YAMATAKE

OM2-5660-3520P

MagneW3000 Ceramic Type Electromagnetic Flowmeter Model: KID30A/KIX20A

(Integral Type)

User's Manual

Yamatake Corporation

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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.

1. UNPACKING AND GENERAL PRECAUTIONS

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.

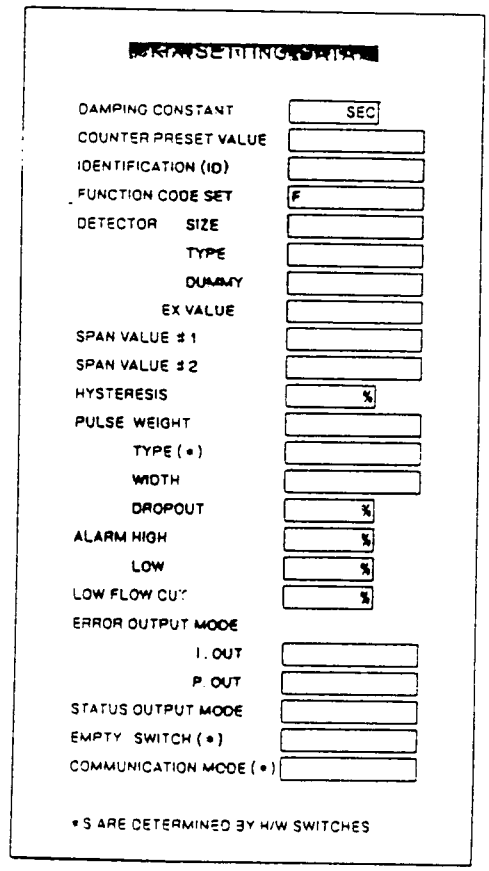
1.1 Unpacking and Inspection

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 below accompany the instrument. If any of them are missing, immediately notify your dealer.

ACCESSORIES

Fuse 3 A	1
Mounting bracket	1
E.U. label	1
KIX setting data list	1

m^3/d	m^3/d	m^3/h	m^3/h	m^3/m	m^3/m	m^3/s	m^3/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^3	m^3	ℓ	ℓ	cc	cc		
B	B	kG	kG	G	G	mG	mG
X10	X10	$X10^2$	$X10^2$	$X10^3$	$X10^3$		
X0.1	X0.1	X0.01	X0.01	X0.001	X0.001		



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 Figure 1.1 and is posted on the side of the instrument. The DETECTOR MODEL column is left blank.

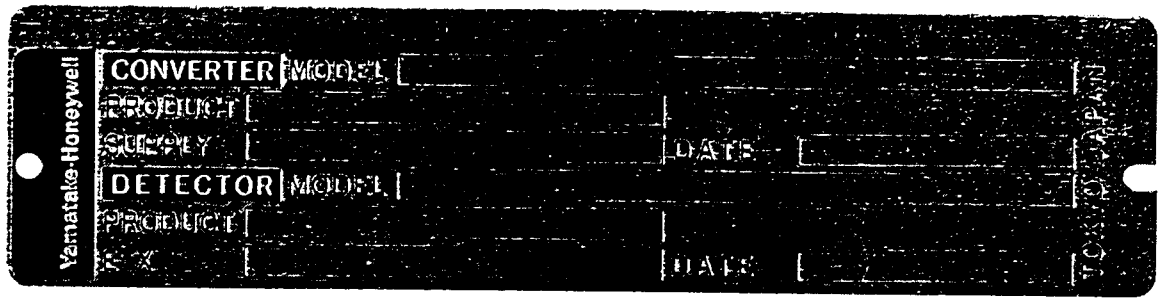


Figure 1.1. Nameplate

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:

- o Should be well protected against adverse weather.
- o Should be well protected against mechanical vibration.
- o Ambient temperature should be -40 to +70°C (25°C is ideal) [-40 to 158°F (77°F is ideal)].
- o Ambient humidity should be 5 to 95% RH (60% RH is ideal).

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 Figure 2.1.

2.2 Structure of MagneW Flowmeter

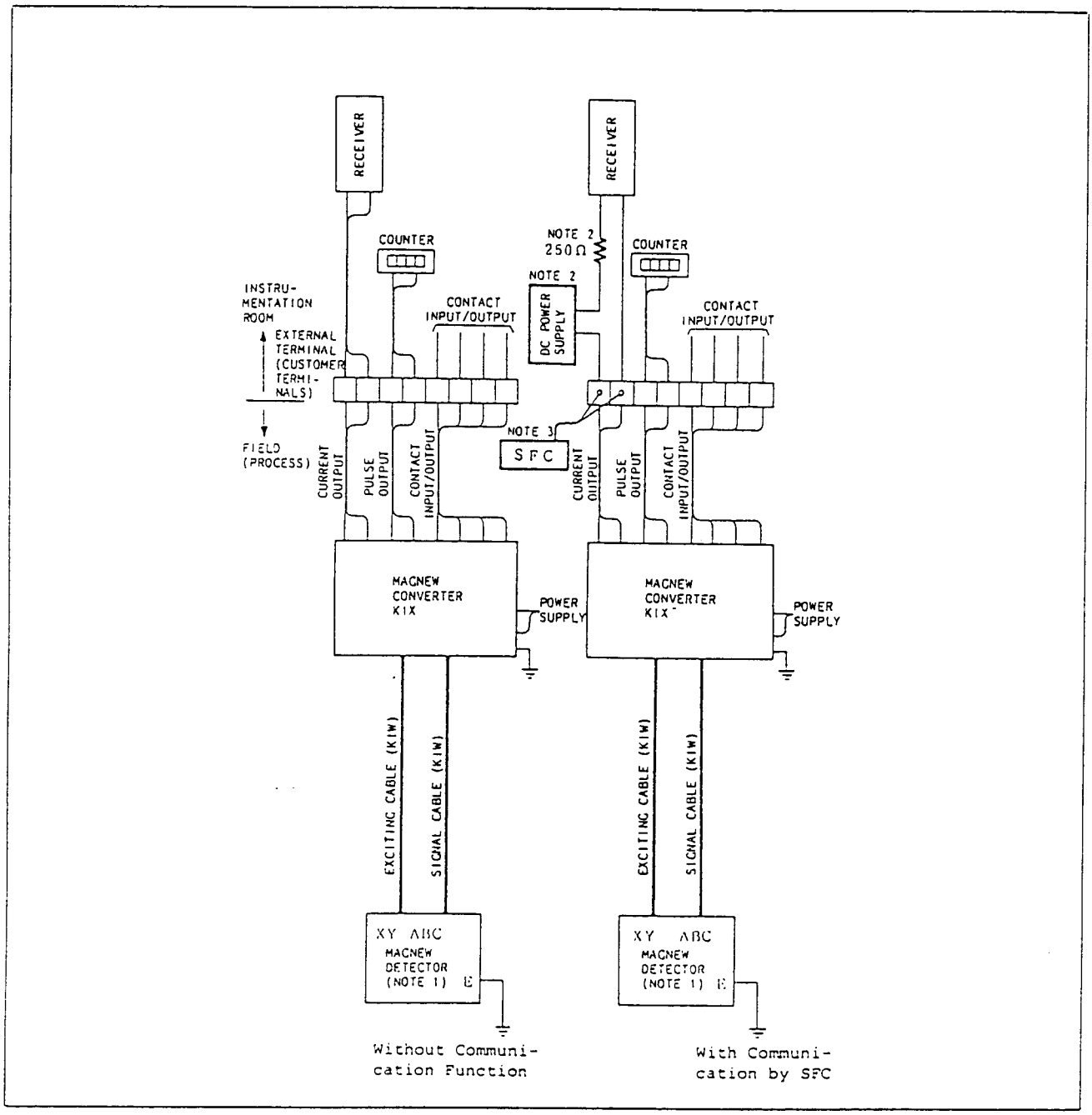


Figure 2.1

Note 1: Models KID, NNM, NNP, and NNK
Note 2: For communication by SFC, a DC power supply and a resistor (≧ 250 ohms) are needed for the current output signal loop.
Note 3: Wiring for the SFC is necessary only when communication by it is needed.

2.3 Measuring Principles of Electromagnetic Flowmeter

The measuring principles of the electromagnetic flowmeter are as follows:

As an electrically conductive liquid flows in a pipe which has a magnetic field in the right-angle direction with respect to the flow direction, an electromotive force is induced in the liquid in the right-angle direction with respect to both liquid flow direction and magnetic field direction by Faraday's law of electromagnetic induction. The induced voltage is proportional to the liquid flow velocity. By detecting the induced voltage with a pair of electrodes installed in the pipe, volumetric measurement of liquid flow can be made. The relationship between the liquid flow velocity and the voltage is expressed as follows:

$$E = kBd\bar{v}$$

where,

- E: Induced emf voltage (V)
- k: Constant
- B: Magnetic flux density (t)
- d: Inside diameter of pipe (m)
- $\bar{v}$: Average flow velocity (m/s)

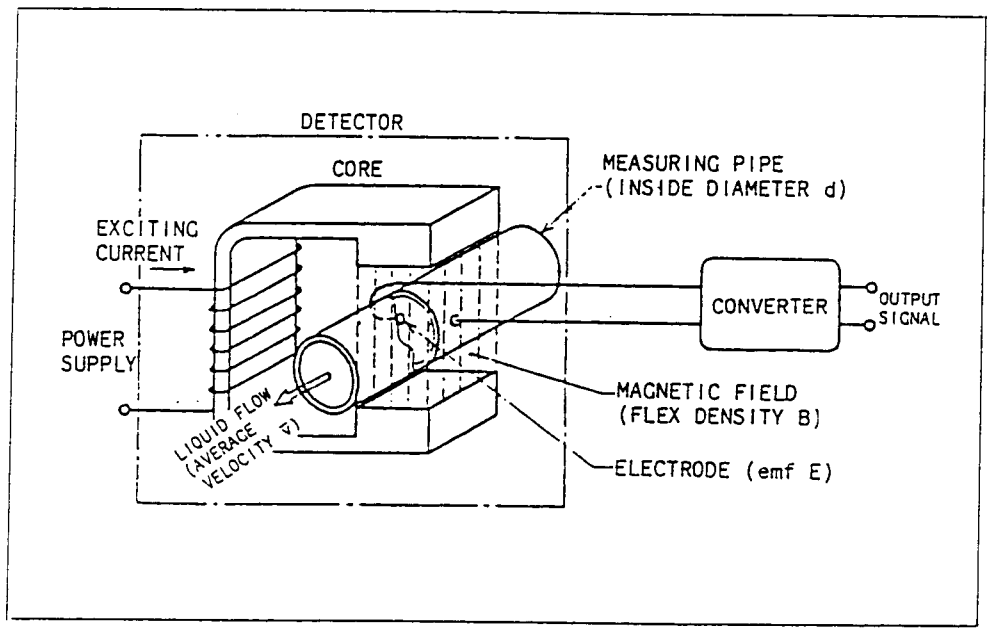
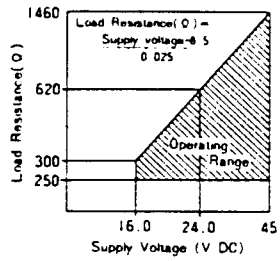


Figure 2.2. Measuring Principles of Electromagnetic Flowmeter

Instrument Specifications

Item	Specifications
Size (Diameter)	15(0.5"S), 25(1"S), 40(1.5"S), 50(2"S), 80(3"S), 100(4"S)mm
Power requirement	100, 110, 120V AC±10%, 50/60Hz±2Hz 200, 220, 240V AC±10%, 50/60Hz±2Hz 24V DC±10%
External power supply for SFC communication	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.) 
Power consumption	14W (22VA including detector and converter)
Input signal	Flow rate signal: Flow rate proportionate signal from detector Contact input: Any one point of the following signals among semiconductor contacts or no-voltage contacts. • 0% signal lock signal • Automatic zero adjust signal • Direct/reverse flow direction switching signal • Dual range switching signal • Totalizer preset signal
Output signal	Excitation current: Output to detector excitation coil Current output: 4 to 20mA DC Contact output: Any one point among the following under open-collector external load of 30V DC max., 200mA max. (in case of resistance load) • Upper/lower limit alarm, self-diagnosis alarm, empty-status detection • Direct/reverse flow direction discrimination • Dual range discrimination • Totalizer preset status Pulse output: • Open-collector output 0 to 2,000Hz, pulse widths 0.3, 0.5, 1, 7, 10, 15, 30, 50, 100ms External load 30V DC max., 200mA max. • Electromagnetic totalizer 0 to 20Hz, pulse widths 30, 50, 100ms External load 24V DC, 210 ohms • Mercury relay 0 to 20Hz, pulse widths 30, 50, 100ms External load 30V DC max., 300mA max.
Display	Display card: 7-segments LED, 6 digits Local setting card: LED, 7-segment LED, 6 digits, 16 digits / 2 lines Instant flow rate percentage display: % Instant actual flow rate display: Cubic-volumetric units: m^3, *l*, cc, B (barrel), KG (kilogallon), G (gallon), mG (milligallon) Time units: day, hour, min., sec. Scaled pulse integration display: m^3/p, *l*/p, cc/p, B/p, KG/p, G/p, mG/p.
Setting method	Local setting card: 5 key-switches Remote setting by SFC
Flow velocity range	0 – 0.1m/s to 0 – 10m/s
Damping time constant	0, 0.5, 1, 2, 3, 4, 5, 10, 50, 100 sec.
Dropout	2 to 10% FS of pulse output (variable integers)
Low flow cutoff	0 to 10% FS of current output (variable integers)

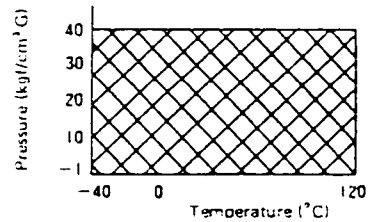
Structure

Item		Specifications
Materials		1) Detector Case: Aluminium alloy (size 40mm and over), cast steel (size 25mm or less) Measuring pipe: Alumina ceramic (Al2O3: 99.7%) Electrodes: SUS316L, hastelloy C, titanium, tantalum, platinum/iridium Ground ring: Not provided or platinum metallized (If not provide, ground with mating conduit.) 2) Converter Case: Aluminium alloy
Electrodes		Internal insertion type (Detachable electrodes)
Case	**Structure**	NEMA4, IEC IP66, JIS C0920 Water-proof type equivalent
	Finish	Acryl paint
	Finish color	Detector: Dark beige (Munsell 10YR4.7/0.5) Converter: Light beige (Munsell 4Y7.2/1.3)

Installation Specifications

Ambient temperature	−10 to +50°C
Relative humidity	10 to 90% RH
Installation	Flange-pincered installation type
Flange ratings	JIS 10K, JIS 20K, JIS 30K, JIS 40K, ANSI 150, ANSI 300, DIN ND 10, DIN ND 40
Electrical conduit connection	G1/2, CM20, 1/2NPT internal thread
Mounting angle	The two electrodes to be in mutually horizontal position
Ground	JIS Class 3 ground (Ground resistance not greater than 100 ohms)

Liquid Flow Specifications

Flow velocity ranges	0 – 0.1m/s to 0 – 10m/s
Electrical conductivity of liquid	3 μS/cm or over
Liquid pressure and temperature ranges	−40 to +120°C 
Maximum allowable temperature shock	Positive: ΔT=150°C/1 sec. or less Negative: ΔT=100°C/1 sec. or less

Performance Specification

	Span (Vs)	Flow rate ≧ 25%	Flow rate ≦ 25%
Accuracy (Reference operating conditions)	Vs=1.0 to 10m/s	±0.5% of rate	±0.125% FS
	Vs=0.1 to less than 1.0m/s	$\pm\left(\frac{0.1}{Vs}+0.4\right)$ % of rate	$\pm\frac{1}{4}\left(\frac{0.1}{Vs}+0.4\right)$ % FS

Semi-standard Specificaion

Corrosion-resistant finish (Y 138A, B)	Corrosion-resistant finish (Y138A): Baked acryl finish Corrosion-proof finish (Y138B): Baked epoxy finish

Flow Conversion Table

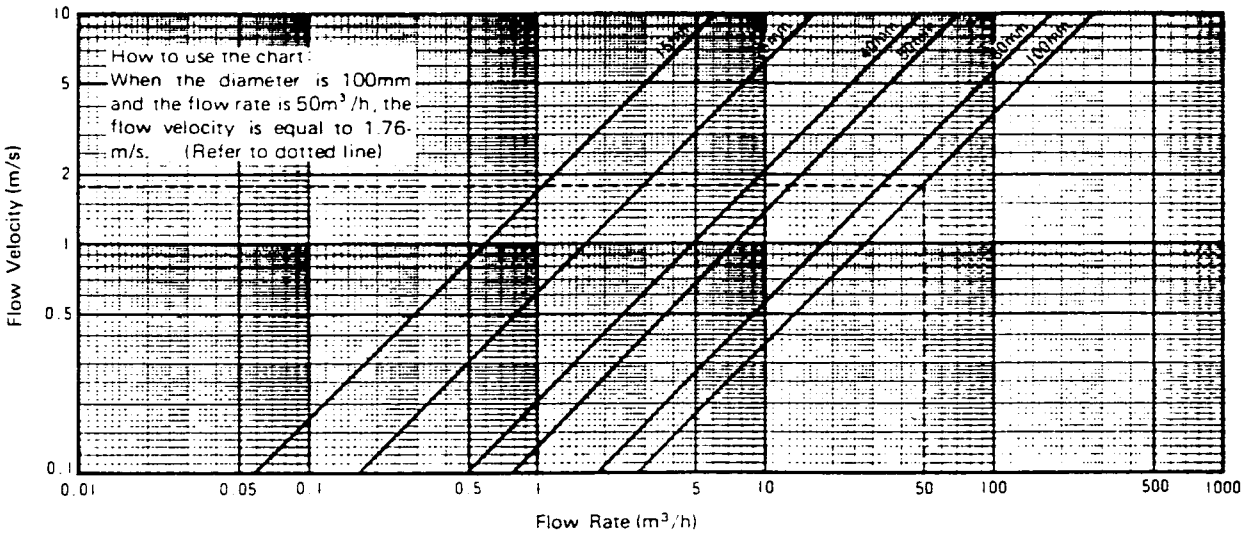
V = K x Q [V: Flow velocity (m/s),
Q: Flow rate (m^3/h),

K: Flow conversion factor $\frac{1}{3600} \times \frac{4}{\pi D^2}$]

Example: When size is 50mm and flow rate is $20m^3/h$,
V = 0.1415 x 20 = 2.830m/s.

Size (mm)	Flow Conversion Factor K	Flow Span Q (m3/h)	Flow Velocity V (m/s)
15	1.572	0.0636 to 6.36	0.1 to 10m/s
25	0.5659	0.177 to 17.7	
40	0.2210	0.452 to 45.2	
50	0.1415	0.707 to 70.7	
80	0.05526	1.81 to 181	
100	0.03537	2.83 to 283	

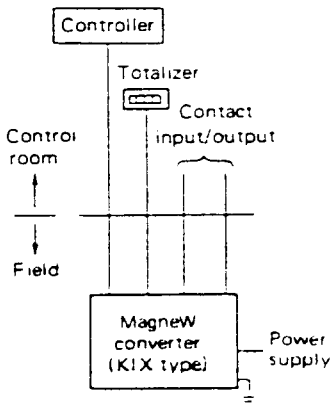
Maximum Flow Velocity Conversion Chart



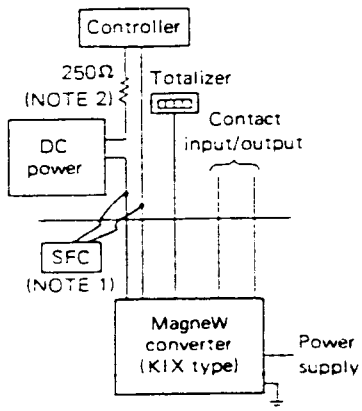
Configuration of Smart MagneW3000

KIX-type MagneW converter, mounted with a microprocessor, can conduct remote setting of various parameters by external communications with SFC.

1) No communication function provided



2) Communication by SFC



Notes: 1) Under configuration of "communication by SFC," DC power supply for loop and resistance of over 250 ohms are required on the current output line.
2) Wire connection of SFC is effected only when communications are made.

Model Number Table

Detector

Ex: KID30A-0050CL11XXX-A

Basic Model No.	Selections								Applicable Size						Description
	Flowmeter Size	Lining	Electrodes	Flange Standards & Pressure Rating	Ground Ring	Conduit Connection	Option I	Options II	15mm	25mm	40mm	50mm	80mm	100mm	
	I	II	III	IV	V	VI	VII	VIII							
KID 30A									○	○	○	○	○	○	Integral type detector
	-0015								○						15mm
	-0025									○					25mm
	-0040										○				40mm
	-0050											○			50mm
	-0080												○		80mm
	-0100													○	100mm
		C							○	○	○	○	○	○	Ceramic
			L						○	○	○	○	○	○	SUS316L
			C						○	○	○	○	○	○	Hastelloy C
			K						○	○	○	○	○	○	Titanium
			T						○	○	○	○	○	○	Tantalum
			P						○	○	○	○	○	○	Platinum/iridium
				11					○	○	○	○	○	○	JIS 10K
				12					○	○	○	○	○	○	JIS 20K
				13					○	○	○	○	○	○	JIS 30K
				16					○	○	○	○	○	○	JIS 40K
				21					○	○	○	○	○	○	ANSI 150
				22					○	○	○	○	○	○	ANSI 300
				41					○	○	○	○	○	○	DIN ND10
				43					○	○	○	○	○	○	DIN ND40
					X				○	○	○	○	○	○	None
					M				○	○	○	○	○	○	Platinum metallized
						X			○	○	○	○	○	○	None
							-X		○	○	○	○	○	○	None
								X	○	○	○	○	○	○	None
								A	○	○	○	○	○	○	SUS304 bolts and nuts
								B	○	○	○	○	○	○	Carbon steel bolts and nuts

Converter

Basic Model No.	Selections: Power Supply		Selections: Output Signal: Analog	Selections: Output Signal: Indicator	Selections: Output Signal: Pulse	Selections: Terminal Box/ Lightning Arrester	Selections: Installation	Selections: Electrical Connection	Options: Waterright Gland	Options: Communi-cation	Options: Function Designation	Description	
	–	I	II	III	IV	V	VI	VII	VIII	IX	X		
KIX20A												Integral-type converter	
	–	A										100V AC, 50/60Hz	
	–	C										110V AC, 50/60Hz	
	–	E										120V AC, 50/60Hz	
	–	G										200V AC, 50/60Hz	
	–	I										220V AC, 50/60Hz	
	–	K										240V AC, 50/60Hz	
	–	M										24V DC	
			1									4 to 20mA DC	
				X								None	(Note 1)
				1								Flowrate indicator	(Note 1)
				2								Local operating panel	
					X							None	
					O							Open collector pulse output	
					P							Electromagnetic totalizer drive pulse output	
					Q							Mercury relay contact pulse output (Note 3)	
						2						Terminal box and lightning arrester provided	
							X					Integral type	
								V				G1/2	
								W				CM20 internal thread	Watertight gland is not available.
								Y				1/2NPT internal thread	Watertight gland is not available.
									–X			Without watertight gland	
									–1			With brass (plating Ni) watertight gland	
									–2			With plastic watertight gland	
										X		Communication function not provided	
										S		Communication by SFC	
											X	None (Note. 2)	
											F□□□□	Provided (used according to function designation table)	

NOTES:

1) Effect data setting or changes under communication mode by SFC or MCI.
2) Function types (default value)
   - Ranging function → Single range
   - Built-in totalizer function→Not provided
   - Contact input function → Not provided
   - Contact output function → Not provided

   FOXXX: When pulse card is not provided
   FOAXX: When pulse card is provided
3) This output cannot be selected when the converter is installed for vertical conduit.

o MODEL NUMBERS "F"

The instrument is delivered to you with its functions provided as denoted by its model number. The two major objectives of specifying the required functions are as follows:

(1) To make the instrument best suited for its application.

(2) To eliminate the necessity of operations for the functions which are not specified. (No displays other than those of the specified functions are displayed.)

For the procedures of setting or modifying the contents of the specified function items, see Section 6.4.10).

o Single Range

Function Selection					Description	
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function		
F	I	II	III	IV		
	0				Direct direction, single range	
		X			None	Note 1
		A			Totalizer	Note 2
		B			Preset-counter	Note 3
			X		None	
			1		External 0% lock	
			2		External auto zero adjustment	
			4		Internal counter reset	Note 4
				X	None	
				1	Alarm	
				3	Preset counter	Note 4

o Direct Direction, Auto Select Dual Ranges

Function Selection					Description	
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function		
F	I	II	III	IV		
	1				Direct direction, auto select dual ranges	
		X			None	
		A			Totalizer	
			X		None	
			1		External 0% lock	
			2		External auto zero adjustment	
			4		Internal counter reset	Note 4
				2	Range select	

o Direct Direction, External Select Dual Ranges

Function Selection					Description
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function	
F	I	II	III	IV	
	2				Direct direction, external select dual ranges
		X			None Note 1
		A			Totalizer Note 2
		B			Preset-counter Note 3
			3		External range select
				X	None
				1	Alarm
				2	Range select
				3	Preset counter Note 4

o Direct/Reverse Direction, Auto Range Select

Function Selection					Description
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function	
F	I	II	III	IV	
	3				Direct/reverse direction, auto range select
		X			None Note 1
		A			Totalizer
		C			Direct/reverse flow totalization Note 2
			X		Note
			1		External 0% lock
			2		External auto zero adjustment
			4		Internal counter reset Note 4
				2	Range select

o Direct/Reverse Direction, External Range Select

Function Selection					Description
	Ranging Function	Internal Counter Function	Contact Input Function	Contact Output Function	
F	I	II	III	IV	
	4				Direct/reverse direction, external range select
		X			None Note 1
		A			Totalizer Note 2
		B			Preset-counter Note 3
		C			direct/reverse flow totalization Note 2
			3		External range select
				X	Note
				1	Alarm
				2	Range select
				3	Preset counter Note 4

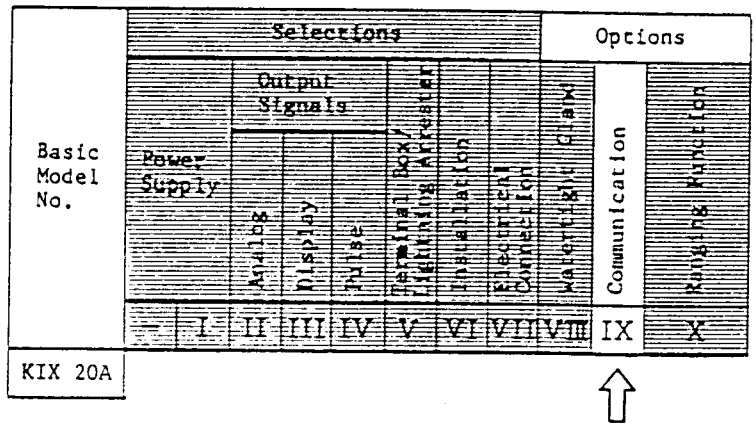
Note 1: Internal counter reset (III-4) and preset counter (IV-3) are not available.

Note 2: Preset counter (IV-3) is not available.

Note 3: Preset counter (IV-3) must be specified.

Note 4: Install counter is available only when "with pulse output" and "with output display" or "with a SFC" are specified.

3.1 Details of Optional Item "Communication"



X: No communication function

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

S: Communication by SFC

- o The 24 VDC external power supply for analog output is needed. See Figure 2.1.
- o The allowable external load resistance is 250 ohms or more. See Figure 2.1.
- o 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"

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

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

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 Figure 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.

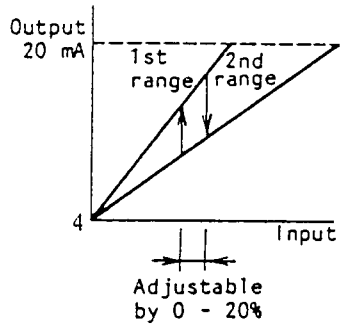


Figure 3.1. Direct Direction, Automatic Dual Range Transfer Hysteresis

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 Figure 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 differental 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 possible.

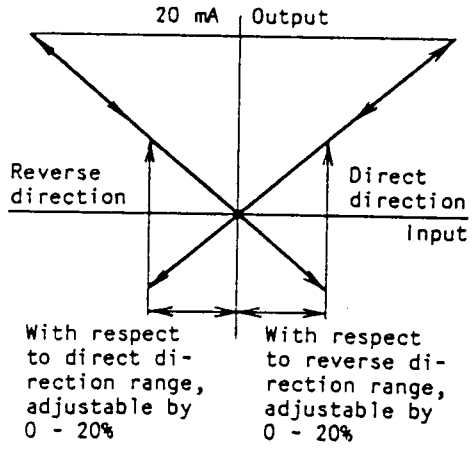


Figure 3.2. Direct/Reverse Transfer Hysteresis

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) in 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)

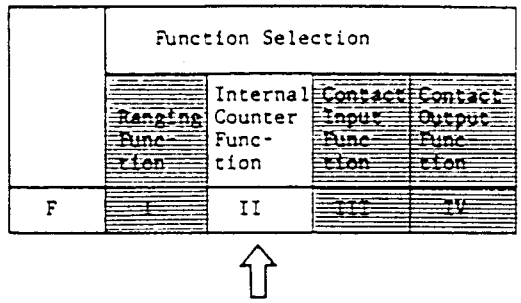
Direct/reverse status signal

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.

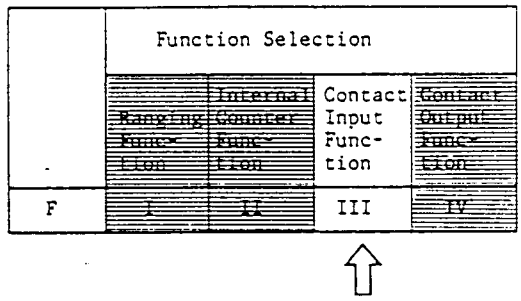
B: Totalizing counter with preset function

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.

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

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.)

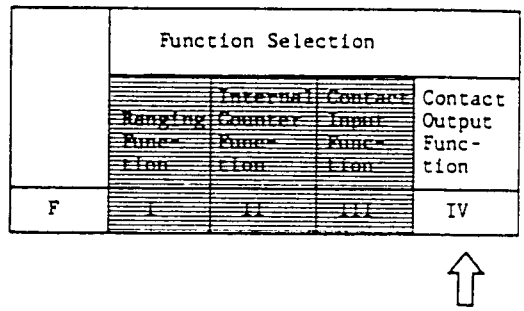
3: External range select input

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 in question can be identified with the internal display of the converter or with the SFC.

(1) Flow value alarm

(2) Self diagnosis

- o Coil open
- o ROM error
- o RAM error
- o NVM error
- o 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.

State / Output signal	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 μS/cm). When the electrical conductivity of the measured fluid is less than 150 μS/cm, errors (negative polarity) are introduced.

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

- 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.

- When the electrical conductivity of the liquid to be measured is less than 150 μS/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: Open

2nd range or reverse direction: Closed

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 Figure 6.2. (The instrument is delivered to you with the switch set in the "EMPTY FUNCTION EMPLOYED" state.)

5.3 Installation

The ceramic-type electromagnetic flowmeter employs ceramics for its detector components contacted with the measured liquid. Handle the detector very carefully, taking heed of the fact that its ceramic components are less resistant against mechanical shocks and shearing stresses.

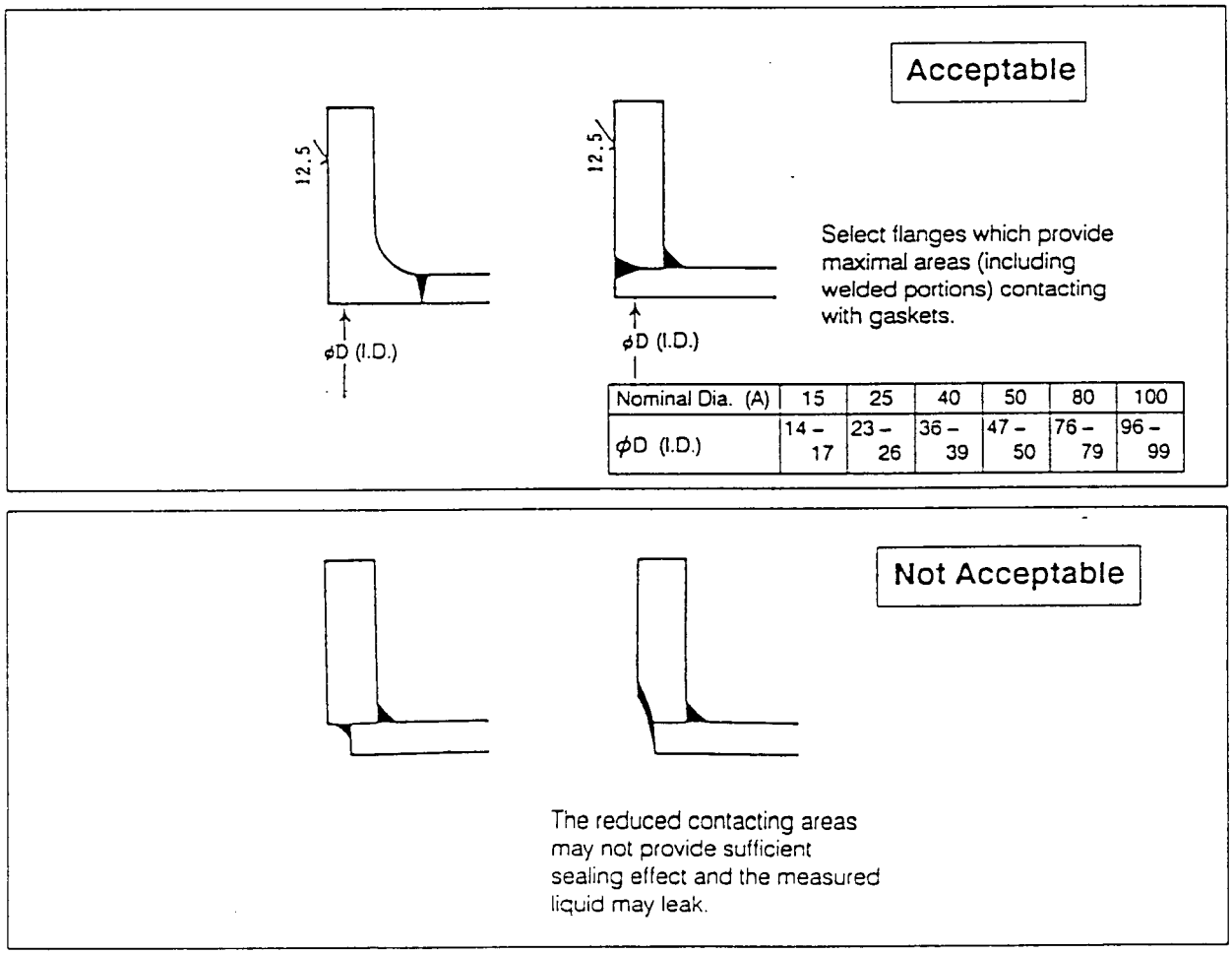
5.3.1 Precautions

- Handle the detector carefully. Do not drop the detector or otherwise let it subjected to mechanical shocks lest it — especially its components made of ceramics — should be subjected to mechanical shocks.
- Do not remove the protective covers from both ends of the detector until immediately before installing the detector in the process pipe.
- Do not step on, pry or hit the detector or its transformer or its terminal box either before or after installing them in the process pipe, lest the ceramic components of the detector should be damaged by mechanical shocks or stresses caused by such acts.

5.3.2 Requirements of Flanges

- Shapes and Conditions of Flanges

  The detector may be damaged if there are protrusions or other unevenness on the flange planes. Smooth out the protrusions and other unevenness so that the planes becomes flat and even.

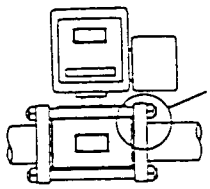


Nominal Dia. (A)	15	25	40	50	80	100
ϕD (I.D.)	14 – 17	23 – 26	36 – 39	47 – 50	76 – 79	96 – 99

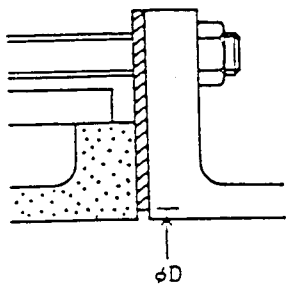
Figure 5-3. Required Shapes and Conditions of Flanges

5.3.3 Requirements of Gaskets

- Gasket OD (full-face gaskets): In order to prevent eccentricity between gaskets and flanges, use full-face gaskets whose outside diameters are identical with those of flanges.
- Gasket thickness: Use approximately 3 mm thick gaskets.
- Gasket ID: To prevent leak of measured liquid, use gaskets whose inside diameters are as shown in Figure. 5-4.



Acceptable



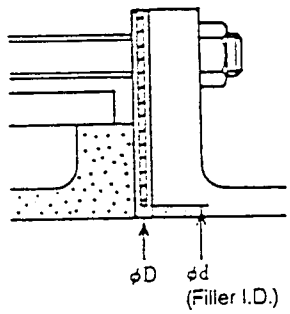
Appropriate gasket I.D.

Full-Face Gasket

Use gaskets which will provide maximal sealing areas.

Nominal Dia. (A)	15	25	40	50	80	100
ϕD (I.D.)	14 – 17	23 – 26	36 – 39	47 – 50	76 – 79	96 – 99

Acceptable



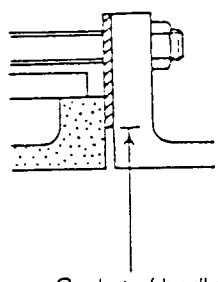
Appropriate gasket I.D.

Teflon Envelope Gasket-Milled Type

Select the gasket so as to maximize the sealing area between the gasket and detector.

Nominal Dia. (A)	15	25	40	50	80	100
ϕD (I.D.)	14	23	36	47	76	96
ϕd (Filler I.D.)	17	26	39	50	79	99

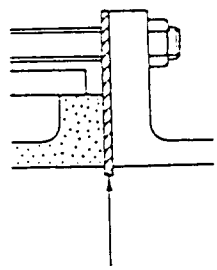
Not Acceptable



The sealing area is less, increasing chances of leak of measured liquid.

Gasket of badly oversized ID

Not Acceptable



The innermost part of the gasket protruding into the process pipe inside will disturb the liquid flow, causing inaccuracies of flow measurement.

Gasket of undersized ID

Figure 5-4.

5.3.4 Grounding of Measured Liquid

- If the piping is metallic, ground it to ground the measured liquid, regardless of whether the detector has a ground ring or not. Ground the casing also (grounding work: JIS, Type 3).
- If the piping is coated with paint or other insulative film, remove it to attain electrical continuity for grounding. If removal of coating is inhibited, use terminal washers on the flanges or tap M4 screw thread holes into the flanges to connect the ground wires.

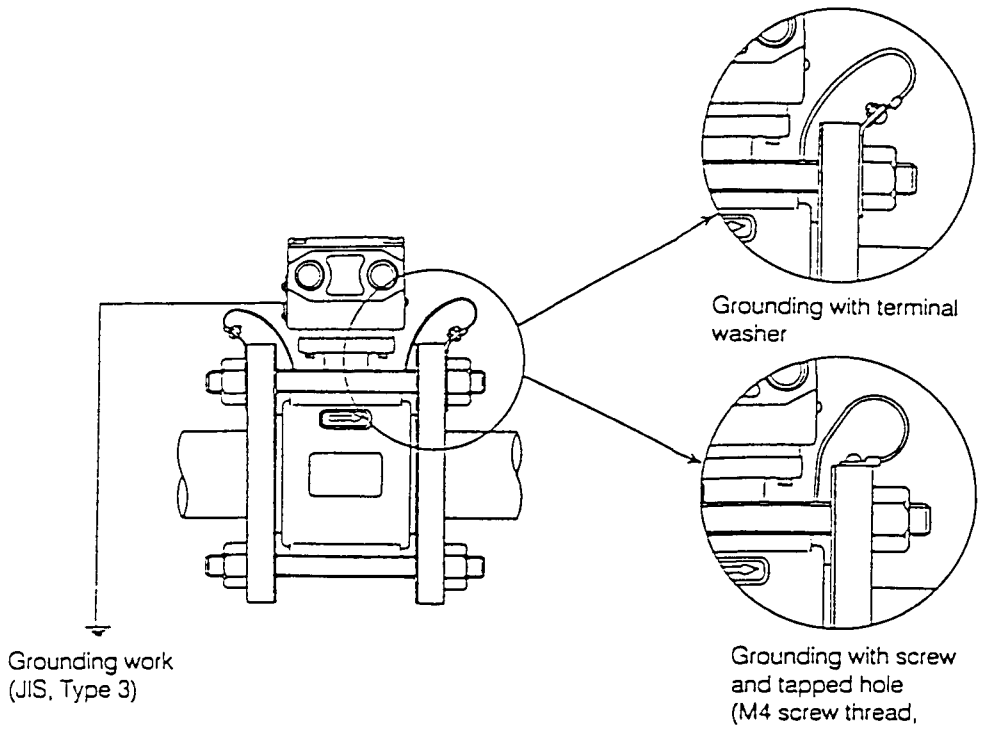


Figure. 5-5. Grounding of Measured Liquid

5.3.5 Installation

(1) Location

- Install the detector at a location where it will constantly be filled with measured liquid. Note that the detector must constantly be filled with liquid — not with air or gas.

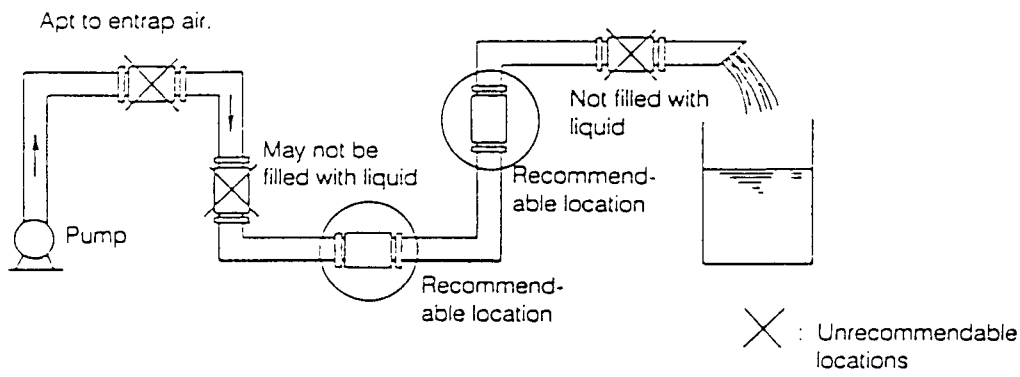
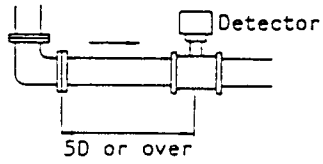
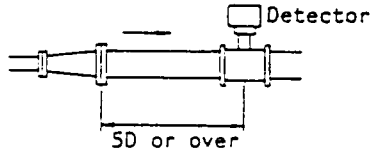
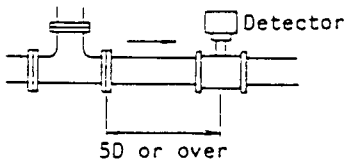
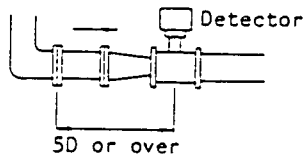
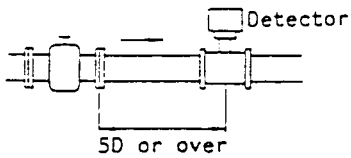
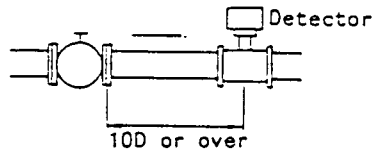


Figure. 5-6. Recommendable/Unrecommendable Locations

Provide a straight pipe section at the upstream and downstream sides of the detector.

<table>
<tr><th colspan="2">Upstream side</th><th>Downstream side</th></tr>
<tr><td>90° bent
 
</td><td>Expander pipe of cone angle 15° or over (If angle is less than 15°, the section can be regarded as a straight pipe section.)
 
</td><td rowspan="3">2D or over</td></tr>
<tr><td>Tee
 
</td><td>Reducer pipe (Can be regarded as a straight pipe section.)
 
</td></tr>
<tr><td>Sluice valve full-open
 
</td><td>Other valves
 
</td></tr>
</table>

Upstream and downstream sides of detector (D: Nominal diameter of detector)

Figure 5-7. Dimension of Straight Piping

(2) Piping

- Be sure that the piping is not inclined or off-centered. If so, correct it before installing the detector.

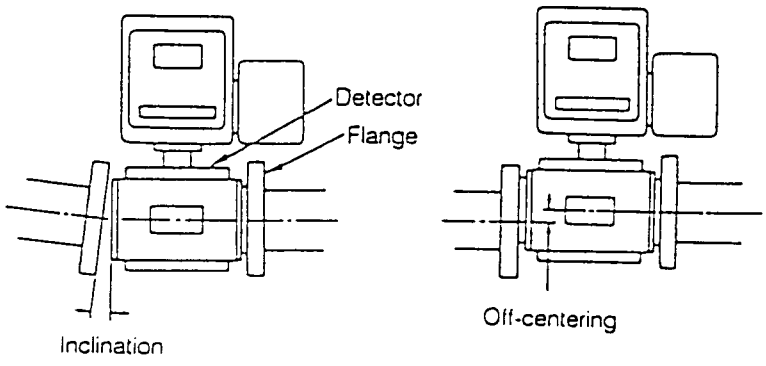


Figure. 5-8. Examples of Inclined or Off-centered Piping

(3) Tightening Torque

- Tighten uniformly the flange nuts with a minimal torque required for reliably stopping leakage, within the range specified for each type of gasket in Table 5.1. If leakage occur after tightening the nuts, increase the tightening torque but never exceed the range shown in Table 5.1.

- If leakage does not stop even when the nuts are tightened with the maximum tightening torque within the specified range, do not attempt to stop it by applying more torque. Note that the ceramic components are not highly tenacious and can be damaged if stresses beyond a certain limit are applied to them. Stop leakage by correcting the piping (see Item (2)).

Table 5.1

Port \ Gasket	Flexible Graphite Sheet 1.6 t	Asbestos 3 t	Teflon with filler 2 t	Teflon Envelope Gasket-Milled Type	Chloroprene rubber 3 t
15 A	180 to 210 kgf·cm (18 to 21 N·m)	170 to 210 kgf·cm (17 to 21 N·m)	190 to 230 kgf·cm (19 to 23 N·m)	90 to 110 kgf·cm (9 to 11 N·m)	70 to 80 kgf·cm (7 to 8 N·m)
25 A	210 to 250 kgf·cm (21 to 25 N·m)	200 to 240 kgf·cm (20 to 24 N·m)	230 to 280 kgf·cm (23 to 28 N·m)	190 to 230 kgf·cm (19 to 23 N·m)	140 to 180 kgf·cm (14 to 18 N·m)
40 A	380 to 470 kgf·cm (38 to 47 N·m)	370 to 450 kgf·cm (37 to 45 N·m)	410 to 500 kgf·cm (41 to 50 N·m)	200 to 250 kgf·cm (20 to 25 N·m)	150 to 180 kgf·cm (15 to 18 N·m)
50 A	270 to 330 kgf·cm (27 to 33 N·m)	250 to 310 kgf·cm (25 to 31 N·m)	290 to 360 kgf·cm (29 to 36 N·m)	230 to 280 kgf·cm (23 to 28 N·m)	150 to 190 kgf·cm (15 to 19 N·m)
80 A	400 to 490 kgf·cm (40 to 49 N·m)	380 to 470 kgf·cm (38 to 47 N·m)	420 to 510 kgf·cm (42 to 51 N·m)	360 to 440 kgf·cm (36 to 44 N·m)	160 to 190 kgf·cm (16 to 19 N·m)
100 A	570 to 700 kgf·cm (57 to 70 N·m)	550 to 670 kgf·cm (55 to 67 N·m)	590 to 730 kgf·cm (59 to 73 N·m)	390 to 480 kgf·cm (39 to 48 N·m)	160 to 200 kgf·cm (16 to 20 N·m)

(4) Mounting Method

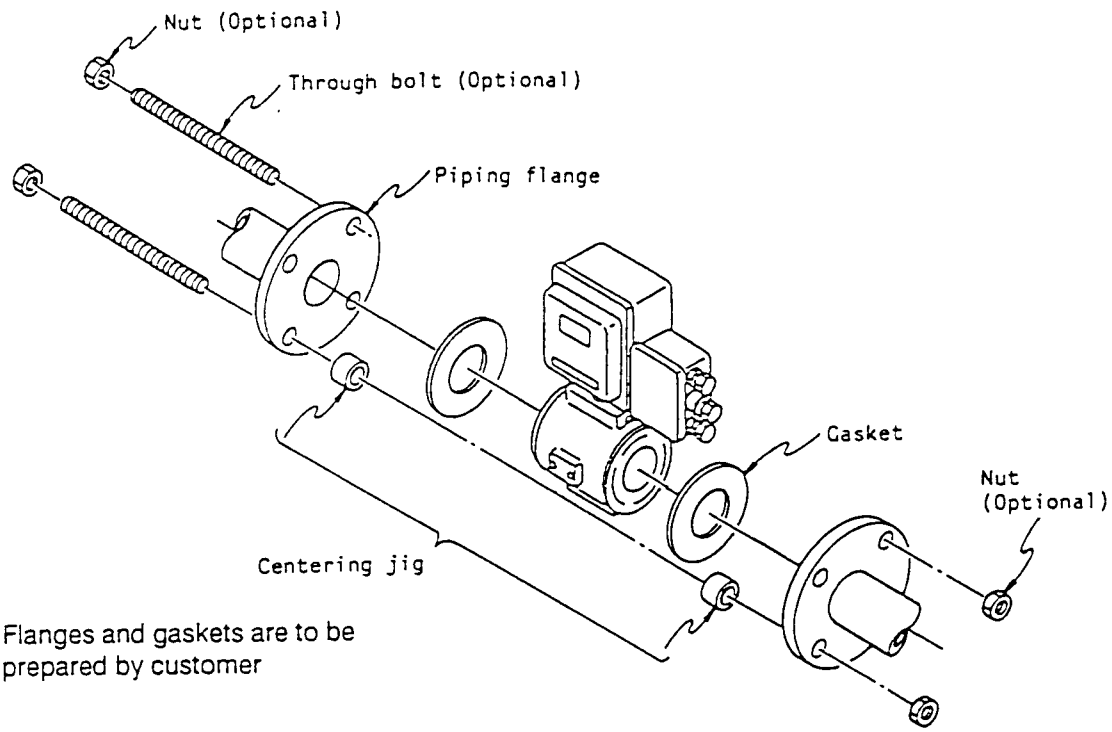


Figure. 5-9. Mounting Method

a) Let the detector's flow direction conform with the fluid flow direction.

b) To prevent shift of the centers between the piping and the detector, pass the centering jigs onto the through bolts and set the detector placed on or sandwiched in between the jigs.

When the pipe size is ANSI150, diameter 15 mm or smaller, no brackets are supplied. Install the detector in such manner that it is directly contacted with the through-bolts.

c) When aligning the center of the detector to that of the piping in the state that the detector is sandwiched between the flanges. Do not turn or hit or otherwise apply unreasonably large shocks or stresses to the detector lest its ceramic components should be damaged.

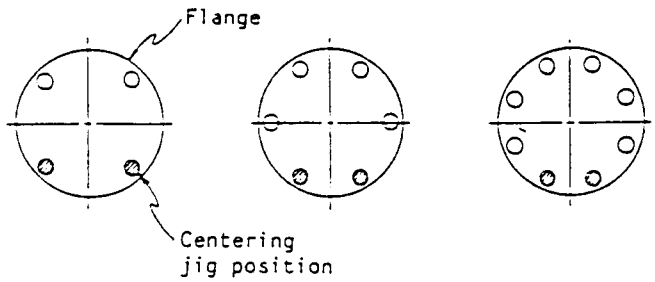


Figure. 5-10. Horizontal Mounting (Use two jigs for each of the right and left flanges.)

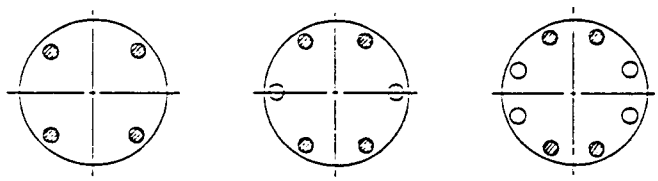


Figure. 5-11. Vertical Mounting (Use four jigs for the lower flange.)

5.2 Notes for Electrical Connections

1) Types of Cables

Use equivalent ones shown in Table 5.4.

Table 5.4. Types of Regular Cables Available on Market

Use	Type of cable (example)		Symbol (example)	Normal cross section	Finished OD
Power cable (within 500 meters)	2 cores or 3 cores*	Control cable, vinyl insulated, vinyl sheathed	CVV 2□ - 2^C	2 mm^2	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^C CVV 2□ - 2^C	2 mm^2	11.4 mm
Pulse output cables	2 cores (Shielded)	Instrumentation cable, polyethylene insulated vinyl sheathed, copper braid shielded	KPEV-SB 1.25□ - 1^P	1.25 mm^2	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.

2) Laying of Cables

(a) Do not lay the cables near a motor, a transformer or a large-current cable which may cause induction noise.

(b) Lay the signal cable in a metallic conduit, a flexible tube or a duct, separately from the excitation current cable.

(c) When a metallic conduit or a flexible tube is used, it is possible that dew is formed and water is entrapped in the tube. Lay the tube in such manner that no water gets into the instrument.

(d) Do not employ any junction point for connection of the signal cable or the excitation cable between the detector and the converter.

3) Grounding

(a) At the detector side, be sure to ground the ground ring as per JIS Class 3 Grounding (grounding resistance 100 Ω or less.)

(b) At the converter side, ground the E of the terminal block or the ground terminal of the case. The E terminal and the ground terminal are mutually connected in the instrument.

(c) Ground the grounding terminal as per JIS Class 3 Grounding (grounding resistance 100 Ω or less.)

4) Watertight Glands

(a) Fully tighten the glands of the cable connection ports to make them watertight.

(b) Watertight Gland Kit (option)

To use the converter as a watertight unit, use watertight gland kits for the cable inlet/outlet. An exploded view of the watertight gland kit is shown in Figure 5.18. Pass the parts onto the cable in the order shown in Figure 5.17 and then tighten the gland. When Yamatake-Honeywell's standard cable is used, packing ④ is not required and you should eliminate it.

(c) When wiring a cable other than specified, keep the terminal box air-tight by applying putty to the inside.

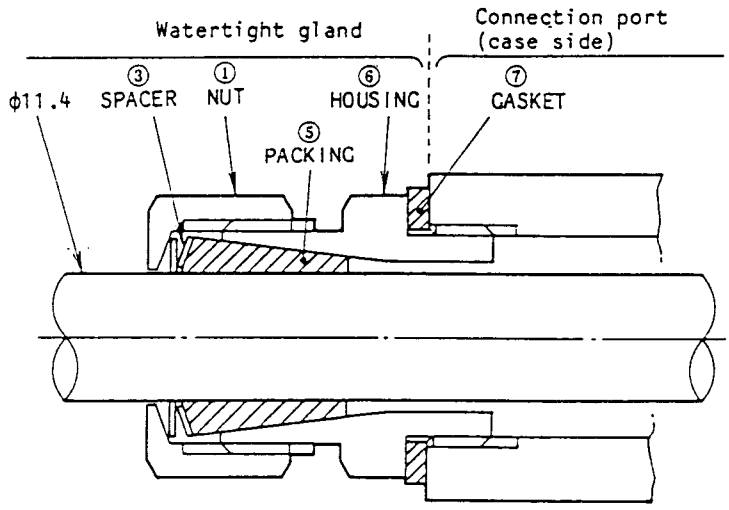


Figure 5.17. Structure of Watertight Gland

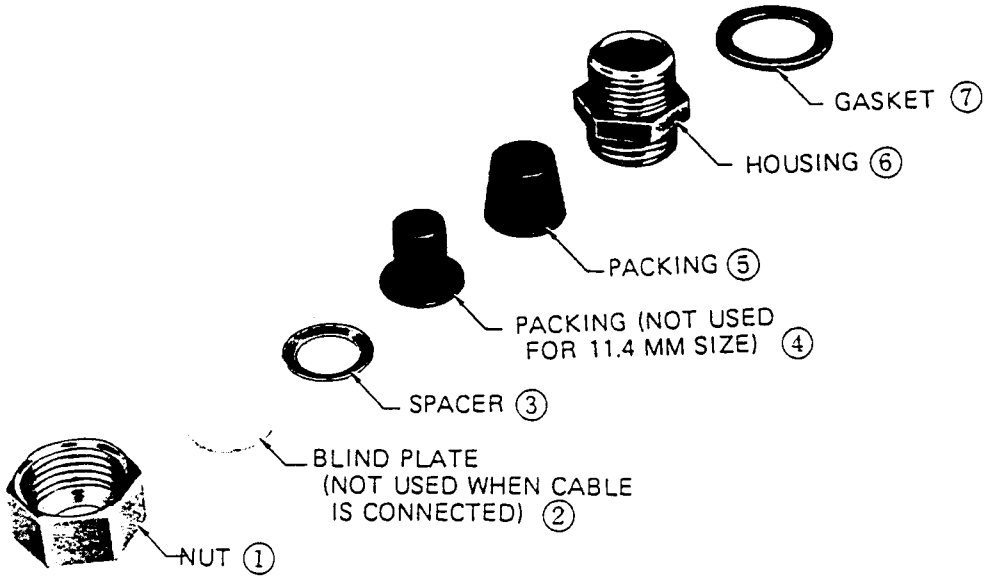
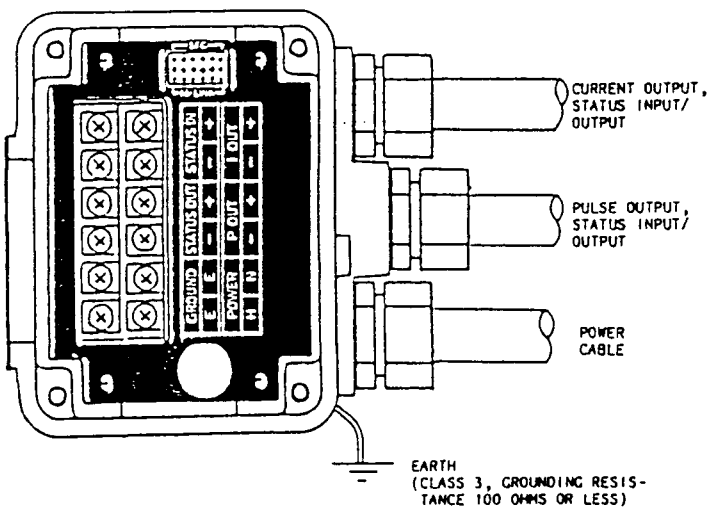


Figure 5.18. Watergitht Gland Kit (Optional)

5.3 Cable Connections

1) Wiring Terminals

To gain access to the terminals, open the terminal box cover. (The terminal screws are Type M3.)



Converter (KIX20A) Terminals and Connections

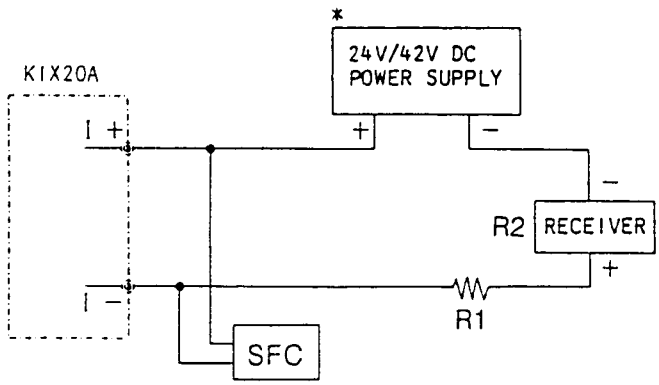
Symbol	Connection
I. OUT +	Current output
I. OUT -	
P. OUT +	Pulse output
P. OUT -	
STATUS OUT +	Contact output
STATUS OUT -	
STATUS IN +	Contact input
STATUS IN -	
POWER H POWER N	Power supply
GROUND E	Chassis ground

Figure 5.19. Cable Connections

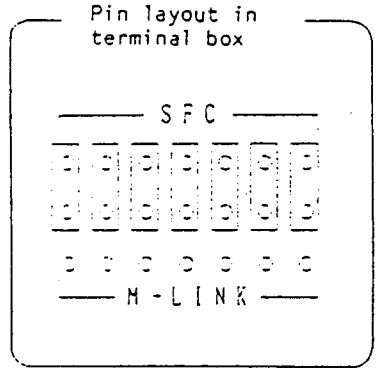
2) Electrical Connection for Current Output

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.)

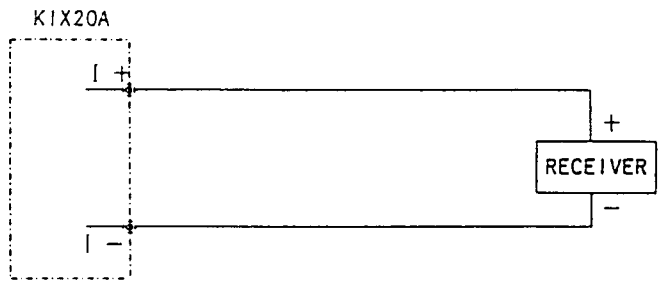
o When communication by SFC is employed * External DC power supply is needed.



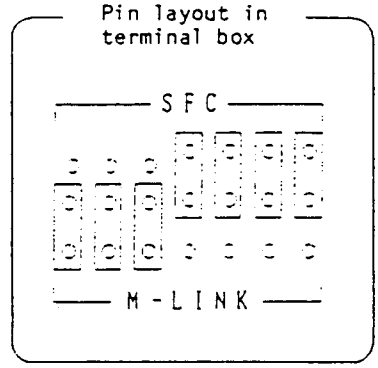
Note: External load resistance (R1+R2) 250 ohms or more, see Figure 2-1.



o When no communication by SFC is employed

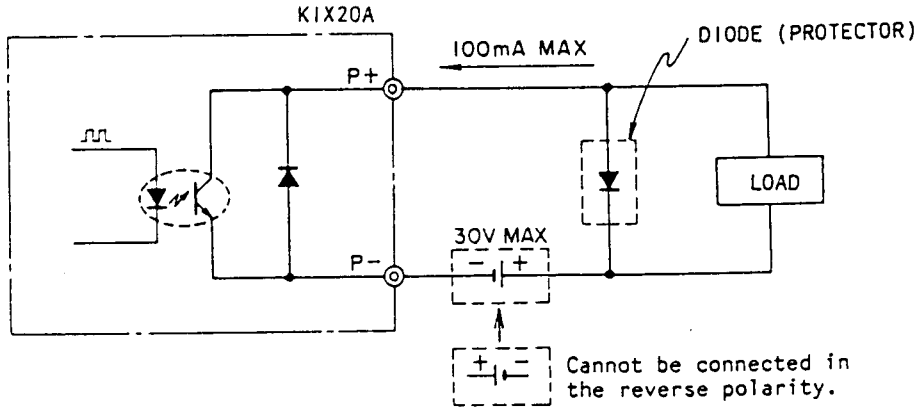


Note: External load resistance 0 - 600 ohms

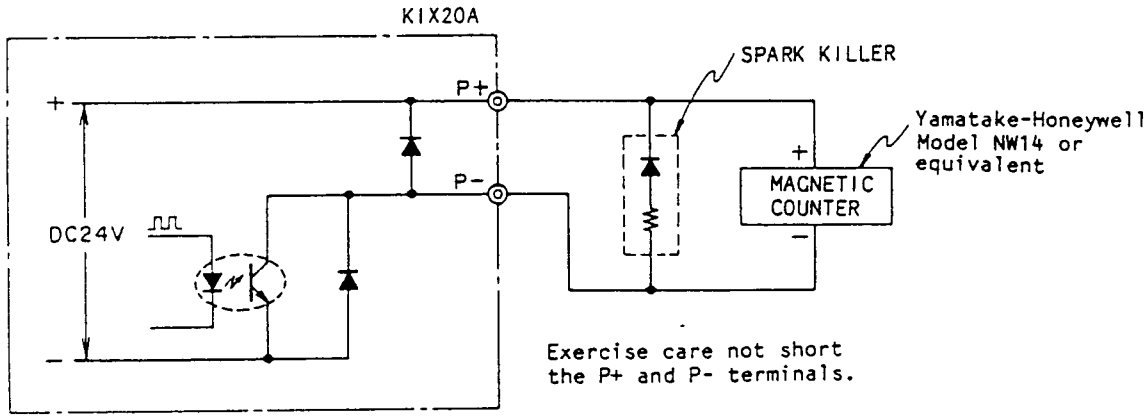


4) Pulse output Connection

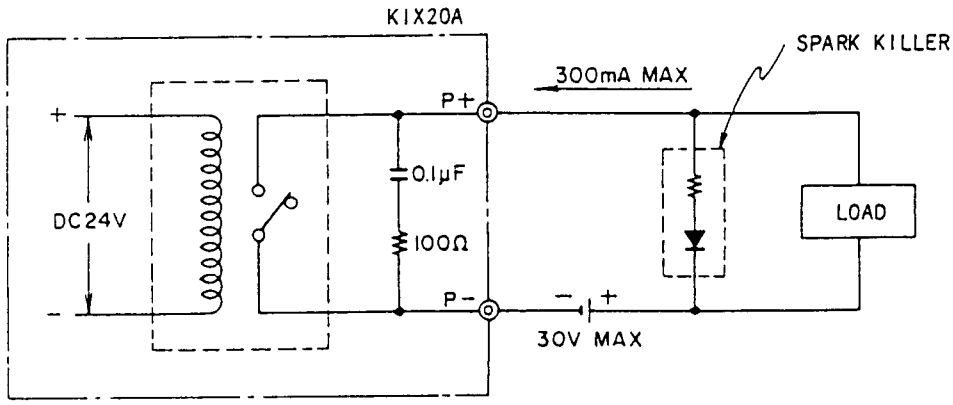
o Open-collector Pulse Output



o Magnetic Counter Drive Pulse Output



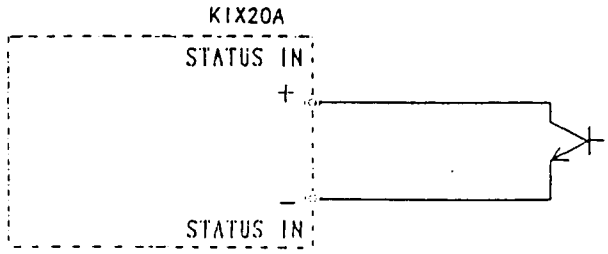
o Mercury Relay contact Pulse Output



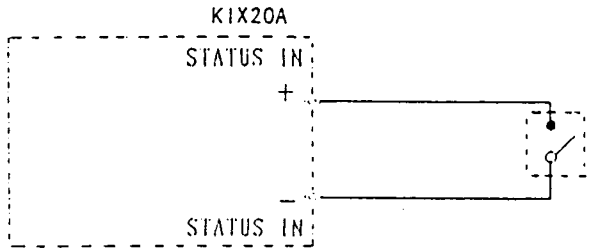
5) Electrical Connections for Contact Input

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

o Semiconductor contact input



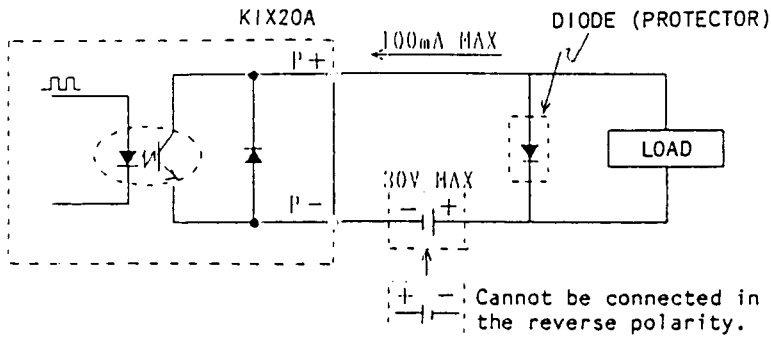
o Voltageless contact input



6) 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	To Check with a SFC
To check that the connections for the receiver are correctly done. The converter has a function as a constantcurrent source and can deliver a current within a range of 0 - 125%.	OUTPUT CHECK MODE (See 6.4.26)	See the Instruction Manual No. 80277307-102 Page 3. "Constant Current Source Model"
To check that the connections for the receiving counter (pulse output) are correctly done. The converter has a function as a pulse generator and can deliver a range of 0 - 125%.	OUTPUT CHECK MODE (See 6.4.27)	——
To check that the connections for the contact input (STATUS IN) are correctly done. It can be confirmed that the contact input signal is being correctly received.	OUTPUT CHECK MODE (See 6.4.28)	——
To check that the connections for the device to which the contact output (STATUS OUT) is fed are correctly done. The contact output can be ON/OFF-operated.		See the Instruction Manual No. 80277307-102 Page 7. "Checking the contact output function"

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 Figure 6-1.

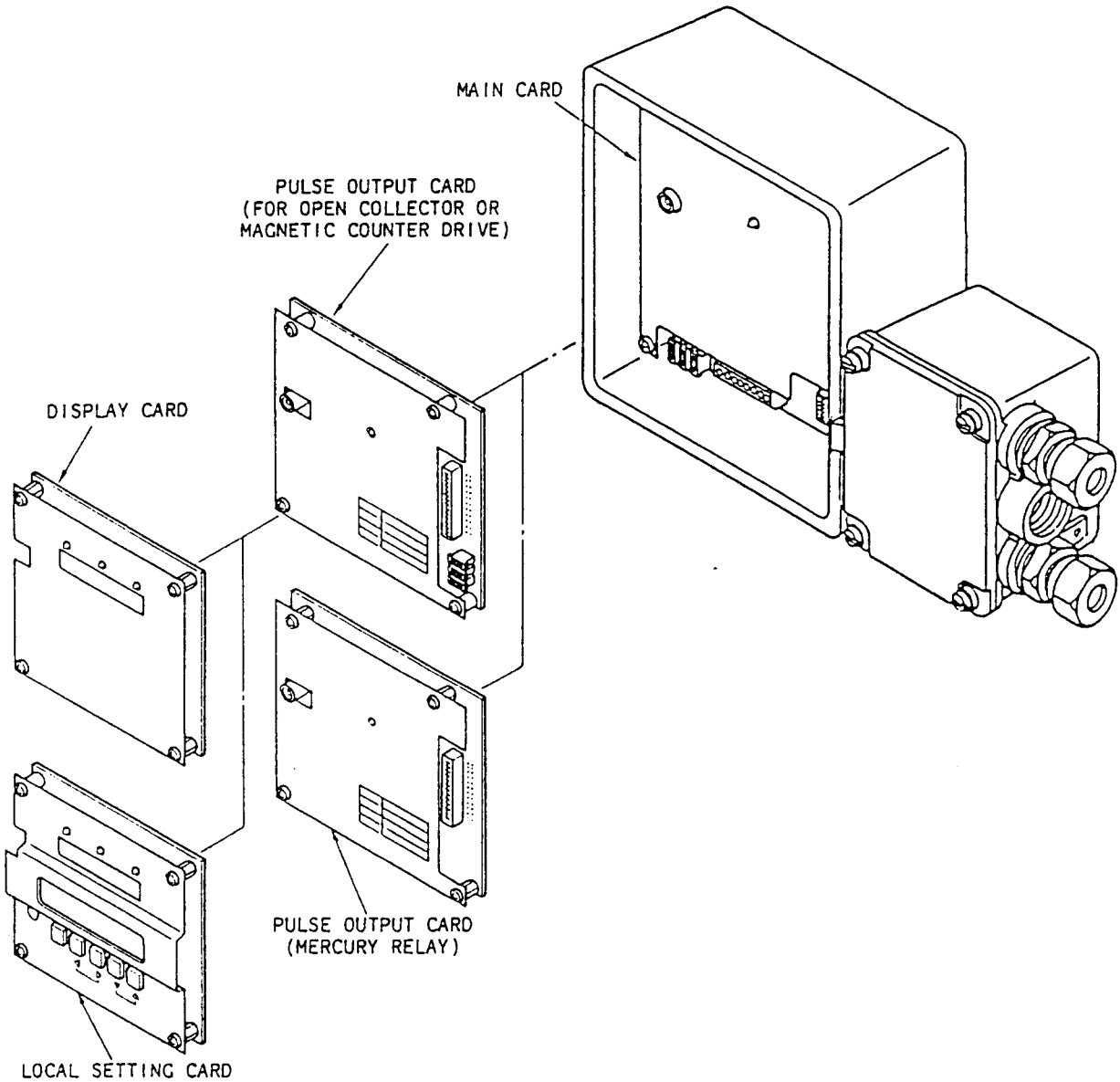


Figure 6.1. Nomenclature of Cards

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 mADC output signal and status input/ output signal.

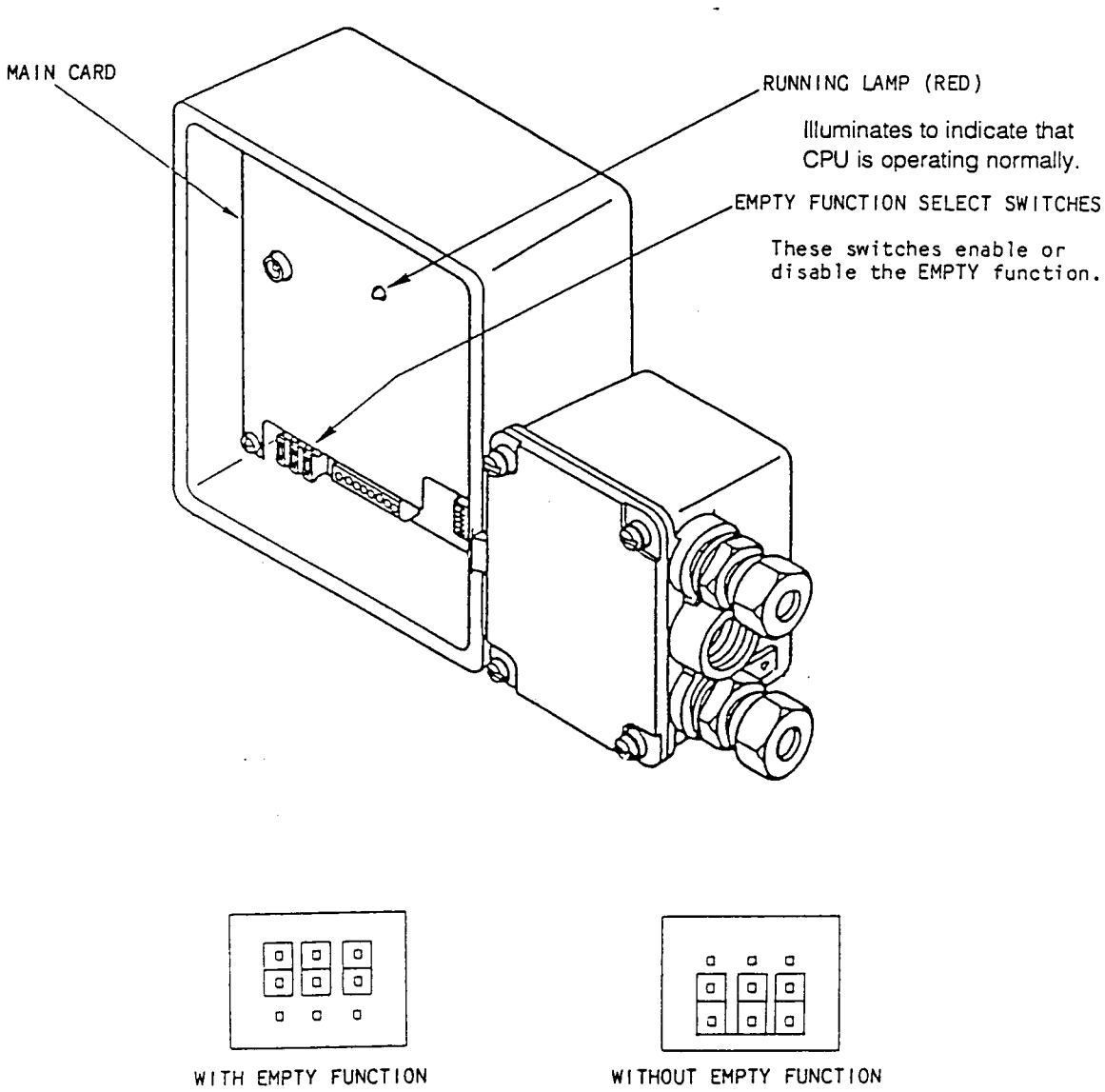


Figure 6.2. Main Card

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.

o Card for open collector or magnetic counter drive

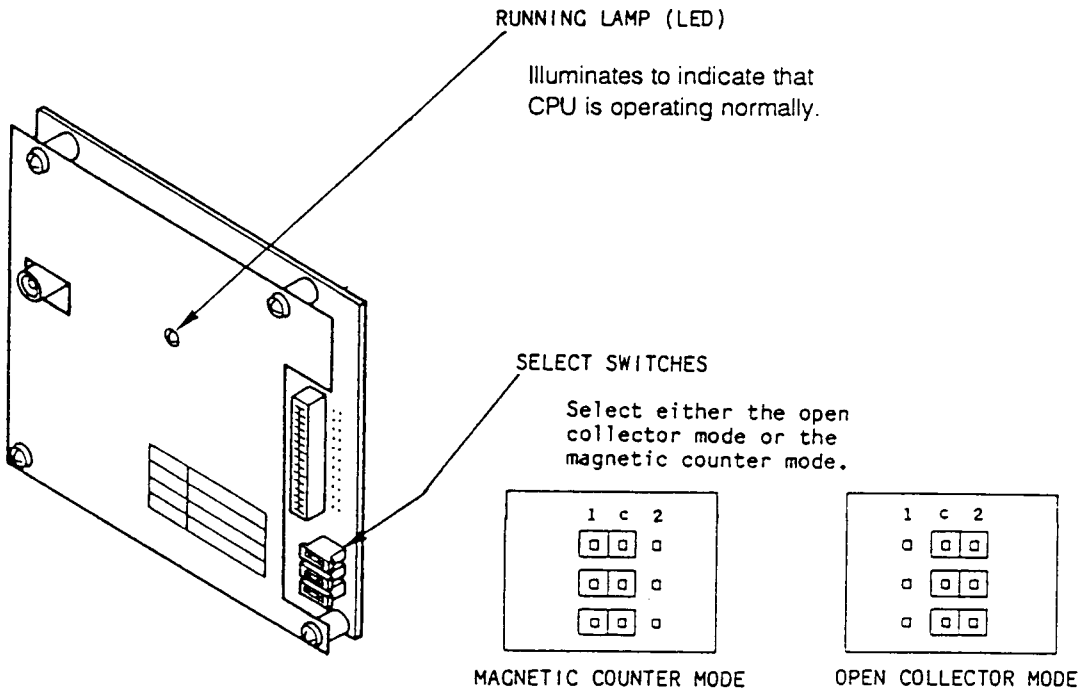


Figure 6.3. Pulse Card for Open Collector or Magnetic Counter Drive

o Card for mercury relay drive

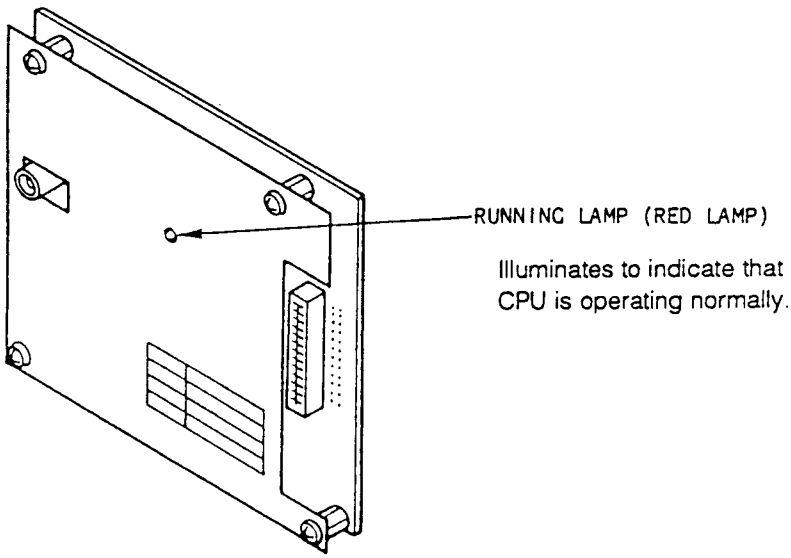


Figure 6.4. Pulse Card for Mercury Relay Drive

3) Display Card

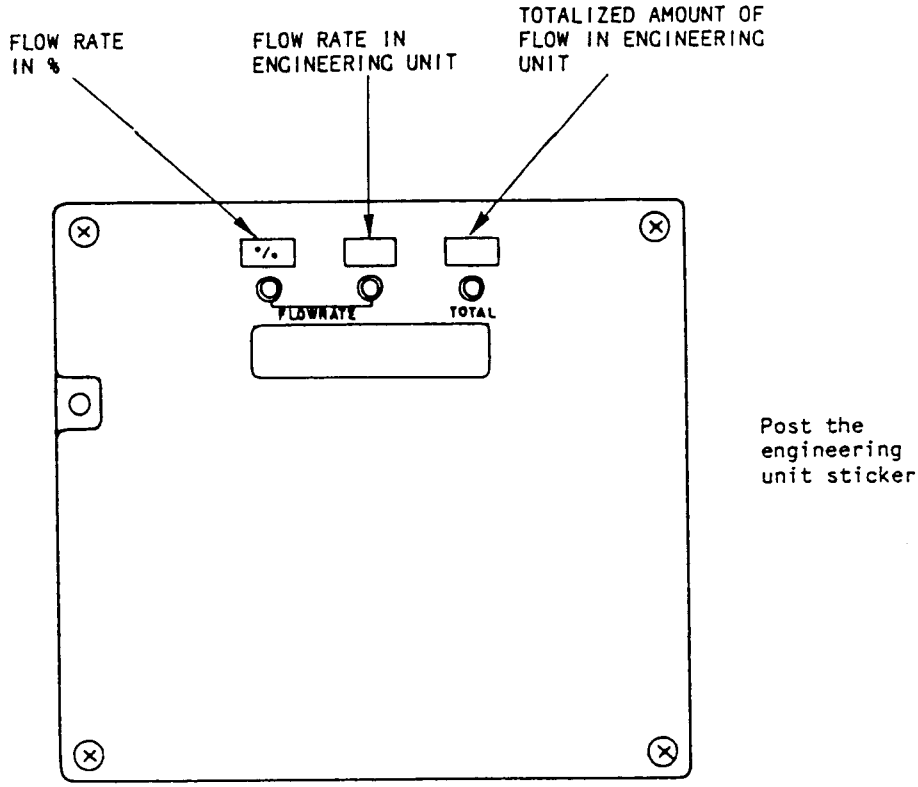
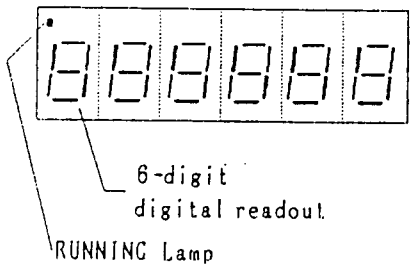
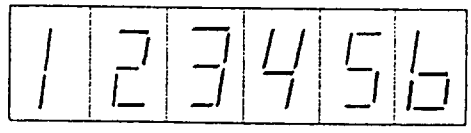


Figure 6.5. Display Card

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

4) Local Setting Card (LSC)

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

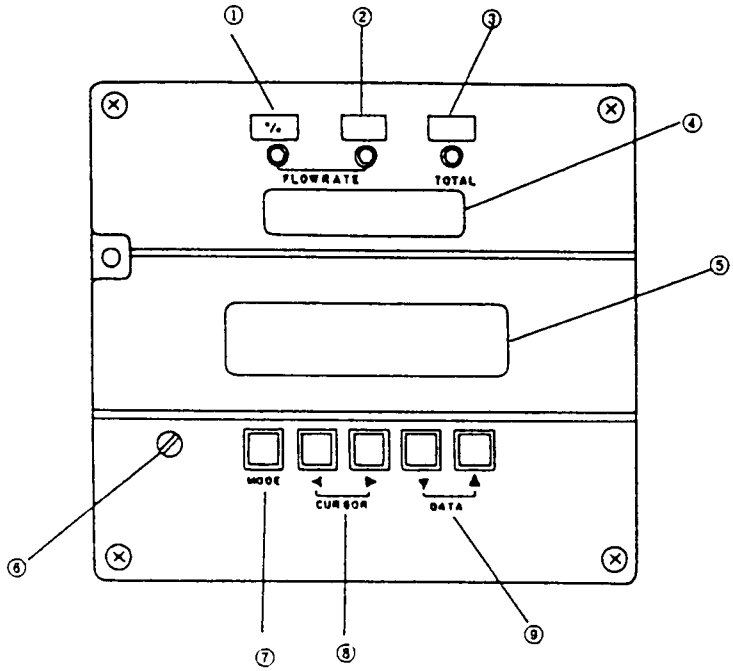


Figure 7.6 Local Setting Card

(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.

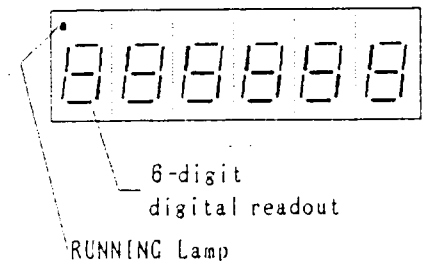
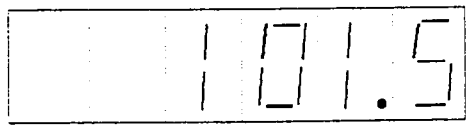
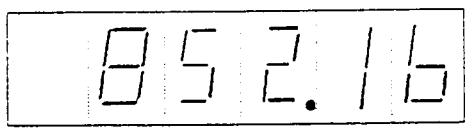
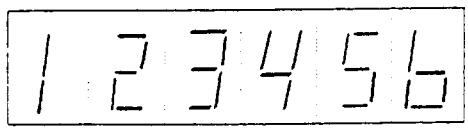
(7) MODE key
Selectes either the MEASURING mode or the SETTING mode.
The set data is store in NVM (non-volatile memory).

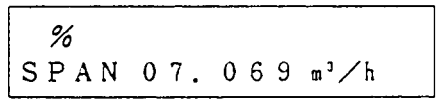
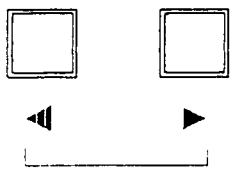
(8) CURSOR keys

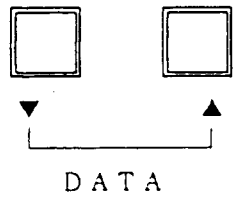
Move the cursor to the required position on the data setting display.

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

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

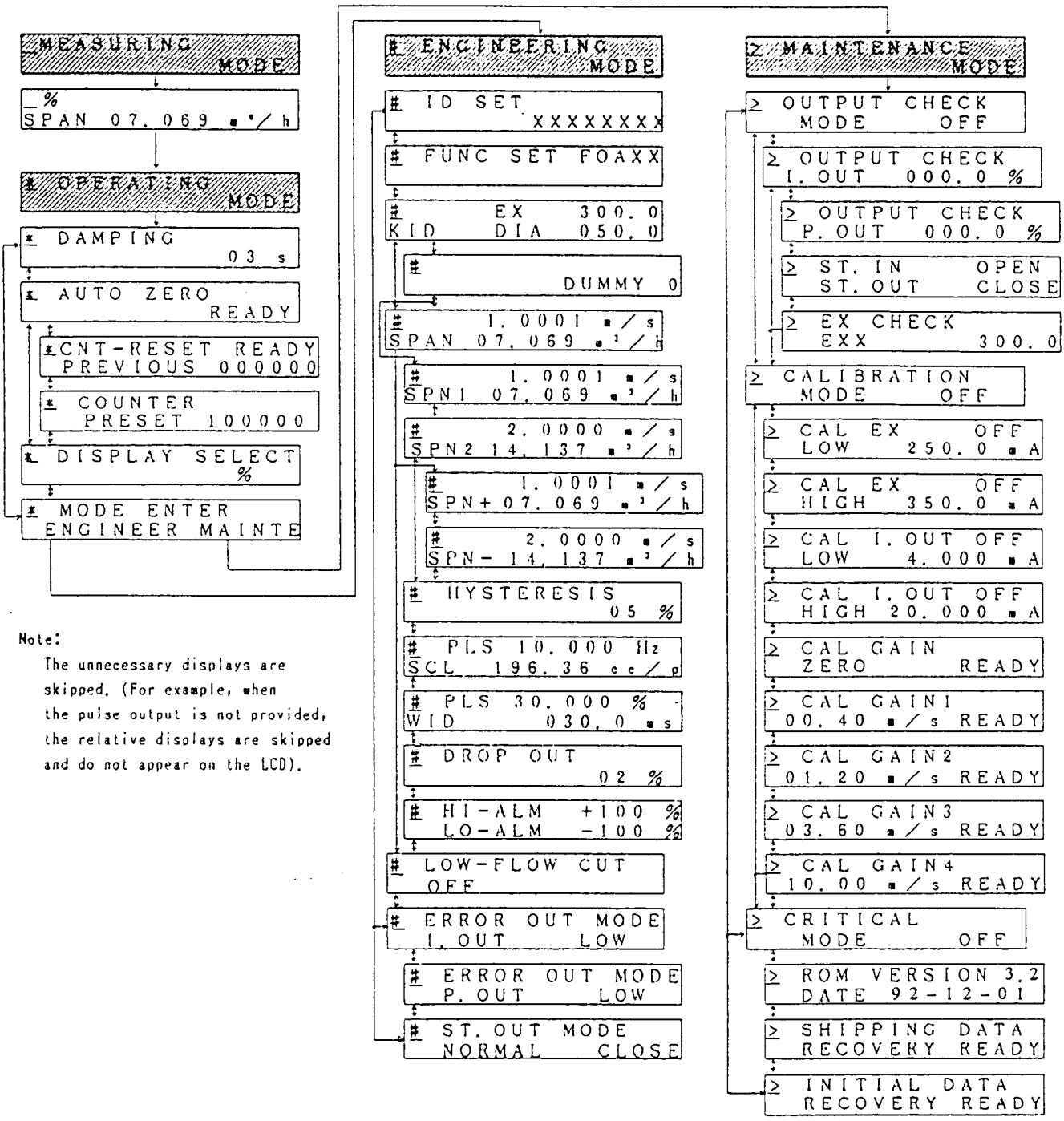
	Display	Description
⑨		Modify or change data setting display. When the cursor is at the uppermost left (* , # , >), displays are changed. * OPERATING MODE CURSOR When the cursor is under a numeral, the numeral is changed. * DAMPING 01 S CURSOR When the cursor is under a decimal point, the decimal point is shifted. # 1.000 m/s SPAN 07.069 m³/h CURSOR When the cursor is under the READY, operation will start as you press the ▲ key. * AUTO ZERO READY CURSOR

6.3 Data Setting with LSC (Local Setting Card)

1) Description of Mode

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, specfied 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 calibreation, and gain calibration).

2) Configuration of Displays



Note:

The unnecessary displays are skipped. (For example, when the pulse output is not provided, the relative displays are skipped and do not appear on the LCD).

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.

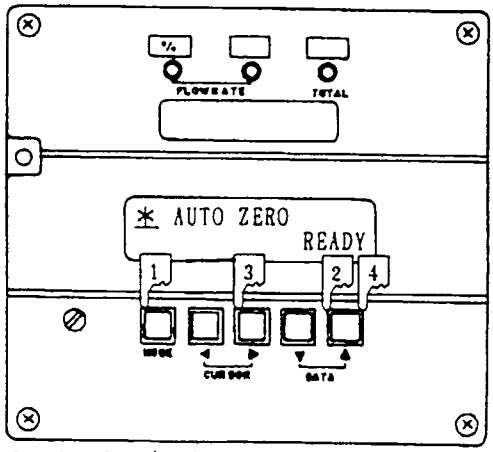
When the detector and converter are purchased in conjunction, the above items are set at the manufacturer's factory before shipment. The setting data at the factory before shipment are indicated in the instruction KIX SECTION DATA on the back surface of the converter cover. Check the items referring 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 ie less than ±0.1m/s.

Local Setting Card(LSC)

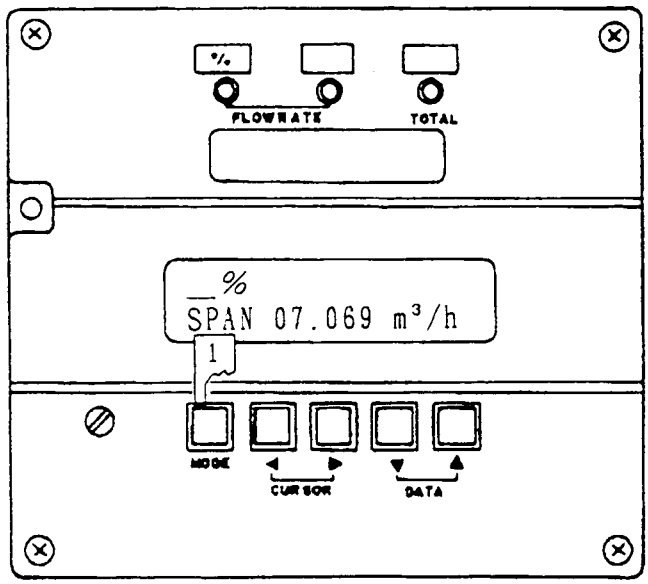
Step	Display	Description
	% SPAN 10.000 m³/h	Example of display when in measurement(MEASURING MODE)
1	* OPERATING MODE	
	2sec late ↓	
	* DAMPING 03 s	
2	* AUTO ZERO READY	
3	* AUTO ZERO READY	Move the cursor to the READY postion. (Make the fluid stationary.)
4	* AUTO ZERO ON	With step 4, start automatic zero adjustment.
	After ON-OFF (about 20sec) ↓	
	* AUTO ZERO READY	Zero adjustment is complete.

To reset to the measuring mode, press the MODE key.

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 7.069m³/h, for example.

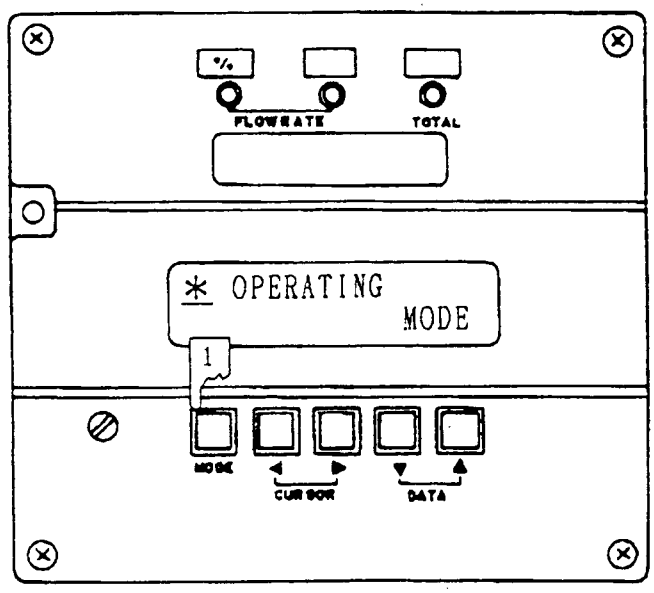
o As you turn on power of the instrument (converter), it is automatically set to the MEASURING MODE.

Procedure	Display	Comments
Turn on power	_SELF CHECK MODE ↓ 5 sec later _MEASURING MODE ↓ 1 sec later % SPAN 07.069 m³/h	

o To change to the MEASURING MODE from other mode

Procedure	Display	Comments
1	Other display _MEASURING MODE ↓ 1 sec later % SPAN 07.069 m³/h	

2) To set to the OPERATING MODE



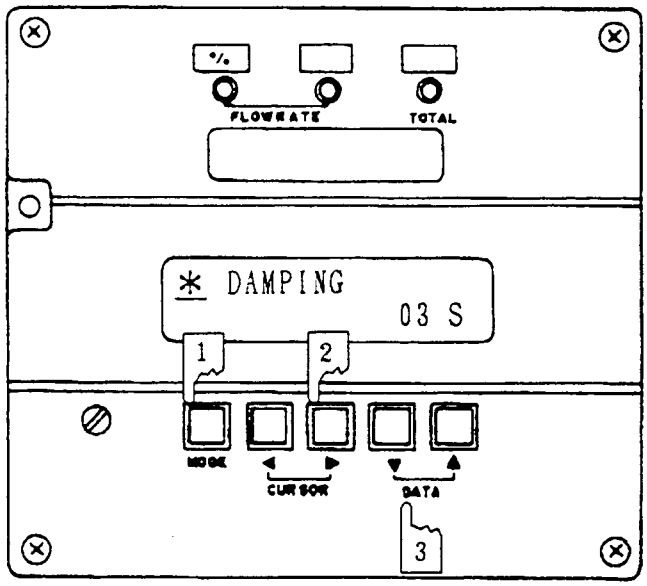
Procedure	Display	Comments
	% SPAN 10.000 m³/h	Example of display when in measurement (MEASURING MODE)
1	* OPERATING MODE ↓ 2 sec later * DAMPING 04 s	Set to the OPERATING MODE

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 3 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
0.5sec*, 5 sec
1 sec, 10 sec
2 sec, 50 sec
3 sec, 100 sec

*: To set "0" or "0.5", keep pressing the DATA KEY more than three second.

Example : To change 3sec. to 4sec.

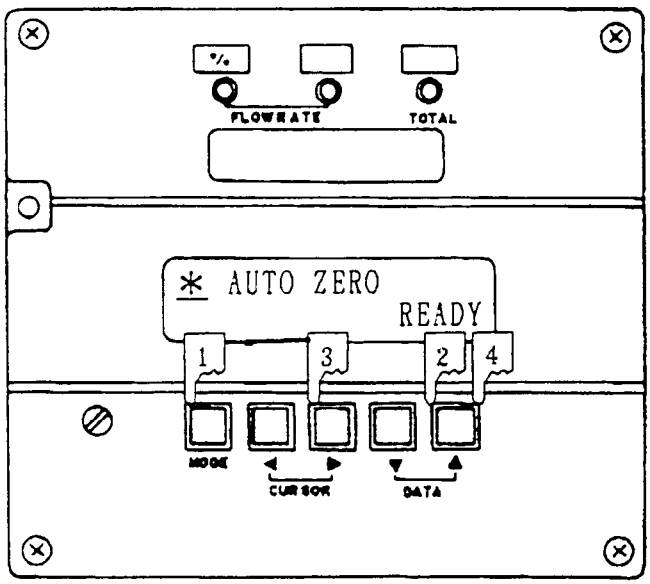
Procedure	Display	Comments
	% SPAN 10.000 m³/h	Example of display when in measurement (MEASURING MODE)
1	* OPERATING MODE	
	↓ 2 sec later	
	* DAMPING 03 s	
2	* DAMPING 03 s	Move the cursor to the numeral to be changed.
3	* DAMPING 04 s	Change the numeral to the required value with the ▼ ▲ keys.

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 ±0.1m/s can be regarded as the flow is stationaly.

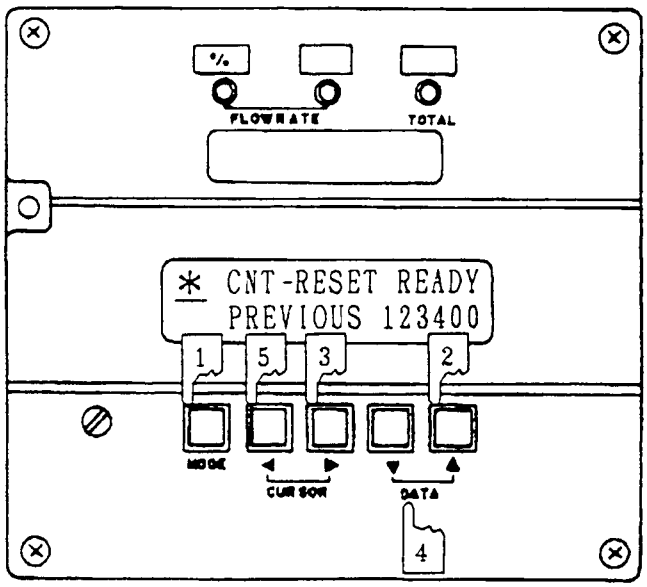
Procedure	Display	Comments
	% SPAN 10.000 m³/h	Example of display when in measurement (MEASURING MODE)
1	* OPERATING MODE	
	↓ 2 sec latar	
	* DAMPING 04 s	
2	* AUTO ZERO READY	
3	* AUTO ZERO READY	Move the cursor to READY.
4	* AUTO ZERO ON	After checking that fluid is stationary, start automatic zero adjustment with 4 key.
	nearly 20 sec ↓ later	
	* AUTO ZERO READY	Automatic zero adjustment is complete.

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

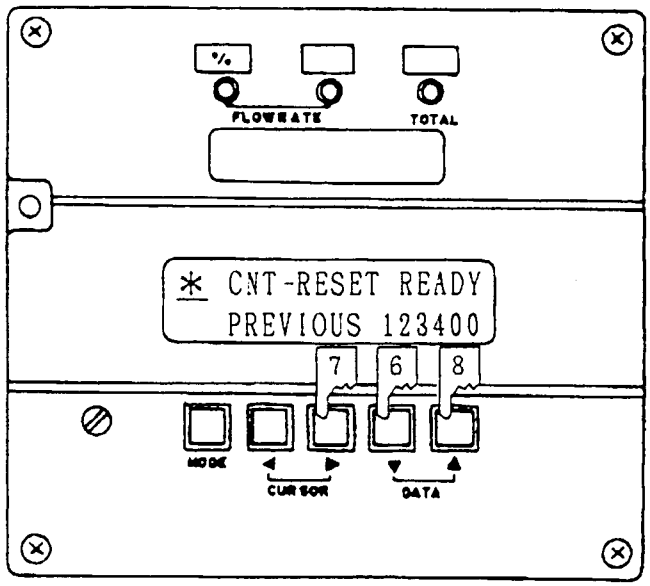
(Data is stored in memory by the procedures of 4 and 8 .)



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

Procedure	Display	Comments
	% SPAN 10.000 m³/h	Example of display when in measurement (MEASURING MODE)
1	* OPERATING MODE	
	↓ 2 sec later	
	* DAMPING 04 s	
2	* DISPLAY SELECT %	Required number of times
3	* DISPLAY SELECT %	Move the cursor to %.
4	* DISPLAY SELECT COUNT	Set the COUNT with the ▼ ▲ keys.
5	* DISPLAY SELECT COUNT	Return the cursor to the asterisk (*).

(to be continued)



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

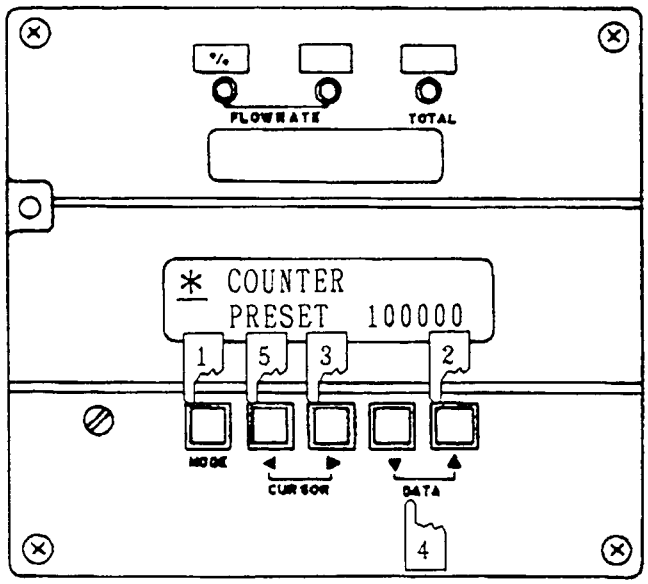
Procedure	Display	Comments
6	*CNT-RESET READY PREVIOUS 123400	A counter reset message will appear.
7	*CNT-RESET READY PREVIOUS 123400	Move the cursor to the READY.
8	*CNT-RESET ON PREVIOUS 123456 ↓ 1 sec later *CNT-RESET READY PREVIOUS 123456	Reset the internal counter by pressing the 8 key. The numerical 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 4 and 8 .)



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 ENGINEERNIG MODE, a display with the counter preset value will appear.

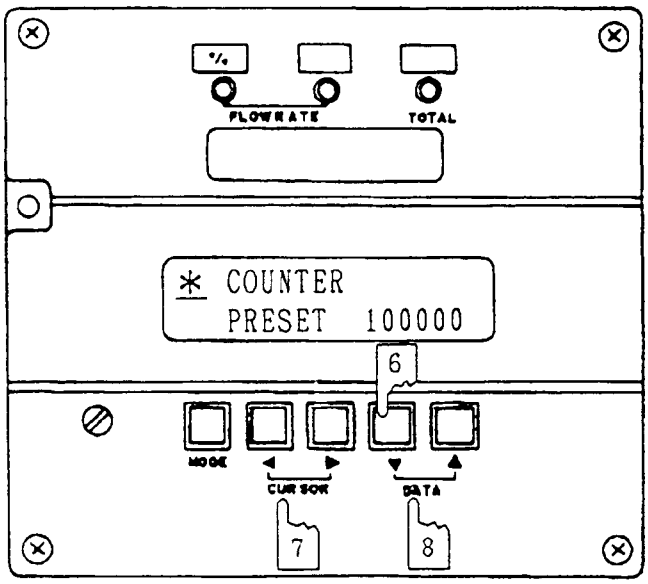
Default value : 100000

Setting range : 1 ~ 999999

Procedure	Display	Comments
	% SPAN 10.000 m³/h	Example of display when in measurement (MEASURING MODE)
1	* OPERATING MODE	
	* DAMPING 04 s	
2	* DISPLAY SELECT %	Required number of times
3	* DISPLAY SELECT %	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
4	* DISPLAY SELECT COUTN	
5	* DISPLAY SELECT COUTN	Return the cursor to the asterisk (*).

to be continued

To set or change the counter preset value



Default value : 100000

Setting range : 1 ~999999

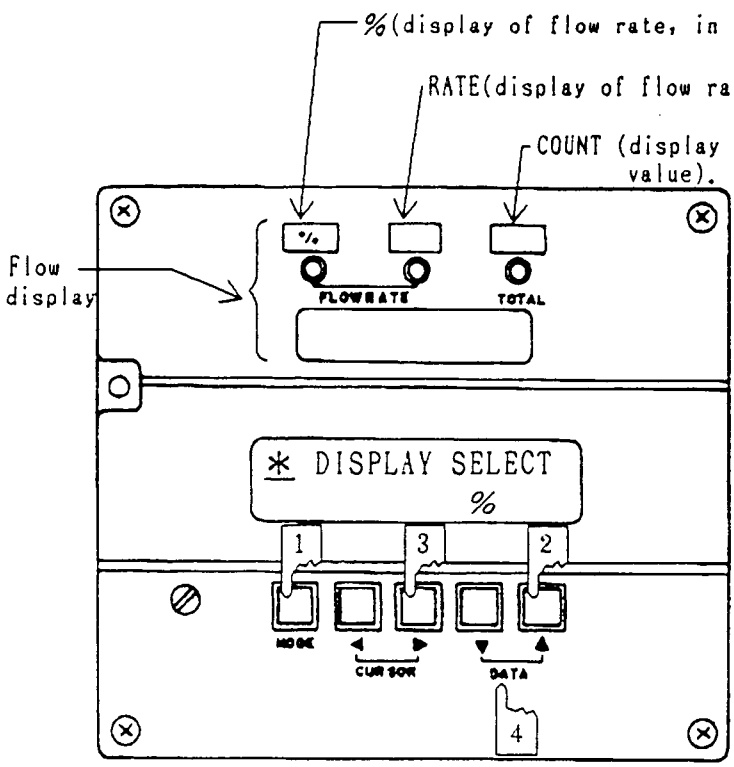
Procedure	Display	Comments
6	* COUNTER PRESET 100000	
7	* COUNTER PRESET 100000	Change the numeral to the required value with the ▼▲keys.
8	* COUNTER PRESET 200000	

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 4 .)



Note 1:

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

Default value : %

Setting : %

RATE (Flow rate, in engineering unit)

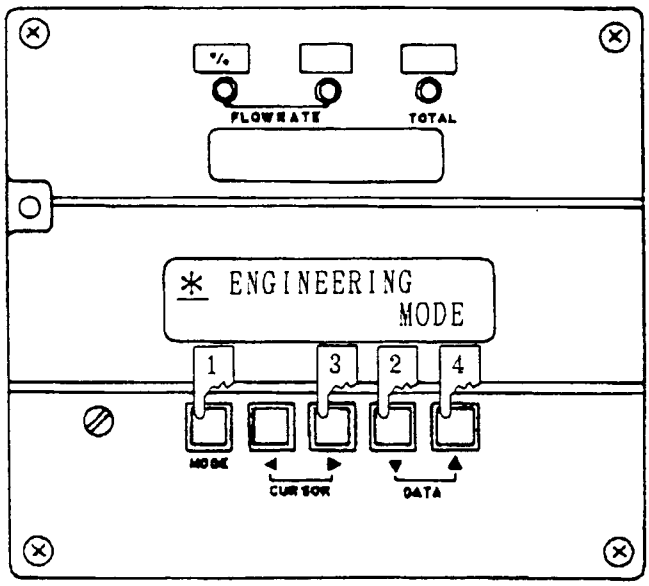
TOTAL(Totalized value)

Procedure	Display	Comments
	% SPAN 10.000 m³/h	The mode that the instrument is measuring the flow.
1	* OPERATING MODE	
	* DAMPING 04 s	
2	* DISPLAY SELECT %	Required number of times
3	* DISPLAY SELECT %	Move the cursor.
4	* DISPLAY SELECT COUNT	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.)

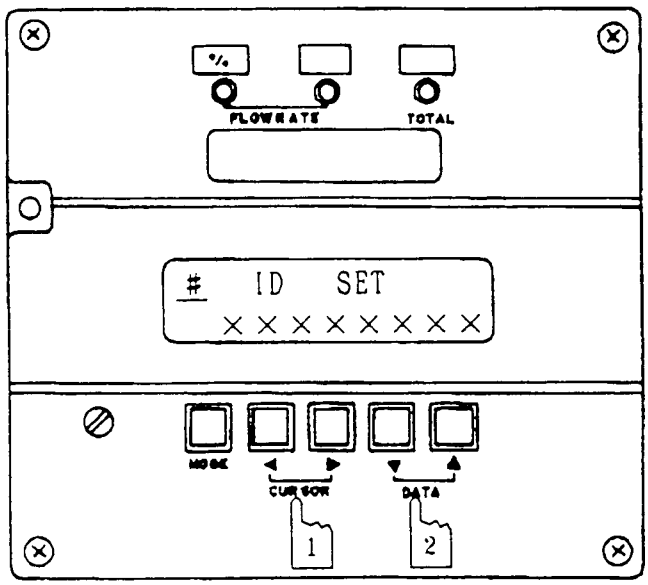


Procedure	Display	Comments
	% SPAN 10.000 m³/h	Example of display when in measurement (MEASURING MODE)
1	* OPERATING MODE	
	2 sec later ↓	
	* DAMPING 04 s	
2	* MODE ENTER ENGINEER MAINTE	
3	* MODE ENTER ENGINEER MAINTE	Move the cursor to "E".
4	# ENGINEERING MODE	Setting to the ENGINEERING MODE is complete.
	3 sec later ↓	
	# ID SET XXXXXXXX	

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

To continue setting : Select other displays with 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 :
XXXXXXXX

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

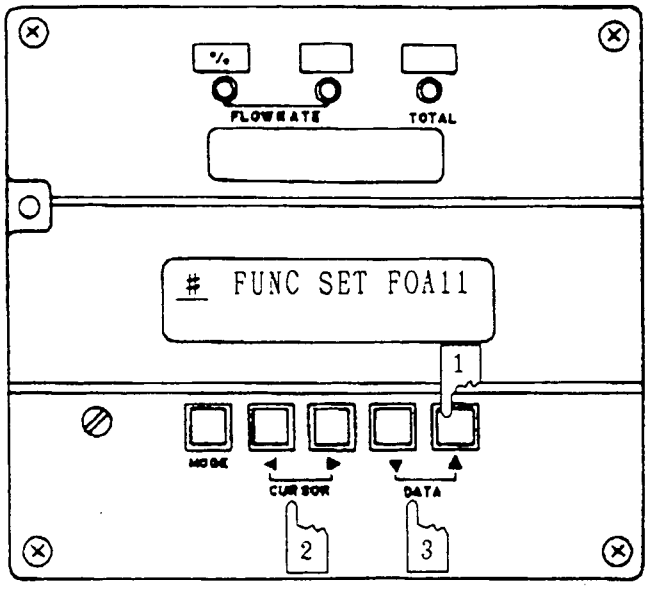
Example : To change ID from XXXXXXXX to FIC-1234

Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	3 sec later ↓	
	# ID SET XXXXXXXX	
1	# ID SET XXXXXXXX	
2	# ID SET FIC－1234	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.

10) To set or change functions



Default value :

F O X X X --- without pulse card

F O A X X --- with pulse card

Setting range :

There are limitations on function combinations (F □□□□). See pages 9,10 and 11.

Example : To change functions from FOA11 to FOAX1.

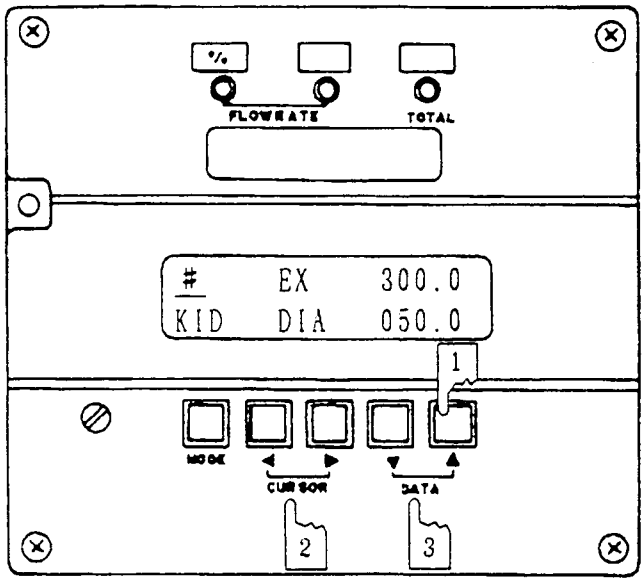
Procedure	Display	Comments
	# ENGINEERING MODE	For the procedure to set to the ENGINEERING MODE, see Section 8).
	# ID SET XXXXXXXX	
	2 sec later ↓	
1	# FUNC SET FOA11	
2	# FUNC SET FOA11 SINGLE RANGE	▷Change the numeral to the required value with the ▶ key and ▼ ▲ keys. (◀ key cannot be used)
3	# FUNC SET FOAX1 ERROR HI-LO ALM	

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 : 300.0mA
MODEL : KID
DIA : 50mm

Setting range :
EX: 230.0～370.0mA
MODEL : KID, NNM(NNP), NNK
DIA: 2.5,5,10,15,25,
40, 50, 80, 100,
150, 200, 250,
300, 350, 400,
500, 600, 700

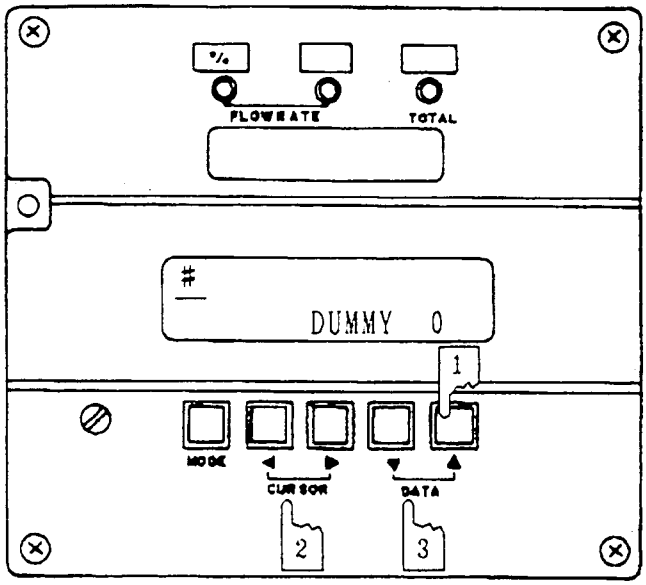
Example : To change diameter from 50 to 80.

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8)
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 ◀ ▶ keys 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).

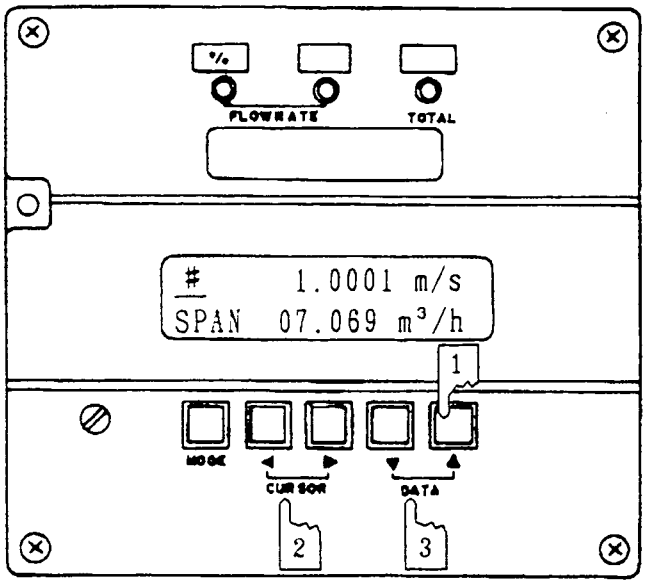
Example : To cange the number of dummies from 0 to 3.

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see opening of the Section 3)
1	# DUMMY 0	Push thrice time.
2	# DUMMY 0	
3	# DUMMY 3	Change the numeral to the requird value with the ◀ ▶ keys and 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.

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



Default value :
07.069m³/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

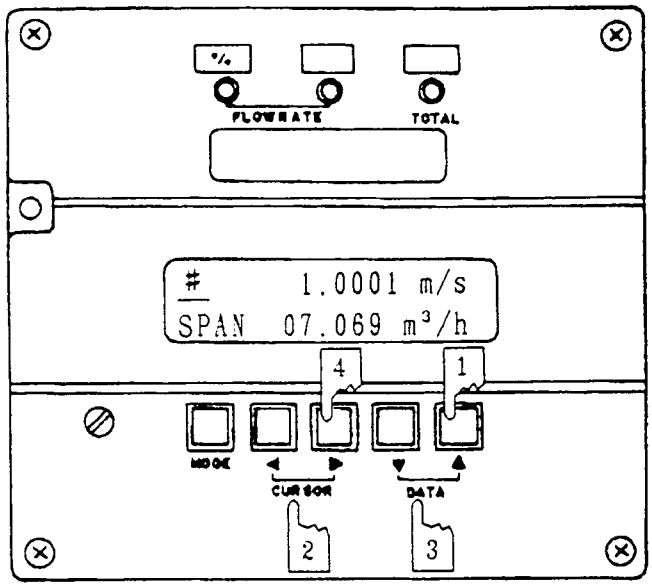
Example : To change range from 7.069 m³/h to 1 ℓ/m.

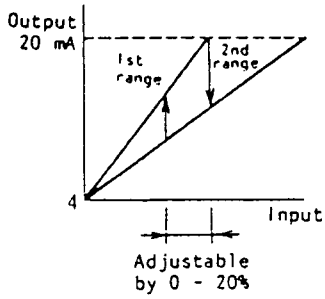
Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see Section 8).
1	# 1.0001 m/s SPAN 07.069 m³/h	Required number of times The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure)
2	# 1.0001 m/s SPAN 07.069 m³/h	Change the numeral to the required value with the ◀▶ keys and ▼▲ keys.
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
07.069m³/h

2nd range
14.137m³/h

Setting range :

0.0001～99999□/□

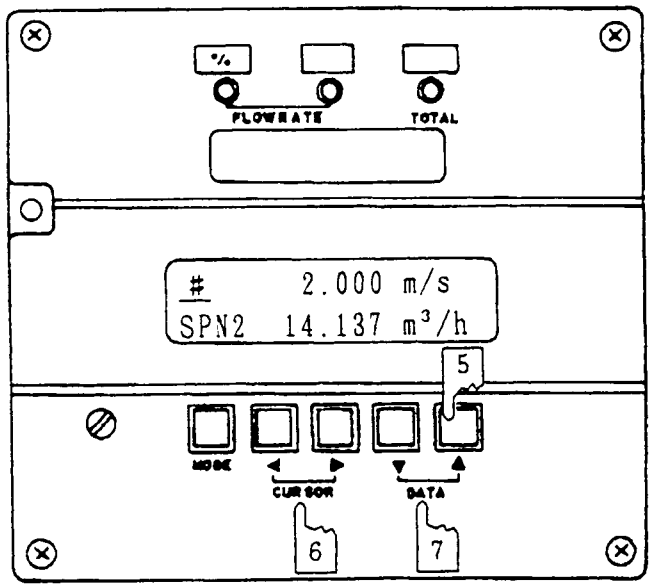
Unit: BPS GPS mGPS cc s
BPM GPM mGPM ℓ m
BPH GPH mGPH m³ h
BPD GPD mGPD m³ d
kGPS
kGPM
kGPH
kGPD

Example : To change range from 7.069m³/h to 1 m³/h

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see Section 8).
1	# 1.0001 m/s SPAN 07.069 m³/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 07.069 m³/h	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
3	# .14147 m/s SPAN 1.0000 m³/h	
4	# .14147 m/s SPAN 1.0000 m³/h	Return the cursor to the asterisk (*).

↓

(to be continued)



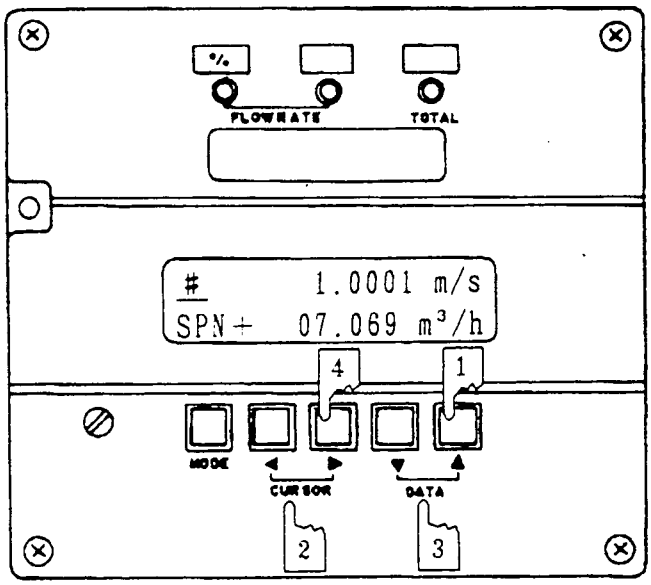
Example : To change range from 14.137m³/h to 4m³/h.

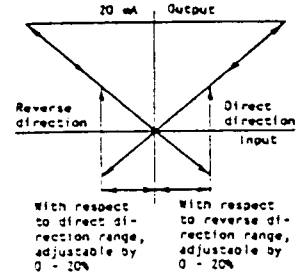
Procedure	Display	Comments
5	# 2.0000 m/s SPN2 14.137 m³/h	The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure)
6	# 2.0000 m/s SPN2 14.137 m³/h	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
7	# .56589 m/s SPN2 04.000 m³/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
+07.069m³/h

Reverse range
−14.137m³/h

Setting range :

0.0001～99999□/□

Unit : BPS GPS mGPS kGPS cc s

BPH GPM mGPM kGPM ℓ m

BPH GPH mGPH kGPH m³ h

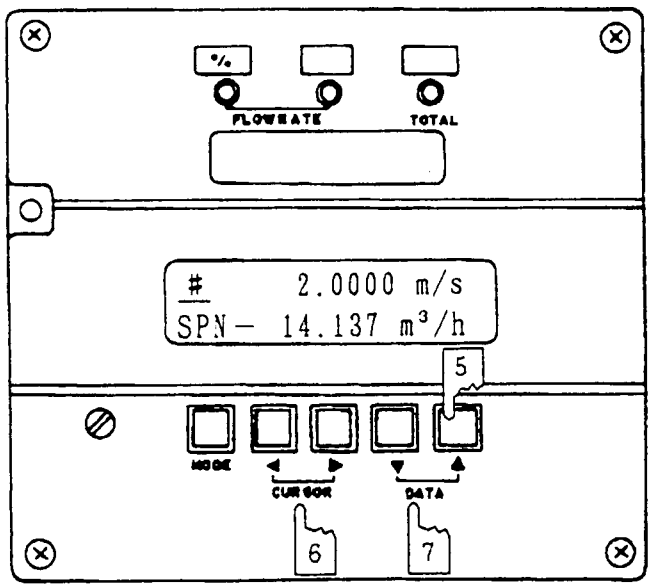
BPD GPD mGPD kGPD d

Example : To change range from 7.069m³/h to 1m³/h

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set the ENGINEERING MODE, see Section8).
1	# 1.0001 m/s SPN+ 07.069 m³/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 SPN+ 07.069 m³/h	Change the numeral to the required value with the ◀▶ keys and ▼ ▲ keys.
3	# .14147 m/s SPN+ 1.0000 m³/h	
4	# .14147 m/s SPN+ 1.0000 m³/h	Return the cursor to the asterisk (*).

↓

(to be continued)



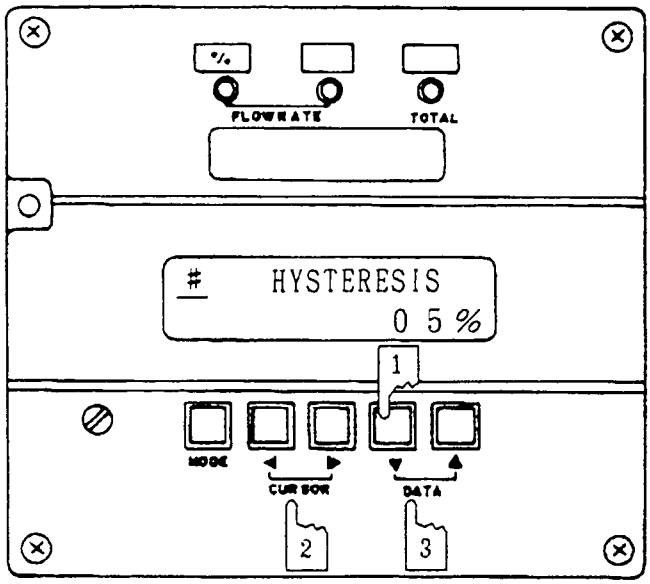
Example : To change range from 14.013m³/h to 1m³/h

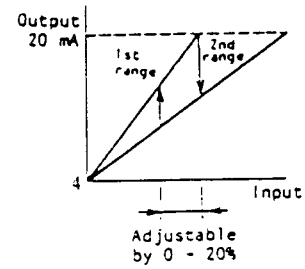
Procedure	Display	Comments
5	# 2.0000 m/s SPN- 14.137 m³/h	The top-line value is in terms of flow velocity. To set or change the range, use the bottom-line value which is in terms of flow rate (in an engineering unit of measure).
6	# 2.0000 m/s SPN- 14.137 m³/h	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
7	# .14147 m/s SPN- 1.0000 m³/h	

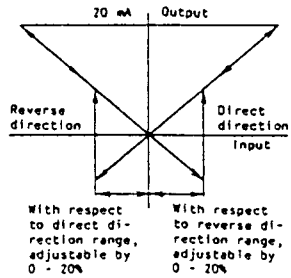
To return to the MEASURING MODE :
Press the MODE key.

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%

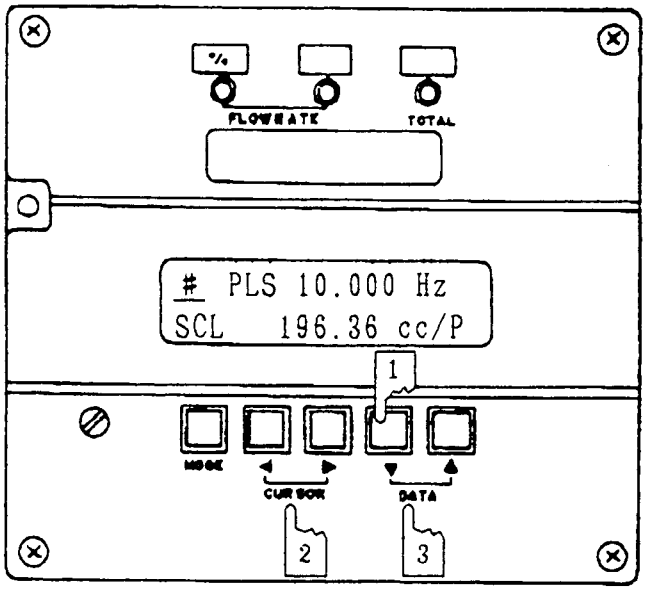
Example : To change hysteresis from 5% to 10%

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
1	# HYSTERESIS 05 %	Required number of times
2	# HYSTERESIS 05 %	
3	# HYSTERESIS 10 %	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 :
196.36cc/p
Setting range :
Frequency when open collector output is selected (the top line of LCD) :
0.00006～2000Hz

Frequency when megnetic counter drive output or mercury relay contact output is selected (the top line of LCD) :
0.00006～20Hz
Unit: cc/p, ℓ/p, m^3/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.

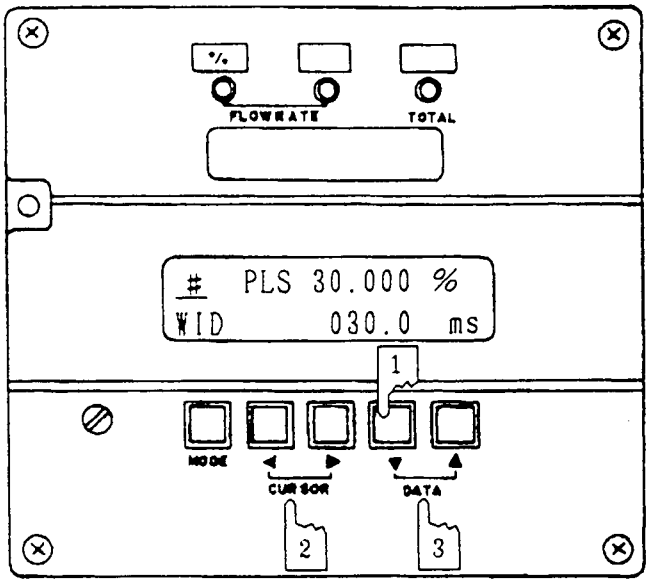
Example : To change pulse weight from 196.33cc/p to 1m^3/p.

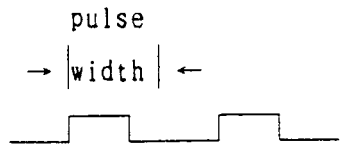
Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
1	# PLS 10.000 Hz SCL 196.36 cc/p	Required number of times The top line shows the pluse output frequency for the maximum span. The frequency maybe used as a reference for selecting an appropriate pulse weight
2	# PLS 10.000 Hz SCL 196.36 cc/p	Change the numeral to the required value with the ◀▶ keys and ▼▲ keys.
3	# PLS .00111 Hz SCL 00001. m^3/p	

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 : 30ms

Settting range :

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

Output for magnetic counter or mercury relay — Open collector

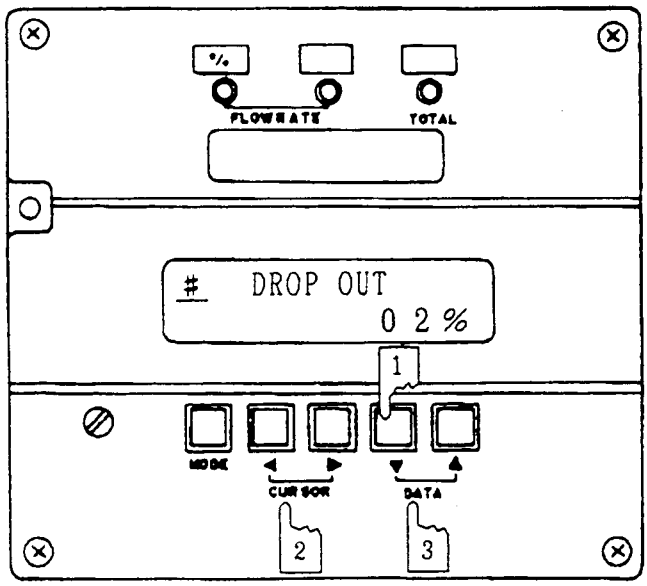
Example : To change pulse width from 30 ms to 0.5 ms

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
1	# PLS 30.000 % WID 030.0 ms	Required number of times The top line of LCD shows the pulse duty ratio.
2	# PLS 30.000 % WID 030.0 ms	$\text{Ratio} = \frac{A}{A+B}$ (Ratio ≦ 70%)
3	# PLS .00005 % WID 000.5 ms	Modify setting using 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.

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%

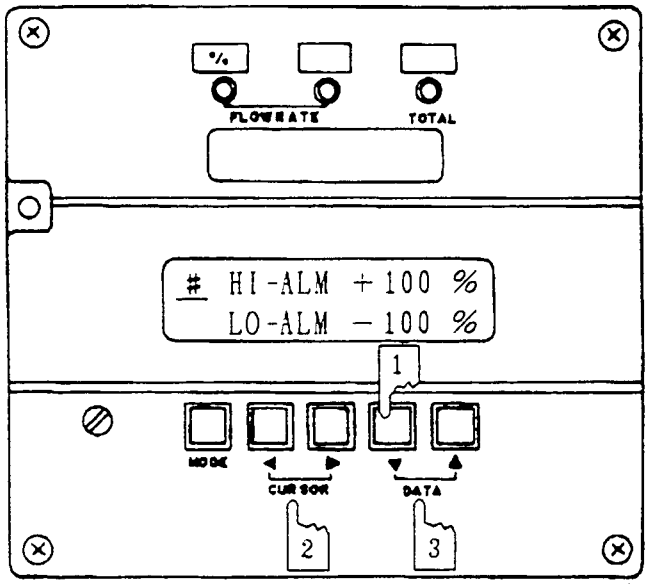
Example : To change output from 2% to 10%

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see opening of the Section 8).
1	# DROP OUT 0 2 %	Required number of times
2	# DROP OUT 0 2 %	
3	# DROP OUT 1 0 %	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～+125%
LO; −125～+125%

Note: For the procedure of selecting either the normally open or normally closed type of contact output signal, see Page 73

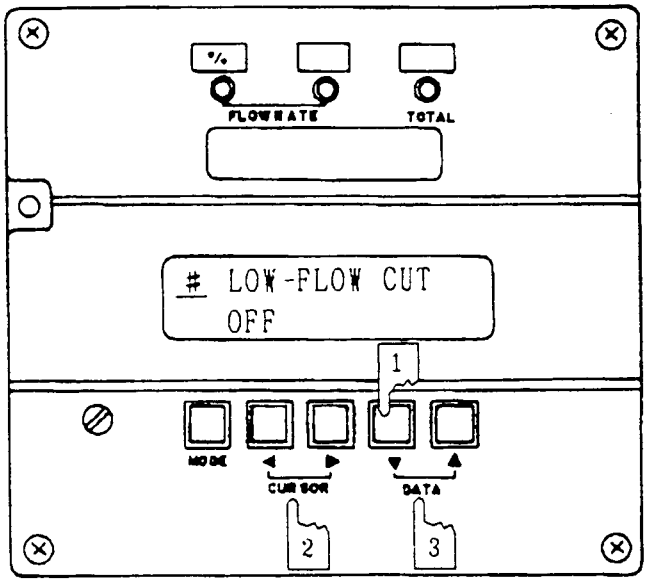
Example : To set high alarm from 100% to 80%

Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set the ENGINEERING MODE, see Section 8).
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 ◀ ▶ keys 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 flow 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%

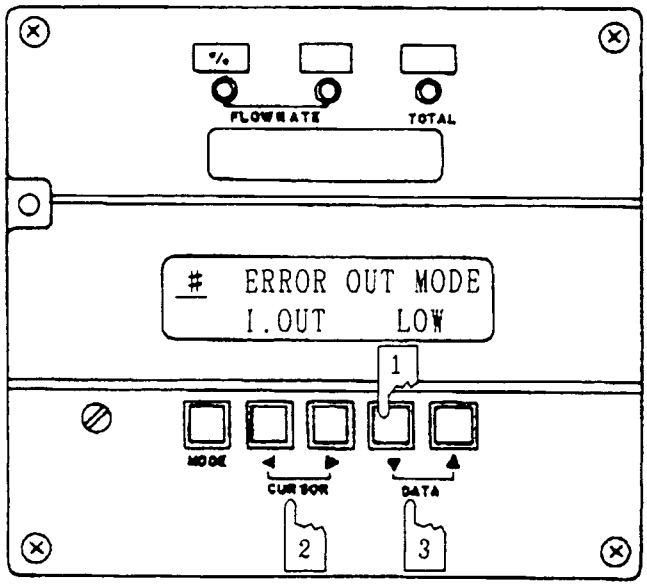
Procedure	Setting	Comments
	# ENGINEERING MODE 2 sec later # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see Section 8).
1	# LOW-FLOW CUT OFF	Required number of times Display when the low flow cutoff function is disabled.
2	# LOW-FLOW CUT OFF	Change the numeral to the required value 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 80.



Default value : LOW

Setting range : HIGH
LOW
HOLD

Example : To change burnout low to burnout high

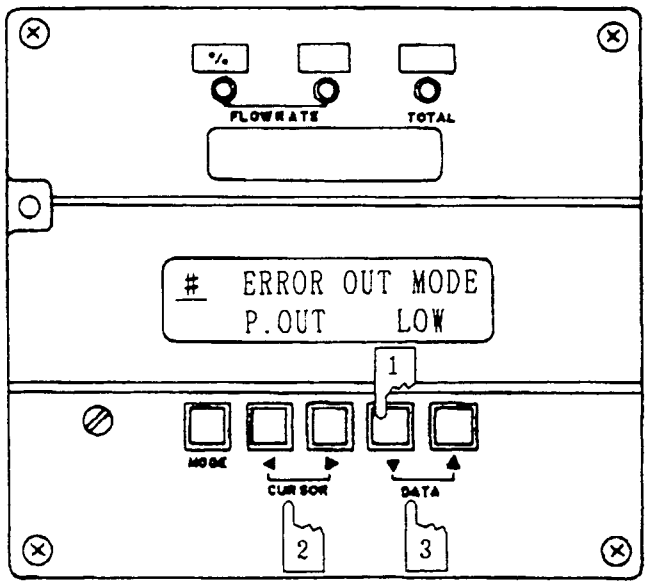
Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see Section 8).
1	# ERROR OUT MODE I.OUT LOW	Required number of times
2	# ERROR OUT MODE I.OUT LOW	Change the numeral to the required value with the ◀ ▶ and ▼ ▲ keys.
3	# ERROR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

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 92.



Default value : LOW

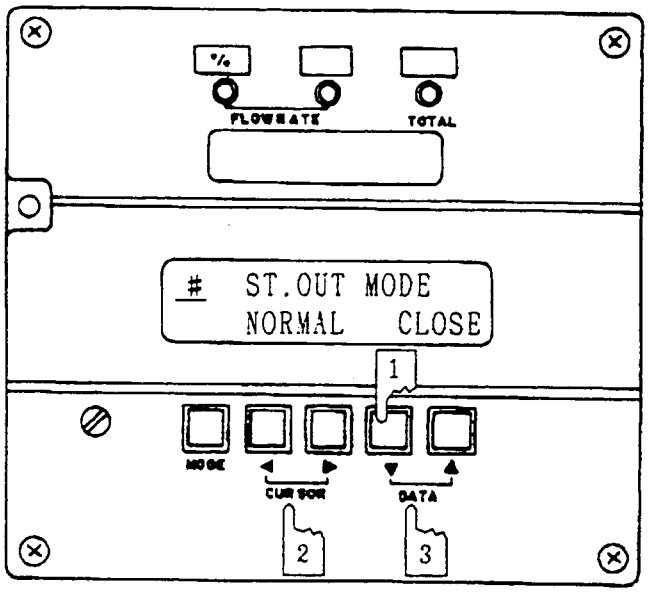
Setting range : LOW
HOLD

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 LOW	Change the numeral to the required value with the ◀ ▶ and ▼ ▲ keys.
3	# ERROR OUT MODE P.OUT HOLD	

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

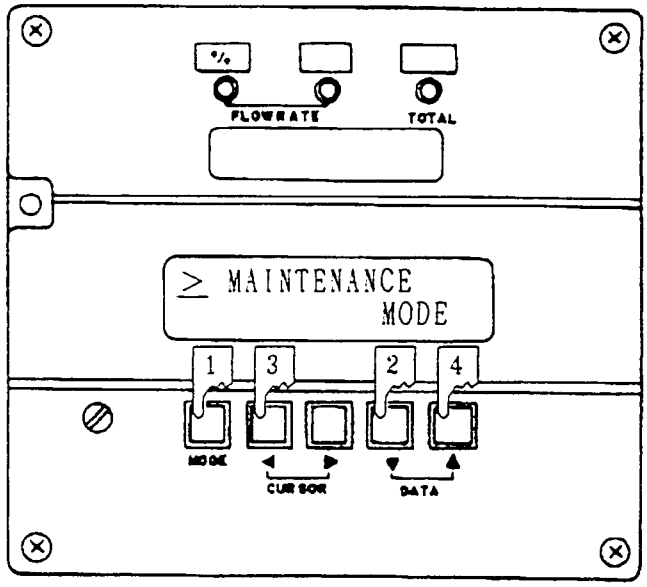
Procedure	Display	Comments
	# ENGINEERING MODE 2 sec later ↓ # ID SET XXXXXXXX	For the procedure to set to the ENGINEERING MODE, see Section 8).
1	# ST. OUT MODE NORMAL CLOSE	
2	# ST. OUT MODE NORMAL CLOSE	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
3	# ST. OUT MODE NORMAL OPEN	

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.)



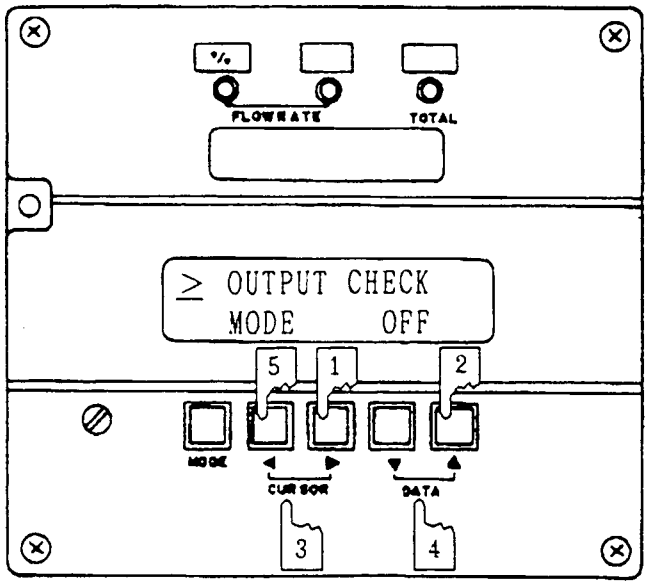
Procedure	Display	Comments
	% SPAN 35,000 m³/h	Example of display when in measurement (MEASUREMENT MODE)
1	* OPERATING MODE	
	2 sec later ↓	
	* DAMPING 04 s	
2	* MODE ENTER ENGINEER MAINTE	
3	* MODE ENTER ENGINEER MAINTE	
4	≥ MAINTENANCE MODE	
	2 sec later ↓	
	≥ OUTPUT CHECK MODE OFF	

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 %

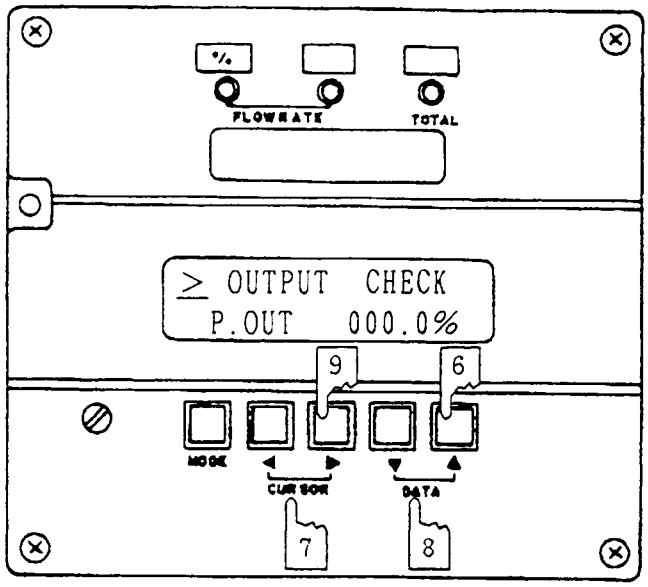
Setting range : 0 ~ +125%

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

Procedure	Display	Comments
	≥ MAINTENANCE MODE	For the precedure to set to the MAINTENANCE MODE, see section 25).
	2 sec later ↓	
	≥ OUTPUT CHECK MODE	
1	> OUTPUT CHECK MODE OFF	
2	> OUTPUT CHECK MODE ON	
	1 sec later ↓	
	≥ OUTPUT CHECK I. OUT 000.0 %	
3	> OUTPUT CHECK I. OUT 000.0 %	Change the numeral to the required value with the ◀ ▶ keys and ▼ ▲ keys.
4	> OUTPUT CHECK I. OUT 050.0 %	
5	≥ OUTPUT CHECK I. OUT 050.0 %	Return the cursor to >.
	(to be continued) ↓	

27) To check the pulse output loop

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



Default value : 0 %

Setting range :
0 ～ +125%

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

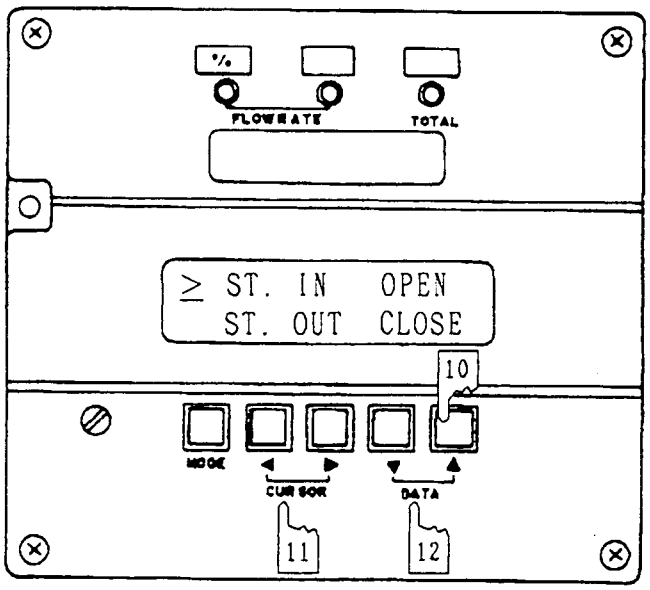
Procedure	Display	Comments
6	> OUTPUT CHECK P. OUT 000. 0 %	
7	> OUTPUT CHECK P. OUT 000. 0 %	Set or change as required with the ◀ ▶ and ▼ ▲ keys.
8	> OUTPUT CHECK P. OUT 100. 0 %	
9	> OUTPUT CHECK P. OUT 100. 0 %	Return the cursor to >.

↓

(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

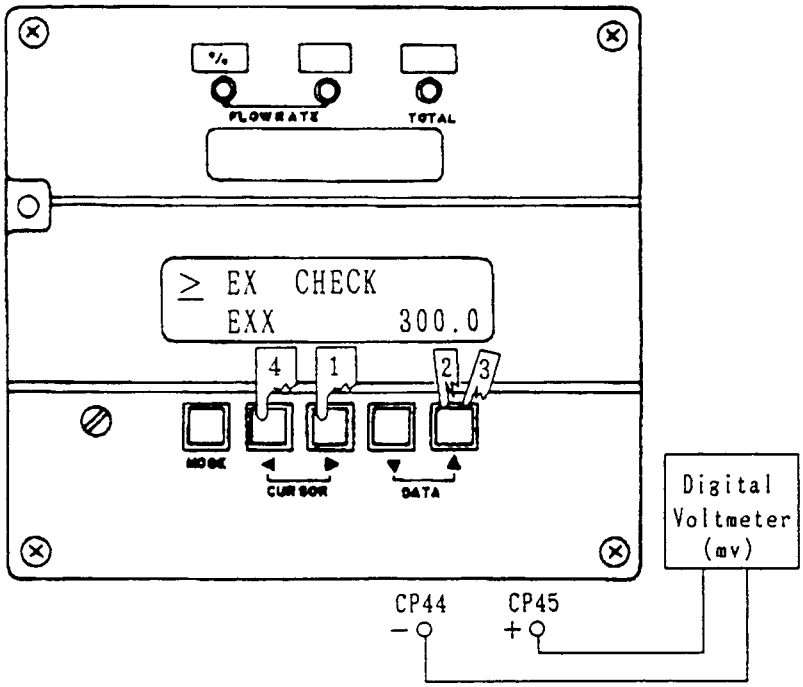
Note: The simulated output is delivered only for the period during which it is displayed on the LCD.

Procedure	Display	Comments
10	≥ ST. IN OPEN ST. OUT CLOSE	Descriptor "OPEN" means that the circuit between the STATUS IN terminals is not wired or is open.
11	> ST. IN OPEN ST. OUT CLOSE	The STATUS OUT is selectable between OPEN and CLOSED by means of the ▼ ▲ keys.
12	> ST. IN OPEN ST. OUT OPEN	

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



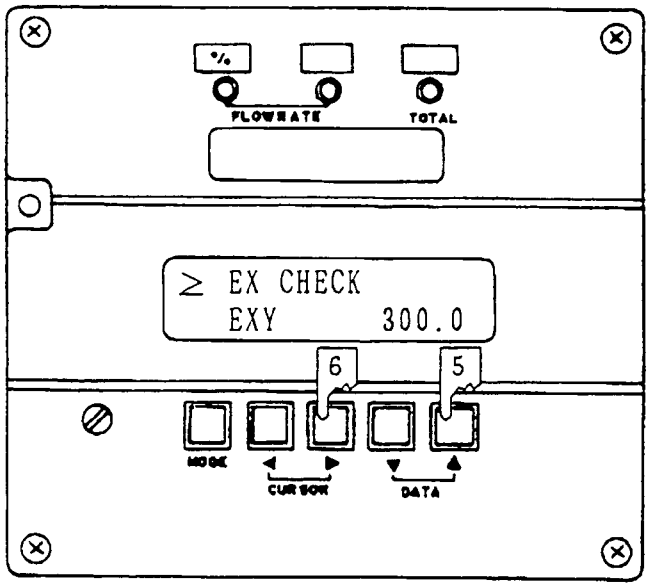
(Preparation)

(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
	≥ MAINTENANCE MODE	For the procedure to set to the MAINTENANCE MODE, see the section 25).
	2 sec later ↓	
	≥ OUTPUT CHECK MODE OFF	
1	> OUTPUT CHECK MODE OFF	
2	> OUTPUT CHECK MODE ON	
	1 sec later ↓	
	> OUTPUT CHECK I. OUT 000.0 %	
3	≥ EX CHECK EXX 300.0	Required number of times
	2 sec later ↓	
4	> EX CHECK EXX 300.0	At this stage the excitation current (EX) which flows from X to Y direction can be checked with the external digital voltmeter.

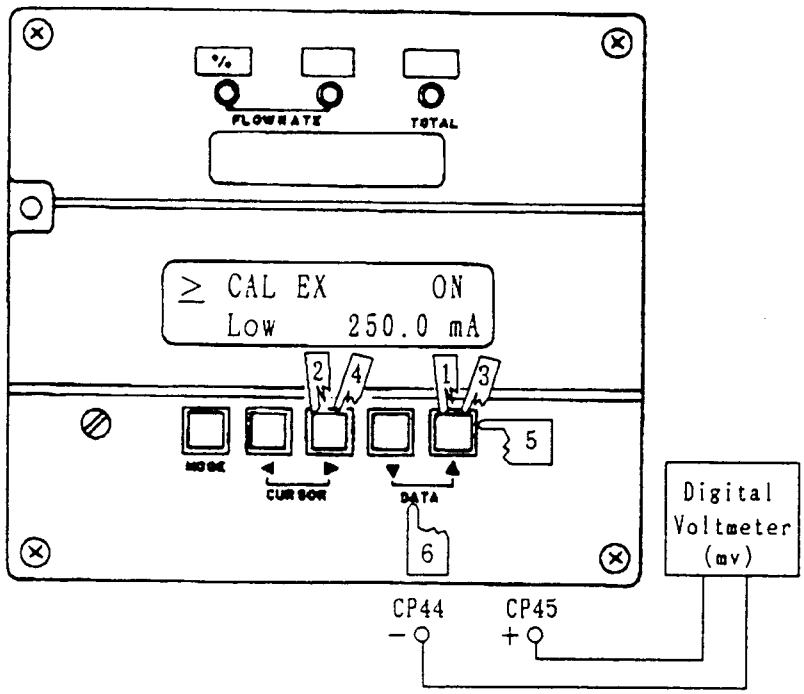


Procedure	Display	Comments
5	> EX CHECK EXY 300.0	At this stage the excitation current (EX) which flows from X to Y direction can be checked with the external digital voltmeter.
6	≥ EX CHECK EXY 300.0	Return the cursor to >.

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 250mA and 350mA

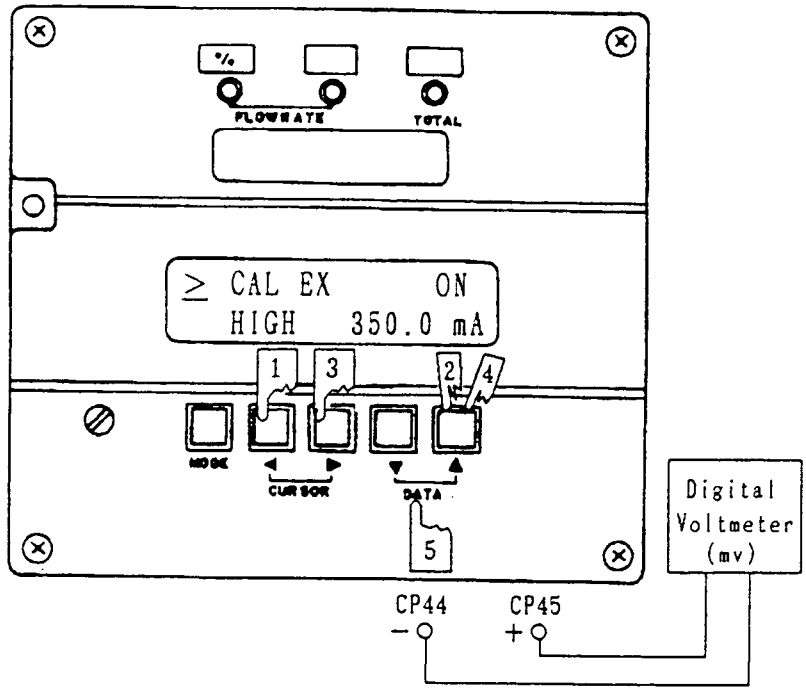


(Preparation)

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

Procedure	Display	Comments
	≥ MAINTENANCE MODE	For the procedure to set to the MAINTENANCE MODE, see section 25).
	2 sec later ↓	
	≥ OUTPUT CHECK MODE OFF	
1	≥ CALIBRATOIN MODE OFF	
2	> CALIBRATOIN MODE OFF	
3	≥ CAL EX OFF LOW 250.0 mA	
4	> CAL EX OFF LOW 250.0 mA	
5	> CAL EX ON LOW 250.0 mA	
6	> CAL EX ON LOW 250.0 mA	With this display, the calibration shall be made using ▼ ▲ keys so as to have the digital voltmeter indicated 250.0 mV.

to be continued

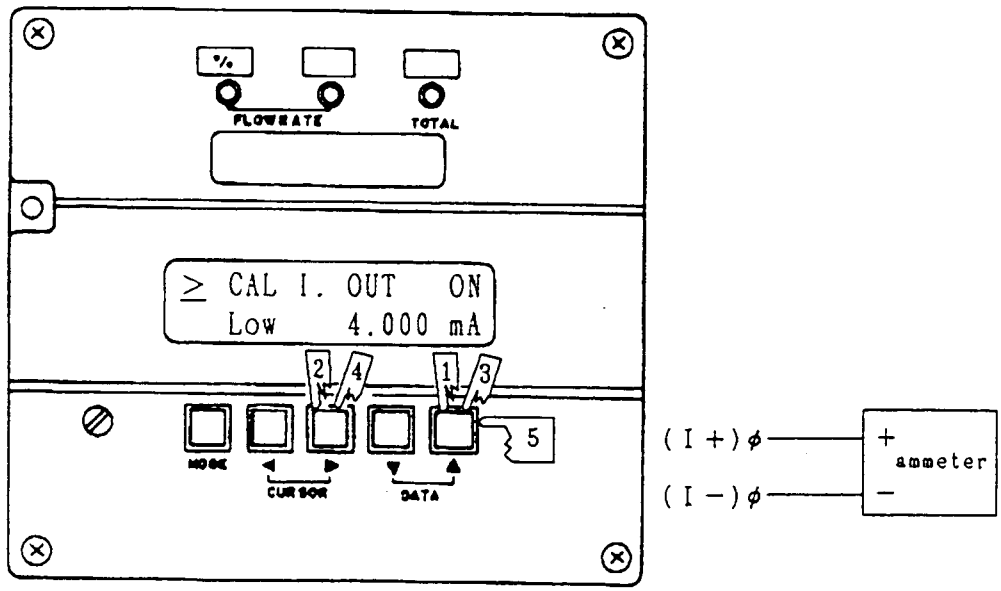


Procedure	Display	Comments
1	≥ CAL EX ON LOW 250.0 mA	
2	≥ CAL EX OFF HIGH 350.0 mA	
3	> CAL EX OFF HIGH 350.0 mA	
4	> CAL EX ON HIGH 350.0 mA	With this display, the calibration shall be made using ▼ ▲ keys so as to have the digital volmeter indicated 350.0 mV.
5	> CAL EX ON HIGH 350.0 mA	

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.

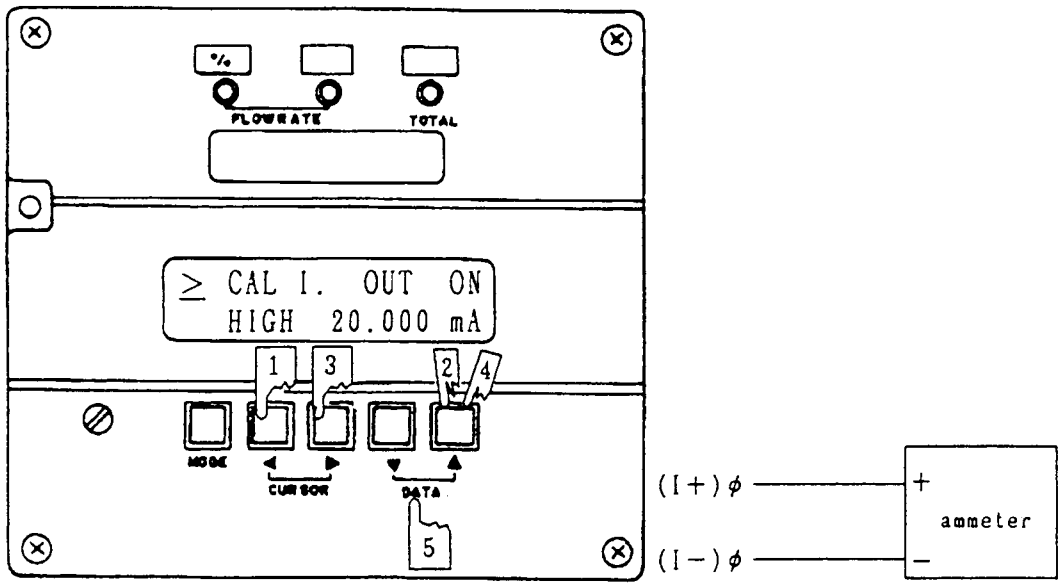
31) To calibrate the analog current output 4mA and 20mA



Procedure	Display	Comments
	≥ MAINTENANCE MODE 2 sec later ↓ ≥ OUTPUT CHECK MODE OFF	For the procedure to set to the MAINTENANCE MODE, see section 25).
1	≥ CALIBRATION MODE OFF	
2	> CALIBRATION MODE OFF	
3 (3times)	≥ CAL I. OUT OFF LOW 4.000 mA	
4	> CAL I. OUT OFF LOW 4.000 mA	
5	> CAL I. OUT ON LOW 4.000 mA	
6	> CAL I. OUT ON LOW 4.000 mA	With this display, the calibration shall be made using ▼ ▲ keys so as to have the ammeter indicated 4.000 mA.

↓

to be continued



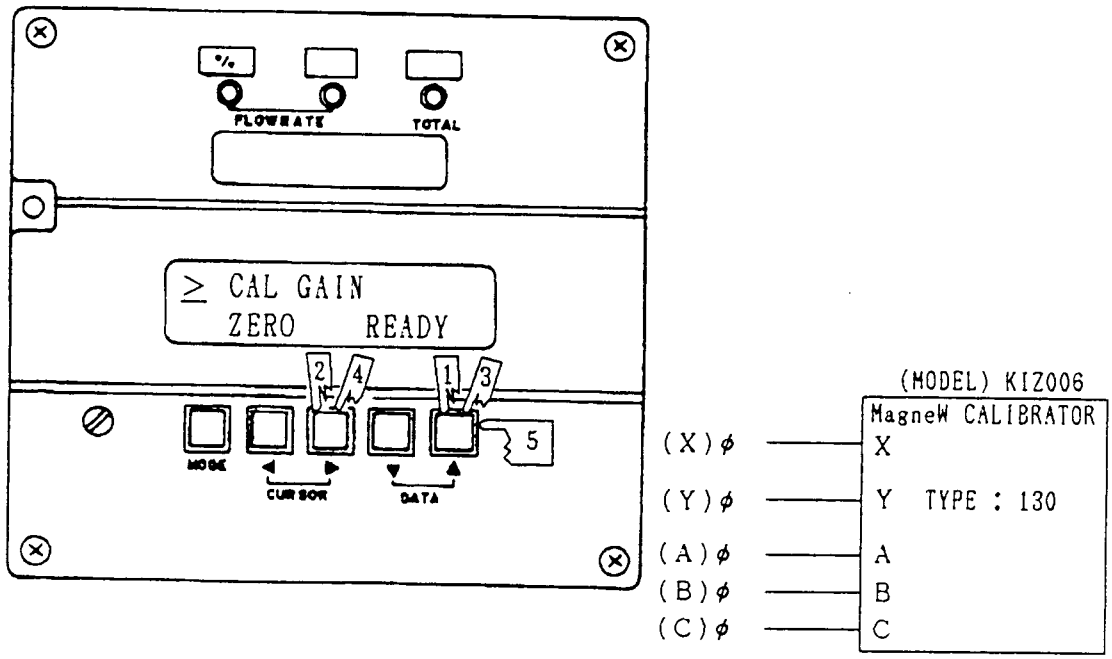
Procedure	Display	Comments
	≥ MAINTENACE MODE 2sec later ↓ ≥ OUTPUT CHECK OFF	For the procedure to set to the MAINTENANCE MODE, see Section 25).
1	≥ CAL I. OUT ON LOW 4.000 mA	
2	≥ CAL I. OUT OFF HIGH 20.000 mA	
3	> CAL I. OUT OFF HIGH 20.000 mA	
4	> CAL I. OUT ON HIGH 20.000 mA	
5	> CAL I. OUT ON HIGH 20.000 mA	With this display, the calibration shall be made using ▲ ▼ keys so as to have the ammeter indicated 20.00mA.

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.

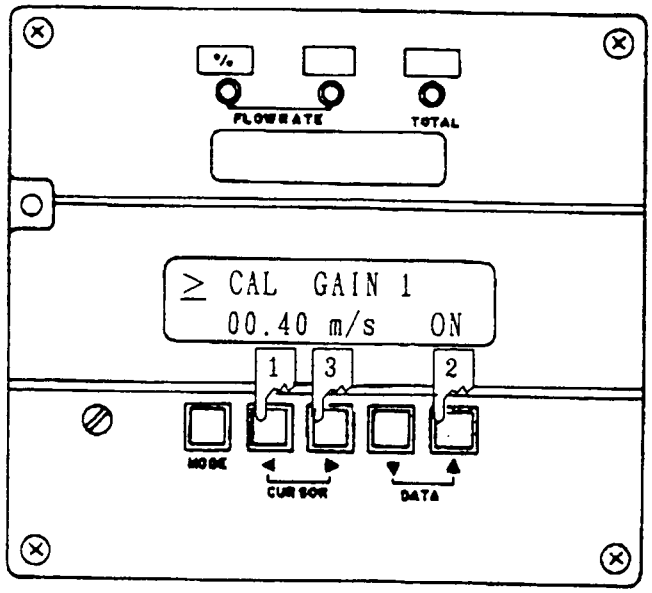
32) To calibrate the internal gain coefficient

The calibration of "ZERO" internal gain coefficient



Procedure	Display	Comments
	≥ MAINTENANCE MODE	For the procedure to set to the MAINTENANCE MODE, see section 25).
	2 sec later ↓	
	≥ OUTPUT CHECK MODE OFF	
1	≥ CALIBRATION MODE OFF	
2	> CALIBRATION MODE OFF	
3 (5times)	≥ CAL GAIN ZERO READY	
4	> CAL GAIN ZERO READY	Input "zero (0m/s)" from MagneW Calibrator
5	> CAL GAIN ZERO ON	The calibration of "zero(0m/s)" stars by 5 operation
	20sec later ↓	
6	> CAL GAIN ZERO READY	The calibration of "zero(0m/s)" point has complated.
	↓	
	to be continued	

The calibration of 0.4m/s internal gain Coefficient

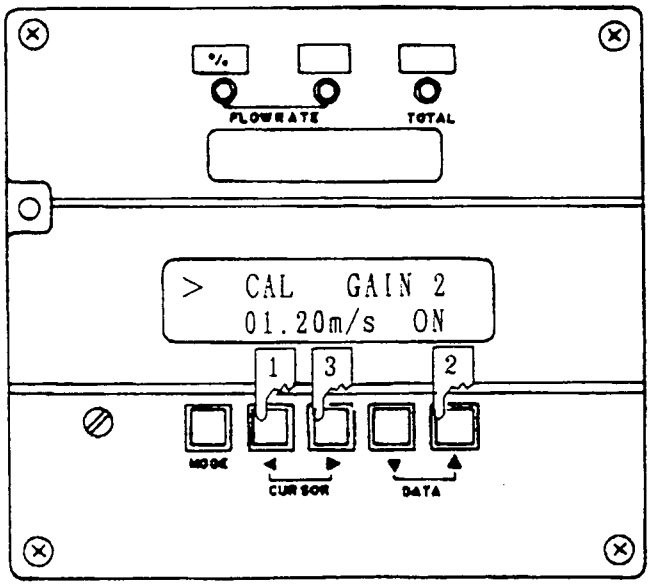


Procedure	Display	Comments
1	≥ CAL GAIN 1 ZERO READY	
2	≥ CAL GAIN 1 00.40 m/s READY	
3	> CAL GAIN 1 00.40 m/s READY	Input "0.4m/s" signal from MangeW Calibrator.
4	> CAL GAIN 1 00.40 m/s ON	The calibration of "0.4m/s" gain starts by 4 opration.
	12sec later ↓	
5	> CAL GAIN 1 00.40 m/s READY	The calibration of "0.4m/s"gain has complated

↓

to be continued

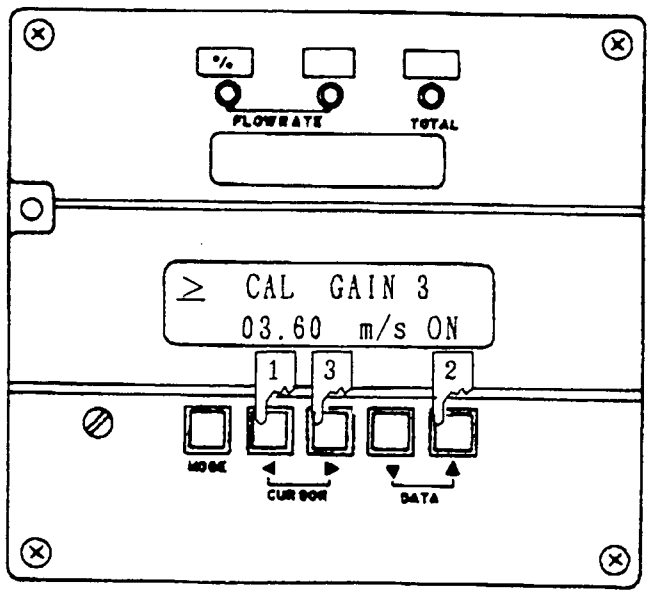
The calibration of 1.2m/s internal gain Coefficient



Procedure	Display	Comments
1	≥ CAL GAIN 1 00.40 m/s READY	
2	≥ CAL GAIN 2 01.20 m/s READY	
3	> CAL GAIN 2 01.20 m/s READY	Input "1.2m/s" signal from MangeW Calibrator.
4	> CAL GAIN 2 01.20 m/s ON	The calibration of "1.2m/s" gain starts by 4 opration.
	12sec later ↓	
5	> CAL GAIN 2 01.20 m/s READY	The calibration of "1.2m/s"gain has complated

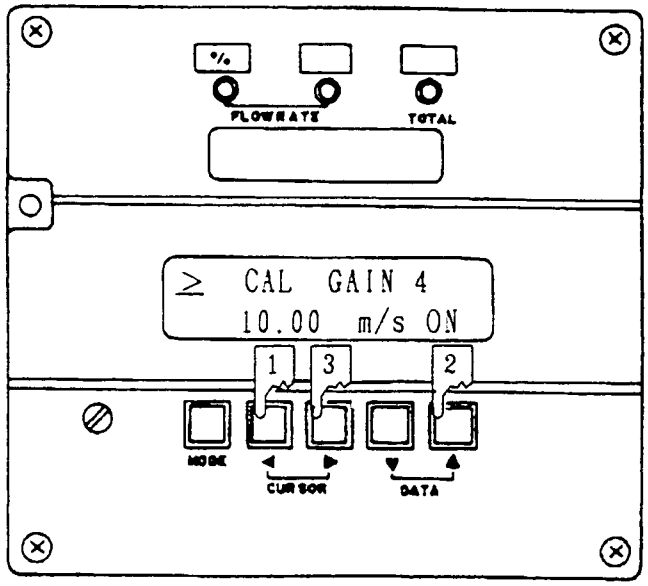
to be continued

The calibration of 3.6m/s internal gain Coefficient



Procedure	Display	Comments
1	≥ CAL GAIN 2 01.20 m/s READY	
2	≥ CAL GAIN 3 03.60 m/s READY	
3	> CAL GAIN 3 03.60 m/s READY	Input "3.6m/s" signal from MangeW Calibrator.
4	> CAL GAIN 3 03.60 m/s ON	The calibration of "3.6m/s" gain starts by 4 opration.
	12sec later ↓	
	> CAL GAIN 3 03.60 m/s READY	The calibration of "3.6m/s" gain has complated
	↓	
	to be continued	

The calibration of 10m/s internal gain Coefficient

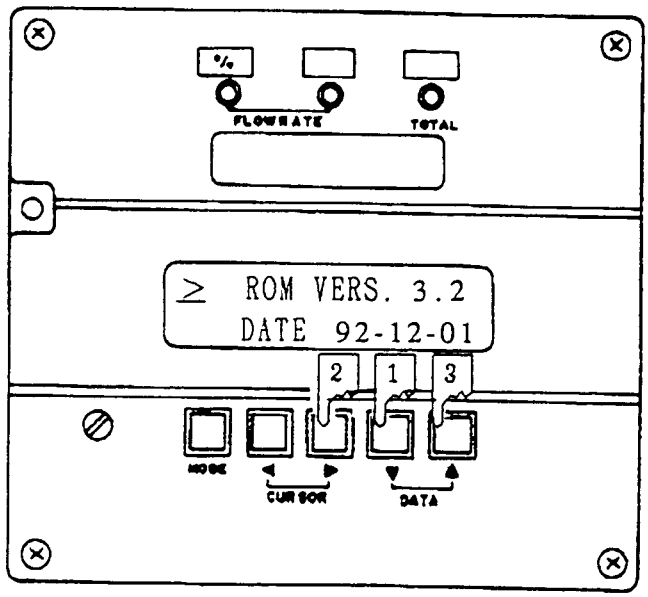


Procedure	Display	Comments
1	≥ CAL GAIN 3 03.60 m/s READY	
2	≥ CAL GAIN 4 10.00 m/s READY	
3	> CAL GAIN 4 10.00 m/s READY	Input "10m/s" signal from MangeW Calibrator.
4	> CAL GAIN 4 10.00 m/s ON 12sec later ↓ > CAL GAIN 4 10.00 m/s READY	The calibration of "10m/s" gain starts by [4] opration. The calibration of "10m/s" gain has complated

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

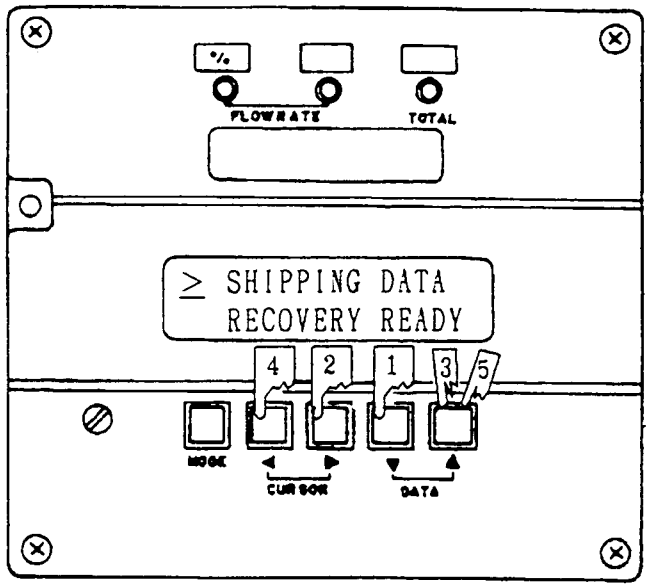


Procedure	Display	Comments
	≥ MAINTENACE MODE 2sec later ↓ ≥ OUTPUT CHECK MODE OFF	For the procedure to set to the MAINTENANCE MODE, see section 25)
1 (2times)	≥ CRITICAL MODE OFF	
2	> CRITICAL MODE OFF	
3	≥ ROM VERS. 3.2 DATE 92-12-01	

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.

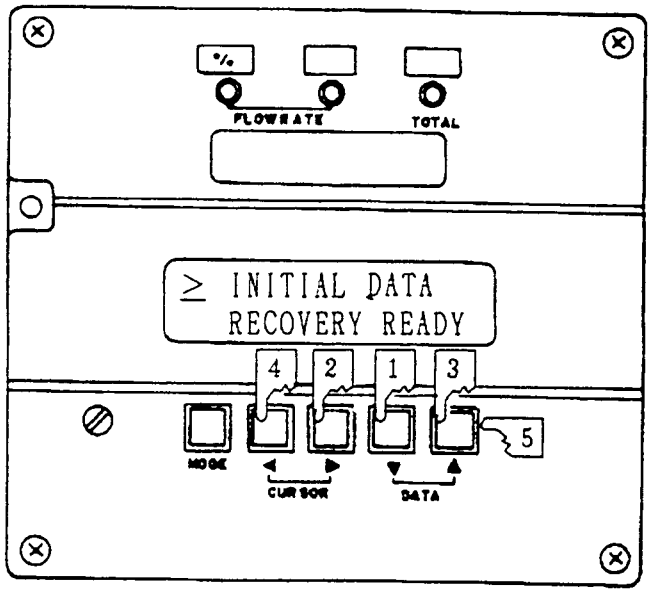
34) To recover the shipping data



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

Procedure	Display	Comments
	≥ MAINTENACE MODE 2sec later ↓ ≥ OUTPUT CHECK MODE OFF	·For the procedure to set to the MAINTENANCE MODE, see Section 25).
1 (2times)	≥ CRITICAL MODE OFF	
2	> CRITICAL MODE OFF	
3 (2times)	≥SHIPPING DATA RECOVERY READY	「READY」→「ON」→「READY」
4	>SHIPPING DATA RECOVERY READY	After the excution of this function, the mode is automatically changed to "Measuring Mode"
5 (more than 3sec)	- SELF CHECK MODE 5sec later ↓ - MEASURING MODE 1sec later ↓ % SPAN □□.□□□m³/h	

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



This mode is used in the event that normal operation can not be recovered even ofter proper coutermeasures are taken.

* Caution *

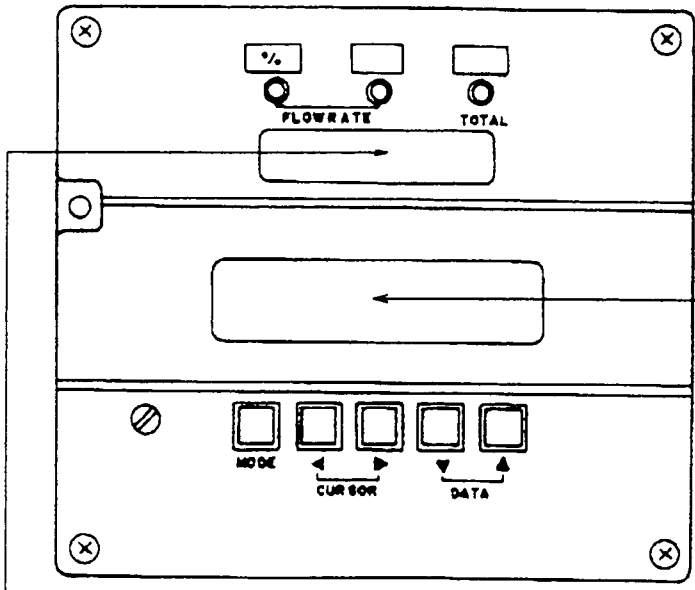
after excuting this function, re-calibration is necesarry

Procedure	Display	Comments
	≥ MAINTENACE MODE	For the procedure to set to the MAINTENANCE MODE, see Section 25).
	2sec later ↓	
	≥ OUTPUT CHECK MODE OFF	
1 (2times)	≥ CRITICAL MODE OFF	
2	> CRITICAL MODE OFF	
3 (3times)	≥ INITIAL DATA RECOVERY READY	
4	> INITIAL DATA RECOVERY READY	
5 (more than 3sec)	> INITIAL DATA RECOVERY ON	
	1sec later ↓	
	- SELF CHECK MODE	
	5sec later ↓	
	- MEASURING MODE	
	1sec later ↓	
	% SPAN □□.□□□ m³/h	After the excution of this function, the mode is automatically changed to "Measuring Mode"

6.6 Diagnostic Functions

1) H/W Check

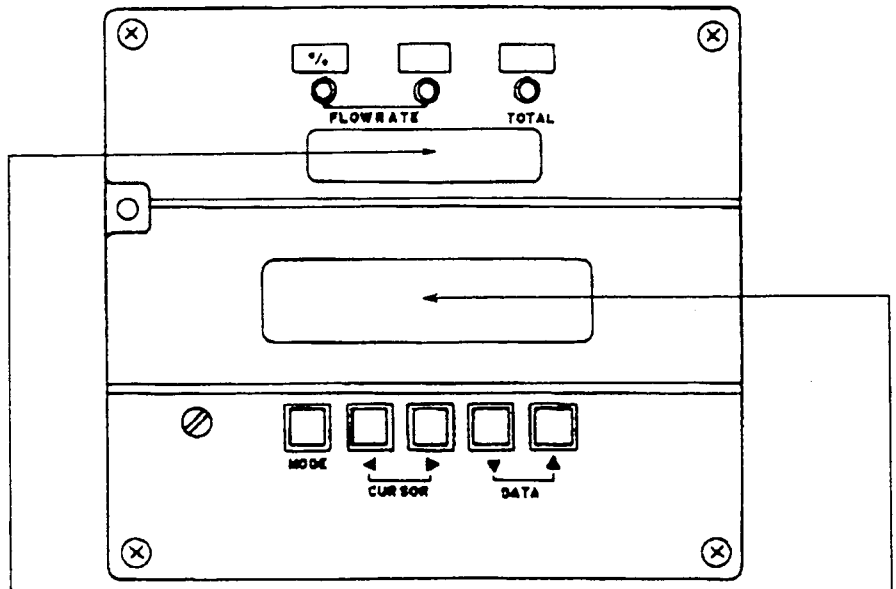
The H/W check is done in the MEASUREING MODE. When an error is found, immediately take appropriate corrective measures.



Error Code (on Readout)	Type of Error	Corrective Measure	Error Message (on LCD)
Err-01	EX loop open, coil open	1. Check connections. 2. Measure coil resistance. 3. Turn on power again.	EX CHECK ERROR
Err-02	ROM check-sum error	1. Turn on power again. 2. Replace ROM. 3. Replace main card.	ROM CHECK ERROR
Err-03	RAM READ AFTER WRITE error	1. Turn on power agian. 2. Replace main card.	RAM CHECK ERROR
Err-04	NVM READ AFTER WRITE error	1. Turn on power. 2. Replace main card.	NVM CHECK ERROR
Err-05	A/D Conversion error	1. Turn on power. 2. Replace main card.	ADC CHECK ERROR

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 ≧ LO.	SETTING ERROR HI<LO
Err-21	Range setting >12 m/s	Check the settings of SPAN, DIA, MODEL, and DUMMY.	SPAN ERROR OVER 12m/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 exiciting 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 Figure 7.1.

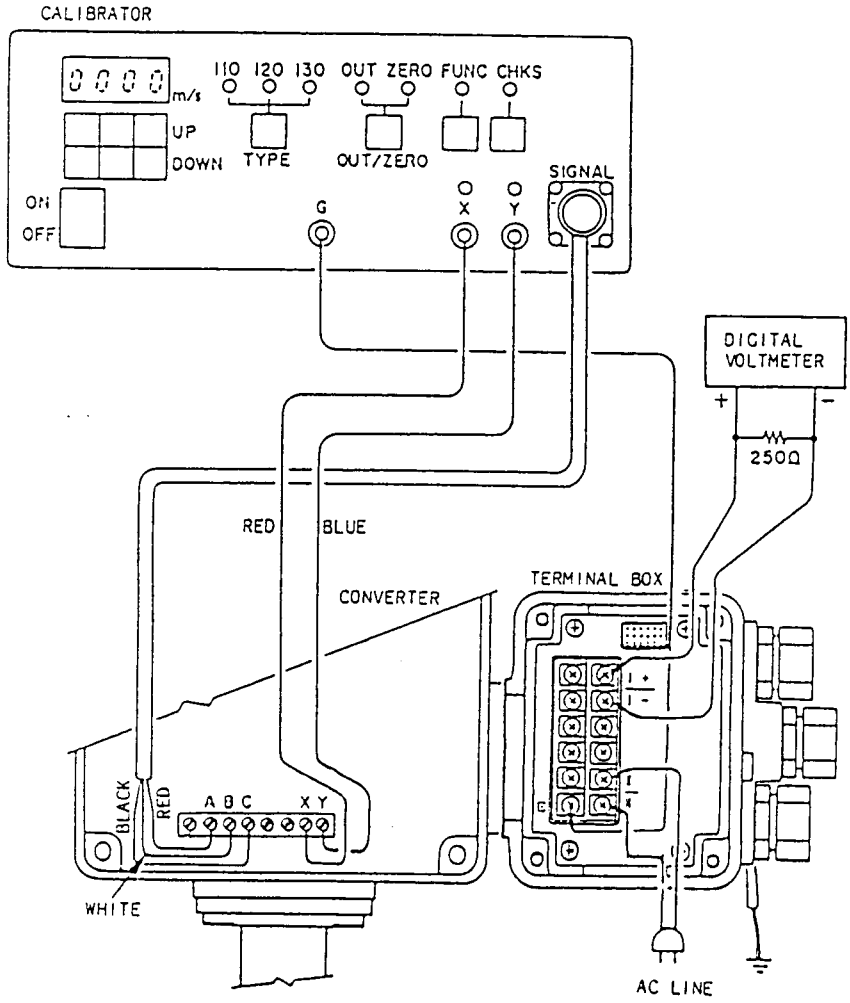


Figure 7.1. Calibration Setup

(c) Nomenclature of Panel Items and Operation of Calibrator

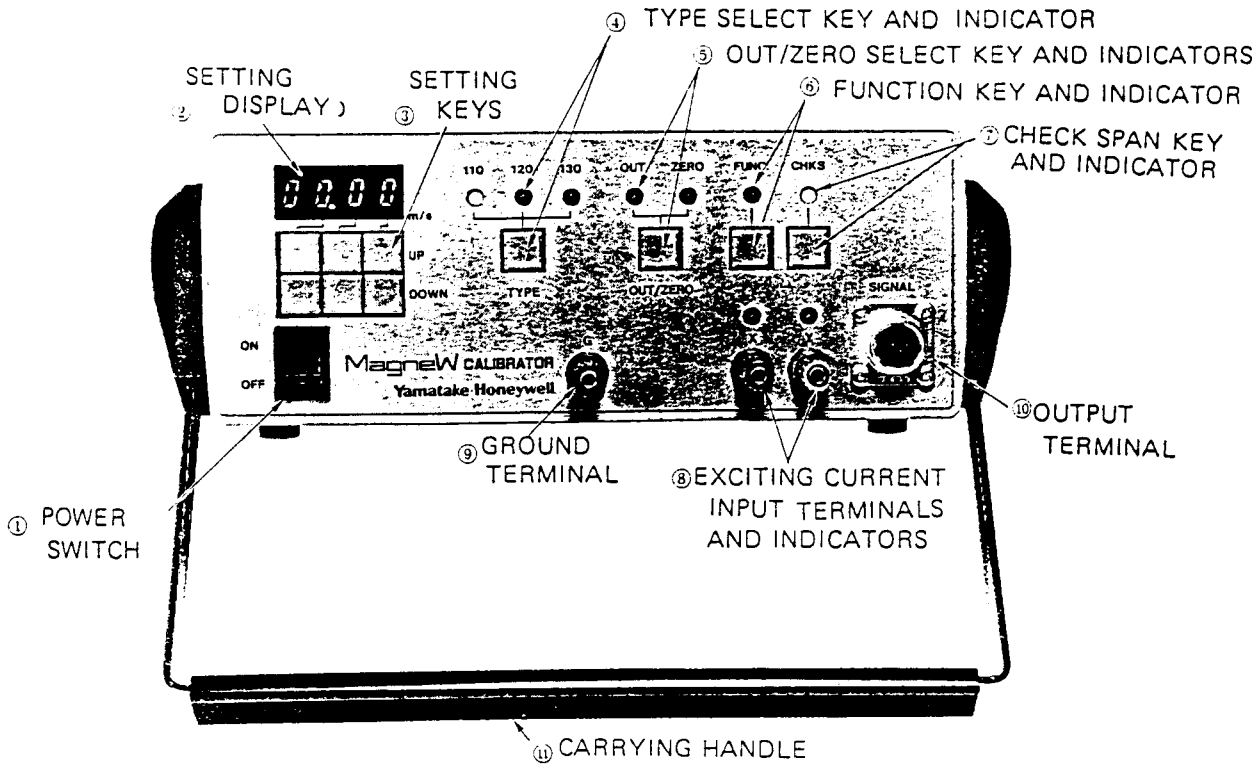


Figure 8.2. Calibrator Panel

(1) Select "130" for the type of the detector.

(2) With ③ SETTING keys, 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 your press ⑥ FUNCTION key, the converter output is incremented to 0%, 25%, 50%, 75%, or 100%.

8. TABLE OF STANDARD ACCESSORIES

	Q'ty
Fuse, tublar glass, 3A	1
Mounting brackets	1 set
Centering jigs	4

Document Number :	OM2-5660-3520P
Document Name :	MagneW3000 Ceramic Type Electromagnetic Flowmeter Model: KID30A/KIX20A (Integral Type)
Date :	April, 1994 July, 1998 (Rev. 1) (Y)
Issued / Edited by :	Yamatake Corporation