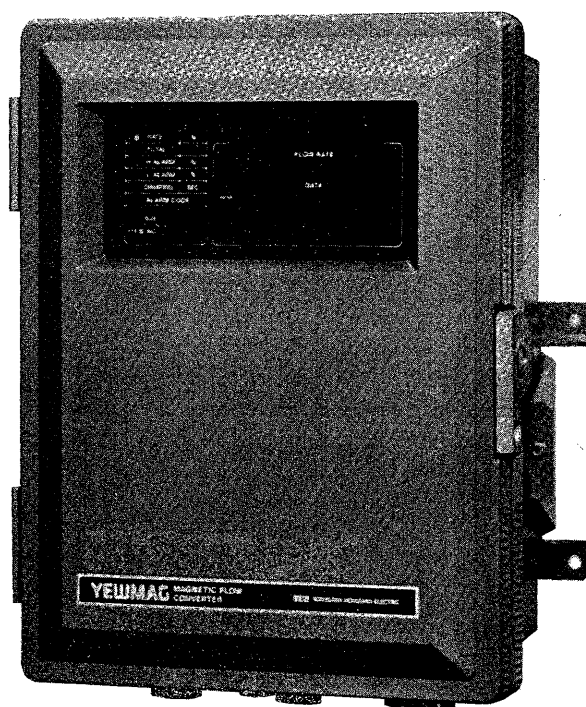


# Instruction Manual

**YEW MAG**

**Model YMA 11  
MAGNETIC FLOW CONVERTER**



**YOKOGAWA** ◆

3rd Edition  
IM 1E4B0-01E

## YMA 11 METER FACTOR TABLE FOR ADMAG FLOWTUBE

When connecting a YMA11 flow converter to an ADMAG flowtube, perform the following steps.

1. Record the "low" meter factor and size of the ADMAG flowtube.
2. On the chart below, calculate the new meter factor for the YMA11.

example. low meter factor for a 2" admag flowtube : 0.8203

1/8 mode meter factor:  $0.8203 \times 0.9725 = 0.7974$

1/2 mode meter factor:  $0.8203 \times 0.9705 = 0.7961$

YMA11 excitation current = 0.13 amp.

3. Record the new meter factors and excitation current in the YMA11.

ADMAG flowmeter size  (inch)	YMA 11 Excitation Current  (AMP)	To obtain meter factor for YMA11, multiply "low meter factor" of ADMAG flowmeter by the data below.	
		standard 1/8 mode excitation	slurry 1/2 mode excitation
0.1	0.12	1.0162	1.006
0.2	0.14	0.9788	0.975
0.4	0.23	0.9403	0.9335
0.5	0.23	0.9419	0.9399
1	0.15	0.9760	0.9747
1.5	0.13	0.9719	0.9708
2	0.13	0.9725	0.9705
3	0.17	0.9726	0.9674
4	0.14	0.9625	0.9526
6	0.11	0.9779	0.9613
8	0.12	0.9759	0.9468
10	0.5	0.9925	0.9483
12	0.5	0.9855	0.9265
14	0.5	*	*
16	0.5	0.9841	0.9193

1. Explosion proof rating can not be obtained with YMA 11/ ADMAG combination.
2. Excitation current must be set to the data in the table above.

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## 1. HANDLING CAUTIONS.

The Model YMA11 Magnetic Flow Converter is thoroughly tested at the factory before shipment. When this instrument is delivered, perform a visual check to ascertain that no damage occurred during shipment.

This section describes important cautions in handling this instrument. Read carefully the section before using the instrument.

If you have any problem or question, contact your nearest YEW service center or sales representative.

### 1-1. Models and Specifications.

The model and important specifications are indicated on the data plate attached to the rear face of the door. Verify that they are the same as those specified in the original order, referring to subsection 2-4, Model and Suffix Codes. In any correspondence, always state the model (MODEL) and serial number (NO.) marked on the data plate.

### 1-2. Cautions for Storage.

If the instrument is to be stored for a prolonged period after delivery, observe the following:

- (1) Where possible, store the converter without unpacking.
- (2) Select the storing place that is
  - protected against rainfall and water,
  - relatively free from mechanical vibration or impact shock,
  - in the following temperature and humidity range,  
 Temperature:  $-40$  to  $+70^{\circ}\text{C}$  ( $-40$  to  $+158^{\circ}\text{F}$ )  
 Humidity : 5 to 80% R.H.

though it is preferable to normal temperature and humidity (about  $25^{\circ}\text{C}$  and 65% R.H.) as far as possible.

### 1-3. Installation Area Selection.

To ensure stable and accurate operation for a long term, the following cautions must be observed in selecting an installation area.

- (1) Ambient temperature  
 Avoid an area which has wide temperature variations. When the installation area is subjected to heat radiation from process plant, ensure adequate heat shielding or ventilation.
- (2) Atmospheric condition  
 Avoid installing the converter in corrosive atmosphere. When the converter is obliged to be installed in corrosive atmosphere, adequate ventilation must be provided.

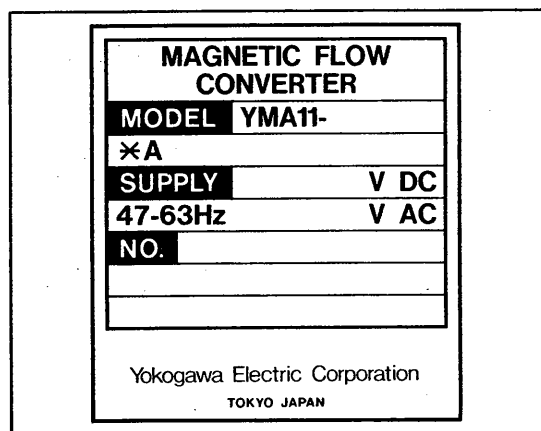


Figure 1-1. Data Plate.

## 2. GENERAL.

A magnetic flowmeter is an instrument which measures flow (rate) of conductive liquids using Faraday's law of electromagnetic induction. It has many features such as obstruction less metering tube, no pressure loss, capability of measuring corrosive liquids, etc.

A YEWMAG magnetic flow converter amplifies and converts a minute voltage obtained from a YEWMAG magnetic flowmeter into a DC analog sig-

nal (4 to 20 mA or 1 to 5V) or a series of pulse signals for totalization.

A YEWMAG magnetic flow converter is an all-in-one type field mounting magnetic flow converter with sophisticated "intelligence".

It can be combined with commercial frequency excited magnetic flowmeters and conventional low frequency excited magnetic flowmeters as well as YEWMAG series magnetic flowmeters.

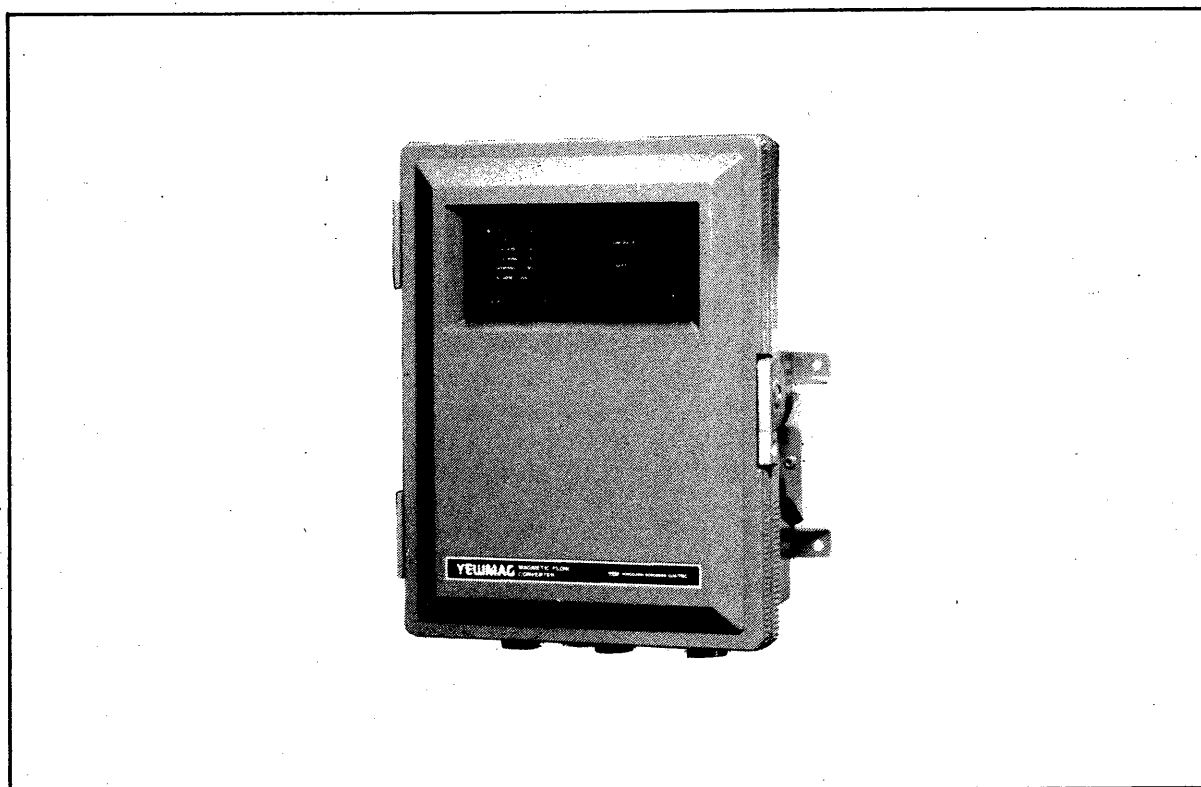


Figure 2-1. External View.

## 2-1. Standard Specifications.

### Input Signals:

Flow signal: Signal proportional to flow from transducer.

On-off or voltage signal: Span switching signal, "output zero" clamp signal (both unpowered contact, solid state switch or voltage level signals)

### Output Signals:

Current output: 4 to 20 mA DC (load resistance 0 to 600 ohms)

Voltage output: 1 to 5V DC

Pulse output: Open-collector transistor switch

Rating 30V DC, 200 mA

Output rate 0.0004 to 1000 pps

Alarm contact On-off output: High/low limit alarms (open collector transistor switch)

Self-diagnosis alarms (open collector transistor switch)

Rating 30V DC, 200 mA

Status contact On/off output: Forward and reverse flow measurement (open collector transistor switch)

Automatic multi-range output (open collector transistor switch)

Rating 30V DC, 200 mA

### Span Setting Functions:

Volumetric flow span setting is available by setting volume units, time units, flow span and nominal flowmeter sizes.

Volume units: m<sup>3</sup>, L, cm<sup>3</sup>, gallon, bbl

Time units: hour, min., sec.

Flow rate indication: 5 significant digits from 0.0000 to 30000.

Flowmeter nominal size: 5 significant digits from 1.0 to 3000.0 mm or 0.1 to 300.00 inches.

For gravimetric flow, set the reciprocal of liquid density with 5 significant digits.

### Multiple Range Function:

Max. 4 ranges selectable with external range-selecting on-off inputs in the multi-range measuring mode.

Automatic range switching available between 2 ranges.

### Damping:

Damping time range: 1 to 100 sec. (63% response)

### Forward and Reverse Flow Measurement Function:

Reverse flow measurement available in the forward and reverse flow measurement mode.

In reverse flow measurement, a minus sign is added to the flow display and the status on-off output changes from open to closed.

### Instantaneous Flow Rate Display Function:

Ten-segment bar graph display.

Flow rate display in an engineering unit or in % (4 significant digits) available.

### Totalized Counts Display Function:

Totalized volume can be displayed by setting the number of pulses per unit volume.

Totalized flow counts for forward or reverse flow and difference between both direction flows available.

### Pulse Output Function:

Flow pulses after scaling are output by setting the number of pulses per unit volume.

Pulse duration: Freely selectable the following:

Duty 50%; 0.5, 1, 20, 33, 50 and 100 ms

### Power Backup Functions:

Totalizer function at power recovery: Normal (continues totalizing).

Data protection during power failure: Internal battery.

On-off outputs by contacts are all open (OFF) during power failure.

Battery life: At least 10 years (in normal operation at ambient temperature 40°C (104°F))

At least 6 years (in backup mode at ambient temperature (104°F))

### Self-Diagnostic Functions:

Microprocessor failure: RAM data volatilization.

A/D failure: A/D converter failure.

Coil disconnection: Cable or coil disconnected.

Input signal error: Detection of empty flowmeter tube.

High limit alarm: Flow rate over high limit setting.

Low limit alarm: Flow rate under low limit setting.

Output pulse overflow: Output pulse memory over.

Invalid setting: Erroneous parameter setting.

Battery failure: Battery is not mounted or voltage drop.

**Zero Adjustment Function (automatic):** Automatic zero adjustment initiated by pressing RESET switch when liquid flow is zero.

**Calibration Function (automatic span adjustment):** Span can be adjusted by connecting reference flow signal obtained from the TEST terminal to the input terminal and by pressing RESET switch.

**Signal Lock Function (at 0% flow):** Output can be locked at 0% by external on-off signal when flow rate display and flow totalization are desired to be completely stopped.

### Rate Limit Function:

Rate limit function removes abruptly changing noises superimposed to a flow signal.

### Two User-Selectable Excitation Modes:

The usual three-state excitation mode offers low drift, low power consumption. Two-state excitation mode provides good rejection of slurry noise, for slurry flow measurement.

**Surge Arrestors:** Surge arrestors are incorporated at terminals for power supply, excitation, analog output, pulse output, and on-off input/output.

**Mounting and Construction:**

Mounting: 50 mm (2-inch) pipe mounting, panel or surface mounting.

Electrical connection: JIS PF1/2 female or ANSI 1/2NPT female.

Wiring terminals: ISO M4 screws (4 mm).

Case material: Aluminum alloy.

Finish: Light grayish green, backed polyurethane resin paint.

Enclosure classification: Conforming to JIS C 0920 deck water-tight and NEMA type 4 water-tight and dust-tight.

Weight: Approx. 9.5 kg (21 lb).

**Standard Performance**

**Accuracy (when used with flowmeter) :**

Nominal size	Span(m/s)	Accuracy
2.5 to 15 mm (1/10 to 1/2 inches)	0.3( 1.0ft/s) or more and less than 0.5( 1.6ft/s)	1.5% of span
	0.5( 1.6ft/s) or more and less than 1.0( 3.3ft/s)	1.0% of span
	1( 3.3ft/s) to 10( 33 ft/s) (both including)	1.0% of flow rate (at indication 50% of span or more) 0.5% of span (at indication below 50% of span)
25 to 400 mm (1 to 16 inches)	0.3( 1.0ft/s) or more and less than 0.5( 1.6ft/s)	1.0% of span
	0.5( 1.6ft/s) or more and less than 1.0( 3.3ft/s)	0.5% of span
	1( 3.3ft/s) to 10( 33 ft/s) (both including)	0.5% of flow rate (at indication 50% of span or more) 0.25% of span (at indication below 50% of span)
500 to 1000 mm (20 to 40 inches)	0.3( 1.0ft/s) or more and less than 0.5( 1.6ft/s)	1.5% of span
	0.5( 1.6ft/s) or more and less than 1.0( 3.3ft/s)	1.0% of span
	1( 3.3ft/s) to 10( 33 ft/s) (both including)	1.0% of flow rate (at indication 50% of span or more) 0.5% of span (at indication below 50% of span)
1100 mm or more (44 inches or more)	1( 3.3ft/s) to 10( 33 ft/s) (both including)	1.0% of span

**Power Consumption:** 18 VA or 11 W (without excitation to flowmeter).

**Insulation Resistance:** 100 Mohms at 500V DC between power and ground terminals.

100 Mohms at 500V DC between power terminal and each terminal of excitation, analog output, pulse output, and on-off input and output.

**Dielectric Strength:**

- Power supply 100V version: 1000V AC for one minute between power and ground terminals.
- Power supply 200V version: 1500V AC for one minute between power and ground terminals.

**Normal Operating Conditions:**

Ambient temperature: -10 to +60°C

Ambient humidity: 5 to 95% R.H. (no condensing)

Supply voltage: DC or AC (Changing the converter is not necessary)

• 100V version DC drive: 20 to 130V, No polarity

AC drive: 80 to 138V, 47 to 63 Hz

• 200V version AC drive: 138 to 264V, 47 to 63 Hz

**2-2. Options.**

**Air Purge Connection:** Pressure 1.4 kgf/cm<sup>2</sup> (20 psi) or less

Connector JIS PT1/4 female or 1/4NPT female (as specified)

Suffix code: APC

**Waterproof Gland:** Waterproof glands are provided for electrical power and signal connections.

Unavailable for 1/2NPT connection

Suffix code: ECG

**Waterproof Gland with Union:** Waterproof glands with unions are provided for electrical power and signal connections.

Unavailable for 1/2NPT connection

Suffix code: ECU

**Stainless Steel Tag Plate:** Stainless steel (JIS SUS304) tag plate is fixed with screws on the front face of the case.

Suffix code: SCT

**2-3. Model and Suffix Codes.**

Model	Suffix code	Description
YMA11		Magnetic Flow Converter
Power supply	-A1	For both 100V AC and 24V DC systems
	-A2	For 200V AC systems
Electrical connection	J A	JIS PF1/2 female ANSI 1/2NPT female
Style code	•A	Style A
Options	/APC ...	Air purge connection (Note 1)
	/ECG ...	Waterproof gland
	/ECU ...	Waterproof gland with union
	/SCT ...	Stainless steel tag plate

(Note 1) Main specifications for air purge connecting port should be the same as those for wiring ports.

**2-4. Accessories.**

Fuse (3A) 1 pc.

Engineering unit label 1 set

## 2-5. Functional Combinations.

	100V AC/24V DC	200V AC	4 to 20 mA	1 to 5V	Pulse output	Incorporated totalization	Forward, signal range	Forward, 2 ranges, external	Forward, 3 ranges, external	Forward, 4 ranges, external	Forward, 2 ranges, automatic	Reverse, signal range	Reverse, 2 ranges, external	Reverse, 3 ranges, external	Reverse, 4 ranges, external	Variable damping	Rate limit	High and low alarms	Empty tube detection	Alarm contact	Output in failure	Alarm contact selection	Signal lock at 0%	Slurry mode	Semi-automatic zero adjust	Calibrator	Surge arrestor
100V AC/24V DC		X	O	O	O	O																					
200V AC			O	O	O	O																					
4 to 20 mA				O	O	O																					
1 to 5V					O	O																					
Pulse output						O																					
Incorporated totalization																											
Forward, signal range								X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Forward, 2 ranges, external									X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Forward, 3 ranges, external										X	X	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O
Forward, 4 ranges, external											X	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O
Forward, 2 ranges, automatic												X	X	X	X	O	O	O	O	O	O	O	O	O	O	O	O
Reverse, signal range													X	X	X	O	O	O	O	O	O	O	O	O	O	O	O
Reverse, 2 ranges, external														X	X	O	O	O	O	O	O	O	O	O	O	O	O
Reverse, 3 ranges, external															X	O	O	O	O	O	O	O	X	O	O	O	O
Reverse, 4 ranges, external																O	O	O	O	O	O	O	X	O	O	O	O
Variable damping																	O	O	O	O	O	O	O	O	O	O	O
Rate limit																		O	O	O	O	O	O	O	O	O	O
High and low alarms																			O	O	O	O	O	O	O	O	O
Empty tube detection																				O	O	O	O	O	O	O	O
Alarm contact																					O	O	O	O	O	O	O
Output in failure																						O	O	O	O	O	O
Alarm contact selection																							O	O	O	O	O
Signal lock at 0%																								O	O	O	O
Slurry mode																									O	O	O
Semi-automatic zero adjust																										O	O
Calibrator																											O
Surge arrestor																											



## 2-6. External Dimensions.

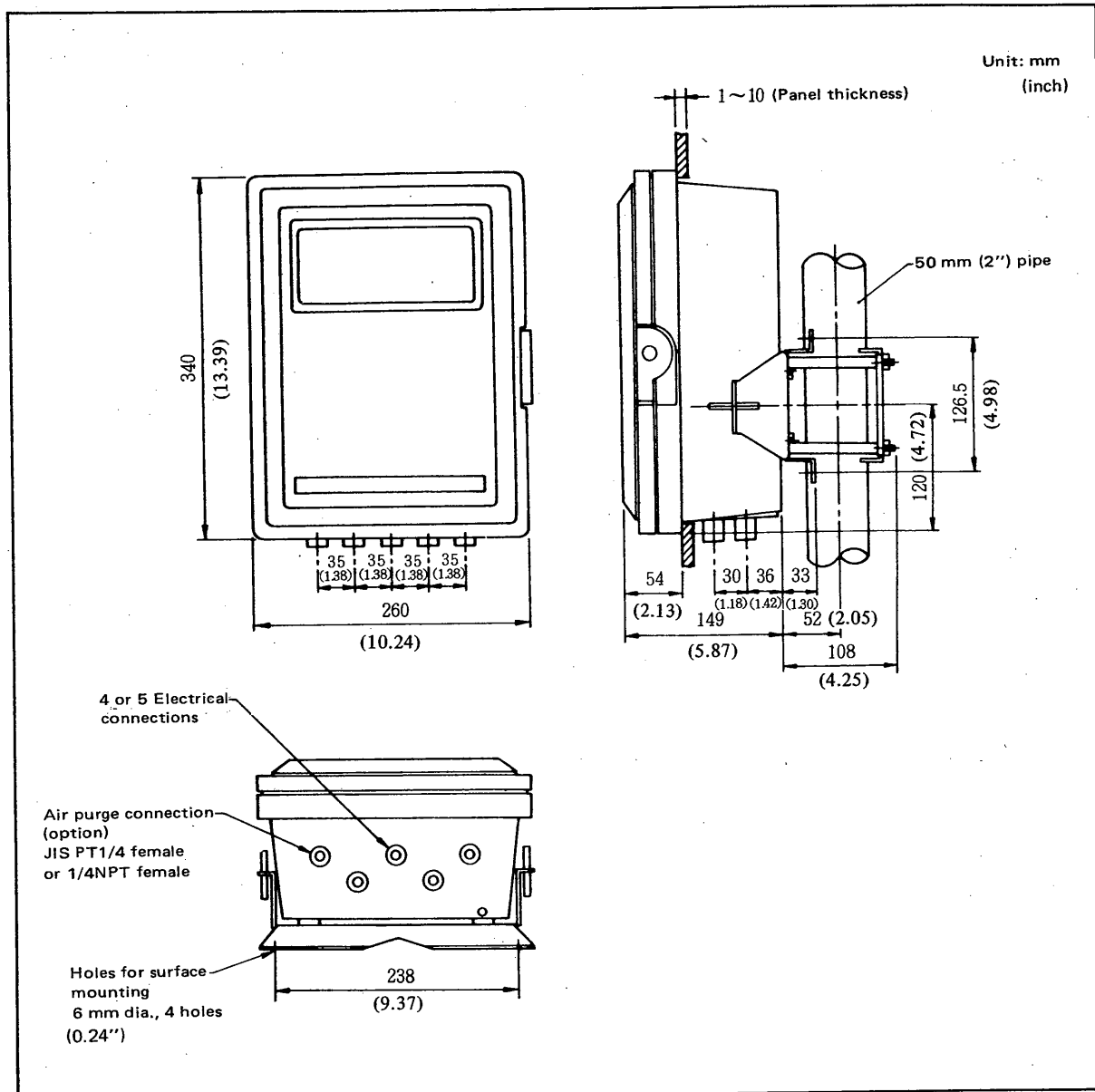


Figure 2-2. External Dimensions.

### 3. INSTALLATION.

When installing the converter, refer to subsection 1-3, "Installation Area Selection", and subsection 2-1 "Standard Specifications".

#### 3-1. Mounting.

Three mounting methods—50 mm (2-inch) pipe mounting, panel mounting, or surface mounting—are selectable depending on the installation area.

Refer to Figure 3-1 for panel cutout dimensions and surface mounting hole dimensions.

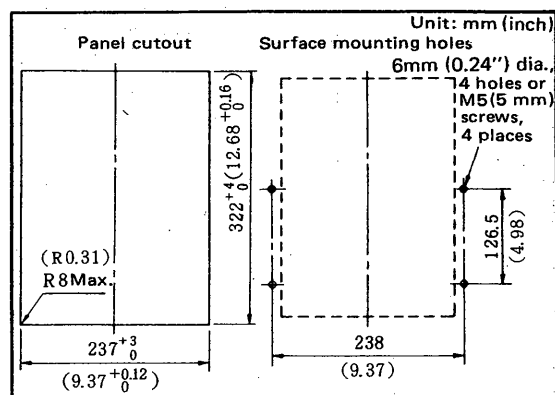


Figure 3-1. Panel Cutout and Surface Mounting Holes.

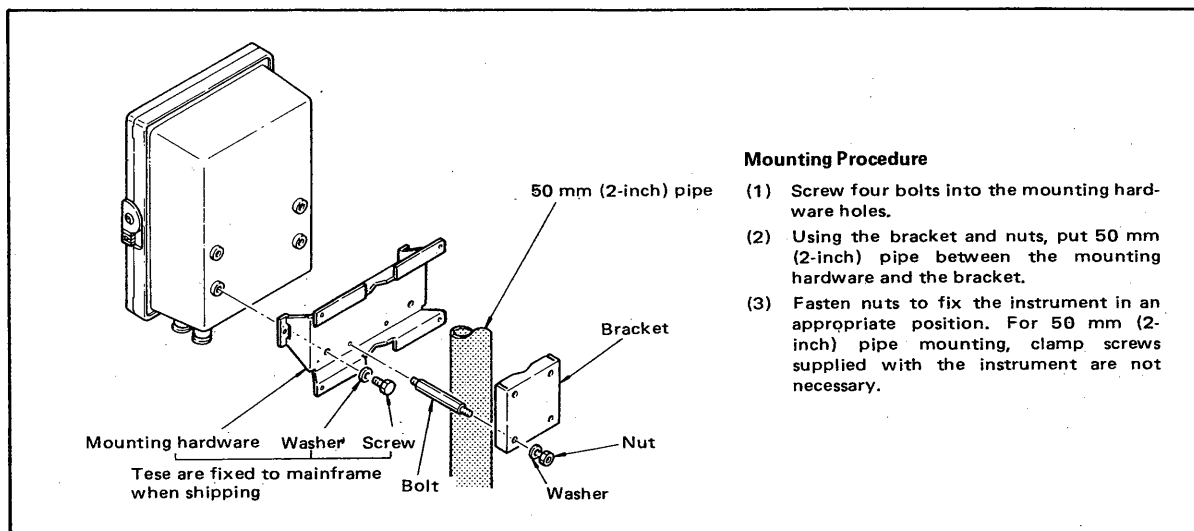


Figure 3-2. 50 mm (2-inch) Pipe Mounting.

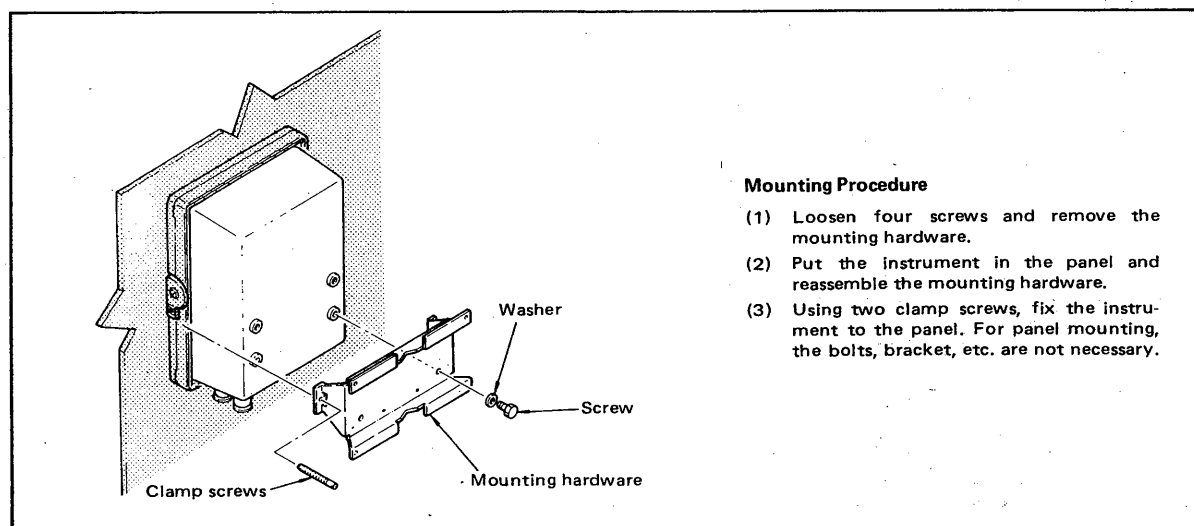


Figure 3-3. Panel Mounting.

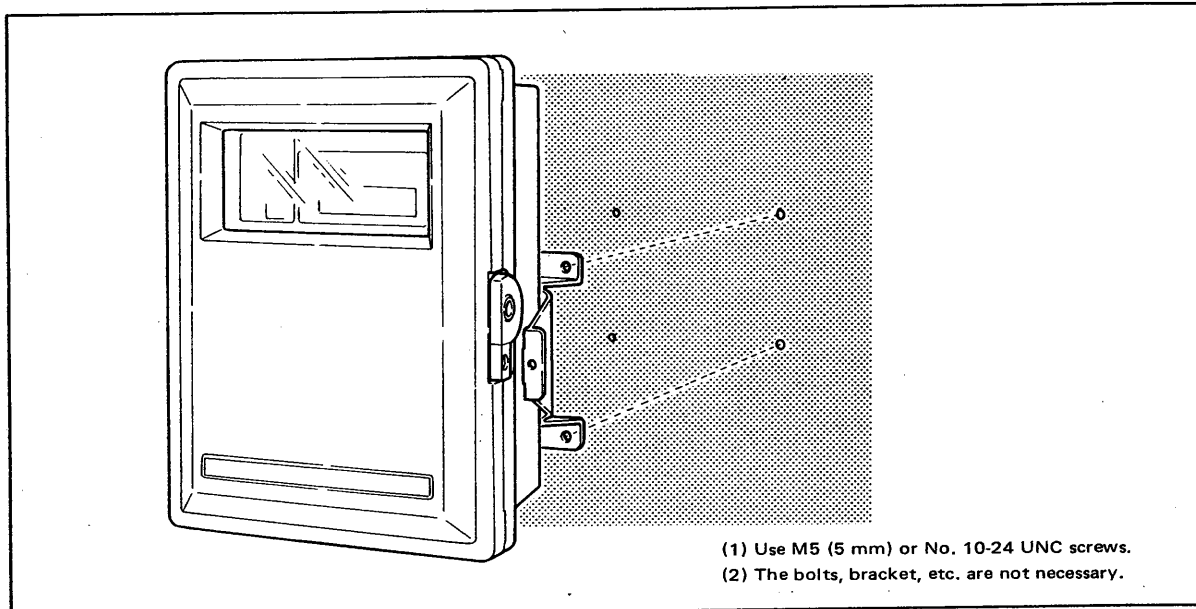


Figure 3-4. Surface Mounting.

### 3-2. Wiring.

The external signal wires to the instrument must be connected to the terminal board inside the instrument.

Open the door and swing open the display panel, and then the terminal board appears (see Figure 3-5 and 3-6).

Carry out the terminal wiring according to Figure 3-7. M4 (4 mm) size screws are used for the instrument terminal screws.

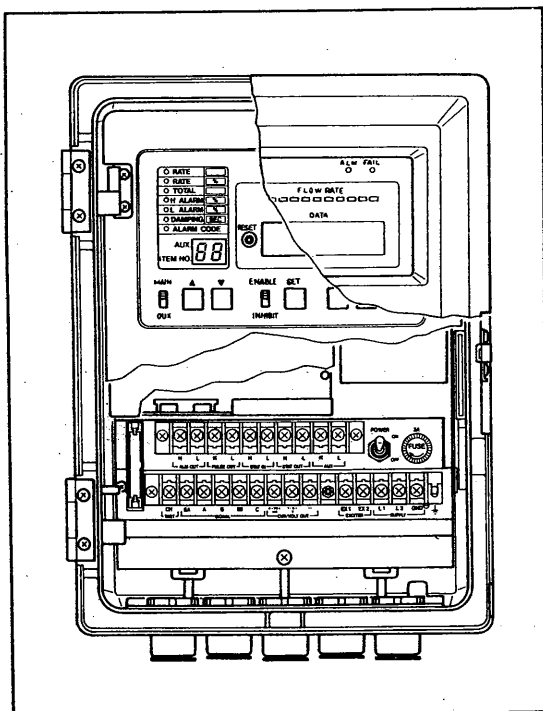


Figure 3-5. Terminal Board Location.

#### 3-2-1. Cautions for Wiring.

- (1) Be sure to terminate all leadwire connections using solderless crimp-on lugs.
- (2) It is recommended to carry out wiring through conduits. Use the rigid steel conduit 16 (see JIS C 8305) or flexible metal conduit 15 (see JIS C 8309) for conduit wiring.
- (3) Be sure to carry out separate conduit wirings for input signal, output signal, and power supply.

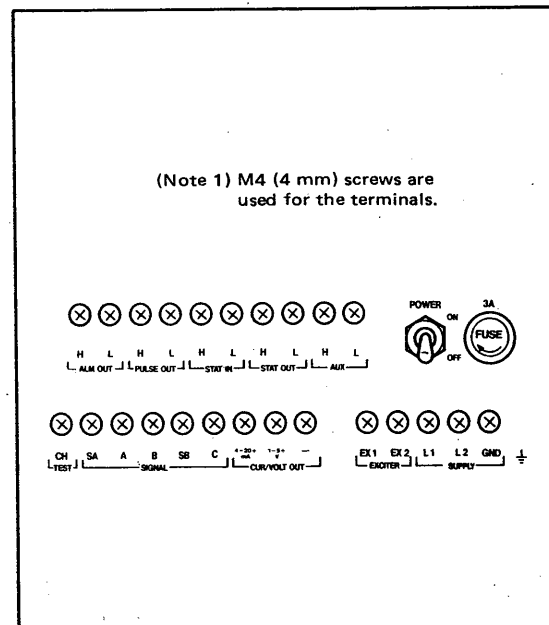


Figure 3-6. Terminal Configuration.

Terminal designation		Remarks
TEST	-CH	Standard flow signal output
SIGNAL	SA	Flow signal input
	A	
	B	
	SB	
CUR/VOLT OUT	4-20 <sup>+</sup> mA	4 to 20 mA DC current output
	1-5+V	
	-	
EXCITER	EX1	Exciting current output
	EX2	
SUPPLY	L1	+ Power supply
	L2	
	GND	
		- Ground

Terminal designation		Remarks
ALM OUT	[H] [L]	+ - Alarm on-off output
PULSE OUT	[H] [L]	+ - Pulse output
STAT IN	[H] [L]	+ - Selector switch input for ranges 1 and 2
STAT OUT	[H] [L]	+ - Forward/reverse status on-off output or Automatic 2-range status on-off output
AUX	[H] [L]	+ - Selector switch input for ranges 3 and 4 or 0% signal lock on-off input

Figure 3-7. Terminal Wiring.

### 3-2-2. Wiring for Power Supply and Exciting Current Output.

#### Cable:

Use the following cables or cables equivalent to them. PVC insulated and sheathed control cable CVV (JIS C 3401), or 600V grade PVC insulated and sheathed portable power cables (JIS C 3312).

#### Specifications:

Nominal conductor cross-section 2.0 mm<sup>2</sup>  
Finished O.D. 10.5 mm

### 3-2-3. Wiring for Signal (between Transducer and Converter).

#### Special signal cable (Model YM011):

The flow signal is transmitted by this special cable. This cable is of 2-conductor double shielded construction, whose outer sheath is made of heat-resistant PVC and its finished O.D. is 10.5 mm (0.41 inches).

#### Cable length:

The max. extendable length of the special cable is 300 m (1,000 ft). If the max. extendable cable length is longer than a practically required length, do not round the cable of full extendable length between the flowmeter and the converter but cut off the remainder and make end-treatment as shown in Figure 3-9.

#### CAUTION

- To prevent a shield from contacting with the other shield or case, cover the exposed parts of each shield with PVC tubes or wrap them with PVC tapes.

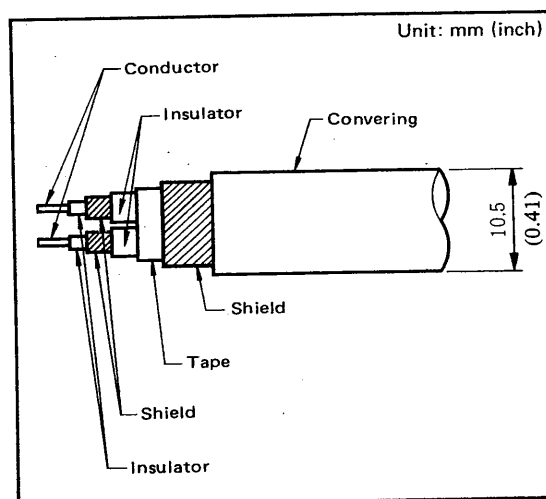


Figure 3-8. Special Signal Cable YM011.

- Connect the conductor A and B, shields of each conductor (SA and SB), and the outer shield C to the specified converter terminals. Avoid wiring via repeating terminals, and clamp the cable.

### 3-2-4. Grounding.

Be sure to perform grounding equivalent to Class 3 grounding which requires grounding resistance of 100 ohms or less at three points of flowmeter, converter, and receiving instrument respectively. When surge arrestors are employed, be sure to perform grounding equivalent to Special Class 3 grounding which requires grounding resistance of 10 ohms or less.

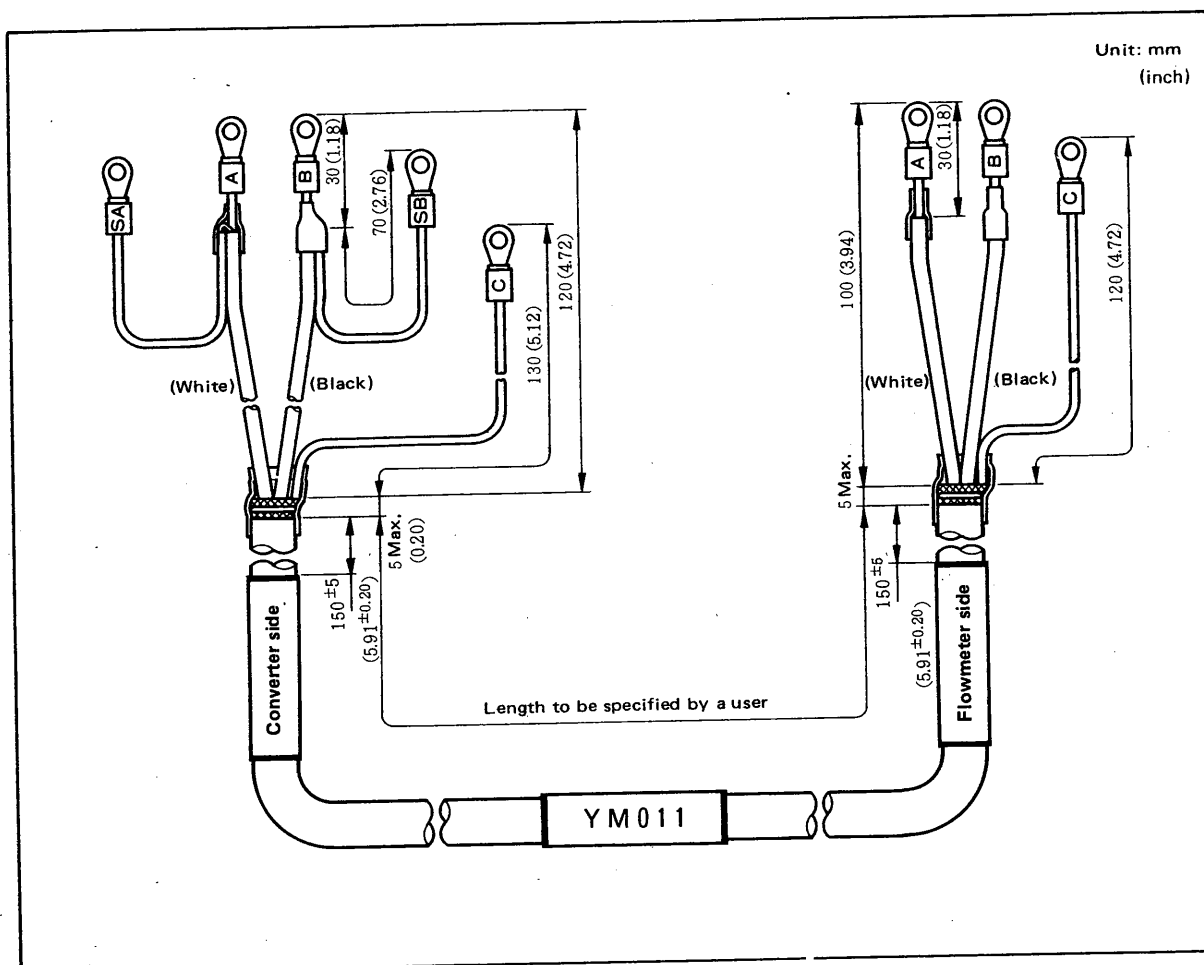


Figure 3-9. End-Treatment for Special Signal Cable.

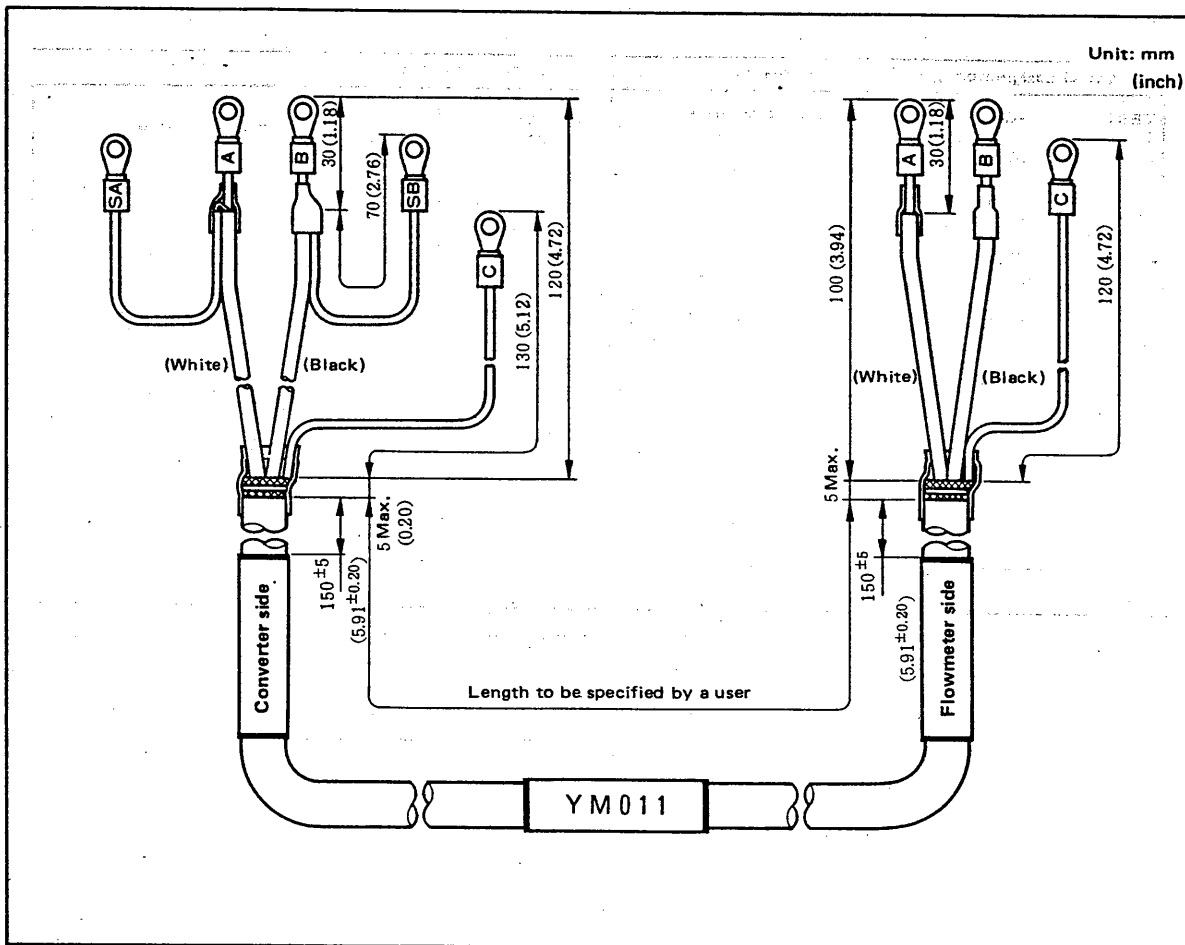


Figure 3-9. End-Treatment for Special Signal Cable.

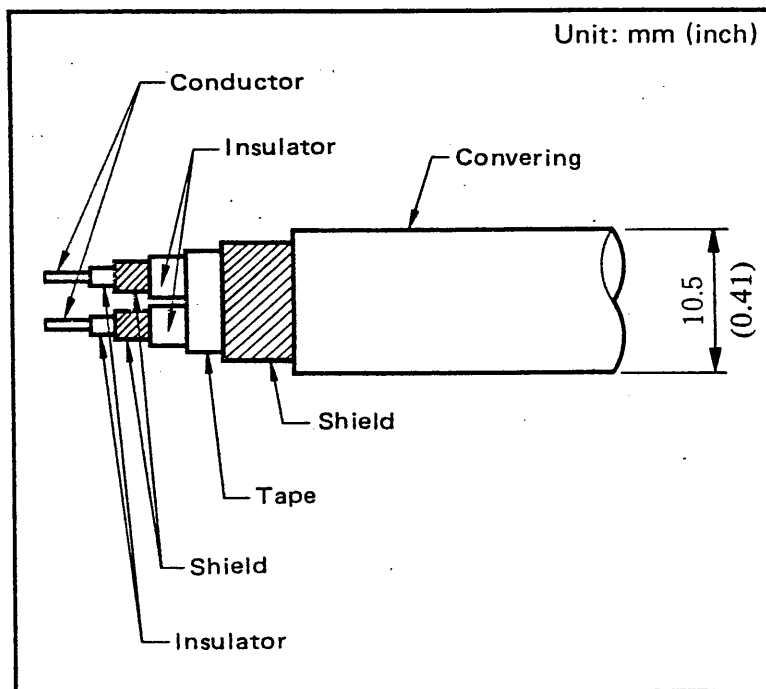
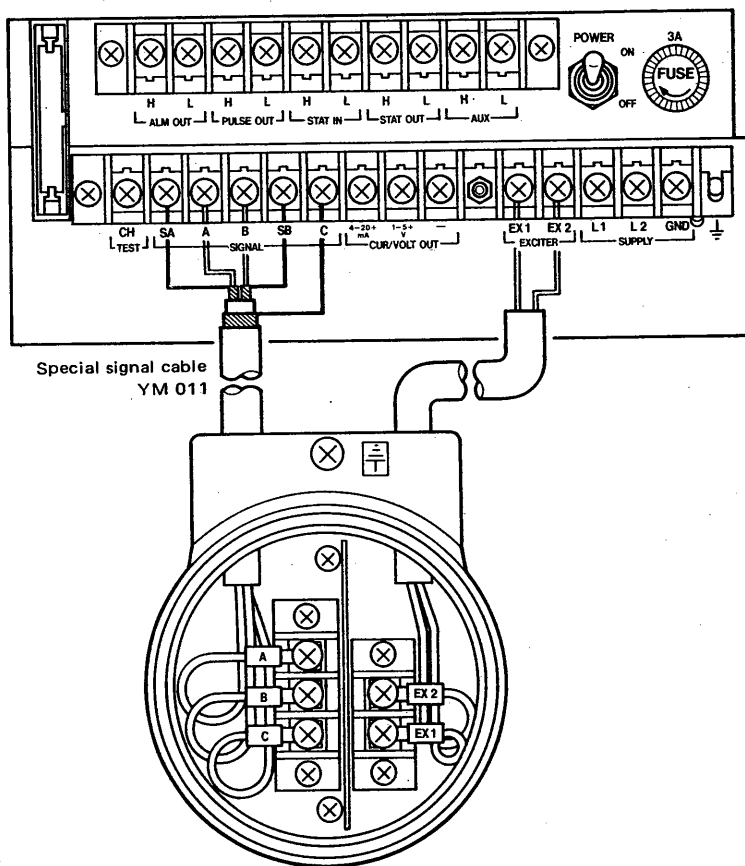


Figure 3-8. Special Signal Cable YM011.

### 3-2-5. Connection to Flowmeter.

The connection methods are shown below. Connect cables after acknowledging the flowmeter model to be combined.

- (1) Combination with flowmeter model YM100, 200, 300, or 400.



### Terminal Correspondence List.

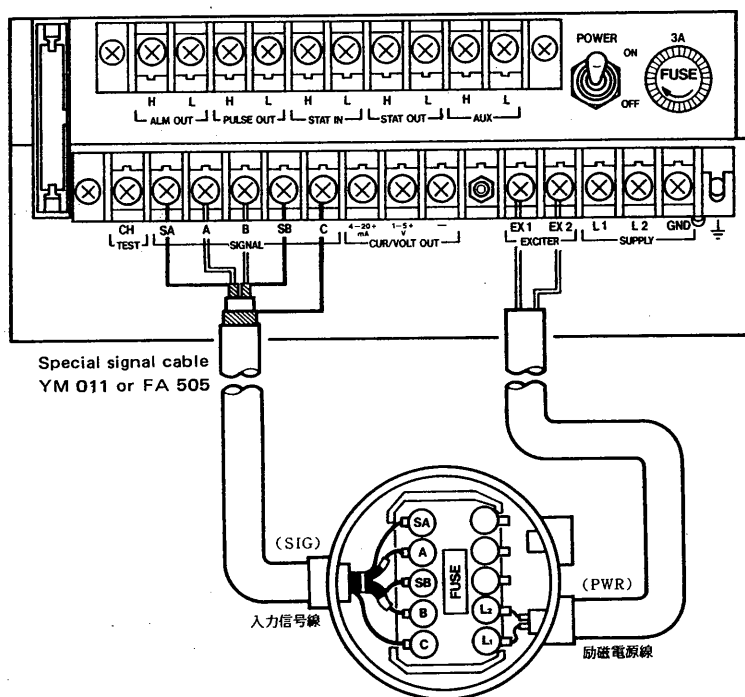
Converter	Flowmeter YM100, 200, 300 and 400
SA	Taping*
A	A
B	B
SB	Taping*
C	C
EX1	EX1
EX2	EX2

- \* Separately tape the shield wires corresponding to SA and SB to make insulation treatment.

Figure 3-10. Connection (1).

Exciting current is 0.7A.

(2) Combination with flowmeter model F553 or F556.



Terminal Correspondence List.

Converter	Flowmeter F553 or F556
SA	SA*
SB	SB*
A	A
B	B
C	C
EX1	L1
EX2	L2

\* Shields corresponding to SA and SB may be separately taped to make insulation treatment without connecting them to SA and SB terminals of the flowmeter.

Figure 3-11. Connection (2).

Exciting Current.

Nominal size		Exciting current (A)
(mm)	(inch)	
1100	44	0.45
1200	48	0.5
1350	54	0.5
1500	60	0.6
1600	64	0.6
1800	72	0.7
2000	80	0.7
2200	88	0.75
2400	96	0.8
2600	104	0.9



## 3-2-6. Other Connections.

## (1) Analog signal output.

Both 4 to 20 mA DC and 1 to 5V DC can be sent out.

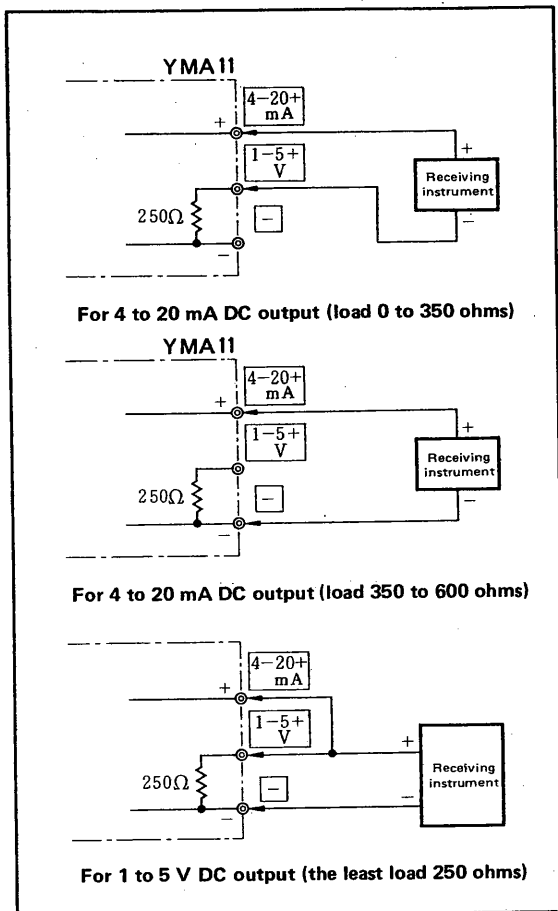


Figure 3-12. Connection for Analog Signal Output.

## (2) Pulse output.

Make wiring taking care of voltage and polarity because this output is a transistor switch (isolated type).

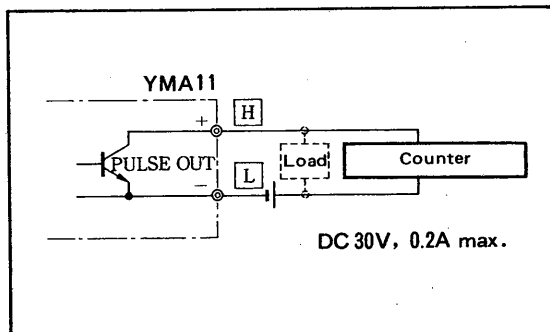


Figure 3-13. Pulse Output Connection.

## (3) On-Off Input (by contact).

Both powered and unpowered voltage inputs can be received.

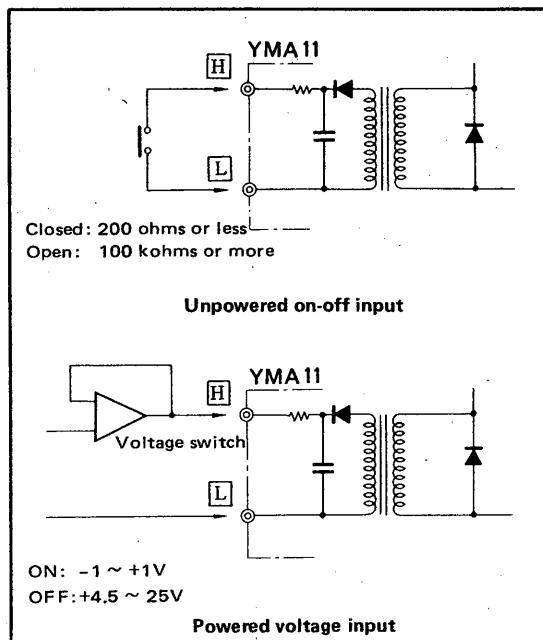


Figure 3-14. On-Off Input Connection (by Contact).

## (4) On-Off output.

Make wiring taking care of voltage and polarity because this output is a transistor switch (isolated type).

This switch output cannot directly turn ON and OFF the AC loads. For this purpose, provide a repeating relay or equivalent as shown in Figure 3-15.

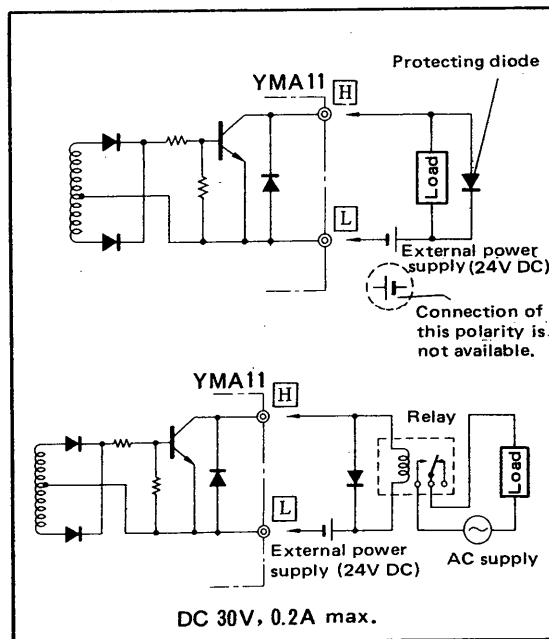


Figure 3-15. On-Off Output Connection.

**3-2-7. Checking Connections.**

When all connections are completed, check again that these connections are entirely correct. With the converter power supply turned ON, the following items concerning connection become checkable.

**(1) Are receiving instruments (analog signal and pulse output signal) properly connected?**

Since the converter has a function of signal generator capable of outputting any value in the range 0 to 106%, the connection can be checked by seeing whether or not the receiving instruments are working normally.

**(2) Is an instrument which receives an on-off output (alarm or status output) properly connected?**

Since the alarm or status on-off output can be set to the desired state either open or closed, the connection can be checked by seeing whether or not the required action is taken.

**(3) Is an instrument which outputs an on-off signal (range selection or 0% signal lock) properly connected?**

The connection can be checked by a function indicating whether or not the on-off signal is received.

For the procedures which operates the functions, see Section 6. MAINTENANCE; 6-1. Testing.

## 4. PRINCIPLE.

### 4-1. Principle.

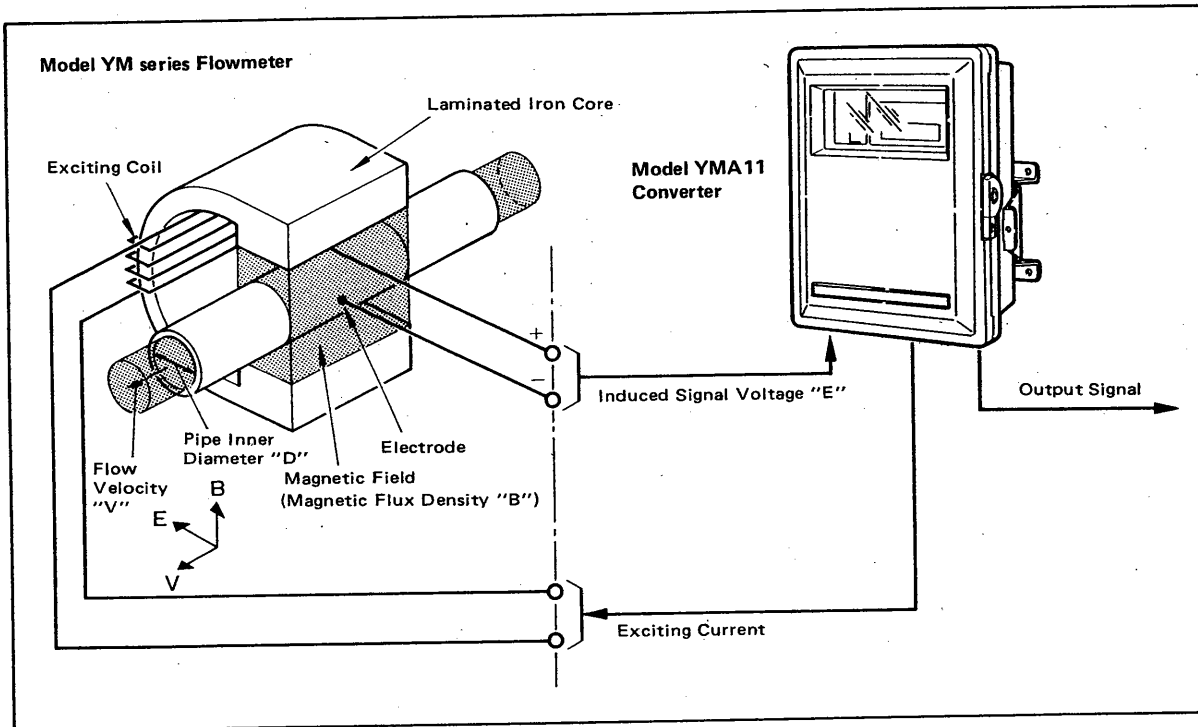


Figure 4-1. Principle Diagram.

The principle of the magnetic flowmeter is based on the "law of electromagnetic induction" which states that, when a conductor moves in a magnetic field, an electromotive force is induced perpendicular to the directions of conductor movement and magnetic field and its strength is proportional to the conductor moving velocity and the magnetic flux density.

In Figure 4-1, if a conductive liquid flows at an average velocity of  $V$ (m/s) through a pipe whose inner diameter is  $D$ (m), in which a uniform magnetic field of the flux density  $B$ (T esla) exists, an electromotive force  $E$ (volt) is generated perpendicular to the directions of the magnetic field and the flow.

$$E = D \cdot V \cdot B \text{ (V)} \quad (1)$$

The volumetric flow rate  $Q$  is given by the following equation:

$$Q = \frac{\pi}{4} \cdot D^2 \cdot V \text{ (m}^3\text{/sec)} \quad (2)$$

From equations (1) and (2),

$$Q = \frac{\pi}{4} \cdot \frac{D}{B} \cdot E \text{ (m}^3\text{/sec)} \quad (3)$$

Therefore,  $E$  is expressed as shown below.

$$E = \frac{4}{\pi} \cdot \frac{B}{D} \cdot Q \text{ (V)} \quad (4)$$

If  $B$  is a constant,  $E$  will be proportional only to  $Q$  or  $E$  will be a measure to know  $Q$ .

## 4-2. Model YMA11 Converter: Circuit and Its Features.

### (Power Supply and Excitation)

The switching regulator is the power supply circuit unique to YEW. The converter operation is not affected by supply voltage variation because the regulator employs the method in which a microprocessor always controls the exciting circuit secondary voltage in addition to the fact that the regulator can be applied to both AC and DC supply.

YEW MAG series converters provide highly stable excitation at the minimum power consumption by rationally changing the secondary voltage with a microprocessor.

### (Signal Processing)

Relationship between excitation system and signal processing system is not separable. The YEW MAG series converter incorporates two excitation systems and can stably take out flow signals being interfered

with various noises by conducting signal processings appropriate to each excitation system.

### (Functions)

In YEW MAG series converters, the microprocessor capability is utilized to the full extent by software engineering. Functions worthy of all-in-one type are packaged as standard specifications such as span setting in engineering units, multi-range selection, and various alarm/detecting functions including empty flowmeter tube detection as well as excitation and signal processings.

### (Electromagnetic Compatibility)

The converter is designed to be immune to noises from outside by a few measures such as measures against impulse noises by means of double shielded box, measures against high frequency noises, and against lightning. In addition, consideration not to send out noises to the outside is taken by providing noise filters.

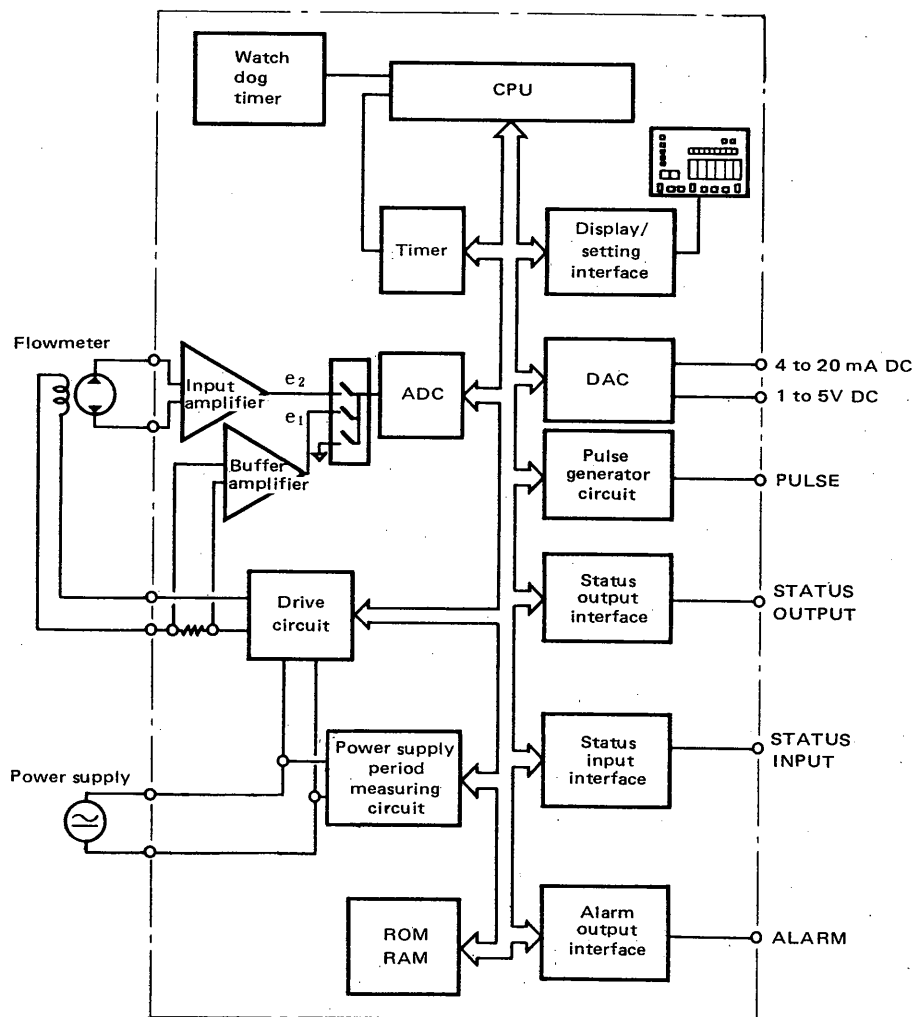


Figure 4-2. Circuit Diagram.

## 5. OPERATION.

### 5-1. Front Panel Features.

Figure 5-1 shows the front panel displays and switches.

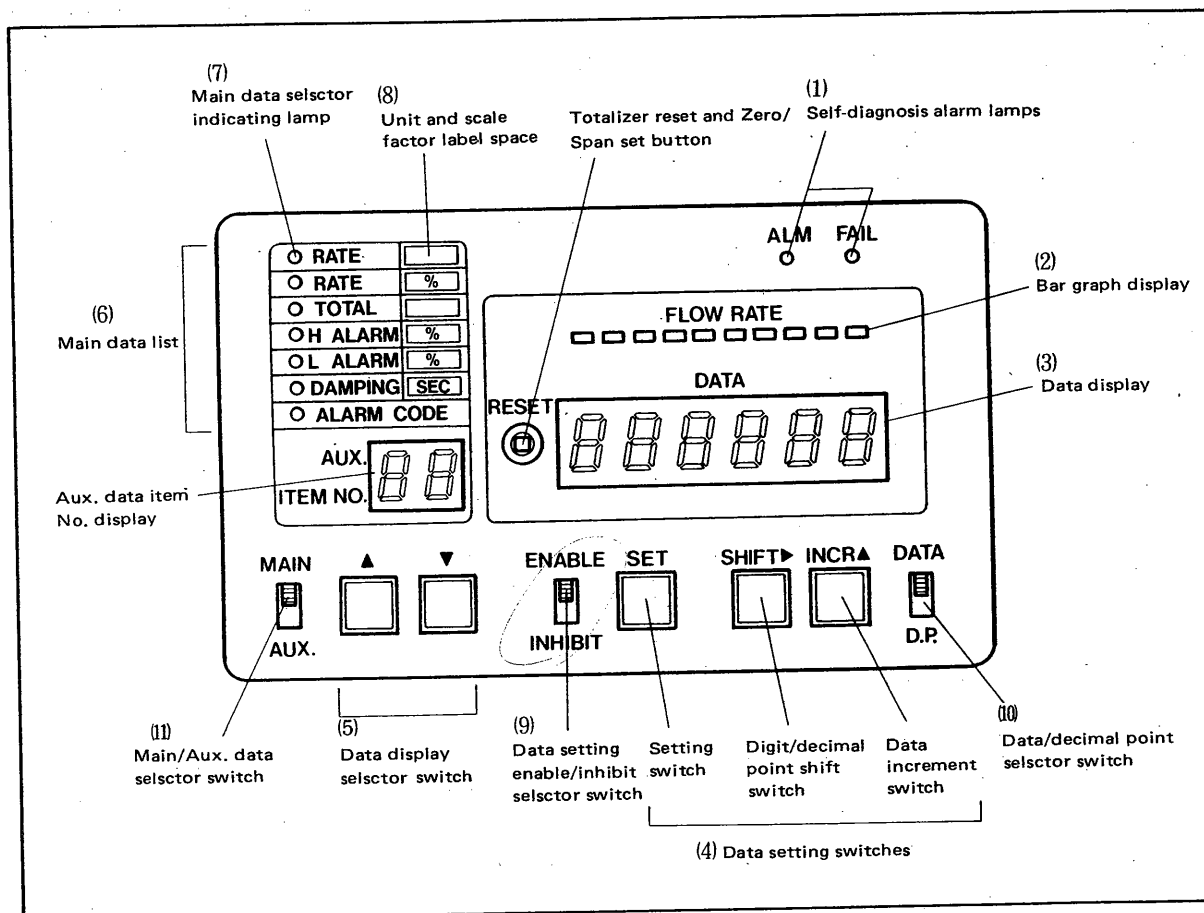


Figure 5-1. Front Panel.

#### (1) Self-diagnosis alarm lamps.

FAIL lamp (red): Goes ON if the instrument fails.

ALM lamp (yellow): Goes ON if an alarm status occurs. This lamp flashes when the data memory backup battery is not mounted or its voltage drops below the predetermined level.

#### (2) Flow rate bar graph display.

A flow rate is displayed by a bar graph consisting of 10-segment LEDs.

#### (3) Data display.

The data display is a six-digit digital display.

The main data necessary in normal operation, such as flow rate and totalized counts, (items

shown in the main data list on the front panel) or the auxiliary data, such as parameters, (items shown in the data card inserted in the rear pocket of the door) are indicated in this data display by selecting the position of the Main/Aux. data selector switch.

In normal operation, set this selector switch to MAIN (main data). Using the data display selector switches  $\blacktriangle$  and  $\blacktriangledown$ , select the main data item, then the data of that item is indicated in the DATA display. The selected data item is presented by the main data selector indicating lamp (see Figure 5-2).

To display an auxiliary data item, set the Main/Aux. data selector switch to AUX. In this situation, the auxiliary data item is indicated in the left-hand AUX.ITEM NO. display and the corresponding data is presented in the right-hand DATA display. Select the desired item No. using the data display selector switches ▲ and ▼ (see Figure 5-3).

The DATA display is used for displaying set-points and parameters as well as for displaying data.

(4) **Data setting switches** (SET, SHIFT, INCR).

These are used for data setting.

(5) **Data display selector switches** (▲, ▼).

These are used for selecting main or auxiliary data items to be displayed in the data display.

(6) **Main data list.**

A list containing items necessary for daily operation among the data to be indicated in DATA display. A desired item can be selected using the display selector switches.

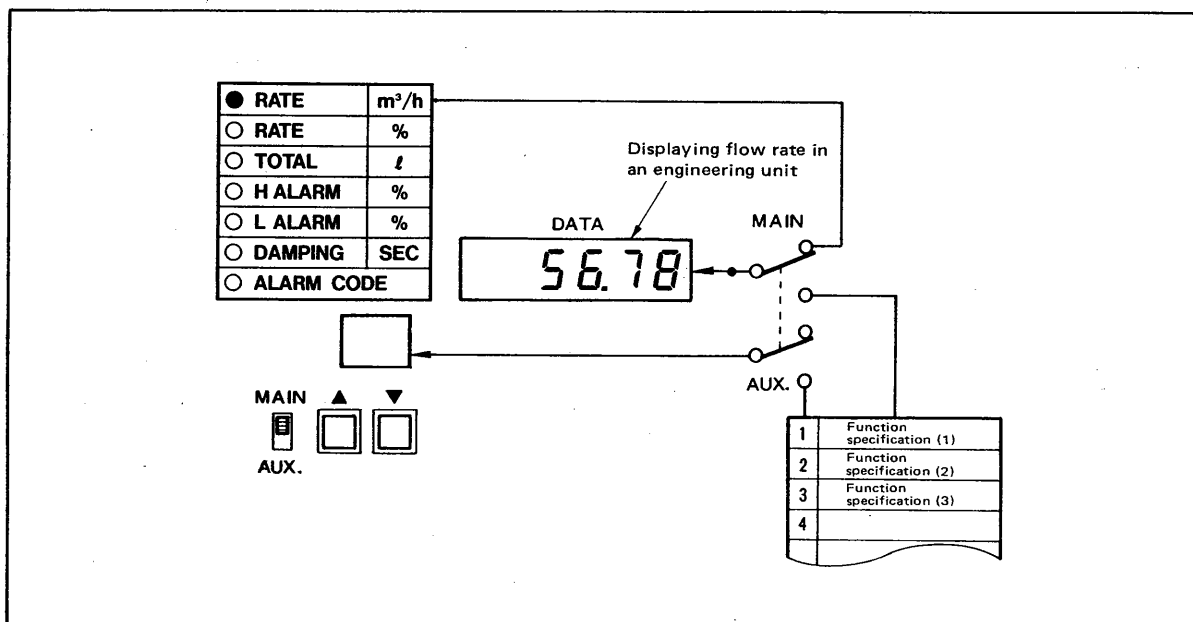


Figure 5-2. Data Display Function for Main Data.

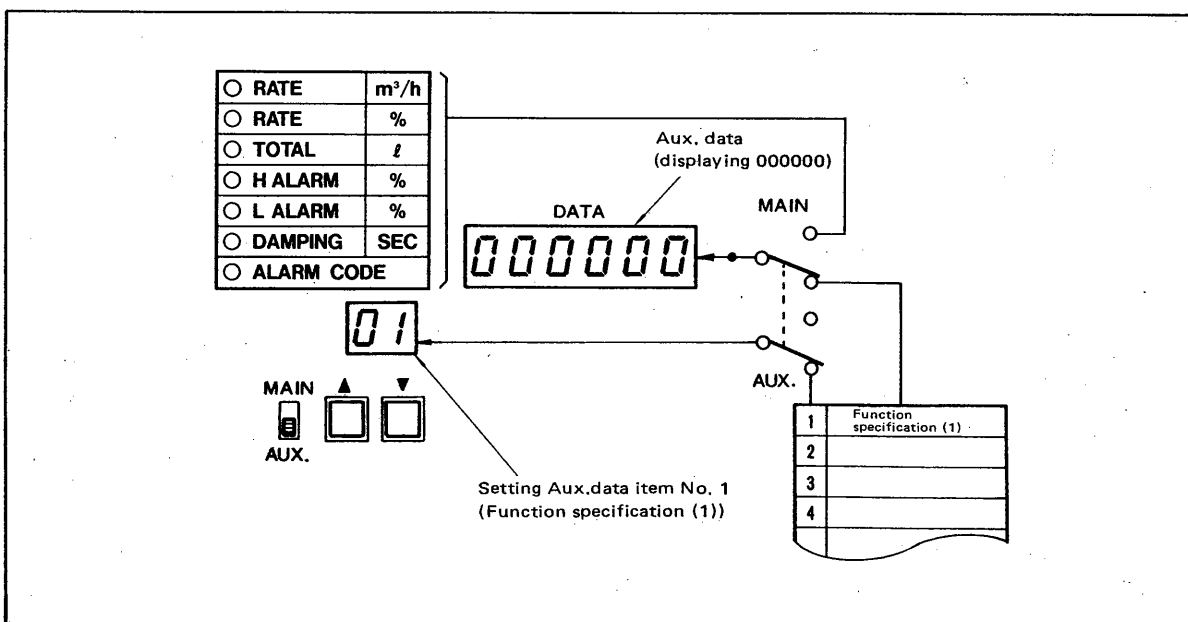


Figure 5-3. Data Display Function for Aux. Data.

YEW MAG Magnetic Flow Converter									
RATE	Flow rate in engineering unit			11	Flowmeter nominal size				
RATE	Flow rate in %		%	12	Meter factor	0.5		mΩ	
TOTAL	Totalized flow			13	Exciting current	0.1		A	
H ALARM	High flow alarm setpoint		%	14	Totalizing pulse output low cut			%	
L ALARM	Low flow alarm setpoint		%	15	Analog output low cut			%	
DAMPING	Damping time constant second		sec	16	Automatic multi-range switching hysteresis width			%	
ALARM CODE	Code designation of alarm contents			17	Forward/reverse flow switching hysteresis width			%	
1	Function specification (1)	000001		18	Rate limit dead time second			sec	
2	Function specification (2)	001000		19	Rate limit value %			%	
3	Function specification (3)	041220		20	ALM output selection				
4	Forward flow span 1			21	Frequency to be synchronized			Hz	
5	Forward flow span 2			22	Reverse flow span 1				
6	Forward flow span 3			23	Reverse flow span 2				
7	Forward flow span 4			24	Reverse flow span 3				
8	Unit conversion factor	1.0		25	Reverse flow span 4				
9	Pulse output factor	1.0		26	Test mode	0-0000			
10	Totalizer factor	1.0		27	Key code	77			

Function Specification Details																																							
Function specifications (1) <b>A B C D E F</b>		Function specifications (2) <b>0 0 1 0 K L</b>																																					
<b>A Excitation mode</b> 0: Standard mode 1: Slurry mode <b>B Forward flow, multi-range mode</b> 0: Forward, single range 1: Forward, single range 2: Forward, 2 ranges, external selection 3: Forward, 3 ranges, external selection 4: Forward, 4 ranges, external selection 5: Forward, automatic 2 range switching <b>C Reverse flow, multi-range mode</b> 0: Reverse flow measurement not required 1: Reverse, single range 2: Reverse, 2 ranges, external selection 3: Reverse, 3 ranges, external selection 4: Reverse, 4 ranges, external selection <b>D Totalizer display</b> 0: Forward flow, totalizer display 1: Reverse flow, totalizer display 2: Flow difference, totalizer display <b>E Totalizer reset/semi-automatic zero and span adjust</b> 0: Valid 1: Invalid <b>F 0% signal lock</b> 0: Not provided 1: Provided		<b>I Flowmeter nominal size unit</b> 0: mm 1: inch <b>K Failure current output</b> 0: 2 mA or less 1: Hold 2: 22 mA or more <b>L Selection of alarm output</b> 0: Not provided 1: Provided Function specifications (3) <b>0 N P Q R S</b> <b>N Flow units</b> 0: m <sup>3</sup> 1: l 2: cm <sup>3</sup> 3: 10 <sup>3</sup> gallon 4: 10 <sup>0</sup> gallon 5: 10 <sup>-3</sup> gallon 6: 10 <sup>3</sup> bbl 7: 10 <sup>0</sup> bbl 8: 10 <sup>-3</sup> bbl <b>P Flow rate time unit</b> 0: */H 1: */min 2: */sec <b>Q Output pulse factor</b> 0: 10 <sup>-6</sup> pulse/* 1: 10 <sup>-3</sup> pulse/* 2: 10 <sup>0</sup> pulse/* 3: 10 <sup>3</sup> pulse/* 4: 10 <sup>6</sup> pulse/* <b>S Output pulse factor</b> 0: Duty 50% 1: 0.5 ms 2: 1 ms 3: 20 ms 4: 33 ms 5: 50 ms 6: 100 ms																																					
*: (Unit selected in the digit N) x (Unit conversion factor)																																							
<table border="1"> <thead> <tr> <th colspan="3">Alarm details code display</th> </tr> <tr> <th>Code</th> <th>Lamp</th> <th>Diagnostic details</th> </tr> </thead> <tbody> <tr> <td>good</td> <td>—</td> <td>Normal</td> </tr> <tr> <td>FAIL- 1</td> <td>FAIL</td> <td>RAM data volatilization</td> </tr> <tr> <td>Err - 2</td> <td>ALM</td> <td>A/D converter</td> </tr> <tr> <td>Err - 3</td> <td>ALM</td> <td>Coil disconnection</td> </tr> <tr> <td>Err - 5</td> <td>ALM</td> <td>Input signal error (Empty tube detection)</td> </tr> <tr> <td>Err - 6</td> <td>ALM</td> <td>High flow alarm</td> </tr> <tr> <td>Err - 7</td> <td>ALM</td> <td>Low flow alarm</td> </tr> <tr> <td>Err - 8</td> <td>ALM</td> <td>Output pulse overflow</td> </tr> <tr> <td>Err - 9</td> <td>ALM</td> <td>Erroneous setting</td> </tr> <tr> <td>Err -10</td> <td>ALM (flashing)</td> <td>No mounting of battery or battery voltage drop</td> </tr> </tbody> </table>				Alarm details code display			Code	Lamp	Diagnostic details	good	—	Normal	FAIL- 1	FAIL	RAM data volatilization	Err - 2	ALM	A/D converter	Err - 3	ALM	Coil disconnection	Err - 5	ALM	Input signal error (Empty tube detection)	Err - 6	ALM	High flow alarm	Err - 7	ALM	Low flow alarm	Err - 8	ALM	Output pulse overflow	Err - 9	ALM	Erroneous setting	Err -10	ALM (flashing)	No mounting of battery or battery voltage drop
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Err - 8	ALM	Output pulse overflow																																					
Err - 9	ALM	Erroneous setting																																					
Err -10	ALM (flashing)	No mounting of battery or battery voltage drop																																					

Fig. 5-4. Data Card.

**Main Data:**

RATE..... in engineering unit  
 RATE..... in %  
 TOTAL ..... totalized flow  
 H ALARM ..... high flow alarm setpoint  
 L ALARM ..... low flow alarm setpoint  
 DAMPING ..... damping time constant  
                     in second  
 ALARM CODE..... code designation of  
                     alarm contents

- (7) **Main data selector indicating lamp.**  
 This lamp indicates the main data item selected with the data display selector switches.
- (8) **Unit and scale factor label space.**  
 Spaces for presenting the engineering units of main data, used by attaching the "unit and scale factor label" provided as accessories.
- (9) **Data setting enable/inhibit selector switch (ENABLE/INHIBIT).**  
 This switch inhibits the data setting by switch operation in its INHIBIT position.
- (10) **Data/decimal point selector switch (DATA/D.P.).**

This switch is used when the decimal point place of a set data is to be set. Setting the switch in the D.P. position allows the decimal point to be set with the data setting switches (**SHIFT**, **SET**).

(11) **Main/Aux, data selector switch (MAIN/AUX.).**

This switch selects the categories of the data to be indicated in DATA display; either main or aux.data.

MAIN: Main data

AUX.: Auxiliary data

(12) **Data card.**

The data card is a list of main data and auxiliary data items, such as measuring flow span, meter factor, function specifications, etc. It is used by writing the determined data and units in vacant fields. Figure 5-4 shows the data card (in which the details of aux. data function specifications are included), inserted in the rear pocket of the door together with the unit and scale factor labels.



## 5-2. Main and Auxiliary Data Specifications and Writing Them in Data Card.

Before using the YMA11 Magnetic Flow Converter, the required main and auxiliary data items, such as function specification data, measuring flow span, pulse factor (weighting), meter factor, and others, must be determined and written in the data card.

Using this data card as a check list allows the data settings without omission and also is useful for maintenance work.

## 5-3. Preparation for Operation.

Perform preparation works with the converter mounted in the installation place or removed from the place and put on a workbench.

### 5-3-1. Checking Special Parts Mounted.



Make sure that the fuse and data memory backup battery are mounted in place.

If not, mount them referring to the replacing procedures described later (Section 6, MAINTENANCE).


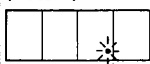



### 5-3-2. Setting Decimal Point.

Turn ON power and set the "data set ENABLE" according to the data set ENABLE/INHIBIT procedure described in 5-3-4.


Set the data/decimal point (DATA/D.P.) selector switch to D.P.

Next, using the data display selector switch  or , select the data item No. in the display, whose decimal point is to be set. Then carry out the following operations.

#### (Example of setting decimal place)

Switch operation	Display	Description
		The initial or existing setpoint is displayed.
	(Note 1)	
SHIFT▶		The decimal point of the above setpoint flashes.
SHIFT▶		When the SHIFT switch is continued to be depressed, the decimal place changes digit by keeping flashing. When the decimal point reaches the desired place, release the switch.
	(Note 2)	
SET		The whole displayed data flashes.
SET		Decimal point setting is completed.



(Note 1) The \* mark represents a flashing decimal point.

(Note 2) The shaded portion  represents the flashing displayed data.

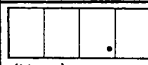
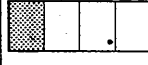
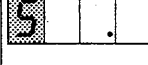




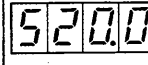
### 5-3-3. Setting Data.

Turning ON power and set "the data set ENABLE" according to the data set ENABLE/INHIBIT procedure described in 5-3-4.

Set the data/decimal point (DATA/D.P.) selector switch to DATA.

Then, using the data display selector switch  or , select the data item NO. in the display, whose data is to be set. Next, carry out the following operations.

#### (Example of setting data and display)

Switch operation	Display	Description
		The initial or existing setpoint is displayed.
	(Note)	
SHIFT▶		The enabled most significant digit flashes.
INCR▲		Set the desired data. If setting is not needed, go to the next step.
SHIFT▶		The next significant digit flashes.
INCR▲		Set the desired data. If setting is not needed, go to the next step.
INCR▲		Repeat the above setting operation to the least significant digit.
SET		The whole displayed data flashes.
SET		Data setting is completed.

(Note) The shaded portion  represents the flashing displayed digit(s).

### 5-3-4. Data Setting ENABLE/INHIBIT Procedure.

Data setting ENABLE/INHIBIT should be required for both hardware and software.

Hardware setting is performed with the data setting enable/inhibit selector switch on the front panel; Data can be set in ENABLE position of the switch, while data setting is inhibited in INHIBIT position.

Software setting is implemented by the data set in AUX. ITEM NO. 27. Data can be set for the data displayed with "77", while data setting is inhibited for the data display of "0". Use the setting procedure described in 5-3-3 for setting "77" or "0".

When all the settings are completed, it is preferable to place both hardware and software in data INHIBIT status to prevent setting error due to mis-operation.

### 5-3-5. Setting Main Data.

In the main data list of the converter, RATE (flow rate) and TOTAL (totalized flow) items are not required to be set because these are only displayed. However, in the item TOTAL, its decimal place can be shifted. For three items of high flow alarm (H ALARM), low flow alarm (L ALARM), and damping (DAMPING), however, set the required values.

Main data item	Item details	Data range	Decimal point place	Default value
H ALARM	High flow limit alarm setpoint	- 110.0 to + 110.0	Fixed	110.0
L ALARM	Low flow limit alarm setpoint	- 110.0 to + 110.0	Fixed	- 110.0
DAMPING	Damping time const.	3 to 100	Fixed	10

### 5-3-6. Setting Auxiliary Data.

This includes the works to set each data written in the data card in subsection 5-2.

Make settings selecting the required data according to subsection 5-4.

### 5-3-7. Indicating Engineering Units and Scale Factors.

Peel off the required engineering unit and scale factor labels from the engineering unit label sheet supplied as the accessories and apply them to the engineering unit and scale factor label spaces in the main data list (see Figure 5-5).

If a required engineering unit or scale factor is not found, fill a blank label of the sheet with the desired unit or scale factor to apply it to the main data list.

○ RATE	
○ RATE	%
○ TOTAL	
○ H ALARM	%
○ L ALARM	%
○ DAMPING	SEC
○ ALARM CODE	
AUX.	
ITEM NO.	

Figure 5-5. Presentation of Engineering Units and Scale Factors.

### 5-3-8. Setting Switches on Front Panel.

Refer to Figure 5-1.

- (1) **Data setting ENABLE/INHIBIT selector switch.**  
Set this switch to INHIBIT in normal operation.
- (2) **DATA/D.P. selector switch.**  
Set this switch to DATA in normal operation.
- (3) **MAIN/AUX.-data selector switch.**  
Set this switch to MAIN (main data) in normal operation.

## 5-4. Auxiliary Data Details.

### 5-4-1. Selecting Functions.

The YMA11 converter is provided with various functions. Setting these functions are described below.

#### (1) Auxiliary data item No. 1: Function specifications (1)

Display **A B C D E F**

\*: Default value

#### A : Excitation mode

- \* 0 : Standard mode ..... Exciting frequency of 1/8 of the commercial frequency.
- 1 : Slurry mode ..... Exciting frequency of 1/2 of the commercial frequency, used if noises are too much in standard mode.

#### B : Forward flow, multi-range mode

- \* 0 : Forward, single range measurement
- 1 : Forward, single range measurement
- 2 : Forward, 2 ranges, external selection ..... Ranges are selected with external on-off input.
- 3 : Forward, 3 ranges, external selection ..... Ranges are selected with external on-off input.
- 4 : Forward, 4 ranges, external selection ..... Ranges are selected with external on-off input.
- 5 : Forward, automatic 2 range switching ..... Output signal level is always compared with 100% level and, if 100% is exceeded, is switched to the second range.

#### C : Reverse flow, multi-range mode

- \* 0 : Reverse flow measurement not required
- 1 : Reverse, single range measurement
- 2 : Reverse, 2 ranges, external selection
- 3 : Reverse, 3 ranges, external selection
- 4 : Reverse, 4 ranges, external selection

#### D : Totalizer display mode at the bidirectional flow measurement .....

Display can be obtained in reverse flow measurement.

Since data are stored for all the three models, the desired value can be displayed.

- \* 0 : Forward flow, totalizer display
- 1 : Reverse flow, totalizer display
- 2 : Flow difference in bidirectional measurement, totalizer display

#### E : Totalizer reset/semi-automatic zero adjust./semi-automatic span adjust. ....

Reset pushbutton operation is valid or invalid.





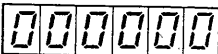



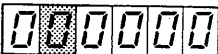

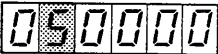





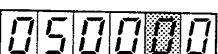

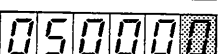

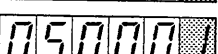



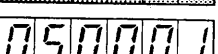
- \* 0 : Valid
- 1 : Invalid

#### F : 0% Signal lock ..... Output signal is forced to be fixed to 0% with an external on-off input. (Note) If code B or C, 3 or 4 is selected, this digit is automatically set to "0".

- \* 0 : Not provided
- 1 : Provided

Example: Setting of Aux. Data Item No. 1 "Function Specification (1)"

- A = 0 : Standard excitation mode  
 B = 5 : Forward, automatic 2 range switching  
 C = 0 : Reverse flow measurement not required  
 D = 0 : Forward flow, totalizer display  
 E = 0 : Reset "Valid"  
 F = 1 : 0% signal lock, provided

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX.  ITEM NO. 	Select Aux. Data Item No. 1.
		The initial setting is displayed in all zeros.
		The most significant digit (first digit from the left) flashes indicating "0".
		The second digit flashes indicating "0".
 5 times		The second digit flashes indicating "5".
		The third digit flashes indicating "0".
		The 4th digit flashes indicating "0".
		The 5th digit flashes indicating "0".
		The 6th digit flashes indicating "0".
		The 6th digit flashes indicating "1".
		The whole set data flashes.
		Data setting is completed.

## (2) Auxiliary data item No. 2: Function specification (2)

Display **0 0 I 0 K L** \*: Default value

**I : Flowmeter nominal size unit**

\*0 : mm

1 : inch

**K : Failure current output** ..... Select and set the current output when alarm occurs.

\*0 : 2 mA or less

1 : HOLD

2 : 22 mA or more

**L : Selection of alarm on-off output**










\*0 : Not provided ..... On-off output is given for all the alarms.

1 : Provided ..... On-off output is given up to 3 kinds of alarm selected at the aux. data item No. 20.

Example of setting Aux. Data Item No. 2 "Function Specifications (2)"

K = 1 : Current output HOLD when alarm occurs.

L = 1 : Selection of alarm on-off output provided.

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX. ITEM NO. <b>02</b>	Select Aux. data item No. 2.
	<b>000000</b>	The initial setting is displayed in all zeros.
	<b>000000</b>	The most significant digit (first digit) flashes indicating "0".
 4 times	<b>000000</b>	The 5th digit flashes indicating "0".
	<b>000010</b>	The 5th digit flashes indicating "1".
	<b>000010</b>	The 6th digit flashes indicating "0".
	<b>000011</b>	The 6th digit flashes indicating "1".
	<b>000011</b>	The whole set data flashes.
	<b>000011</b>	Data setting is completed.

## (3) Auxiliary data item No. 3: Function specification (3)

Display 0 N P Q R S \*: Default value**N : Volumetric flow units**

- \* 0 :  $m^3$
- 1 :  $\ell$
- 2 :  $cm^3$
- 3 :  $10^3$  gallon
- 4 :  $10^0$  gallon
- 5 :  $10^{-3}$  gallon
- 6 :  $10^3$  bbl
- 7 :  $10^0$  bbl
- 8 :  $10^{-3}$  bbl

**P : Flow rate time unit** ..... represents a unit selected in code N, volume flow units multiplied by a unit conversion factor selected at the aux. data item No.8.  
 0 :  $\star/h$   
 1 :  $\star/min$   
 2 :  $\star/sec$

For example, " $m^3$ " is selected in code N and the reciprocal of density " $kg/m^3$ " in an aux. item No. 8, is expressed in the unit kg.

**Q : Output pulse factor** .....  $\star$  represents a unit selected in code N, volume flow units multiplied by a unit conversion factor selected at the aux. data item No. 8 (see Note).

- \* 0 :  $10^{-6}$  pulse/ $\star$  ..... volume/pulse is made  $\times 10^6$
- 1 :  $10^{-3}$  pulse/ $\star$  ..... volume/pulse is made  $\times 10^3$
- 2 :  $10^0$  pulse/ $\star$  ..... volume/pulse is made  $\times 1$
- 3 :  $10^3$  pulse/ $\star$  ..... volume/pulse is made  $\times 10^{-3}$
- 4 :  $10^6$  pulse/ $\star$  ..... volume/pulse is made  $\times 10^{-6}$

**R : Totalizer factor** ..... Similar to the code Q: Output pulse factor (see Note).

- \* 0 :  $10^{-6}$  pulse/ $\star$
- 1 :  $10^{-3}$  pulse/ $\star$
- 2 :  $10^0$  pulse/ $\star$
- 3 :  $10^3$  pulse/ $\star$
- 4 :  $10^6$  pulse/ $\star$

**S : Output pulse duration**













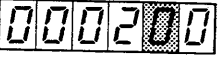



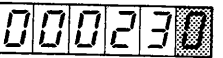

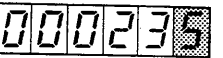



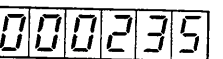
- \* 0 : Duty 50%
- 1 : 0.5 ms
- 2 : 1 ms
- 3 : 20 ms
- 4 : 33 ms
- 5 : 50 ms
- 6 : 100 ms

Note: For example, if m is desired to be selected for N and 1 is desired to be selected for the volume/pulse, select code 3,  $10^3$  pulse/ $\star$  and for  $cm^3$ , code 4,  $10^6$  pulse/ $\star$

Volume unit for span $\star$	Volume unit for pulse, totalization Q and R
0 : $m^3$ 3 : $10^3$ gallon 6 : $10^3$ bbl	0 : -
	1 : -
	2 : $m^3$ , $10^3$ gallon, $10^3$ bbl
	3 : $\ell$ , gallon, bbl
1 : $\ell$ 4 : gallon 7 : bbl	4 : $cm^3$ , $10^{-3}$ gallon, $10^{-3}$ bbl
	0 : -
	1 : $m^3$ , $10^3$ gallon, $10^3$ bbl
	2 : $\ell$ , gallon, bbl
2 : $cm^3$ 5 : $10^{-3}$ gallon 8 : $10^{-3}$ bbl	3 : $cm^3$ , $10^{-3}$ gallon, $10^{-3}$ bbl
	4 : -
	0 : $m^3$ , $10^3$ gallon, $10^3$ bbl
	1 : $\ell$ , gallon, bbl
	2 : $cm^3$ , $10^{-3}$ gallon, $10^{-3}$ bbl
	3 : -
	4 : -

Example: Setting of Aux.Data Item No. 3  
 "Function specifications (3)"

N = 0 : Volumetric flow unit for span m<sup>3</sup>/h  
 P = 0 : Output pulse factor 1 pulse/m<sup>3</sup>  
 Q = 2 : Totalizer factor 1 pulse/ℓ  
 R = 3 : Output pulse duration 50 ms

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX.  ITEM NO. 	Select Aux. data item No. 3.
		The initial setting is displayed in all 0's.
		The most significant digit (first digit) flashes indicating "0".
 3 times		The 4th digit flashes indicating "0".
 2 times		The 4th digit flashes indicating "2".
		The 5th digit flashes indicating "0".
 3 times		The 5th digit flashes indicating "3".
		The 6th digit flashes indicating "0".
 5 times		The 6th digit flashes indicating "5".
		The whole set data flashes.
		Data setting is completed.

### 5-4-2. Setting Span.

Carry out setting with a data and a unit. Perform unit setting using N and P of the aux. data item No. 3 "Function Specifications (3)", and data setting using a maximum of 8 settings depending on the requirements of forward or reverse flow and multi-ranges.

Aux. data item No.	Contents	Data range	Decimal place	Default value	Remarks
4	Forward flow span 1	0 to 30000	0 to 4	100.0	Forward, 1st range
5	Forward flow span 2	0 to 30000	0 to 4	100.0	Forward, 2nd range
6	Forward flow span 3	0 to 30000	0 to 4	100.0	Forward, 3rd range
7	Forward flow span 4	0 to 30000	0 to 4	100.0	Forward, 4th range
22	Reverse flow span 1	0 to 30000	0 to 4	100.0	Reverse, 1st range
23	Reverse flow span 2	0 to 30000	0 to 4	100.0	Reverse, 2nd range
24	Reverse flow span 3	0 to 30000	0 to 4	100.0	Reverse, 3rd range
25	Reverse flow span 4	0 to 30000	0 to 4	100.0	Reverse, 4th range

Note: Decimal place is determined to be represented as shown below.

Setting data ..... 9. 9. 9. 9.





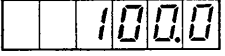

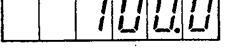

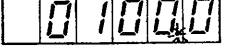

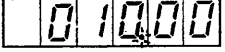

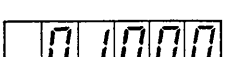








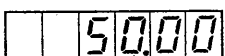
Decimal place ..... 4 3 2 1 0

- When the data for the first range is set, the same data are automatically set for the second range and after.
- The flow display in engineering unit is indicated in the same figures as the setting digits in this span setting.

For example, in span setting of 100 m<sup>3</sup>/h, resolution

is 1% because the display is obtained to the place of 1's. Thus, if the setting is made 100.0 m<sup>3</sup>/h, the resolution is 0.1% because the display is obtained to the first place of decimals.

Example of setting span as 50.00 with a forward flow, single range.

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX.  ITEM NO. 	Select Aux. data item No. 4
		The initial setting is displayed in "100.0".
		Set the data/decimal point selector switch to D.P.
		Then the 2nd digit (from the left) indicates "0" and the decimal point flashes at the 1st place ( $\times 10^{-1}$ ).
		The decimal point shifts to the 2nd place ( $\times 10^{-2}$ ).
 4 times		Set the data/decimal point selector switch to DATA.
		The 4th digit flashes indicating "0".
 4 times		The 3rd digit flashes indicating "1".
 4 times		The 3rd digit flashes indicating "5".
		The whole set data flashes.
		Data setting is completed.



○ **Gravimetric flow span or special volumetric flow span setting:**

Span setting in special units can be simply obtained by using Aux. data item No. 8 "Units conversion factor". The factor to be set here should be determined as shown below.

Factor(k1) = Required unit/unit selected with N of function specification (3) (m<sup>3</sup>, ℓ, cm<sup>3</sup>, gallon and bbl)

For example, if the gravimetric flow of sulfuric acid having the density 1.8 kg/ℓ is desired to be set in kg.

$$\text{set } K1 = \frac{1}{1.8} = 0.555 \frac{\text{kg}}{\ell} \text{ and } N = \ell$$

Through these operations, the span can be set in kg. The unit used for output pulse factor and totalizer factor also changes to kg.

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
8	Unit conversion factor	Required unit/m <sup>3</sup> , ℓ, cm <sup>3</sup> , gallon or bbl	0 to 32767	0 to 4	1	

**5-4-3. Setting Nominal flowmeter Size, Meter Factor, and Exciting Current.**

Set the size, meter factor, and exciting current of the flowmeter to be combined with YMA11 converter. As for the size and meter factor, set them by reading their data on the flowmeter data plate. The two meter factors for standard excitation mode (1/8f) and slurry excitation mode (1/2f) are stamped on the data plate. Use the meter factor for the excitation mode to be employed.

In addition, code "A" of the aux. data item No. 1 "Function Specifications (1)" should first be selected and set in setting a meter factor. Since this converter has separate memories, each for the standard and slurry excitation modes, meter factors are entered in each memory for selected excitation; mode independently.

Set 0.7A for exciting current of YEW MAG YM100, 200, 300, or 400 flowmeter.

For flowmeters of F556 and F553 series, refer to 3-2-5 (2) for exciting current.

YEW MAG		MAGNETIC FLOW TRANSDUCER		METER FACTOR		Hz
MODEL	YM			1/8		mΩ
				1/2		mΩ
RANGE				NO.		
SIZE			mm			
EXC. CUR			0.7A			
Yokogawa Electric Corporation TOKYO JAPAN						

Figure 5-6. Dataplate of Flowmeter.

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
11	Transducer nominal size	mm	2.5 to 3000.0	1 (fixed)	100.0	
12	Meter factor	m	0.0500 to 3.2767	4 (fixed)	0.5000	
13	Exciting current	A	0.1000 to 1.2000	4 (fixed)	0.7000	

Nominal flowmeter size should be set as shown in the following table.

Model code of magnetic flowmeter	Nominal size to be set		Nominal size expression
	unit: mm	unit: inch	
YM102	2.5	0.10	1/10
YM104	4.0	0.15	5/32
YM106	6.0	0.25	1/4
YM115	15.0	0.50	1/2
YM202	25.0	1.00	1
YM204	40.0	1.50	1-1/2
YM205	50.0	2.00	2
YM208	80.0	3.00	3
YM210	100.0	4.00	4
YM315	150.0	6.00	6
YM320	200.0	8.00	8
YM325	250.0	10.00	10
YM330	300.0	12.00	12
YM335	350.0	14.00	14
YM340	400.0	16.00	16
YM405	500.0	20.00	20
YM406	600.0	24.00	24
YM407	700.0	28.00	28
YM408	800.0	32.00	32
YM409	900.0	36.00	36
YM410	1000.0	40.00	40
F500-1100	1100.0	44.00	44
F500-1200	1200.0	48.00	48
F500-1350	1350.0	54.00	54
F500-1500	1500.0	60.00	60
F500-1600	1600.0	64.00	64
F500-1800	1800.0	72.00	72
F500-2000	2000.0	80.00	80
F500-2200	2200.0	88.00	88
F500-2400	2400.0	96.00	96
F500-2600	2600.0	104.00	104

#### 5-4-4. Setting Output Pulse and Totalizer Factors.

Set the weightings for output pulse and totalizer



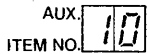


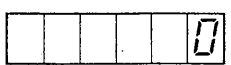



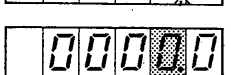





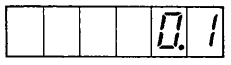
Set the unit volume with N and Q or R in Aux. data item No. 3 "Function Specifications (3)".

counting pulse with pulse counts per unit volume.

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
9	Output pulse factor	pulse/unit volume	0 to 32767	0 to 4	0	Function stops at "0".
10	Totalizer factor	pulse/unit volume	0 to 32767	0 to 4	0	Function stops at "0".

An example of setting by totalizer factor " $\times 10 \mathcal{L}$ " is shown below, assuming that the unit volume is already set as " $\mathcal{L}$ ".

Since the required value is 0.1 pulse/L, set "0.1".

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX. ITEM NO. 	Select Aux. data item No. 10.
		The initial setting is displayed in "0".
DATA  D.P.		Set the data/decimal point selector switch to D.P.
SHIFT 		The decimal point shifts to the 1st place ( $\times 10^{-1}$ ).
DATA  D.P.		Set the data/decimal point selector switch to DATA. Then the 5th digit (from the left) data flashes.
SHIFT 		the 6th digit flashes indicating "0".
INCR 		The 6th digit flashes indicating "1".
SET		The whole set data flashes.
SET		Data setting is completed.

#### 5-4-5. Setting Low Cut and Hysteresis Width Percentages.

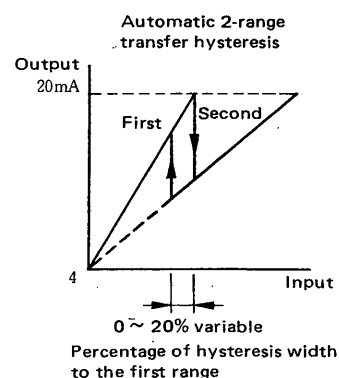
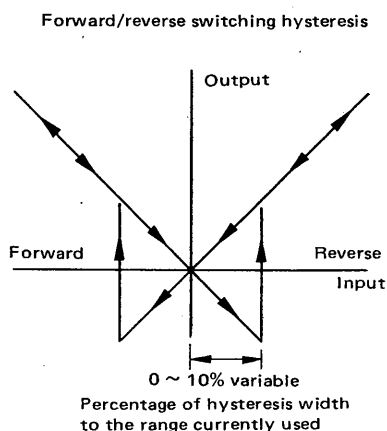
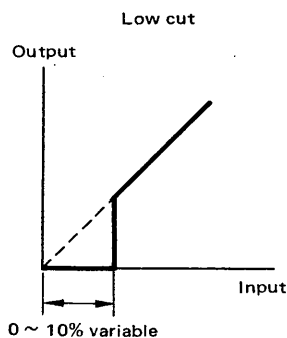
For these items, normally and frequently used data are initially set.

Therefore, settings are not necessary unless specific

data are to be required.

Set the low cut (small pulse outputs and totalizer counts near 0% are forced to be fixed to 0%) percentage and hysteresis widths in forward/reverse switching and automatic 2-range transfer for current output.

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
14	Totalizer and output pulse low cut	%	0.0 to 10.0	1 (fixed)	2.0	
15	Analog output low cut	%	0.0 to 10.0	1 (fixed)	0	
16	Automatic 2-range switching hysteresis width	%	0.0 to 20.0	1 (fixed)	10.0	
17	Forward/reverse switching hysteresis width	%	0.0 to 10.0	1 (fixed)	2.0	



## 5-4-6. Selecting Alarm Outputs.

Display **A B C D E F**

This is a function of giving a max. of three alarm on-off outputs selected out of nine kinds of alarm (except for FAIL). If selection is not required, on-off output can be obtained for all the alarms.



This function is valid only when the ALM output selection "provided" is assigned in Aux. data item No. 2

"Function Specifications (2)" and should be set by Aux. data item No. 20.

Set each error code numeric value in two digits. The display where all the digits are 0's means that no on-off output is given.

For example, only Input signal error (empty tube detection) and High flow alarm are desired to be given on-off output, set the display as

**0 5 0 6 0 0** as shown below.

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX. <b>20</b> ITEM NO.	Select Aux. data item No. 20.
	<b>000000</b>	The initial setting is displayed in all zeros.
<b>SHIFT▶</b> 2 times	<b>000000</b>	The second digit (from the left) flashes indicating "0".
<b>INCRA</b> 5 times	<b>050000</b>	The 2nd digit flashes indicating "5".
<b>SHIFT▶</b> 2 times	<b>050000</b>	The 4th digit flashes indicating "0".
<b>INCRA</b> 6 times	<b>050600</b>	The 4th digit flashes indicating "6".
<b>SET</b> 2 times	<b>050600</b>	Data setting is completed.

**5-4-7. Setting Rate Limit Function.**

This function is used where noises cannot be fully rejected by only increasing the damping time constant. "Rate limit" is a function to reject abruptly changing noises superimposed to flow signals.

"Rate limit" functions by setting both Dead time (seconds) and Rate limit value (%).











The rate limit function rejects the noises in the fol-

lowing operation:

A sampled flow rate is compared with the preceding flow rate value. If it exceeds the rate limit value, employ the rate limit value as the sampled value. If the sampled values have continually exceeded the rate limit value during the dead time, adopt the next sampled value regarding it as a true value. The abruptly changing noises are rejected by these operations.

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
18	Rate limit dead time	Second	0 to 15.0	1 (fixed)	0	Function stops at "0".
19	Rate limit value	%	0 to 30.0	1 (fixed)	1.5	

Example: Setting of Dead time 3 seconds and Rate limit value 3%

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX. ITEM NO. 18	Select Aux. data item No. 18.
	0.0	The initially set data is displayed.
SHIFT  2 times	0.00	The 5th digit (from the left) flashes indicating "0".
INCR  3 times	0.30	The 5th digit flashes indicating "3".
SET 2 times	3.0	Data setting for item No. 18 is completed.
 	AUX. ITEM NO. 19	Select Aux. data item No. 19.
	1.5	The initially set data is displayed.
SHIFT  2 times	0.15	The 5th digit flashes indicating "1".
INCR  2 times	0.35	The 5th digit flashes indicating "3".
SHIFT  2 times	03.5	The 6th digit flashes indicating "5".
INCR  5 times	03.0	The 6th digit flashes indicating "0".
SET 2 times	3.0	Data setting for item No. 19 is completed.

**5-4-8. Setting Frequency.**

This setting is not necessary for driving the converter with AC commercial supply but necessary for employing only DC supply.




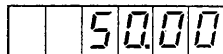





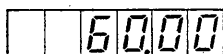
When Aux. data item No. 21 is selected, currently used commercial supply frequency is displayed and

stored in the memory. If only DC power supply is employed, set 50 or 60 Hz depending on the supply frequency of that area where the converter is operated.

(NOTICE) The setting is effective only for DC power supply.

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
21	Frequency to be synchronized	Hz	47.00 to 3.00	2 (fixed)	50.00	

Example of setting 60 Hz

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX. ITEM NO. 	Select Aux. data item No. 21.
		The initially set data is displayed.
		The 3rd digit (from the left) flashes indicating "5".
		The 3rd digit flashes indicating "6".
 2 times		Data setting is completed.

## 5-5. Operation.

After setting the main and auxiliary data of the converter, pass a liquid through the flowmeter tube. The converter will output the flow signal. Since a magnetic flowmeter requires zero adjustment without exception after installation, carry out the zero adjustment in the following procedure.

### 5-5-1. Zero Adjustment.

- (1) After confirming that the flowmeter tube is completely filled with a liquid, make the liquid standstill.
- (2) Adjust zero by means of the automatic zero-adjusting function of the converter








Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
MAIN  AUX. ENABLE  INHIBIT 		Select Aux. with MAIN/AUX. data selector switch.
		Select ENABLE of the data setting enable/inhibit selector switch.
	AUX. 01 ITEM NO. 01 000010	Select Aux. data item No. 1.
	000010	The initially set data is displayed.
SHIFT 5 times	000010	The 5th digit (from the left) flashes
INCR	000000	The 5th digit flashes indicating "0".
	000001	indicating "1".
SET	000000	The whole set data flashes.
SET	000000	Data setting is completed.
MAIN  AUX. 		Select MAIN of the main/Aux. data selector switch.
	● RATE % 0.4	Select the flow rate indication. (The display in engineering unit may be selected.)
	0.4	A data near 0% is displayed.
RESET	2E r 0	"ZERO" is displayed (for about 15 seconds).
	0.0	Zero adjustment is completed.

Operation for making RESET switch enabled.

### 5-5-2. Resetting Totalizer Counts.

Resetting totalizer counts can be done with the RESET button.

Example of resetting.

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition and for making RESET switch valid.		
MAIN  AUX.		Select AUX. of the main/aux. data selector switch.
 	AUX. 01 ITEM NO. 01	Select Aux. data item No. 1.
	000000	The initially set data is displayed.
SHIFT▶ 4 times	000000	The 4th digit (from the left) flashes indicating "0".
INCR▲ 2 times	000200	The 4th digit flashes indicating "2". (Note)
SET 2 times	000200	Data setting is completed.
MAIN  AUX.		Select MAIN of the main/aux. data selector switch.
 	● TOTAL <input type="text"/> 125	Select the totalized flow display.
		The totalized data is displayed.
RESET 	0	The totalized data is reset immediately.

Note: In this example, resetting is performed with the totalizer display mode in "Flow difference, totalizer display".  
The converter contains two memories for forward and reverse flows. /

These two memories must be both reset in resetting operation. In the modes of above example, both memories are reset at a time. If either one of these memories is used, only resetting that memory is permitted.

### 5-5-3. Multi-range Measurement.

If the multi-range measurement is selected by function specification, the ranges can be switched as described below.

#### (1) External (remote) multi-range selection.

Ranges are switched with on-off contact inputs.

On-off input		Range specification			
STATUS IN	AUX	Single range	2-ranges	3-ranges	4-ranges
OFF	OFF	—	1	1	1
ON	OFF	—	2	2	2
OFF	ON	—	—	3	3
ON	ON	—	—	—	4

ON: —1 to 1V DC or 200 ohms or less

OFF: 4.5 to 25V DC or 100k ohms or more



**(2) Automatic two-range switching.**

If an input exceeds the 100% point of the first range, the second range are automatically selected.

At this time, a contact outputs a signal notifying that the range is switched.

Set the hysteresis width in the aux. data item No. 16.

**On-off (contact) output specifications:**

- (1) Isolated, open collector output
- (2) DC 30V, 0.2A max.
- (3) Contact status

Range \ Output terminal	STATUS OUT
First range	Open
Second range	Closed

**5-5-4. Direct and Reverse Flow Measurement.**

If the direct or reverse flow rate is selected by function specification, the absolute value of the flow rate is output as the analog or pulse output even for the reverse flow and an on-off (contact) output notifies the reverse flow. In the display, a minus sign is indicated preceding the data in reverse flow. As for the totalized counts, the reverse flow counts are memorized as the reverse totalization and can be presented by selecting the aux. data item No. 1-D.

Set the hysteresis width at this time in the aux. data item No. 17.

**On-off (contact) output specifications:**

- (1) Isolated, open collector output
- (2) DC 30V, 0.2A max.
- (3) Contact status

Flow direction \ Output terminal	STATUS OUT
Forward	Open
Reverse	Closed

**5-5-5. Operation During Power Failure.**

The data, such as totalizer counts and parameters, are protected by the built-in battery when power fails. During power failure, however, the totalizer counting is interrupted, current output is forced to 0 mA, and all the on-off (contact) outputs are brought to "open" status.

When power is restored, the totalizer restarts and continues totalizing and the converter automatically returns to normally operation.

**5-6. FAIL and ALM Lamps.**

Any fault in the converter or in input/output signals is indicated by the FAIL or ALM lamp. If either of these lamps lights (or begins to flash), take appropriate actions without delay.

**5-6-1. Action to be Taken when FAIL Lamp Lights.**

If FAIL lamp lights and alarm contact on-off output becomes "open", these show that a serious failure has occurred in the magnetic flowmeter.

During indication of either MAIN or AUX. data, if a FAIL error occurs, the DATA display indicates the FAIL code preferentially over any other data (see paragraph 5.6.4). Take appropriate actions depending on the cause of failure.

In this situation, the analog current output takes any of the values specified in K mode of Function Specification (2), 0: 2 mA or less, 1: HOLD, and 2: 22 mA or more, and the pulse output halts. Note that, however, functions other than the lamp and on-off output might not operate depending on the type of failure.

**5-6-2. Action to be Taken when ALM Lamp Lights.**

This lamp lights when the alarm functions operate. Indicate the ALARM CODEs of the main data list in DATA display and examine the causes of failure (see paragraph 5.6.4).

Take appropriate actions depending on the causes of failure.

In this situation, the analog current output takes any of the values specified in K mode of Function Specification (2), 0: 2 mA or less, 1: HOLD, and 2: 22 mA or more, and the pulse output halts.

**5-6-3. Action to be Taken When ALM Lamp Flashes.**

The ALM lamp begins flashing if the voltage of the data memory backup battery drops. Replace the battery with a new one (see Subsection 6.4 for replacement).

**NOTE**

- (1) If the ALM lamp begins to flash during normal operation, replace the battery within one month.
- (2) Flashing of the ALM lamp has precedence over its continuous lighting.

**5-6-4. Alarm (ALM) Code Details.**

Table 5-1 shows the alarm code details (contents, codes, analog outputs, etc.).

The display codes and ALM lamp automatically go OFF if the very cause of the failure is removed.

**Table 5-1. Alarm Code Details.**

Alarm	Contents	ALARM CODE	Lamp	ALM on-off output	Analog output	Pulse and totalizer outputs	Remarks
Normal		Good	Not go ON	Closed	Normal	Normal	
Microprocessor failure	RAM data volatilization Program runaways	FAIL-1	FAIL	Open	Depending on parameter setting	Halt	Note that functions other than the lamp and ALM contact on-off output might not operate depending on the conditions.
A/D converter failure	A/D converter failure	Err-2	ALM	Open	Depending on parameter setting	Halt	
Coil disconnection	Shortcircuiting of cables or coils	Err-3	ALM	Open	Depending on parameter setting	Halt	
Input signal error	Abnormal input signal (Empty tube detection)	Err-5	ALM	Open	Depending on parameter setting	Halt	
High flow alarm	Flow rate of upper limit alarm setpoint or more	Err-6	ALM	Open	Continues	Continues	
Low flow alarm	Flow rate of lower limit alarm setpoint or less	Err-7	ALM	Open	Continues	Continues	
Output pulse overflow	Output pulse memory overflow	Err-8	ALM	Open	Continues	Continues	At the time of overflow exceeding 100000.
Erroneous setting	Erroneous parameter setting	Err-9	ALM	Open	Depending on parameter setting	Halt	
Battery failure	No mounting of battery or battery voltage drop	Err-10	ALM (flashing)	Open	Continues	Continues	

## 6. MAINTENANCE.

Various checks can be carried out using micro-processor in Model YMA11 Converter. Do maintenance works by selecting appropriate modes.

### 6-1. Testing.

In the test mode assigned to Aux. data item No 26, five types of check are available.

Display 

A	-	C	D	E	F
---	---	---	---	---	---

 \*: Default value.

determined by each test mode.

**A :** Test mode selection

**\*0 :** Measurement mode

**1 :** Checking INPUT

**2 :** Setting Output

**3 :** Setting STATUS OUTPUT

**4 :** Displaying STATUS IN condition

**5 :** Adjustment and inspection

..... As for 5: "Adjustment and inspection", put it in our serviceman's hands except the span check described later.

#### 6-1-1. Checking INPUT.

Display 

1	-	C	0	0	0
---	---	---	---	---	---

Using the standard signal given by test terminal, check the flow signal input circuit. The checking includes three modes, each mode of them being capable of being performed by setting 1, 2, or 3 in the digit of C.

Follow the next procedure.

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
Result ▲ ▼	AUX. 26 ITEM NO. 26	TEST terminal TEST terminal
	0-0000	Select Aux. data item No. 26.
SHIFT▶	0-0000	The initially set data is displayed.
INCR▲	1-0000	The 1st digit (most significant digit) flashes indicating "0".
SHIFT▶	1-0000	The 1st digit flashes indicating "1".
2 times	1-0000	The 3rd digit flashes indicating "0".
INCR▲	1-1000	The 3rd digit flashes indicating "1".
SET	1-1	Data setting is completed. Deciding.
2 times	1-1	MODE 1
Connection	1-1 9d	GOOD (9d flashes: Indication of "good")
	1-1 n9	NO GOOD (n9 flashes: Indication of "no good")
Result	1-1000	TEST terminal TEST terminal
SHIFT▶	1-1000	The 3rd digit flashes indicating "1".
3 times	1-2000	The 3rd digit flashes indicating "2".
INCR▲	1-2000	MODE 2
SET	1-2	Data setting is completed. Deciding.
2 times	1-2	GOOD (9d flashes: Indication of "good")
Connection	1-2 9d	GOOD (9d flashes: Indication of "good")
	1-2 n9	NO GOOD (n9 flashes: Indication of "no good")
Result	1-2000	TEST terminal TEST terminal
SHIFT▶	1-2000	The 3rd digit flashes indicating "2".
3 times	1-3000	The 3rd digit flashes indicating "3".
INCR▲	1-3000	MODE 3
SET	1-3	Data setting is completed. Deciding.
2 times	1-3	GOOD (n9 flashes: Indication of "good")
Connection	1-3 9d	GOOD (n9 flashes: Indication of "good")
	1-3 n9	NO GOOD (9d flashes: Indication of "no good")

If the result of any one of the three TEST MODES shows NO GOOD, contact your nearest YEW service center or sales representative.

Note: If the modes 1, 2, and 3 is to be successfully checked, the result of the preceding mode remains during setting. However, the result of the preceding mode will disappear if the step enters the next mode decision by **SET** switch pressing.

## 6-1-2. Setting Output.








Display **2-0DEF**

In this setting, the YMA11 converter serves as a current generator or pulse generator and allows check-

ing of the output signal wiring and receiving instruments.

By three digits of D, E, and F, output range of 0 of 106% can be set in 1% step.

An example of setting 100% output is shown below.

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX. <b>26</b> ITEM NO. <b>26</b>	Select Aux. data item No. 26.
	<b>0-0000</b>	The initially set data is displayed.
	<b>0-0000</b>	The first digit (most significant digit) flashes indicating "0".
 2 times	<b>2-0000</b>	The 1st digit flashes indicating "2".
 3 times	<b>2-0000</b>	The 4th digit flashes indicating "0".
	<b>2-0100</b>	The 4th digit flashes indicating "1".
 2 times	<b>2-0100</b>	Data setting is completed. 100% output is obtained.

## 6-1-3. Setting STATUS OUTPUT.

Display **3-0DEF**

A STATUS signal output from the YMA11 converter can be obtained in the form of either contact "Open" or contact "Closed". Using this function, checking wiring or checking receiving instruments connected outside is available.

- (1) A STATUS signal is output according to the assignment of digits D and E.

D: ALM





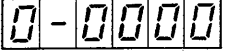

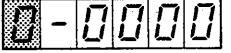

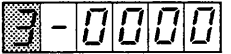





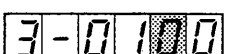

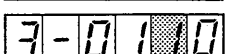

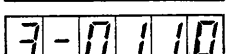
E: STAT OUT

- (2) A signal is output when the following condition is set for D and E.

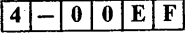
0: Closed

1: Open

An example of making both contacts open will be given below.

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX.  ITEM NO. 	Select Aux. data items No. 26.
		The initially set data is displayed.
		The first digit (most significant digit) flashes indicating "0".
 3 times		The 1st digit flashes indicating "3".
 3 times		The 4th digit flashes indicating "0".
		The 4th digit flashes indicating "1".
		The 5th digit flashes indicating "0".
		The 5th digit flashes indicating "1".
 2 times		Data setting is completed. Output contacts become open.

## 6-1-4. Displaying STATUS IN Condition.

Display 

This is a function which displays whether the converter receives the contact on-off input STATUS IN. Whether or not wiring and the external contact on-off signal transmission functions are normal, can be checked.

- (1) The external STATUS conditions are displayed in E and F digits.





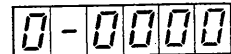

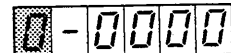



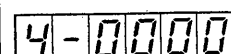
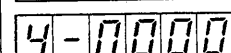
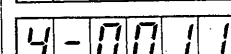
E: AUX IN

F: STA IN

- (2) Display of conditions is as follows:

0: Closed

1: Open

Switch operation	Display	Description
Carry out operation for releasing data setting inhibition.		
 	AUX.  ITEM NO. 	Select Aux. data item No. 26.
		The initially set data is displayed.
		The first digit (most significant digit) flashes indicating "0".
 4 times		The 1st digit flashes indicating "4".
 2 times		Data setting is completed.
Input contact CLOSE		The 5th and 6th digits indicate "0, 0".
Input contact OPEN		The 5th and 6th digits indicate "1, 1".

## 6-2. Calibrating Span (automatic span adjustment).

Span calibration can be conducted using the standard signal obtained at the TEST terminal of the converter. The calibration of converters have been performed with the signal generator for magnetic flowmeter so far. The YMA11 converter incorporates the automatic span adjusting function to make maintenance easy.

Follow the next procedure for implementing calibration. It requires 15 seconds for calibration.

### (1) Connection:

Connect TEST terminal with terminal A.

Connect terminal B with terminal C.

Connect the flowmeter exciting circuit with EX1 and EX2 terminals (a resistor rated 10 ohms, 5W or more, may be used instead of the flowmeter).

### (2) Power supply: Turn ON.

### (3) Setting: See below.

Switch operation	Display	Description
MAIN  AUX. ENABLE  INHIBIT 		Set the main/aux. data selector switch to AUX.
 	AUX. ITEM NO. 01 000010	Select Aux. data item No. 1. The initially set data is displayed.
SHIFT▶ 5 times	000010	The 5th digit (from the left) flashes in indicating "1".
INCR▲	000000	The 5th digit flashes indicating "0".
SET	000000	The whole displayed data flashes.
SET	000000	Data setting is completed.
 	AUX. ITEM NO. 26 0-0000	Select Aux. data item No. 26. The initially set data is displayed.
SHIFT▶	0-0000	The 1st digit flashes indicating "0".
INCR▲ 5 times	5-0000	The 1st digit flashes indicating "5".
SET	5-0000	The whole displayed data flashes.
SET	5-0000	Data setting is completed.
 	AUX. ITEM NO. 29 0.9985	Select Aux. data item No. 29. The initially set data is displayed.
RESET 	CAL	"CAL" is displayed (for about 15s).

Making RESET switch operation valid.

Setting to Adjust/Inspection mode.

Span calibration is carried out.

Switch operation	Display	Description
		Span calibration is completed.
Completed: Restore settings of Aux. data item No. 1 and No. 26.		
	AUX. ITEM NO.	Select Aux. data item No. 26.
		The currently set data is displayed.
		The 1st digit flashes indicating "5".
		The 1st digit flashes indicating "0".
		Data setting is completed.
2 times 	AUX. ITEM NO.	Select Aux. data item No. 1.
		The currently set data is displayed.
		The 5th digit flashes indicating "0".
5 times 		The 5th digit flashes indicating "1".
		Data setting is completed.
2 times		Making RESET switch operation invalid.



### 6-3. Replacing Fuse.

If it seems that the fuse may be faulty, check the inside of the fuse holder for contamination or poor contact with fuse.

- (1) To remove the fuse, unscrew the fuseholder cap by turning it in the direction of the arrow marked on the cap — counterclockwise. Then the fuse is exposed.
- (2) Mount a new fuse after confirming that the fuse rating is appropriate. Tighten the cap firmly.

### 6-4. Replacing Data Memory Backup Battery.

If the ALM lamp on the converter front panel begins flashing, replace the battery without delay.

#### NOTE

Leave power applied to the converter while replacing the battery. If the battery is removed during power failure, data settings may disappear or be volatilized.

- (1) Remove the battery cover and battery (see Figure 6-1).

- (2) Mount a new battery and fit the battery cover securely.
- (3) Make sure that the ALM lamp on the front panel has stopped flashing.

#### [Precautions for storage and handling of data memory backup battery]

- (1) Storage conditions
  - Ambient temperature:  $-10$  to  $+60^{\circ}\text{C}$  ( $14$  to  $140^{\circ}\text{F}$ )
  - Ambient humidity: 5 to 85% R.H
  - Location free from corrosive gases.
- (2) Replace the complete battery assembly (plastic plug-in package). Do not try to remove the battery only in molded plastics.
- (3) When measuring the battery voltage, be sure to employ a high input resistance voltmeter. Do not attempt to measure the voltage with a circuit tester or the like.
- (4) Cautions in handling batteries.
  - Do not charge the battery.
  - Do not heat the battery nor put it into fire.
  - Do not short the positive and negative poles nor mount the battery with its polarity inverted.
  - Do not subject the battery to severe shock nor attempt to disassemble it.

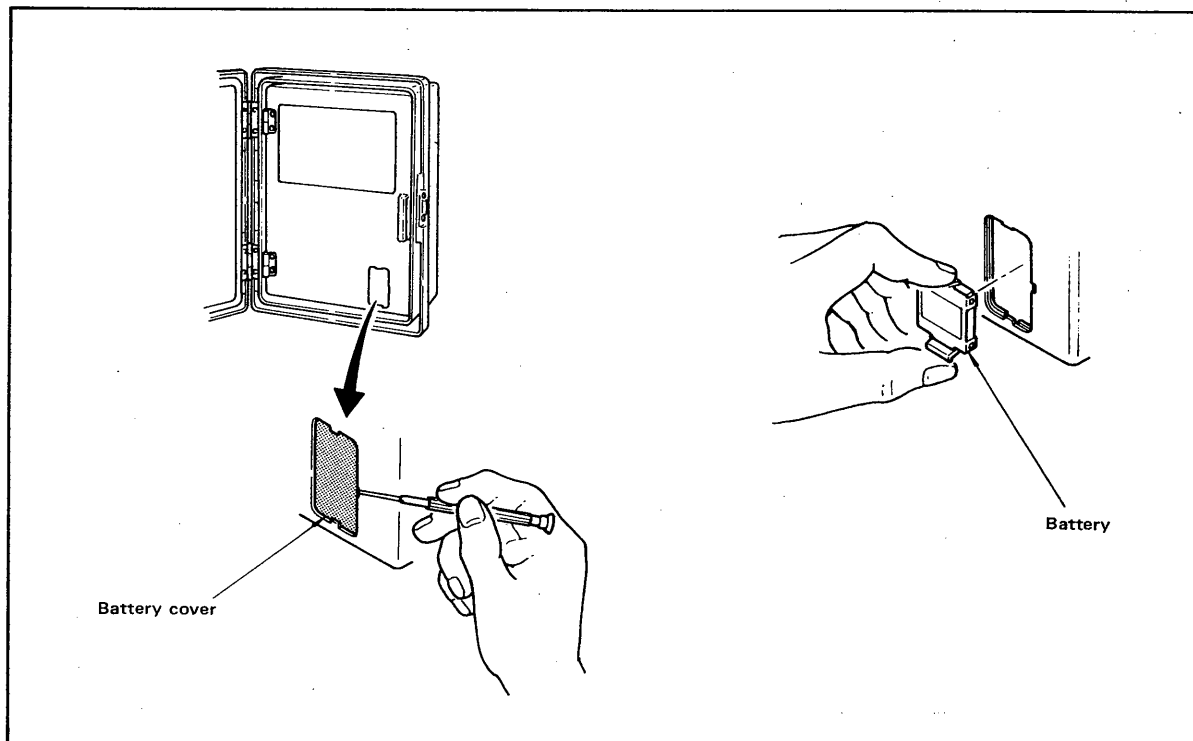
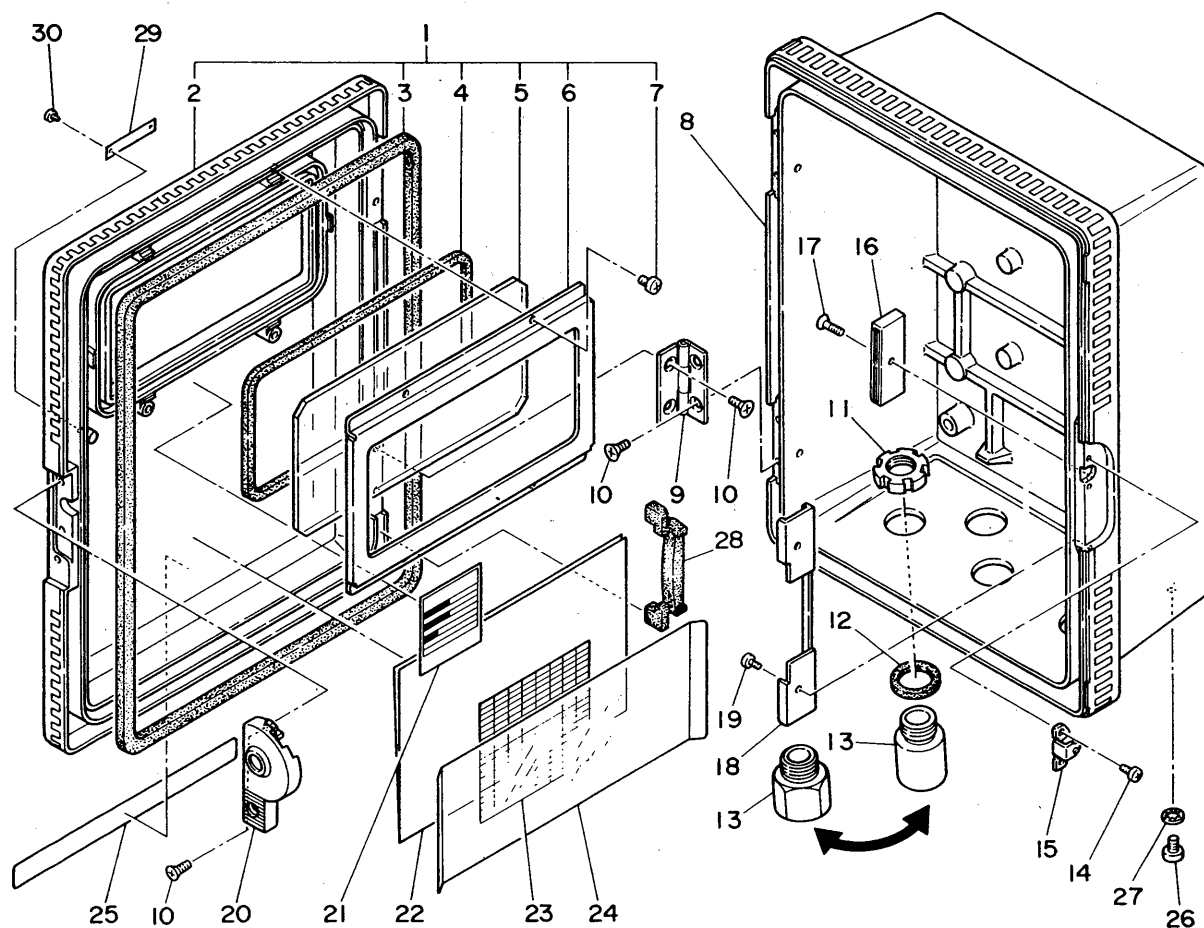


Figure 6-1. Removing Battery.

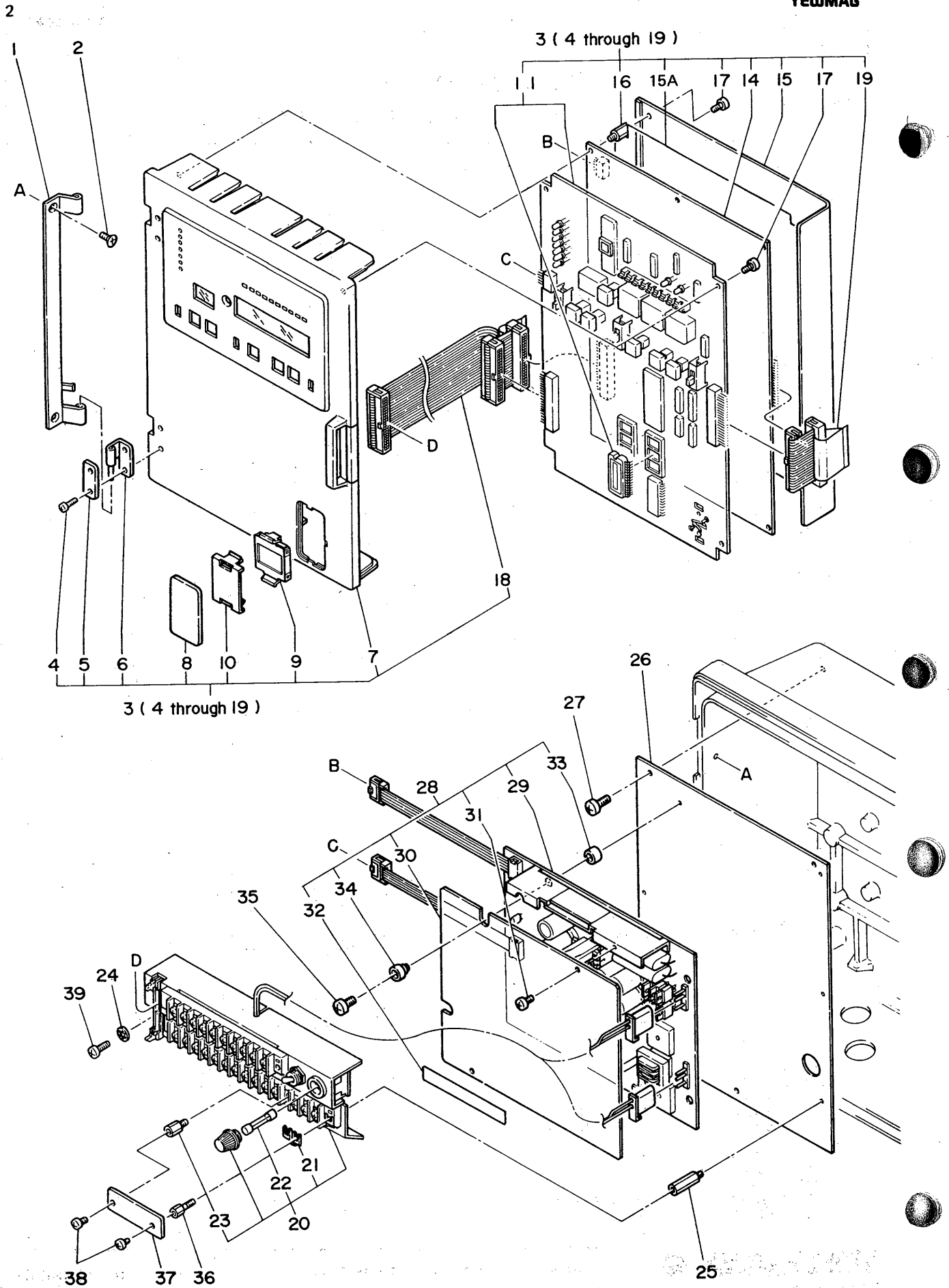
# Parts List

## Model YMA11 MAGNETIC FLOW CONVERTER

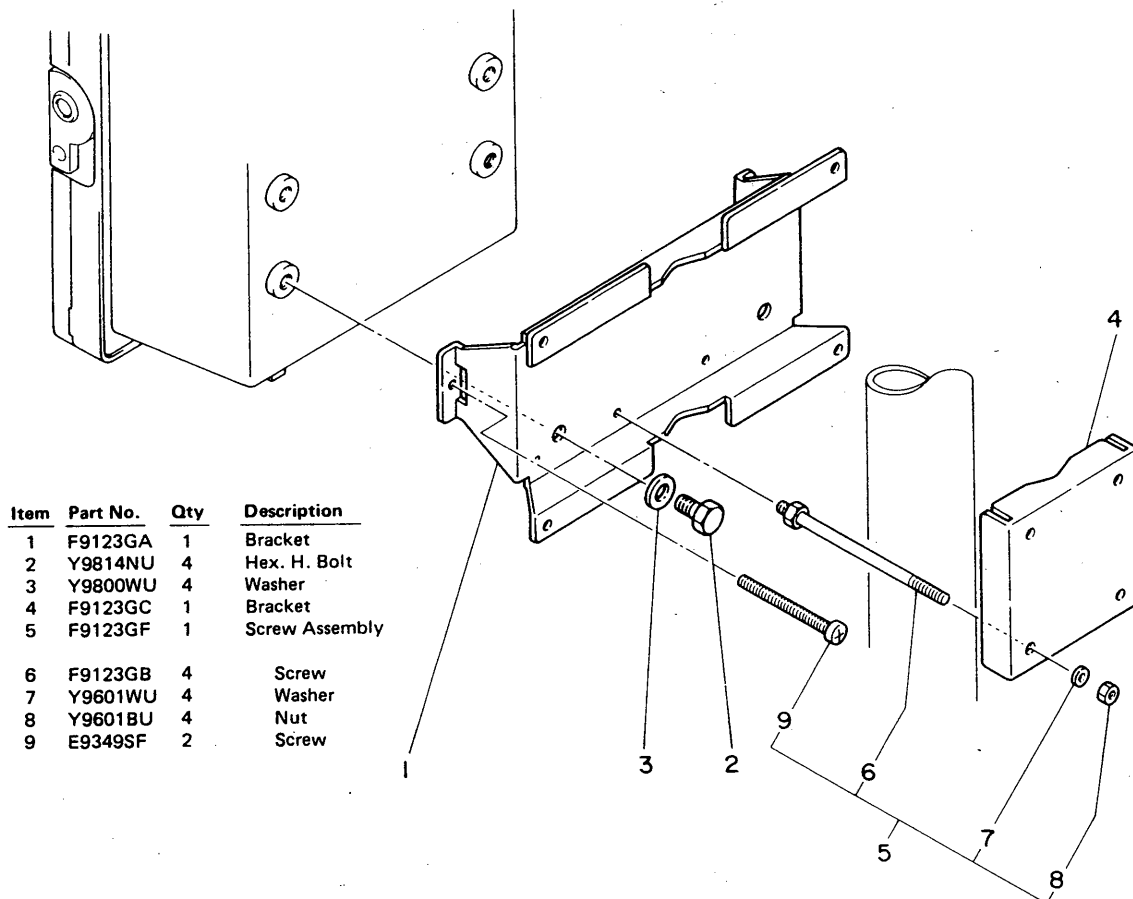


Item	Part No.	Qty	Description
1	F9123CB	1	Door Assembly
2	F9123CH	1	Door
3	F9123EG	1	Gasket
4	F9123EF	1	Gasket
5	F9123EB	1	Glass
6	F9123EC	1	Bracket
7	Y9408JS	4	Pan H. Screw, M4 x 8
8	F9289AA	1	Case
9	F9123EA	2	Hinge
10	Y9408EU	10	F.H. Screw, M4 x 8
11	G9600KC	5	Nut
12	G9600PC	5	Gasket
13	Below G9600MC F9289AR	5	Block For PF 1/2 Female For 1/2 NPT Female
14	Y9406JU	2	Pan H. Screw, M4 x 6
15	F9123EU	1	Roller Assembly
16	F9289AE	1	Magnet
17	Y9310ES	1	F.H. Screw, M3 x 10
18	F9289AF	1	Bracket

Item	Part No.	Qty	Description
19	Y9406JS	2	Pan H. Screw, M4 x 6
20	F9123EL	1	Lock Assembly
21	—	1	Data Plate
22	F9520AG	1	Card
23	F9289AS	1	Label
24	F9289AN	1	Cover
25	F9520AJ	1	Nameplate
26	Y9508JU	1	Pan H. Screw, M5 x 8
27	Y9501WL	1	Toothed Lockwasher
28	F9123EK	2	Cover
29	—	1	Tag No. Plate (specified by user)
30	—	2	Tapping Screw

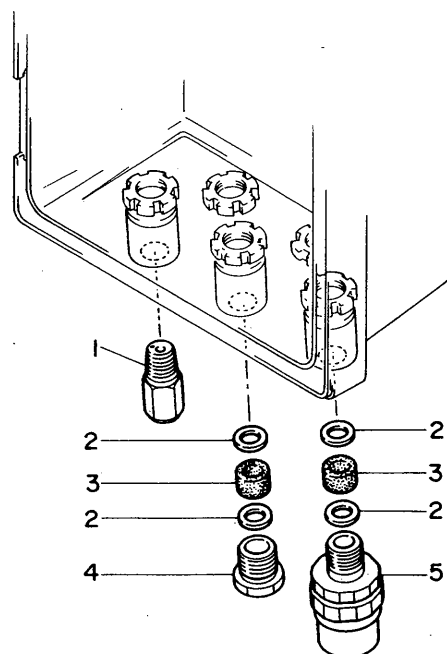


Item	Part No.	Qty	Description
1	F9289AB	1	Hinge
2	Y9408EU	2	F.H. Screw, M4 x 8
3	F9520BA	1	Main Unit Assembly
4	Y9406JS	4	Pan H. Screw, M4 x 6
5	F9289DF	2	Plate
6	F9289DC	2	Hinge Assembly
7	F9520BF	1	Frame Assembly
8	F9520AK	1	Plate
9	E9711DH	1	Battery Assembly
10	E9711GQ	1	Cover
11	F9520DA	1	CPU Board Assembly
14	F9520BD	1	Analog Board Assembly
15	F9520BC	1	Cover
15A	F9520BJ	1	Sheet
16	F9289DK	4	Stud
17	Y9406JS	9	Pan H. Screw, M4 x 6
18	F9520BG	1	Cable Assembly
19	F9289DS	1	Cable Assembly
20	F9520BK	1	Terminal Assembly
21	G9320PB	1	Jumper
22	G9006ZF	1	Fuse — "3 A"
23	F9289BG	1	Stud
24	Y9401WL	1	Toothed Lockwasher
25	F9520AB	2	Stud
26	F9520AE	1	Plate
27	Y9510JS	3	Pan H. Screw, M5 x 10
28	Below F9520CA F9520CB	1	Power Unit Assembly For 100 V Version For 220 V Version
29	Below F9520CD F9520CE	1	Power Board Assembly For 100 V Version For 220 V Version
30	F9520CF	1	Cover
31	Y9406JS	2	Pan H. Screw, M4 x 6
32	G9325LL	1	Label
33	G9320JH	4	Collar
34	G9320JG	4	Bushing
35	Y9412JS	4	Pan H. Screw, M4 x 12
36	F9520AC	1	Stud
37	F9520AD	1	Plate
38	Y9406JS	2	Pan H. Screw, M4 x 6
39	Y9412JS	1	Pan H. Screw, M4 x 12



## Option

Item	Part No.	Type	Qty				Description
			/APC	/ECG	/APC/ECG	/ECU	
1	F9151GL	1		1		1	Airpurge Assembly (for PT 1/4 Female)
	F9151GP	1					Airpurge Assembly (for 1/4 NPT Female)
2	G9600DE		10	8	10	8	Washer
3	G9600FE		5	4	5	4	Gasket
4	G9600YC		5	4			Block
5	G9601AA				5	4	Conduit Union



○ **Gravimetric flow span or special volumetric flow span setting:**

Span setting in special units can be simply obtained by using Aux. data item No. 8 "Units conversion factor". The factor to be set here should be determined as shown below.

Factor(k1) = Required unit/unit selected with N of function specification (3) (m<sup>3</sup>, L, cm<sup>3</sup>, gallon and bbl)

For example, if the gravimetric flow of sulfuric acid having the density 1.8 kg/L is desired to be set in kg.

$$\text{set } K1 = \frac{1}{1.8} = 0.555 \frac{\text{kg}}{\text{L}} \text{ and } N = \text{L}$$

Through these operations, the span can be set in kg. The unit used for output pulse factor and totalizer factor also changes to kg.

*Flow Units (per F.S. 3N)  
Desired Units (per Aux 4)*

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
8	Unit conversion factor	Required unit/m <sup>3</sup> , L, cm <sup>3</sup> , gallon or bbl	0 to 32767	0 to 4	1	

**5-4-3. Setting Nominal flowmeter Size, Meter Factor, and Exciting Current.**

Set the size, meter factor, and exciting current of the flowmeter to be combined with YMA11 converter. As for the size and meter factor, set them by reading their data on the flowmeter data plate. The two meter factors for standard excitation mode (1/8f) and slurry excitation mode (1/2f) are stamped on the data plate. Use the meter factor for the excitation mode to be employed.

In addition, code "A" of the aux. data item No. 1 "Function Specifications (1)" should first be selected and set in setting a meter factor. Since this converter has separate memories, each for the standard and slurry excitation modes, meter factors are entered in each memory for selected excitation; mode independently.

Set 0.7A for exciting current of YEW MAG YM100, 200, 300, or 400 flowmeter.

For flowmeters of F556 and F553 series, refer to 3-2-5 (2) for exciting current.

YEW MAG	MAGNETIC FLOW TRANSDUCER	METER FACTOR	Hz
MODEL	YM	1/8	m <sup>3</sup>
RANGE		1/2	m <sup>3</sup>
SIZE			
EXC CUR	0.7A		
YEW YOKOGAWA HOKUSHIN ELECTRIC TOKYO JAPAN			

Figure 5-6. Dataplate of Flowmeter.

Aux. data item No.	Contents	Unit	Data range	Decimal place	Default value	Remarks
11	Transducer nominal size	mm	2.5 to 3000.0	1 (fixed)	100.0	
12	Meter factor	m	0.0500 to 3.2767	4 (fixed)	0.5000	
13	Exciting current	A	0.1000 to 1.2000	4 (fixed)	0.7000	

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