEER MAINTE</div>	Move the cursor to "E".
3	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* _ MODE ENTER _ _ _ _ _ ENGINEER MAINTE</div>	
4	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"># _ ENGINEERING _ _ _ _ _ MODE</div> <p style="text-align: center;">3 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"># _ ID SET _ _ _ _ _ XXXXXXXX</div>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Select other displays will the ▼ and ▲ keys.

9) To set ID (identification) code



Comments: The equipment tag number or name can be displayed with up to 8 characters.

Default value :  
X X X X X X X X

Setting range :  
8 characters  
Alphabets (A – Z)  
Numerals (0 – 9)  
Hyphen  
Slash  
Blank  
Point

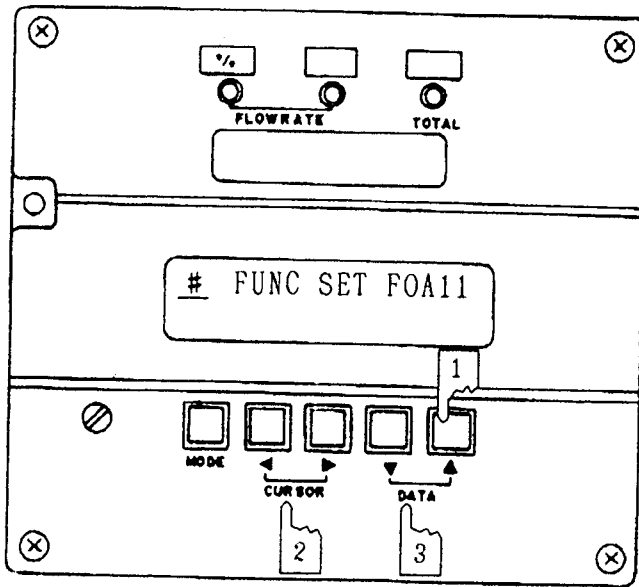
Example: To change ID from X X X X X X X X to FIC-1234

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	3 sec later # ID SET XXXXXXXXXX	
1	# ID SET XXXXXXXXXX	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
2	# ID SET FIC - 1234	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

10) To set or change functions



Default value :

F 0 X X X ...without pulse card

F 0 A X X ...with pulse card

Setting range :

There are limitations on function combination (F□□□□). See page 7.

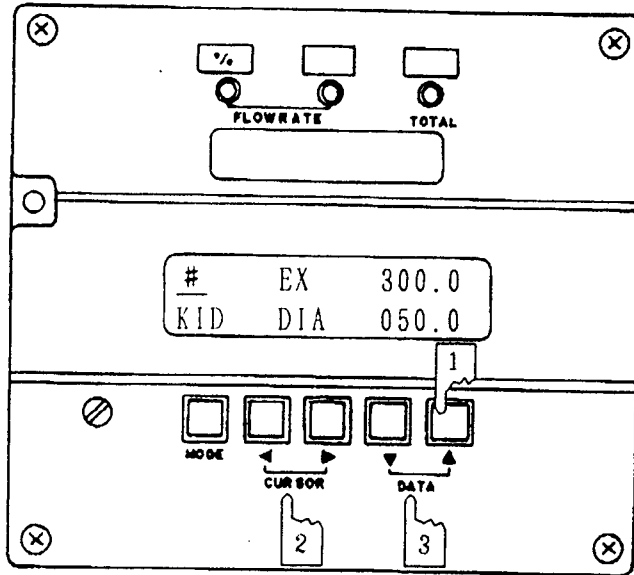
Example: To change functions from FOA11 to FOAX1.

Procedure	Display	Comments
  	<div style="border: 1px solid black; padding: 5px; text-align: center;"># ENGINEERING MODE</div> <div style="border: 1px solid black; padding: 5px; text-align: center;"># ID SET XXXXXXXXX</div> <p style="text-align: center;">2 sec later</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"># FUNC SET FOA11</div>	For the procedure to set to the ENGINEERING MODE, see Section 8).
	<div style="border: 1px solid black; padding: 5px; text-align: center;"># FUNC SET FOA11 SINGLE RANGE</div>	
	<div style="border: 1px solid black; padding: 5px; text-align: center;"># FUNC SET FOAX1 ERROR HI-LO ALM</div>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ► key and then select other displays with the ▼ and ▲ keys.

- 11) To set or change excitation current (EX), detector model (MODEL), and detector diameter (DIA).



**Preparation**

Confirm that the exciting current (EX) detector model (MODEL) and detector diameter (DIA) are correct by referring to the detector nameplate.

**Default value** : EX: 300.0 mA  
MODEL: KID  
DIA: 50 mm

**Setting range** :

EX: 230.0 – 370.0 mA

DIA: 2.5, 5, 10, 15, 25, 40, 50, 80, 100, 150, 200, 250, 300, 350, 400, 500, 600, 700

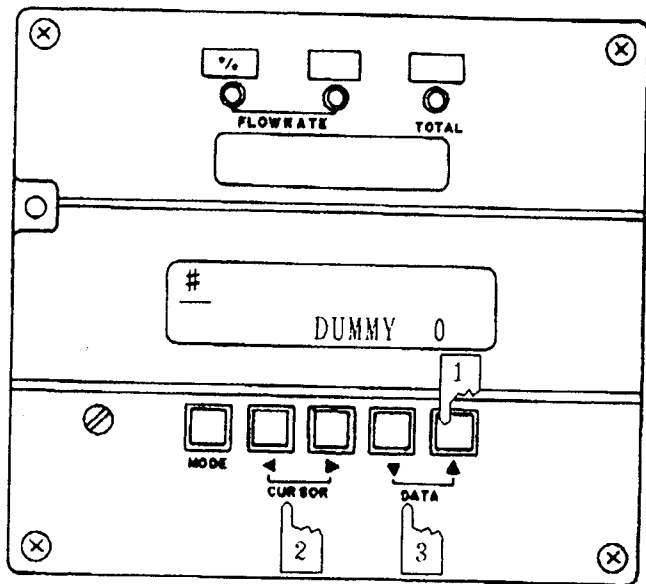
Example: To change diameter from 50 to 80.

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
	2 sec later # ID SET XXXXXXXXXX	
1	# EX 300.0 KID DIA 050.0	Push twice times.
2	# EX 300.0 KID DIA 080.0	Change the numeral to the required value with the ◀ ▶ key and ▼ ▲ keys.
3	# EX 300.0 KID DIA 080.0	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

- 12) To set or change the number of dummy submerged detectors used in conjunction with submerged detector. (Model NNK)



**Preparation**

Confirm the number of dummy submerged detectors.

**Default value** : 0 (without dummy)

**Setting range** : 0 – 9 units

The number of dummy units cannot be set unless the detector is of the submerged type (Model NNK).

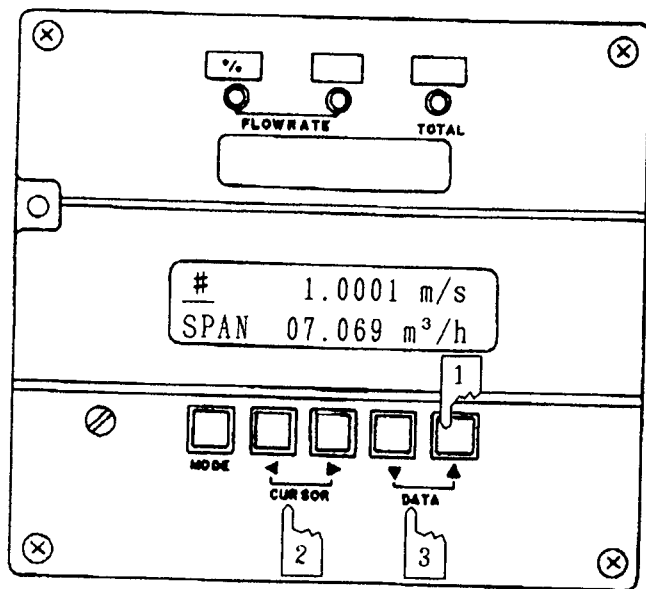
Example: To change the number of dummies from 0 to 3.

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
	2 sec later # ID SET XXXXXXXXXX	
1	# DUMMY 0	Push thrice times.
2	# DUMMY 0	Change the numeral to the required value with the ◀ ▶ key and the ▼ ▲ keys.
3	# DUMMY 3	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

13) To set or change the range of a single range instrument



Default value : 07.069 m<sup>3</sup>/h

Setting range :

0.0001 – 99999 □ / □  
↓ ↓

Unit: BPS GPS mGPS cc s  
BPM GPM mGPM l m  
BPH GPH mGPH m h  
BPD GPD mGPD d  
kGPS  
kGPM  
kGPH  
kGPD

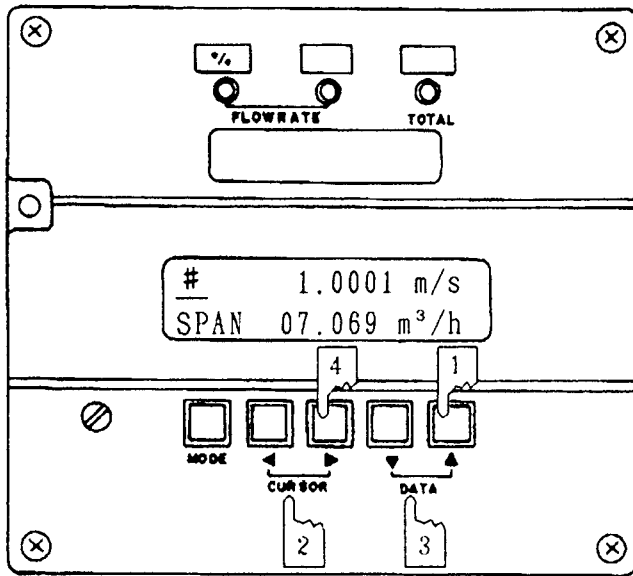
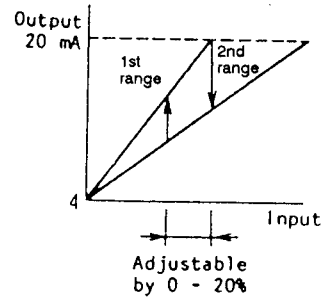
Example: To change range from 7.069 m<sup>3</sup>/h to 1 l/m.

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXX	
1	# 1.0001 m/s SPAN 07.069 m <sup>3</sup> /h	Required number of times The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure) Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
2	# 1.0001 m/s SPAN 07.069 m <sup>3</sup> /h	
3	# .14147 m/s SPAN 1.0000 l/m	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

14) To set or change the range of a dual range instrument



Default value :

1st range 07.069 m<sup>3</sup>/h

2nd range 14.137 m<sup>3</sup>/h

Setting range :

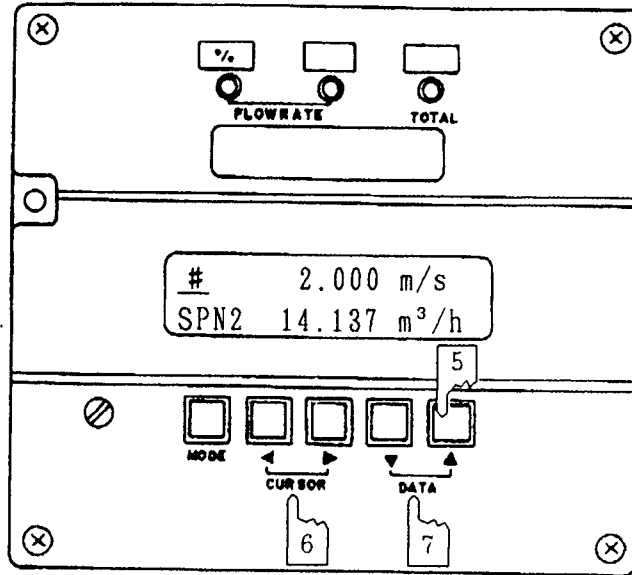
0.0001 - 99999 □ / □

↓ ↓

Unit: BPS GPS mGPS cc s  
 BPM GPM mGPM l m  
 BPH GPH mGPH m<sup>3</sup> h  
 BPD GPD mGPD m<sup>3</sup> d  
 kGPS  
 kGPM  
 kGPH  
 kGPD

Example: To change range from 7.069 m<sup>3</sup>/h to 1 m<sup>3</sup>/h

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXX	
1	# 1.0001 m/s SPAN 07.069 m <sup>3</sup> /h	Required number of times The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure).
2	# 1.0001 m/s SPAN 0 <u>7</u> .069 m <sup>3</sup> /h	
3	# .14147 m/s SPAN 1.000 <u>0</u> m <sup>3</sup> /h	
4	# .14147 m/s SPAN 1.0000 m <sup>3</sup> /h	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
	↓ to be continued	Return the cursor to the asterisk (*).



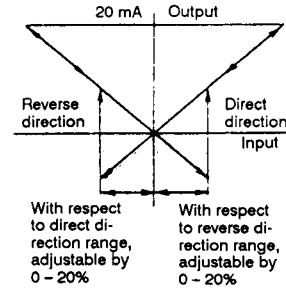
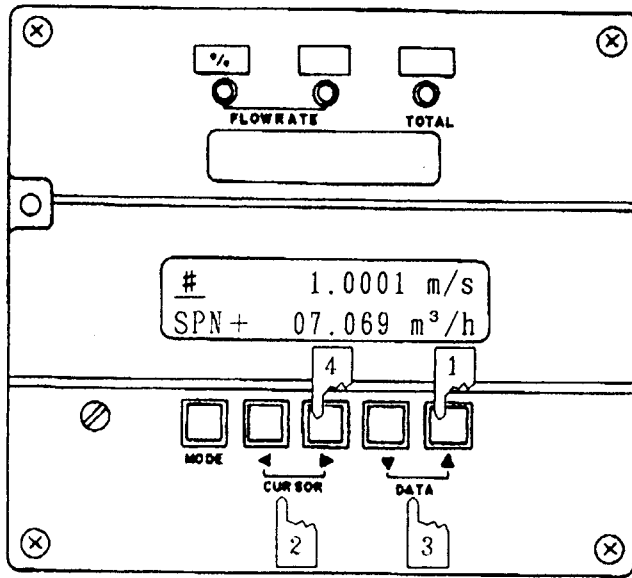
Example: To change range from 14.137 m<sup>3</sup>/h to 4 m<sup>3</sup>/h.

Procedure	Display	Comments
5	# 2.0000 m/s SPN2 14.137 m <sup>3</sup> /h	The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure) Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
6	# 2.0000 m/s SPN2 14.137 m <sup>3</sup> /h	
7	# .56589 m/s SPN2 04.000 m <sup>3</sup> /h	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

15) To set or change the ranges of a direct/reverse range instrument



Default value :

Direct range  
+07.069 m<sup>3</sup>/h

Reverse range  
- 14.137 m<sup>3</sup>/h

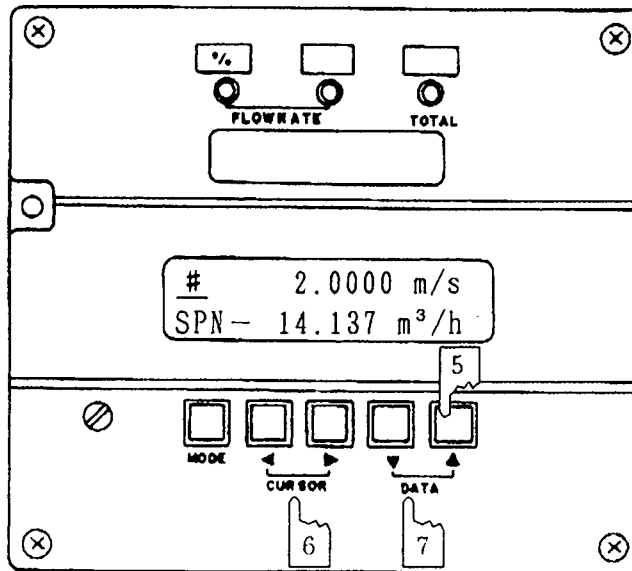
Setting range :

0.0001 - 99999  /

Unit: BPS GPS mGPS kGPS cc s  
BPH GPM mGPM kGPM l m  
BPH GPH mGPH kGPH m<sup>3</sup> h  
BPD GPD mGPD kGPD d

Example: To change range from 7.069 m<sup>3</sup>/h to 1 m<sup>3</sup>/h

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXXXX	
1	# 1.0001 m/s SPN+ 07.069 m <sup>3</sup> /h	Required number of times The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure).  Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
2	# 1.0001 m/s SPN+ 07.069 m <sup>3</sup> /h	
3	# .14147 m/s SPN+ 1.0000 m <sup>3</sup> /h	
4	# .14147 m/s SPN+ 1.0000 m <sup>3</sup> /h	Return the cursor to the asterisk (*).
	↓ to be continued	



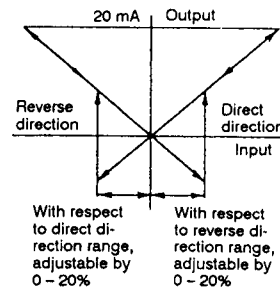
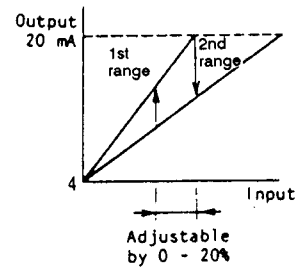
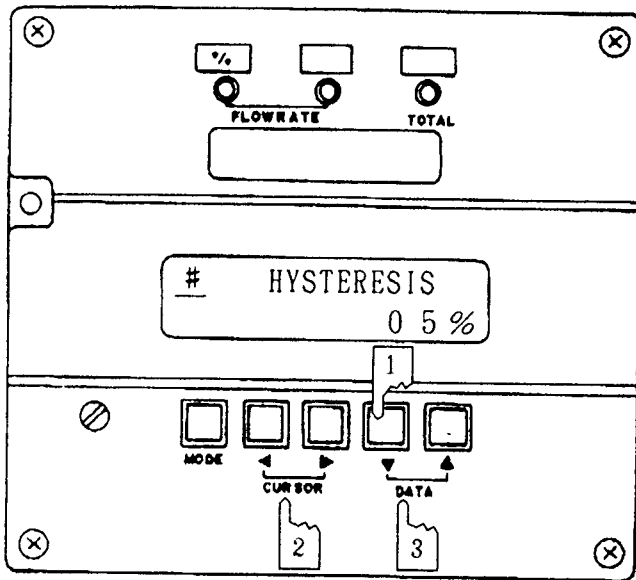
Example: To change range from 14.013 m<sup>3</sup>/h to 1 m<sup>3</sup>/h

Procedure	Display	Comments
	# 2.0000 m/s SPN - 14.137 m <sup>3</sup> /h	<p>The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure).</p> <p>Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.</p>
	# 2.0000 m/s SPN - 1 <u>4</u> .137 m <sup>3</sup> /h	
	# .14147 m/s SPN - 1.0000 m <sup>3</sup> /h	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

16) To set or change the hysteresis of transfer between ranges



Default value : 5%

Setting range : 0 - 20%

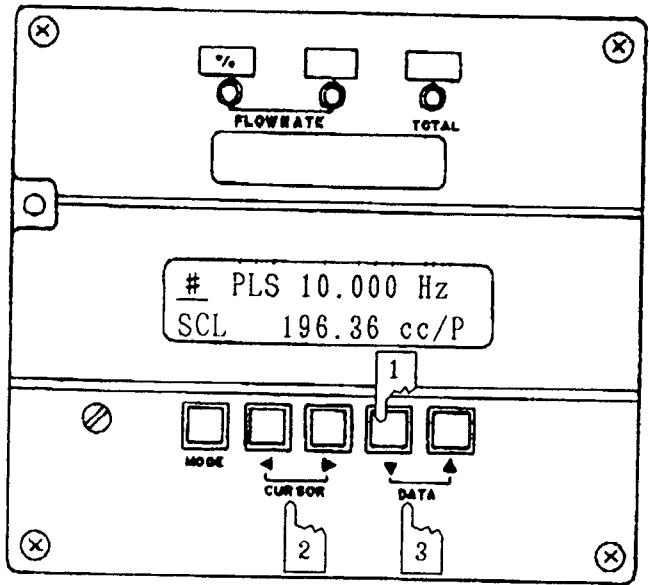
Example: To change hysteresis from 5% to 10%

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
	2 sec later # ID SET XXXXXXXXXX	
1	# HYSTERESIS 05 %	Required number of times
2	# HYSTERESIS 0 <u>5</u> %	
3	# HYSTERESIS 1 <u>0</u> %	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

17) To set or change pulse weight



Default value : 196.36 cc/p

Setting range :

Frequency when open collector output is selected (the top line or LCD):

0.00006 – 2000 Hz

Frequency when magnetic counter drive output or mercury relay contact output is selected (the top line of LCD):

0.00006 – 20 Hz

Unit: cc/p, l/p, m<sup>3</sup>/p  
B/P G/P mG/P  
kG/P

Note: Pulse weight remains constant even when ranges are changed. When setting or changing ranges in the dual-range mode. Use the higher one of the dual ranges.

Example: To change pulse weight from 196.33 cc/p to 1 m<sup>3</sup>/p.

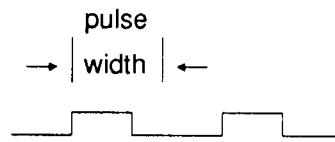
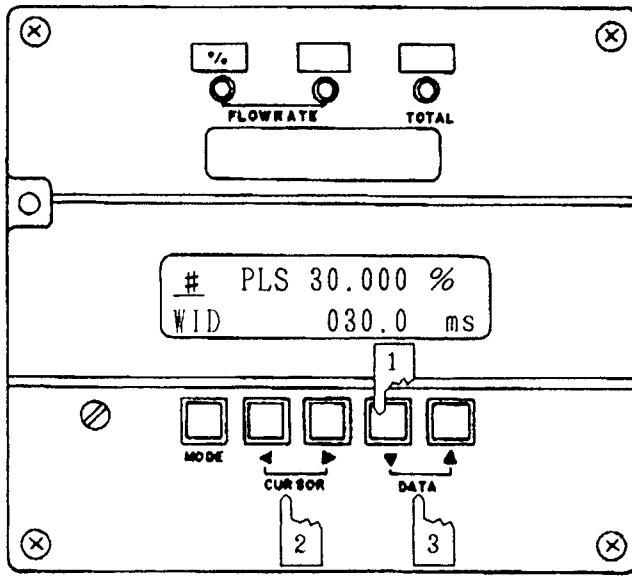
Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
	2 sec later # ID SET XXXXXXXXXX	
1	# PLS 10.000 Hz SCL 196.36 cc/p	Required number of times The top line shows the pulse output frequency for the maximum span. The frequency maybe used as a reference for selecting an appropriate pulse weight
2	# PLS 10.000 Hz SCL 196.36 cc/p	
3	# PLS .00111 Hz SCL 00001. m <sup>3</sup> /P	

Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

18) To set or change pulse width



Default value : 30 ms

Setting range :

- 0.3 ms
- 0.5 ms
- 1 ms
- 7 ms
- 10 ms
- 15 ms
- 30 ms
- 50 ms
- 100 ms

Open collector

Output for magnetic counter or mercury relay

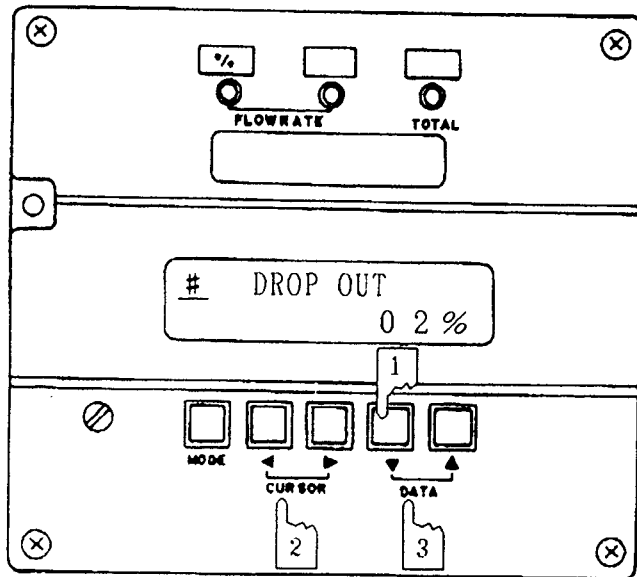
Example: To change pulse width from 30 ms to 0.5 ms

Procedure	Display	Comments
	# ENGINEERING	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
	2 sec later # ID SET	
1	# PLS 30.000 % WID 030.0 ms	Required number of times The top line of LCD shows the pulse duty ratio.  (Ratio ≤ 70%)
2	# PLS 30.000 % WID 0 <u>3</u> 0.0 ms	
3	# PLS .00005 % WID 000. <u>5</u> ms	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ► key and then select other displays with the ▼ and ▲ keys.

19) To set or change dropout point of pulse output signal



Comments: Employed to cut out the pulse output due to such reason as pulsations at a range close to zero.

Default value : 2%

Setting range : 2% – 20%

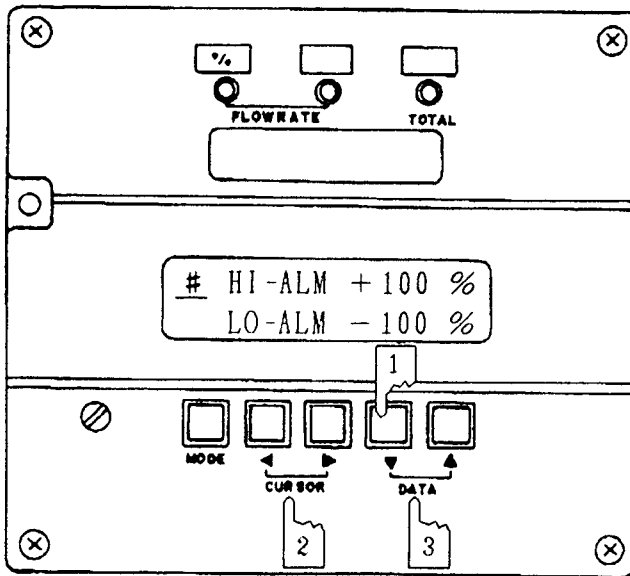
Example: To change output from 2% to 10%

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
	2 sec later # ID SET XXXXXXXXXX	
1	# DROP OUT 02 %	Required number of times
2	# DROP OUT 02 %	
3	# DROP OUT 10 %	Change the numeral to the required value with the ◀ ▶ and ▼ ▲ keys.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

20) To set or change high/low alarm points



Default value : HI: +100%

LO: -100%

Setting range :

HI: -125 to +125%

LO: -125 to +125%

Note: For the procedure of selecting either the normally open or normally closed type of contact output signal, see Section 24).

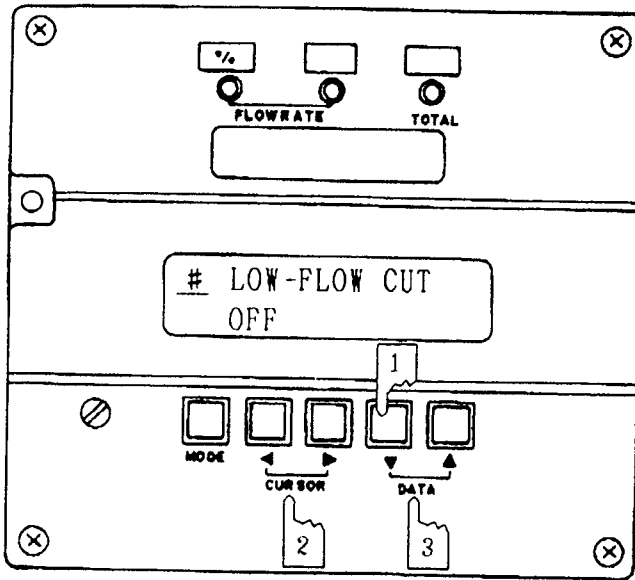
Example: To set high alarm from 100% to 80%

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXXXX	
1	# HI-ALM +100 % LO-ALM -100 %	Required number of times
2	# HI-ALM +100 % LO-ALM -100 %	Change the numeral to the required value with the ◀ ▶ and ▼ ▲ keys.
3	# HI-ALM +080 % LO-ALM -100 %	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

21) To select the low cutoff function



Comments: Employed to cut out the analog output due to such reason as pulsations at a range close to zero.

Default value :

OFF (Low flow cutoff function disabled)

Setting range :

OFF (Low flow cutoff function disabled)

ON (Low flow cutoff function enabled): 0 – 10%

Example: To set low flow cutoff from 0% to 5%

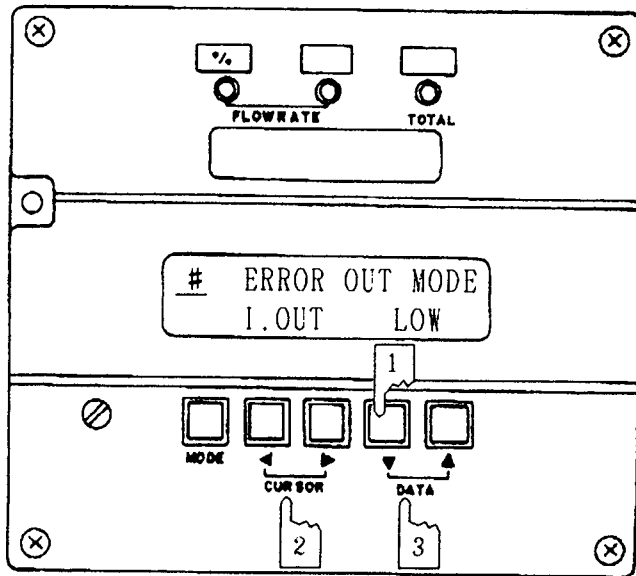
Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXX	
1	# LOW-FLOW CUT OFF	Required number of times Display when the low flow cutoff function is disabled.
2	# LOW-FLOW CUT OFF	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
3	# LOW-FLOW CUT ON 05 %	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

22) To select the state burnout for the analog output signal when in emergency

Note: For errors Err-01 through Err-05 on Page 87.



Default value : LOW

Setting range : HIGH  
LOW  
HOLD

Example: To change burnout low to burnout high

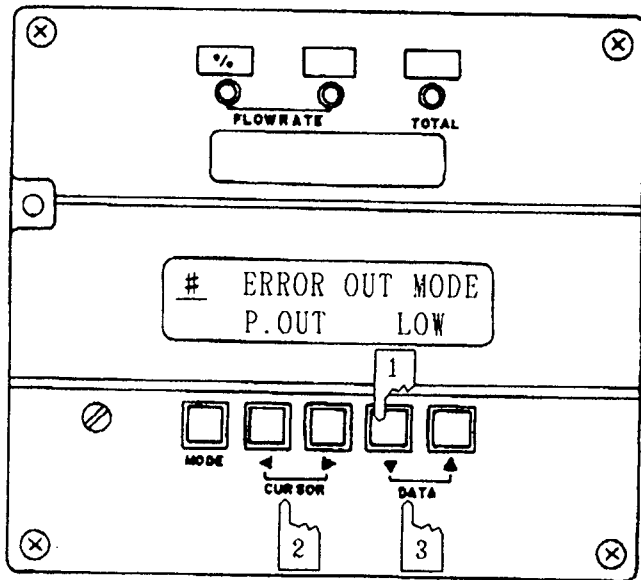
Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXX	
1	# ERROR OUT MODE I. OUT LOW	Required number of times
2	# ERROR OUT MODE I. OUT <u>LOW</u>	Change the numeral to the required value with the ◀ ▶ and ▼ ▲ keys.
3	# ERROR OUT MODE I. OUT <u>HIGH</u>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

23) To select the state for the pulse output signal when in emergency

Note: For errors Err-01 through Err-05 on Page 87.



Default value : LOW

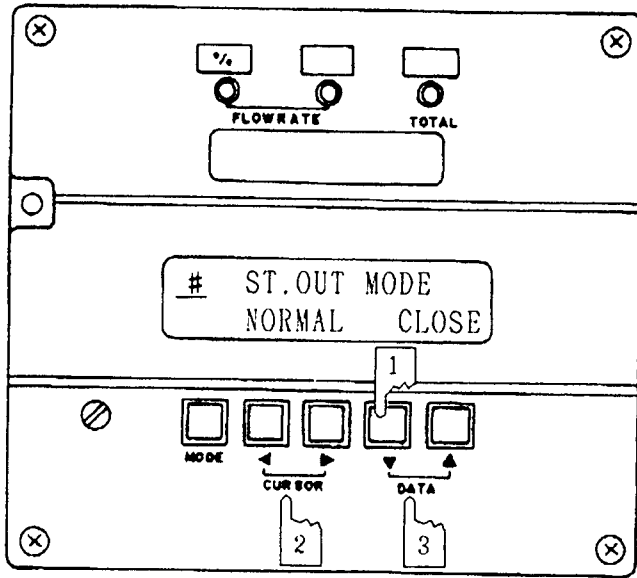
Setting range : LOW  
HOLD

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXX	
1	# ERROR OUT MODE P. OUT LOW	Required number of times
2	# ERROR OUT MODE P. OUT <u>LOW</u>	Change the numeral to the required value with the ◀ ▶ key and ▼ ▲ keys.
3	# ERROR OUT MODE P. OUT <u>HOLD</u>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

24) To select the state for the contact output signal when in emergency (NC/NO)



Default value : CLOSE  
 Setting range : CLOSE  
 OPEN

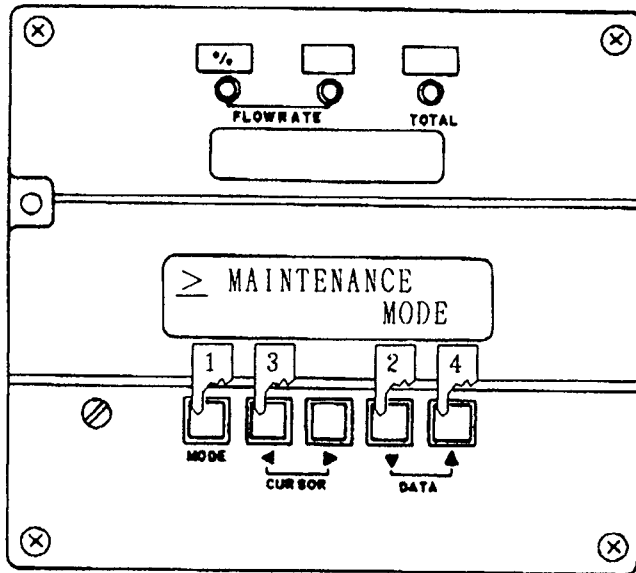
Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	2 sec later # ID SET XXXXXXXX	
1	# ST. OUT MODE NORMAL CLOSE	Change the numeral to the required value with the ◀ ▶ key and ▼ ▲ keys.
2	# ST. OUT MODE NORMAL <u>C</u> LOSE	
3	# ST. OUT MODE NORMAL <u>O</u> PEN	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to # with the ▶ key and then select other displays with the ▼ and ▲ keys.

25) To set to the MAINTENANCE MODE

(The data items set when in the MAINTENANCE MODE are stored in memory when the mode is changed to the MEASURING MODE).



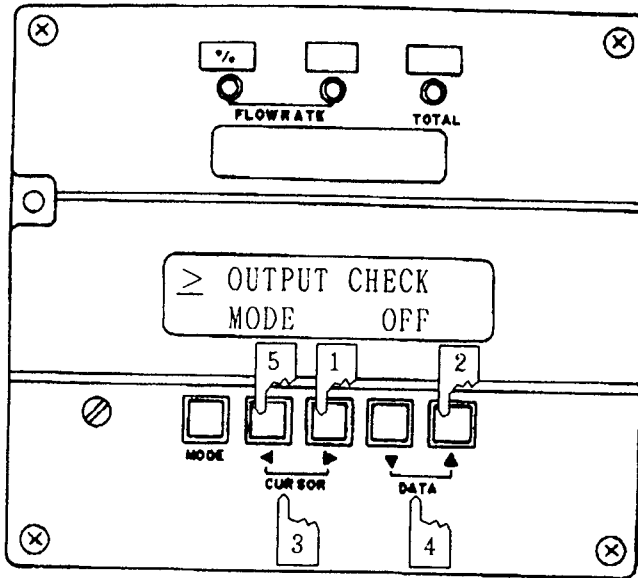
Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">% SPAN 35.000 m<sup>3</sup>/h</div>	Example of display when in measurement (MEASUREMENT MODE)
1	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* OPERATING _ MODE</div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* DAMPING _ 04 s</div>	
2	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* MODE ENTER _ ENGINEER MAINTE</div>	
3	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">* MODE ENTER ENGINEER MA<u>I</u>NTE</div>	
4	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; MAINTENANCE MODE</div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; OUTPUT CHECK MODE OFF</div>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Select other displays with the ▼ and ▲ keys.

26) To check the analog output loop

(To check the function of the converter as a constant-current signal source.)



Default value : 0%

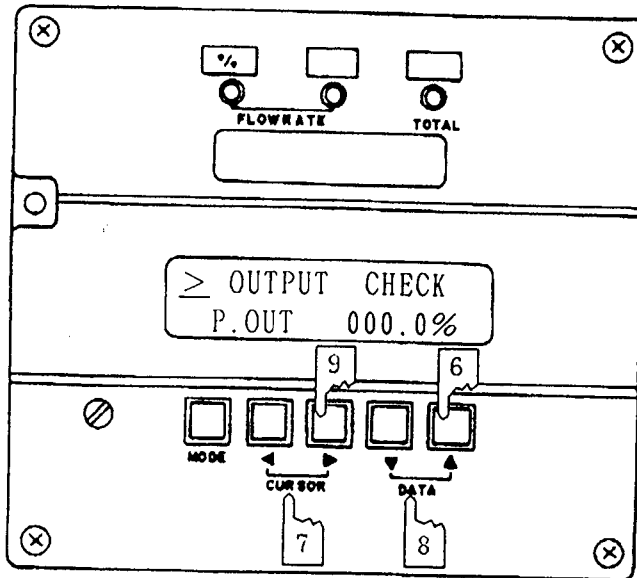
Setting range : 0 to +125%

Note: The simulated output is delivered only for the period during which it is displayed on the LCD.

Procedure	Display	Comments	
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">≥ MAINTENANCE</div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">≥ OUTPUT CHECK</div>	For the procedure to set to the MAINTENANCE MODE, see Section 25).	
1	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; OUTPUT CHECK MODE OFF</div>		
2	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; OUTPUT CHECK MODE ON</div> <p style="text-align: center;">1 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">≥ OUTPUT CHECK I. OUT 000.0 %</div>	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.	
3	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; OUTPUT CHECK I. OUT 000.0 %</div>		
4	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; OUTPUT CHECK I. OUT 050.0 %</div>		
5	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">≥ OUTPUT CHECK I. OUT 050.0 %</div> <p style="text-align: center;">↓</p> <p style="text-align: center;">to be continued</p>		Return the cursor to >.

27) To check the pulse output loop

(To check the function of the converter as a pulse generator)



Default value : 0%

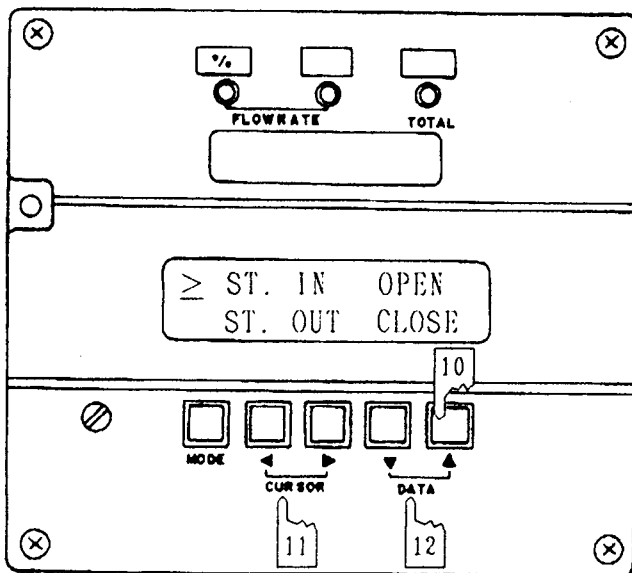
Setting range : 0 to +125%

Note: The simulated output is delivered only for the period during which it is displayed on the LCD.

Procedure	Display	Comments
6	≥ OUTPUT CHECK P. OUT 000.0 %	Set or change as required with the ◀ ▶ and ▼ ▲ keys.
7	> OUTPUT CHECK P. OUT 000.0 %	
8	> OUTPUT CHECK P. OUT 100.0 %	
9	≥ OUTPUT CHECK P. OUT 100.0 %	Return the cursor to >.

↓  
to be continued

- 28) To check the contact input/output loop  
 (To check the open/closed contact signal function)



Default value : OUT: CLOSED  
 Setting range : IN: OPEN  
                   :          CLOSED  
                   OUT: OPEN  
                   :          CLOSED

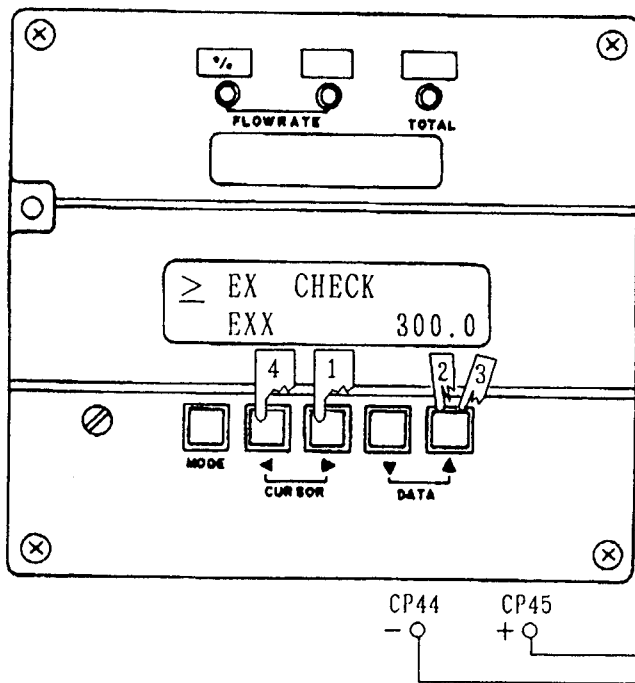
Note: The simulated output is delivered only for the period during which it is displayed on the LCD.

Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; display: inline-block;">           ≥ ST. IN    OPEN              ST. OUT    CLOSE         </div>	Descriptor "OPEN" means that the circuit between the STATUS IN terminals is not wired or is open.  The STATUS OUT is selectable between OPEN and CLOSED by means of the ◀ ▶ keys.
	<div style="border: 1px solid black; padding: 5px; display: inline-block;">           &gt; ST. IN    OPEN              ST. OUT    <u>CLOSE</u> </div>	
	<div style="border: 1px solid black; padding: 5px; display: inline-block;">           &gt; ST. IN    OPEN              ST. OUT    <u>OPEN</u> </div>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to > with the ▶ key and then select other displays with the ▼ and ▲ keys.

29) To check the excitation current output



(Preparation)

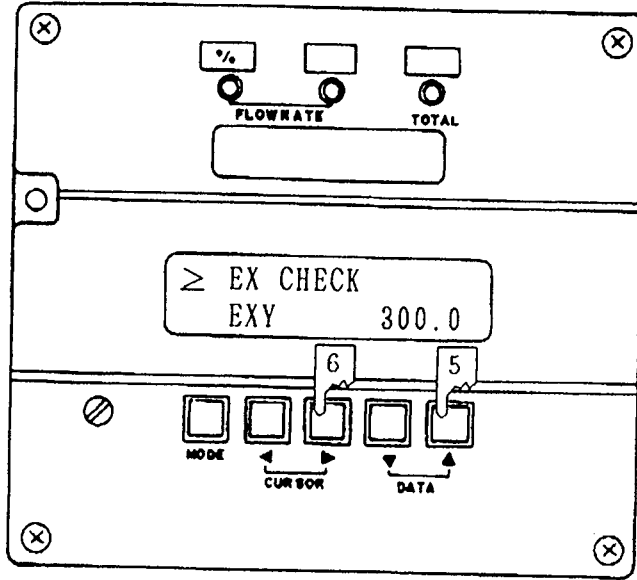
- (1) Check that the excitation current which is set in the ENGINEERING MODE is correct.

The excitation current requirement (EX) is indicated on the detector nameplate.

- (2) Connect a digital voltmeter between CP44 (-) and CP45 (+) of the main card.

Digital voltmeter (mV)

Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ MAINTENANCE MODE                 </div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ OUTPUT CHECK MODE OFF                 </div>	For the procedure to set to the MAINTENANCE MODE, see the Section 25).
1	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; OUTPUT CHECK MODE OFF                 </div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; OUTPUT CHECK MODE ON                 </div> <p style="text-align: center;">1 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ OUTPUT CHECK I. OUT 000.0 %                 </div>	
3	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ EX CHECK EXX 300.0                 </div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; EX CHECK EXX 300.0                 </div>	Required number of times { At this stage the excitation current (EX) which flows from X to Y direction can be checked with the external digital voltmeter.
4	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; EX CHECK EXX 300.0                 </div> <p style="text-align: center;">↓</p> <p style="text-align: center;">to be continued</p>	

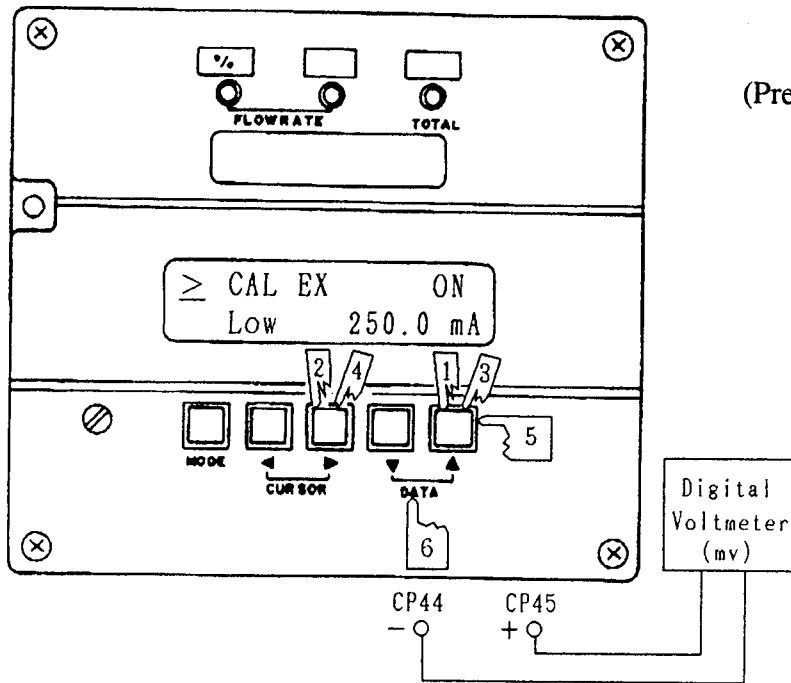


Procedure	Display	Comments
5	<pre> &gt; EX CHECK EXY 300.0 </pre>	<p>At this stage the excitation current (EX) which flows from X to Y direction can be checked with the external digital voltmeter.</p> <p>Return the cursor to &gt;.</p>
6	<pre> ≥ EX CHECK EXY 300.0 </pre>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to > with the ► key and then select other displays with the ▼ and ▲ keys.

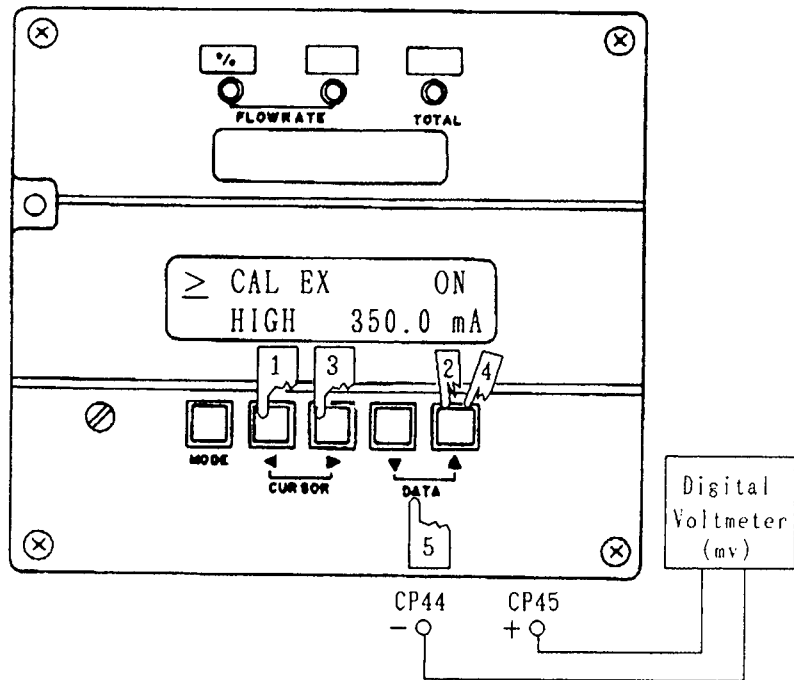
30) To calibrate the excitation current output 250 mA and 350 mA



(Preparation)

Connect a digital voltmeter between CP44 (-) and CP45 (+) of the main card.

Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ MAINTENANCE MODE                 </div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ OUTPUT CHECK MODE OFF                 </div>	For the procedure to set to the MAINTENANCE MODE, see Section 25).
1	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ CALIBRATION MODE OFF                 </div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CALIBRATION MODE OFF                 </div>	
3	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ CAL EX OFF LOW 250.0 mA                 </div>	
4	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CAL EX OFF LOW 250.0 mA                 </div>	
5	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CAL EX ON LOW 250.0 mA                 </div>	
6	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CAL EX ON LOW 250.0 mA                 </div> <p style="text-align: center;">↓ to be continued</p>	With this display, the calibration shall be made using ▼ ▲ keys so as to have the digital voltmeter indicated 250.0 mV.

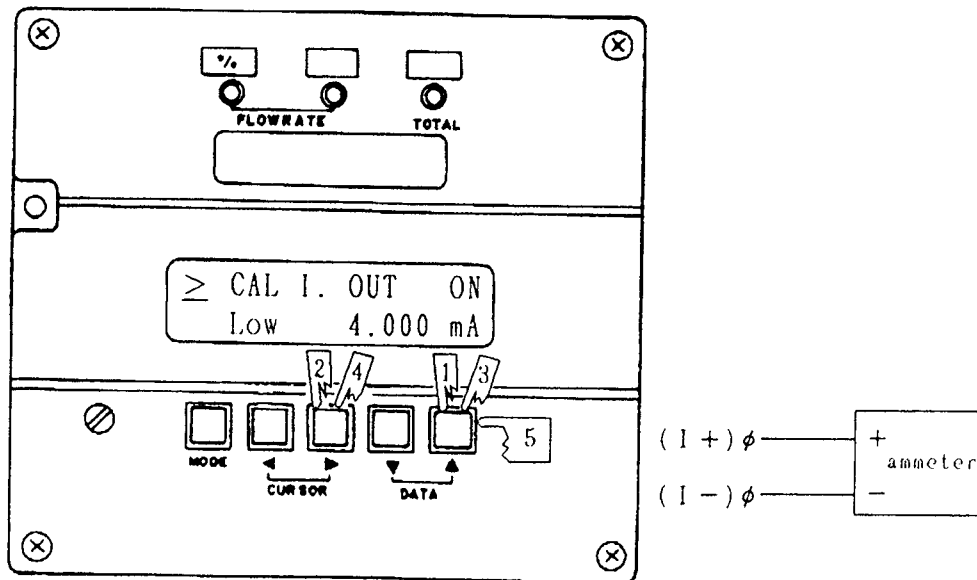


Procedure	Display	Comments
1	≥ CAL EX ON LOW 250.0 mA	
2	≥ CAL EX OFF HIGH 350.0 mA	
3	> CAL EX OFF HIGH 350.0 mA	
4	> CAL EX ON HIGH 350.0 mA	
5	> CAL EX ON HIGH 350.0 mA	With this display, the calibration shall be made using ▼ ▲ keys so as to have the digital voltmeter indicated 350.0 mV.

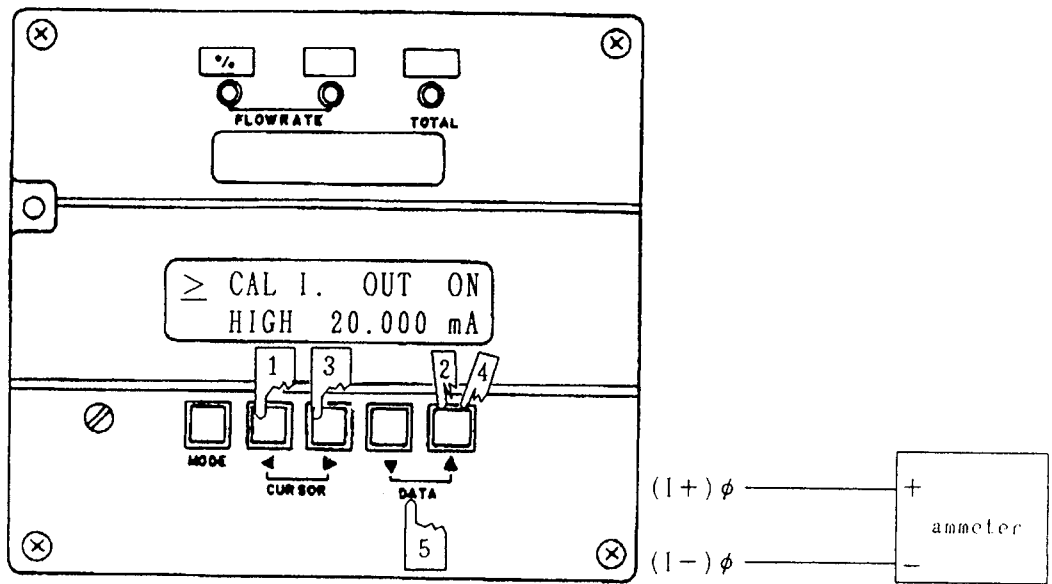
To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to > with the ► key and then select other displays with the ▼ and ▲ keys.

31) To calibrate the analog current output 4 mA and 20mA



Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">≥ MAINTENANCE</div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">≥ OUTPUT CHECK MODE OFF</div>	For the procedure to set to the MAINTENANCE MODE, see Section 25).
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">≥ CALIBRATION MODE OFF</div>	
1	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; CALIBRATION MODE OFF</div>	
2	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; CAL I. OUT OFF LOW 4.000 mA</div>	
3 (3 times)	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; CAL I. OUT OFF LOW 4.000 mA</div>	
4	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; CAL I. OUT ON LOW 4.000 mA</div>	
5	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">&gt; CAL I. OUT ON LOW 4.000 mA</div> <p style="text-align: center;">↓ to be continued</p>	With this display, the calibration shall be made using ▼ ▲ keys so as to have the digital ammeter indicated 4.000 mA.



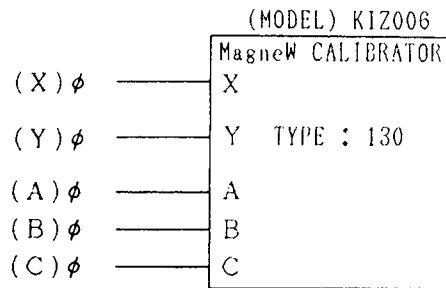
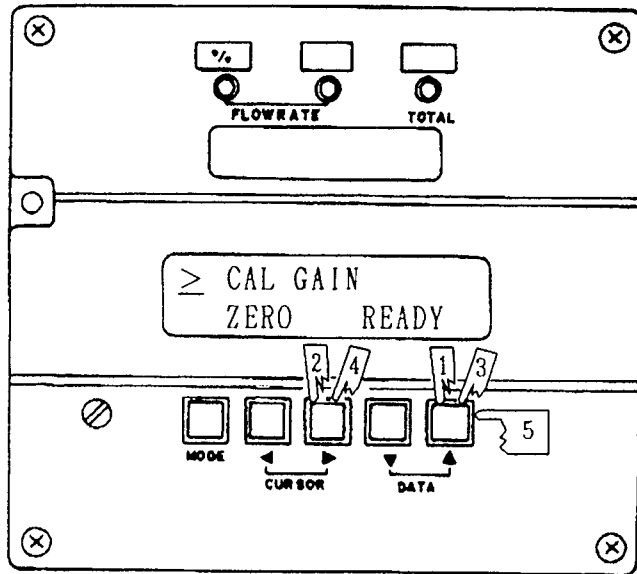
Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">           ≥ MAINTENANCE MODE         </div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">           ≥ OUTPUT CHECK OFF         </div>	For the procedure to set to the MAINTENANCE MODE, see Section 25).
1	<div style="border: 1px solid black; padding: 5px; text-align: center;">           ≥ CAL I. OUT ON LOW 4.000 mA         </div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">           ≥ CAL I. OUT OFF HIGH 20.000 mA         </div>	
3	<div style="border: 1px solid black; padding: 5px; text-align: center;">           &gt; CAL I. OUT OFF HIGH 20.000 mA         </div>	
4	<div style="border: 1px solid black; padding: 5px; text-align: center;">           &gt; CAL I. OUT ON HIGH 20.000 mA         </div>	
5	<div style="border: 1px solid black; padding: 5px; text-align: center;">           &gt; CAL I. OUT ON HIGH 20.000 mA         </div>	With this display, the calibration shall be made using ▼ ▲ keys so as to have the ammeter indicated 20.00 mA.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to > with the ► key and then select other displays with the ▼ and ▲ keys.

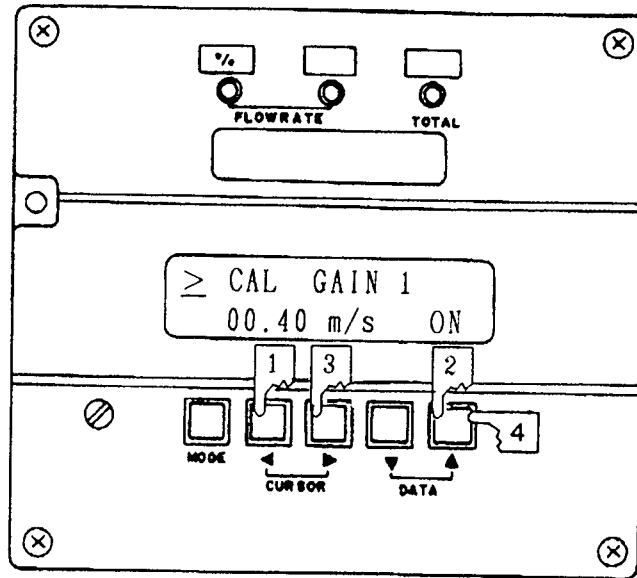
32) To calibrate the internal gain coefficient

The calibration of "ZERO" internal gain coefficient



Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ MAINTENANCE MODE                 </div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ OUTPUT CHECK MODE OFF                 </div>	For the procedure to set to the MAINTENANCE MODE, see Section 25).
1	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ CALIBRATION MODE OFF                 </div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CALIBRATION MODE OFF                 </div>	
3 (5 times)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ CAL GAIN ZERO READY                 </div>	
4	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CAL GAIN ZERO READY                 </div>	Input "zero (0 m/s)" from MagneW Calibrator
5	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CAL GAIN ZERO ON                 </div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CAL GAIN ZERO READY                 </div>	The calibration of "zero (0 m/s)" starts by 5 operation The calibration of "zero (0 m/s)" point has completed.
	↓ to be continued	

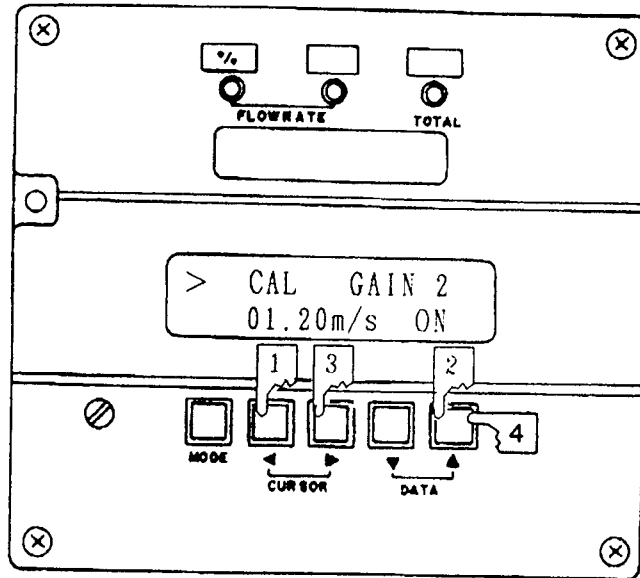
The calibration of 0.4 m/s internal gain coefficient



Procedure	Display	Comments
1	<pre> ≥ CAL GAIN 1 ZERO      READY                     </pre>	
2	<pre> ≥ CAL GAIN 1 00.40 m/s  READY                     </pre>	
3	<pre> &gt; CAL GAIN 1 00.40 m/s  READY                     </pre>	Input "0.4 m/s" signal from MagneW Calibrator.
4	<pre> &gt; CAL GAIN 1 00.40 m/s  ON                     </pre> <p style="text-align: center;">12 sec later</p> <pre> &gt; CAL GAIN 1 00.40 m/s  READY                     </pre>	<p>The calibration of "0.4 m/s" gain starts by 4 operation.</p> <p>The calibration of "0.4 m/s" gain has completed.</p>

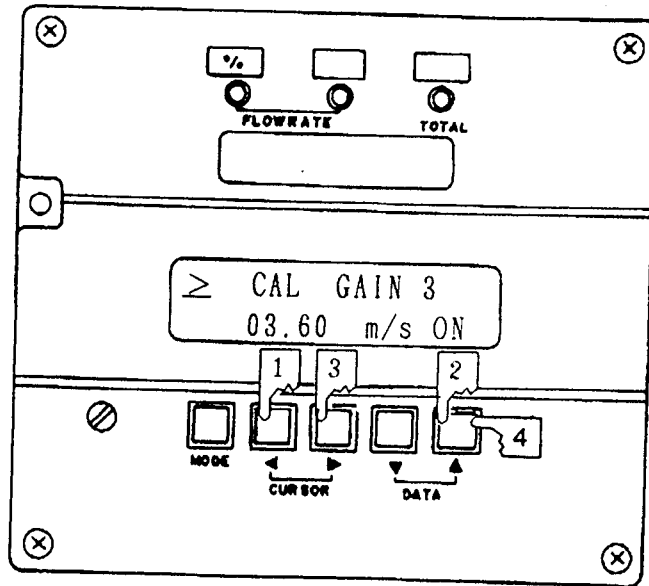
↓  
to be continued

The calibration of 1.2 m/s internal gain coefficient



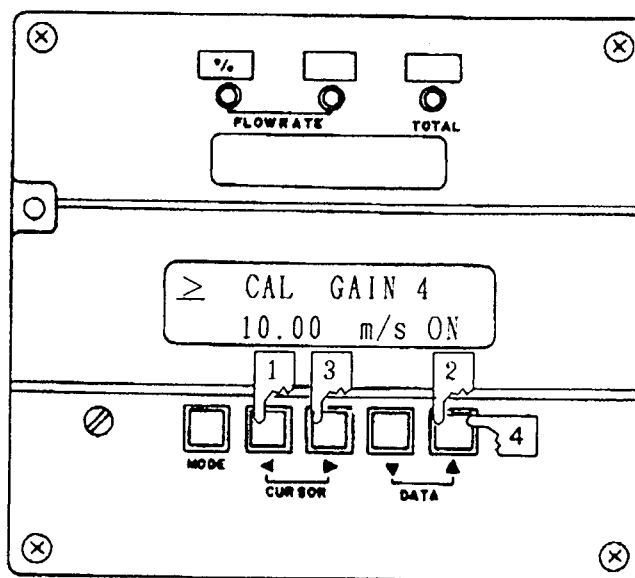
Procedure	Display	Comments
1	<pre> ≥ CAL GAIN 1 00.40 m/s  READY                     </pre>	
2	<pre> ≥ CAL GAIN 2 01.20 m/s  READY                     </pre>	
3	<pre> &gt; CAL GAIN 2 01.20 m/s  READY                     </pre>	Input "1.2 m/s" signal from MagneW Calibrator.
4	<pre> &gt; CAL GAIN 2 01.20 m/s  ON                     </pre> <p style="text-align: center;">12 sec later</p> <pre> &gt; CAL GAIN 2 01.20 m/s  READY                     </pre>	<p>The calibration of "1.2 m/s" gain starts by 4 operation.</p> <p>The calibration of "1.2 m/s" gain has completed.</p>
	↓	
	to be continued	

The calibration of 3.6 m/s internal gain coefficient



Procedure	Display	Comments
1	<pre> ≥ CAL GAIN 2 01.20 m/s  READY                     </pre>	
2	<pre> ≥ CAL GAIN 3 03.60 m/s  READY                     </pre>	
3	<pre> &gt; CAL GAIN 3 03.60 m/s  READY                     </pre>	Input "3.6 m/s" signal from MagneW Calibrator.
4	<pre> &gt; CAL GAIN 3 03.60 m/s  ON                     </pre> <p>12 sec later</p> <pre> &gt; CAL GAIN 3 03.60 m/s  READY                     </pre>	<p>The calibration of "3.6 m/s" gain starts by 4 operation.</p> <p>The calibration of "3.6 m/s" gain has completed.</p>
	↓	
	to be continued	

## The calibration of 10 m/s internal gain coefficient

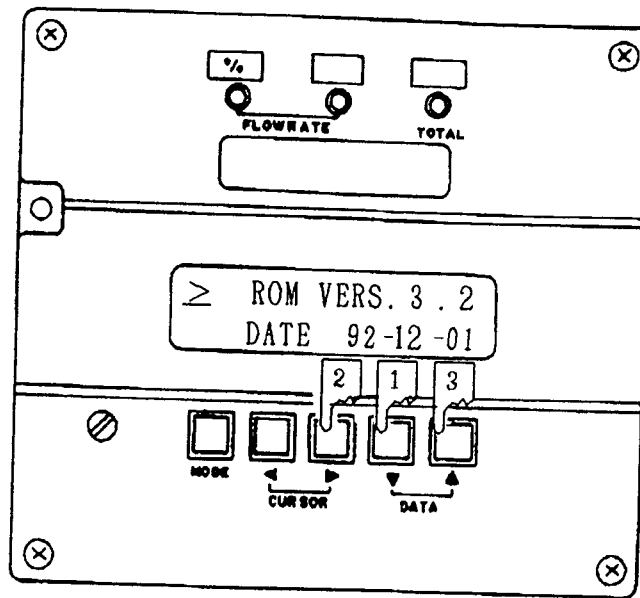


Procedure	Display	Comments
1	<pre> ≥ CAL GAIN 3 03.60 m/s  READY                     </pre>	
2	<pre> ≥ CAL GAIN 4 10.00 m/s  READY                     </pre>	
3	<pre> &gt; CAL GAIN 4 10.00 m/s  READY                     </pre>	Input "10 m/s" signal from MagneW Calibrator.
4	<pre> &gt; CAL GAIN 4 10.00 m/s  ON                     </pre> <p style="text-align: center;">12 sec later ↓</p> <pre> &gt; CAL GAIN 4 10.00 m/s  READY                     </pre>	The calibration of "10 m/s" gain starts by operation. 4
		The calibration of "10 m/s" gain has completed.

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to > with the ► key and then select other displays with the ▼ and ▲ keys.

33) To check PROM version

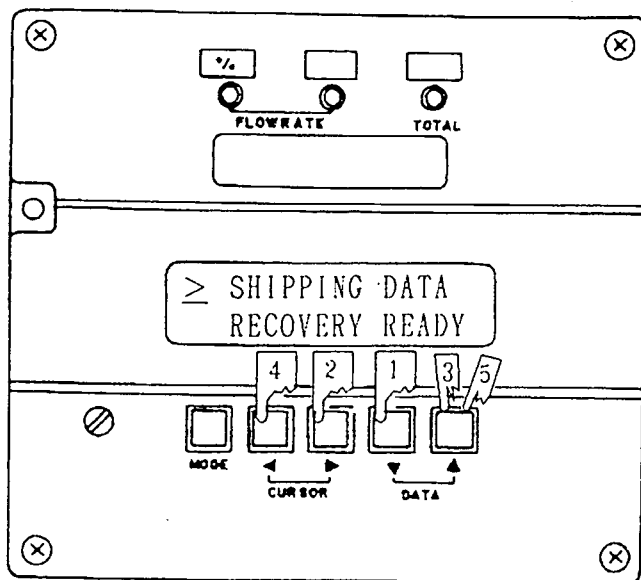


Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ MAINTENANCE MODE                 </div> <p style="text-align: center; margin: 5px 0;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ OUTPUT CHECK MODE OFF                 </div>	For the procedure to set to the MAINTENANCE MODE, see Section 25).
1 (2 times)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ CRITICAL MODE OFF                 </div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CRITICAL MODE OFF                 </div>	
3	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ ROM VERS. 3.2 DATE 92-12-01                 </div>	

To return to the MEASURING MODE: Press the MODE key.

To continue setting: Move the cursor to > with the ► key and then select other displays with the ▼ and ▲ keys.

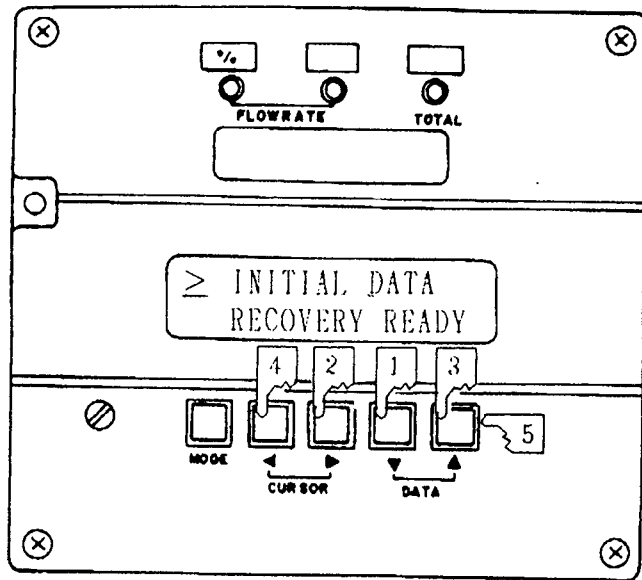
34) To recover the shipping data



Using this "SHIPPING DATA RECOVERY" function, all of the KIX internal data can be changed to the shipping data of Yamatake Corporation.

Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ MAINTENANCE MODE                 </div> <p style="text-align: center;">2 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ OUTPUT CHECK MODE OFF                 </div>	For the procedure to set to the MAINTENANCE MODE, see Section 25).
1 (2 times)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ CRITICAL MODE OFF                 </div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CRITICAL MODE OFF                 </div>	
3 (2 times)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ SHIPPING DATA RECOVERY                 </div>	[ READY ] → [ ON ] → [ READY ]
4	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; SHIPPING DATA RECOVERY                 </div>	After the execution of this function, the mode is automatically changed to "Measuring Mode".
5 (more than 3 sec)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     — SELF CHECK MODE                 </div> <p style="text-align: center;">5 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     — MEASURING MODE                 </div> <p style="text-align: center;">1 sec later ↓</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">                     % SPAN    □□.□□□ m<sup>3</sup>/h                 </div>	

35) Mode for emergency (data broken, etc.)



This mode is used in the event that normal operation can not be recovered even after proper counter-measures are taken.

\* **Caution** \*

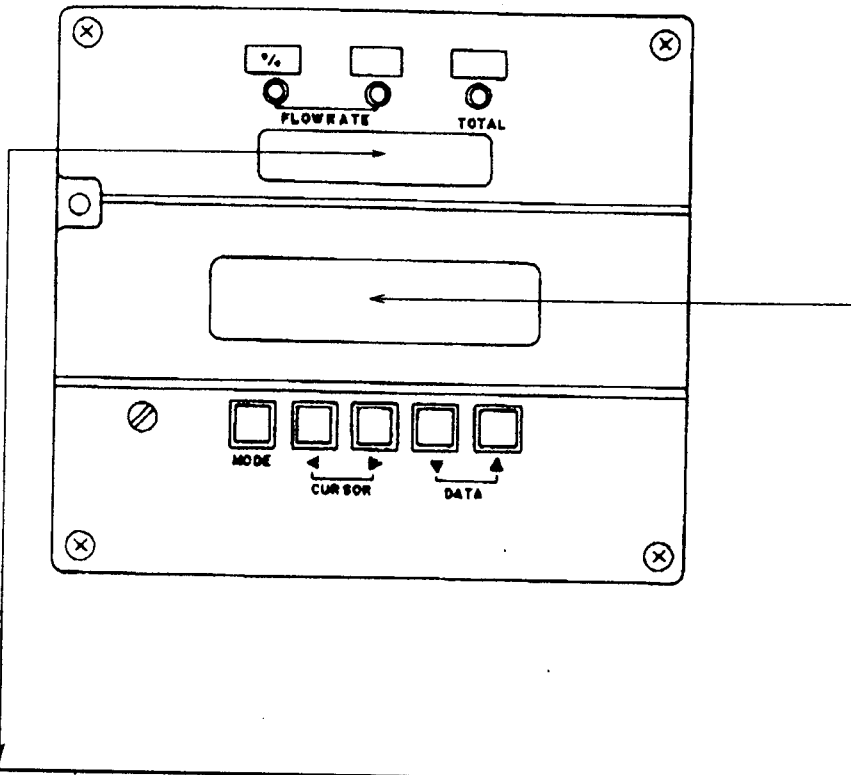
after excuting this function, re-calibration is necessary

Procedure	Display	Comments
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ MAINTENANCE MODE                 </div> <p style="text-align: center;">2 sec later ↓</p>	For the procedure to set to the MAINTENANCE MODE, see Section 25).
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ OUTPUT CHECK MODE OFF                 </div>	
1 (2 times)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ CRITICAL MODE OFF                 </div>	
2	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; CRITICAL MODE OFF                 </div>	
3 (3 times)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ≥ INITIAL DATA RECOVERY                 </div>	
4	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; INITIAL DATA RECOVERY                 </div>	
5 (more than 3 sec)	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     &gt; INITIAL DATA RECOVERY ON                 </div> <p style="text-align: center;">1 sec later ↓</p>	
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     — SELF CHECK MODE                 </div> <p style="text-align: center;">5 sec later ↓</p>	
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     — MEASURING MODE                 </div> <p style="text-align: center;">1 sec later ↓</p>	
	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     % SPAN    □□.□□□ m<sup>3</sup>/h                 </div>	After the excution of this function, the mode is automatically changed to "Measuring Mode".

## 6.6 Diagnostic Functions

### 1) H/W Check

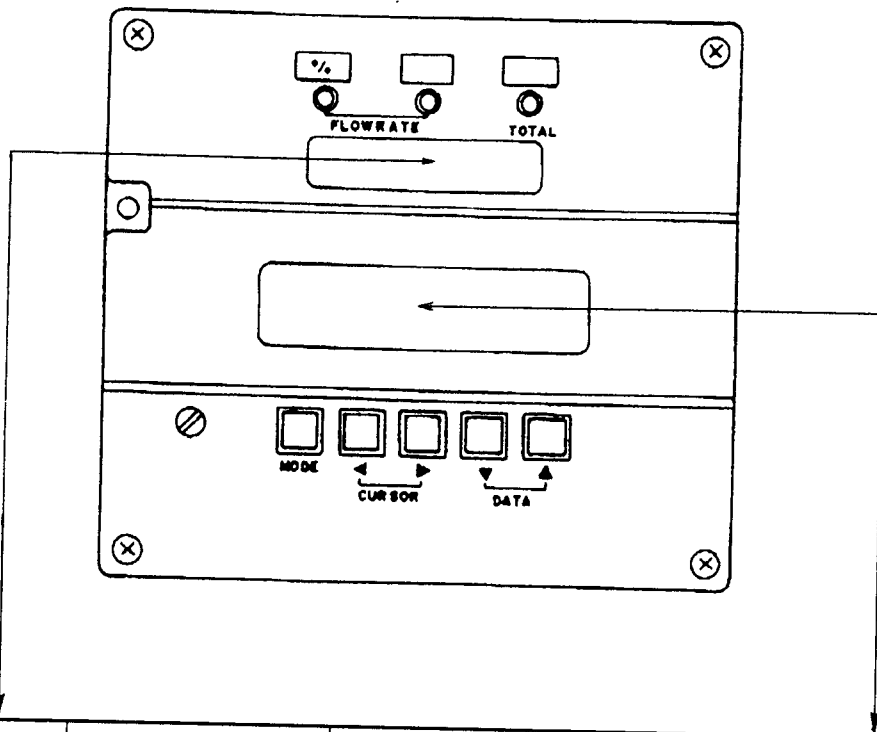
The H/W check is done in the MEASURING MODE. When an error is found, immediately take appropriate corrective measures.



Error Code (on Readout)	Type of Error	Corrective Measure	Error Message (on LCD)
Err - 01	EX loop open, coil open	<ol style="list-style-type: none"> <li>1. Check connections.</li> <li>2. Measure coil resistance.</li> <li>3. Turn on power again.</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     EX CHECK ERROR                 </div>
Err - 02	ROM check-sum error	<ol style="list-style-type: none"> <li>1. Turn on power again.</li> <li>2. Replace ROM.</li> <li>3. Replace main card.</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ROM CHECK ERROR                 </div>
Err - 03	RAM READ AFTER WRITE error	<ol style="list-style-type: none"> <li>1. Turn on power again.</li> <li>2. Replace main card.</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     RAM CHECK ERROR                 </div>
Err - 04	NVM READ AFTER WRITE error	<ol style="list-style-type: none"> <li>1. Turn on power.</li> <li>2. Replace main card.</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     NVM CHECK ERROR                 </div>
Err - 05	A/D Conversion error	<ol style="list-style-type: none"> <li>1. Turn on power.</li> <li>2. Replace main card.</li> </ol>	<div style="border: 1px solid black; padding: 5px; text-align: center;">                     ADC CHECK ERROR                 </div>

2) Check for Setting Errors

Check for setting errors are done in the ENGINEERING MODE.



Error Code (on Readout)	Type of Error	Corrective Measure	Error Message (on LCD)
Err - 11	Detector diameter or model mismatch	Check the detector diameter and model.	TYPE-DIA MATCHING ERROR
Err - 12	HI - LO ALARM setting error (HI < LO)	Set as HI $\geq$ LO.	SETTING ERROR HI < LO
Err - 21	Range setting > 12 m/s	Check the settings of SPAN, DIA, MODEL, and DUMMY.	SPAN ERROR OVER 12 m/s
Err - 22	Pulse span frequency is too high or low. (Note 1)	Check the settings of pulse weight, span, and type of pulse.	PULSE WEIGHT SETTING ERROR
Err - 23	Pulse width is too large. Pulse duty of span frequency output is 70% or more.	Check the settings of pulse width, pulse weight, and span.	PULSE WIDTH OVER DUTY 70 %
Err - 24	When in Direct/ Reverse Auto Ranging, hysteresis is more than 100% of range.	Check the setting of hysteresis.	HYSTERESIS SETTING ERROR

## 7. CALIBRATION

### Check of Converter

The converter may be checked by employing a calibrator or a checker. For precision adjustment, be sure to use the calibrator (do not use the checker for this purpose).

### 7.1 Calibration of Converter with Calibrator KIZ006

For details of Calibrator KIZ006, refer to OM2-5610-0710 "Operator's Manual for Calibrator."

#### (a) General

The calibrator generates a simulated flow velocity signal which is synchronized with the exciting current of the electromagnetic flowmeter. The simulated flow velocity signal is adjustable for a range of 0 – 10.00 m/sec in steps of 0.01 m/sec.

#### (b) Calibration Setup

To calibrate the converter using the calibrator, prepare a setup as shown in Fig. 7.1.

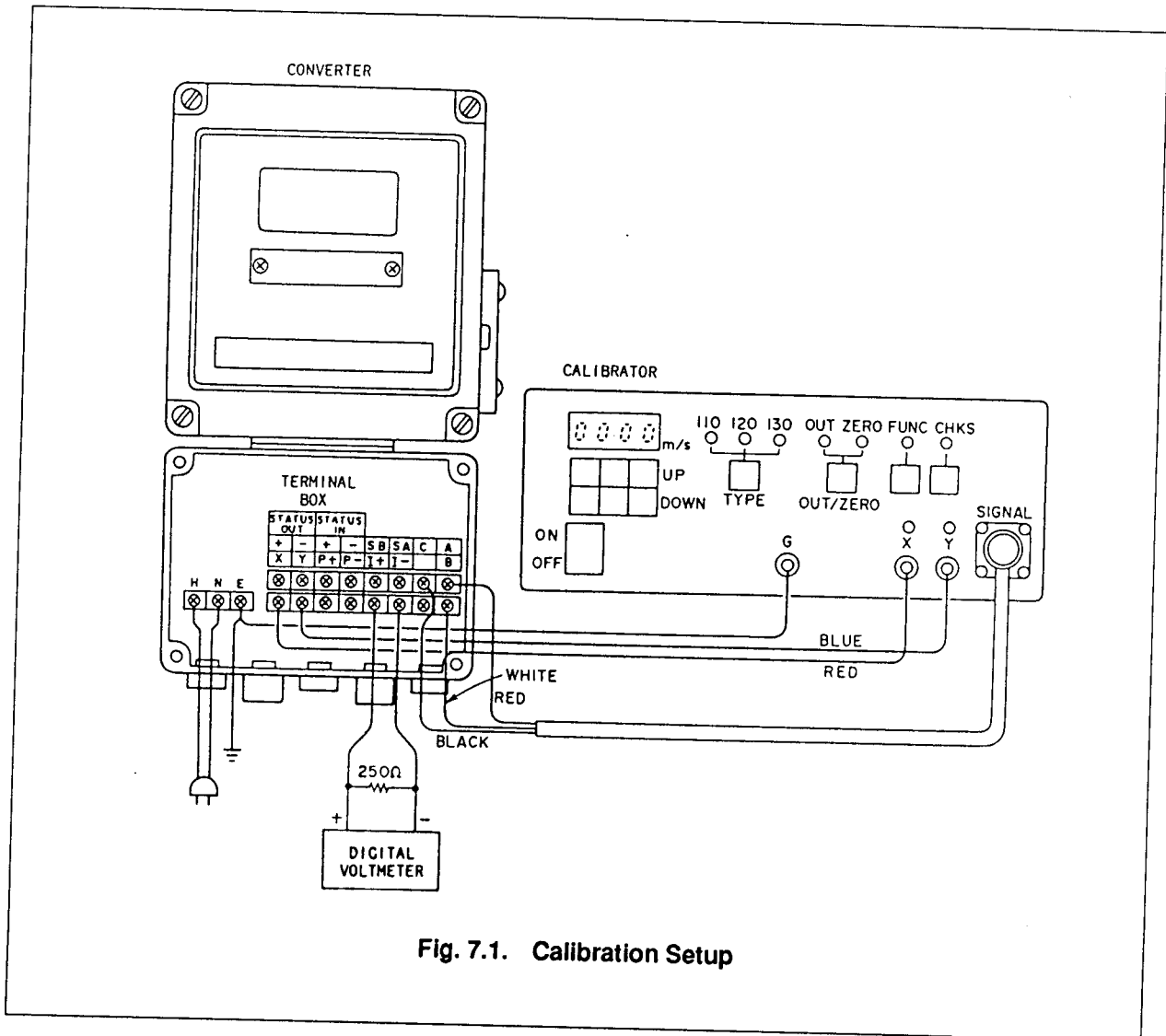


Fig. 7.1. Calibration Setup

(c) Nomenclature of Panel Items and Operation of Calibrator

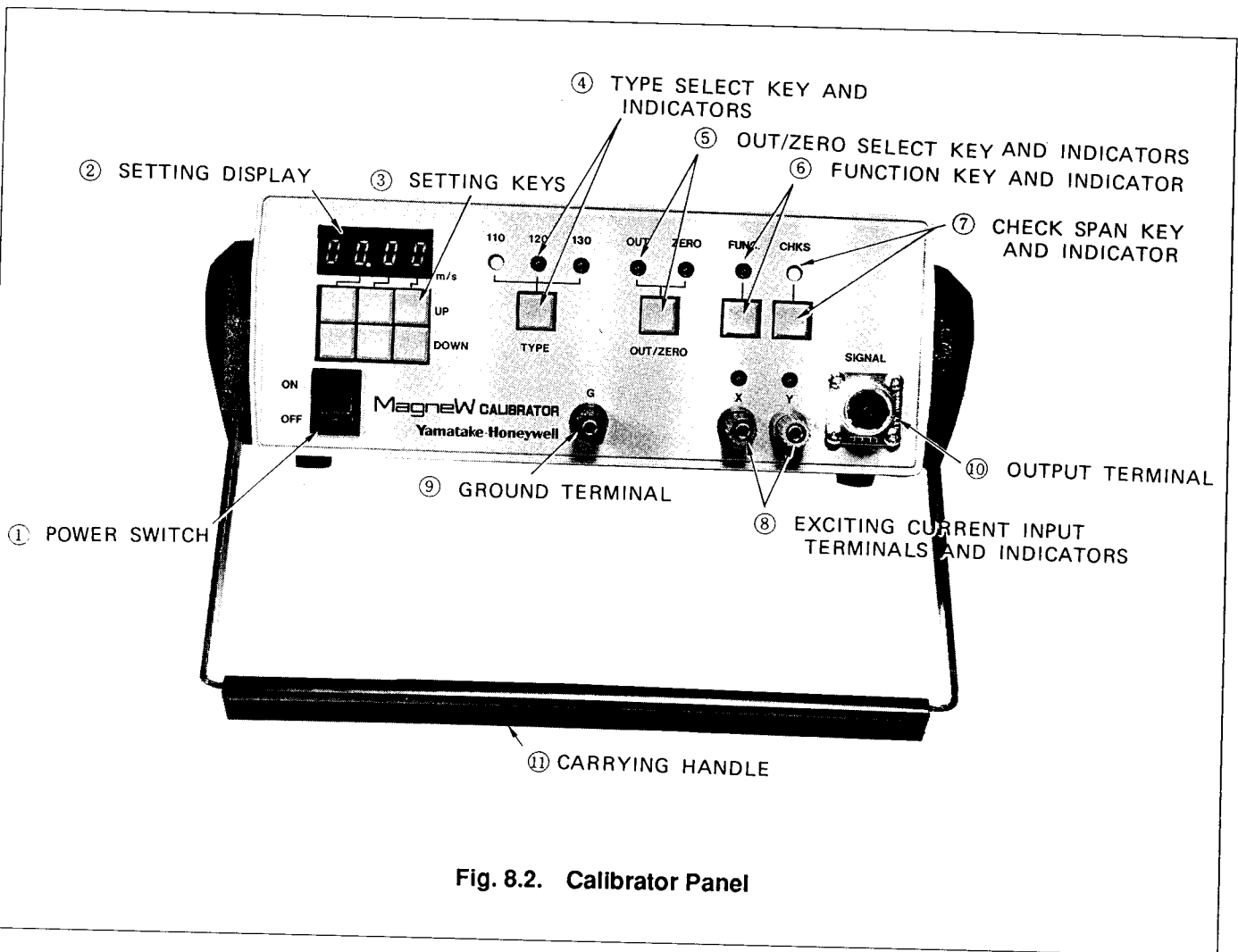


Fig. 8.2. Calibrator Panel

- (1) Select "130" for the type of the detector.
- (2) With ③ SETTING key, set the flow velocity span (m/sec) which has been set for the converter.
- (3) By monitoring the converter output, check that, each time as you press ⑤ OUT/ZERO SELECT key, the converter output is changed alternately to 100% (OUT) or 0% (ZERO).
- (4) By monitoring the converter output, check that, each time as you press ⑥ FUNCTION key, the converter output is incremented to 0%, 25%, 50%, 75%, or 100%.

## 7.2 Turning-off Converter Power

To turn-off power of the converter, use an external power switch or a breaker or other appropriate device that will instantaneously turn power off.

## 8. ACCESSORIES

Fuse 3 A	1
Mounting bracket	1
E.U. level	1

m <sup>3</sup> /d	m <sup>3</sup> /d	m <sup>3</sup> /h	m <sup>3</sup> /h	m <sup>3</sup> /m	m <sup>3</sup> /m	m <sup>3</sup> /s	m <sup>3</sup> /s
ℓ/d	ℓ/d	ℓ/h	ℓ/h	ℓ/m	ℓ/m	ℓ/s	ℓ/s
cc/d	cc/d	cc/h	cc/h	cc/m	cc/m	cc/s	cc/s
BPD	BPD	BPH	BPH	BPM	BPM	BPS	BPS
KGPD	KGPD	KGPH	KGPH	KGPM	KGPM	KGPS	KGPS
GPD	GPD	GPH	GPH	GPM	GPM	GPS	GPS
mGPD	mGPD	mGPH	mGPH	mGPM	mGPM	mGPS	mGPS
m <sup>3</sup>	m <sup>3</sup>	ℓ	ℓ	cc	cc		
B	B	KG	KG	G	G	mG	mG
X10	X10	X10 <sup>2</sup>	X10 <sup>2</sup>	X10 <sup>3</sup>	X10 <sup>3</sup>		
X0.1	X0.1	X0.01	X0.01	X0.001	X0.001		

### KIX setting data list 1

**KIX SETTING DATA**

DAMPING CONSTANT

COUNTER PRESET VALUE

IDENTIFICATION (ID)

FUNCTION CODE SET

DETECTOR SIZE

TYPE

DUMMY

EX VALUE

SPAN VALUE #1

SPAN VALUE #2

HYSTERESIS

PULSE WEIGHT

TYPE (\*)

WIDTH

DROPOUT

ALARM HIGH

LOW

LOW FLOW CUT

ERROR OUTPUT MODE

I. OUT

P. OUT

STATUS OUTPUT MODE

EMPTY SWITCH (\*)

COMMUNICATION MODE (\*)

\* S ARE DETERMINED BY H/W SWITCHES

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**Document Number :** OM2-5661-3020  
**Document Name :** Smart MagneW3000 Electromagnetic  
Flowmeter Converter  
Model: KIX18B (FM Approved)

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**Date :** July, 1998 (Rev. 4) (Y )  
**Issued / Edited by :** Yamatake Corporation

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**YAMATAKE**