

**MagneW3000
Electromagnetic
Flowmeter Converter
Model: KIC20B
(Remote type)**

User's Manual

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TABLE OF CONTENTS

	<u>Page</u>
1. GENERAL	1
1.1 Scope	1
1.2 Measuring Principles of Electromagnetic Flowmeter	1
1.3 Structure of Electromagnetic Flowmeter System	2
2. SPECIFICATIONS	3
2.1 Standard Specifications	3
2.2 Semi-standard Specifications	3
3. MODEL NUMBERS	4
4. NOMENCLATURE OF COMPONENTS	5
5. INSTALLATION	6
5.1 Identification by Nameplate	6
5.2 Dimension Drawings and Weight	7
5.3 Installation	8
5.4 Notes for Electrical Connections	8
5.5 Cable Connections	16
6. OPERATION METHOD	18
6.1 Inspection	18
6.2 Preparation for Operation	19
6.3 Operation Method	20
6.4 Simple Troubleshooting	21
7. FULL-SCALE FLOW VELOCITY	22
7.1 Adjustment of Detector Constant (Exciting Current)	22
7.2 Change of Full-scale Flow Velocity (Span)	25
7.3 Pulse Outputs	27
7.4 AC Line Voltage Setting Change	37
8. MAINTENANCE	38
8.1 General	38
8.2 Electrode Cleaning	40
9. STANDARD ACCESSORIES	41

1. GENERAL

1.1 Scope

This manual covers the operation instructions for Model KIC20 Regular-type converter of MagneW 3000 Electromagnetic Flowmeters.

1.2 Measuring Principles of Electromagnetic Flowmeter

The measuring principles of the electromagnetic flowmeter are as follows:

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

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

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

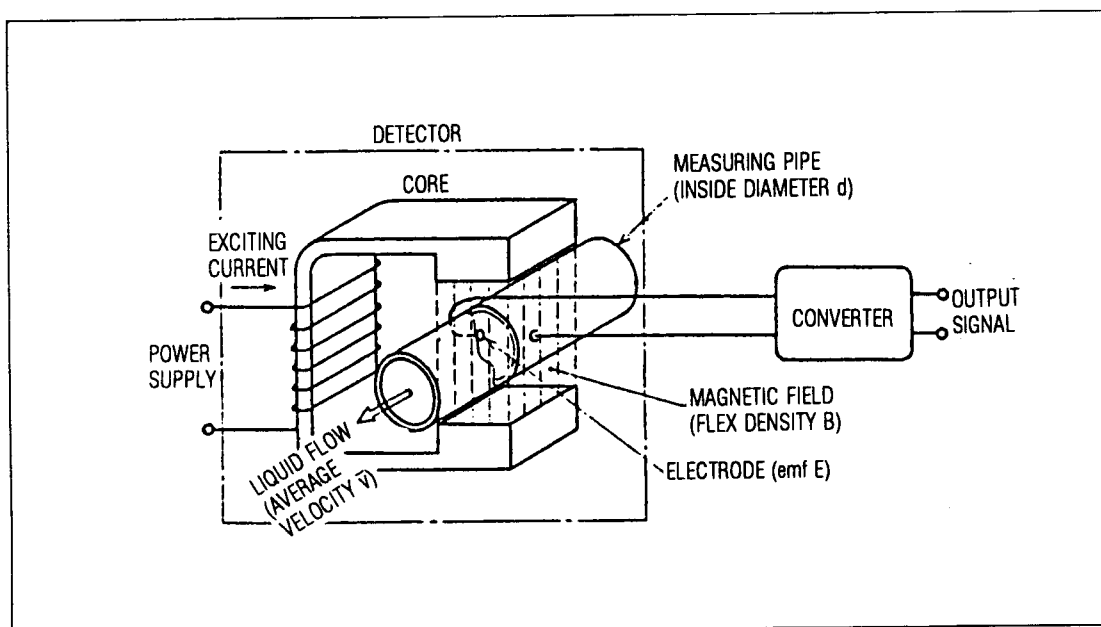


Figure 1-1. Measuring Principles of Electromagnetic Flowmeter

1.3 Structure of Electromagnetic Flowmeter System

A typical example of electromagnetic flowmeter system is shown in Figure 1-2. The detector is connected to the converter with the signal cable and exciting cable. The converter delivers a current output and a pulse output.

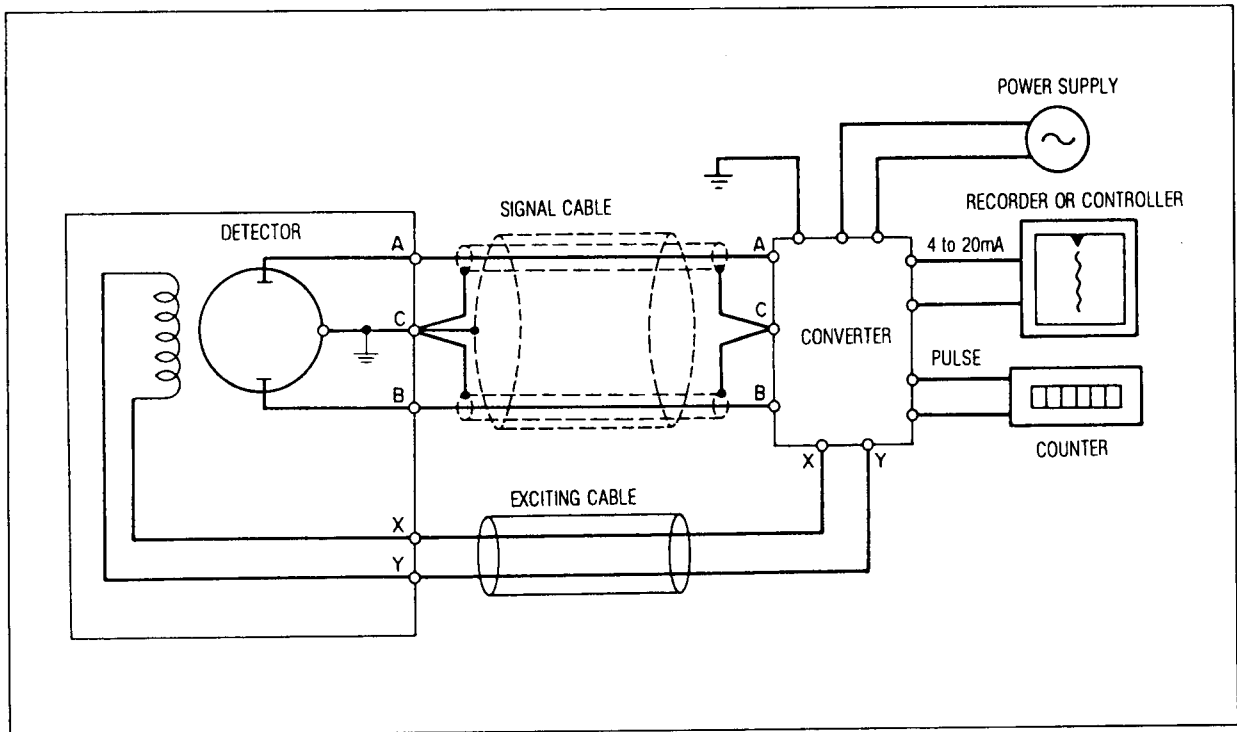


Figure 1-2. An Electromagnetic Flowmeter System

2. SPECIFICATIONS

2.1 Standard Specifications

Item	Specifications		
Power Requirements	AC 100, 110, 120, 200, 220, 240V \pm 10%, 50/60 Hz \pm 2 Hz; 24V DC \pm 10%		
Power Consumption	14W (22VA) (Including detector and converter)		
Outputs	Current output: 4 to 20mA DC (Load: 0 to 600 ohms) Pulse outputs: Mercury relay contact pulse output 0 to 17 Hz (Ext. power supply 30V DC max., 300 mA, pulse width 30 ms) Counter drive pulse output, 0 to 17 Hz (24V DC, external coil load 210 ohms, 30 ms) Open collector pulse output, 0 to 1,700 Hz (Ext. power supply 30V DC max., 100 mA, pulse width selectable for 0.3 ms or 30 ms) High-speed voltage pulse output, 0 to 1,700 Hz, external load 5 k ohms or over (15V DC, pulse width selectable for 0.3 ms or 30 ms) Flowrate Indicator: 3.5 digits, 7-segment LED		
Flow Velocity Ranges	0 – 0.3 m/s to 0 – 9.999 m/s (Can be set with 4-digit digital switch)		
Damping Time Constant	1 to 10 sec (continuously variable)		
Low Flow Cut off (Drop Out)	0 to 10% FS (continuously variable)		
Accuracy (As used in conjunction with KID Detector)	Span	Flow rate \geq 25%	Flow rate \leq 25%
	1.0 to 9.999 m/s	\pm 0.5% of rate	\pm 0.125% of full scale
	0.3 to less than 1.0 m/s	\pm 1.0% of rate	\pm 0.25% of full scale
Ambient Temperature	–10 to +50°C		
Relative Humidity	10 to 90% RH		
Cables (between detector and converter) For Model KIW Y-H standard cable, refer to the No. SS2-5662-0100	Signal cable: 2-core or 3-core individually-double-shielded cable (Yamatake Corporation standard KIW, 0.75 mm ² , outside dia. 11.4 mm), or equivalent cable (CVVS, CEEV, etc.) Cable for excitation current: Chloroprene cable 2RNCT, JIS C 3327 (2 mm ² , outside dia. 11.4 mm) or equivalent cable (vinyl sheathed cable CVV JIS C 3401, etc.)		
Cable Length	Up to 300 meters. When a cable of 50 meters or longer is used for a detector of 2.5 to 10 mm, be sure to use Model KIC20 or KIC33 converter and Yamatake Corporation standard cable (3-core individually-double-shielded cable).		
Installation	Wall or 2" pipe mounting		
Grounding	JIS Class 3 grounding (Grounding resistance not greater than 100 ohms)		
Case	Materials	Aluminium alloy	
	Structure	JIS C 0920 Waterproof type	
	Finish	Acryl paint	
	Finish Color	Light beige (Munsell 4Y7.2/1.3)	
Electrical Conduit Connection	G $\frac{1}{2}$, CM20, $\frac{1}{2}$ NPT internal thread		

2.2 Semi-standard Specifications

Item	Specifications
Corrosion-resistant Finish (Y 138)	Y138A Corrosion-resistant finish (baked acryl finish) Y138B Corrosion-proof finish (baked epoxy finish)

3. MODEL NUMBERS

Table 3.1. Model No. Table

Basic Model No.	Selections									Description
	Power Supply		Output Signal			Terminal Box/ Lightning Arrester	Installation	Electrical Connection	Options	
			Analog	Indicator	Pulse					
—	I	II	III	IV	V	VI	VII	—VIII		
KIC 20B										Remote type converter
	—	A								100V AC, 50/60 Hz
	—	C								110V AC, 50/60 Hz
	—	E								120V AC, 50/60 Hz
	—	G								200V AC, 50/60 Hz
	—	I								220V AC, 50/60 Hz
	—	K								240V AC, 50/60 Hz
	—	M								24V DC ± 10%
			X							None
			I							4 to 20 mA DC
				X						None
				D						Flowrate Indicator (%)
					X					None
					O					Open collector pulse output
					P					Counter drive pulse output
					Q					Mercury relay contact pulse output
					R					High speed voltage pulse output
						1				With terminal box, without lightning arrester
						2				With terminal box, with lightning arrester
							S			Wall mounting
							T			2" pipe mounting
								V		G½ Internal thread
								W		CM20 Internal thread
								Y		½NPT Internal thread
										Watertight gland is not selectable
								—X		Without watertight gland
								—1		With SUS304 watertight gland
								—2		With plastic watertight gland

Note: Specify no arrester for instrument used on liquid whose electrical conductivity is less than 100 μS/cm.

4. NOMENCLATURE OF COMPONENTS

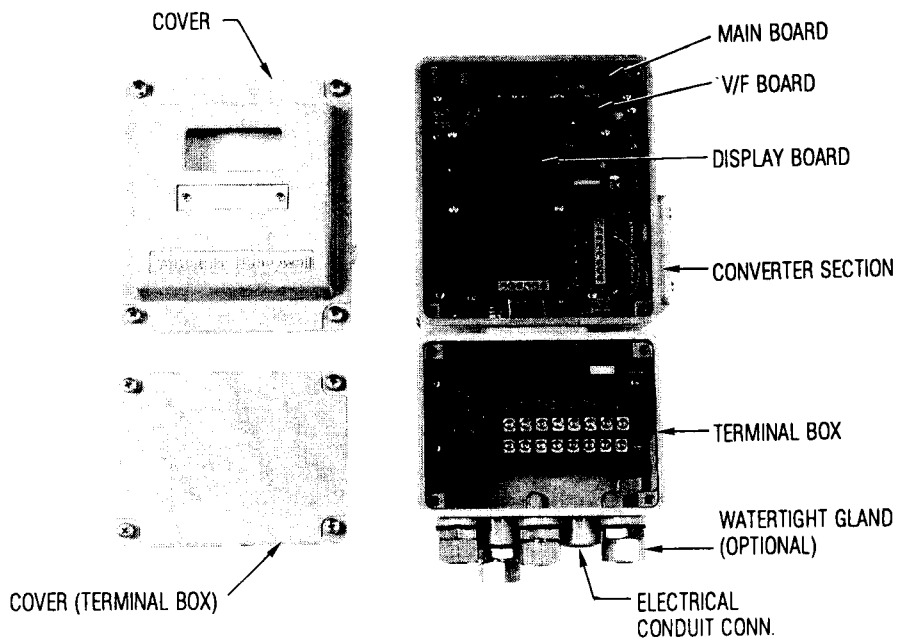


Figure 4-1. View of Remote Type Converter

The main board, V/F board and display board are made of unit-structure boards and can be readily installed or removed by means of simple connectors.

5. INSTALLATION

5.1 Identification by Nameplate

The major identification and specification items of the converter are indicated on the nameplate. Confirm referring to the nameplate that the converter is the correct one for the process. (When asking your Yamatake Corporation agent any questions on the converter, please mention the model number (MODEL), products number (PROD), and detector constant (EX) which are indicated on the nameplate.)

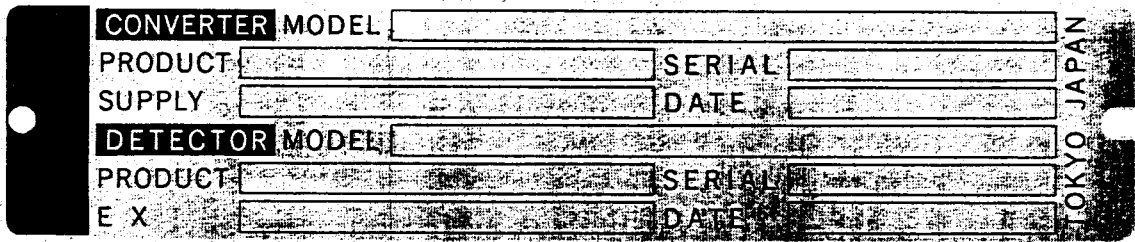


Figure 5-1. Nameplate

5.2 Dimension Drawings

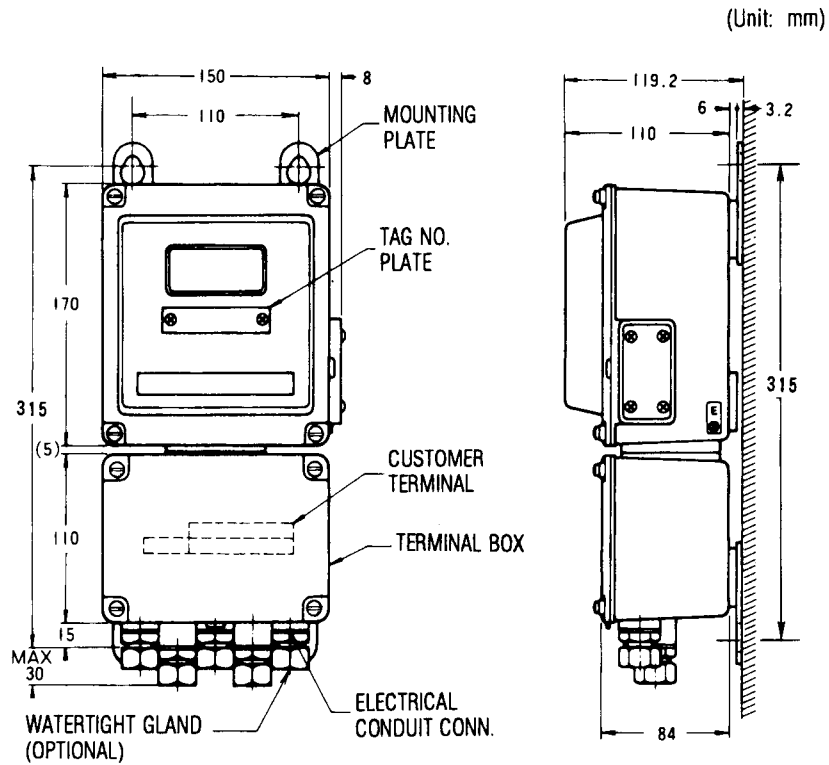


Figure 5-2. Wall Mounting

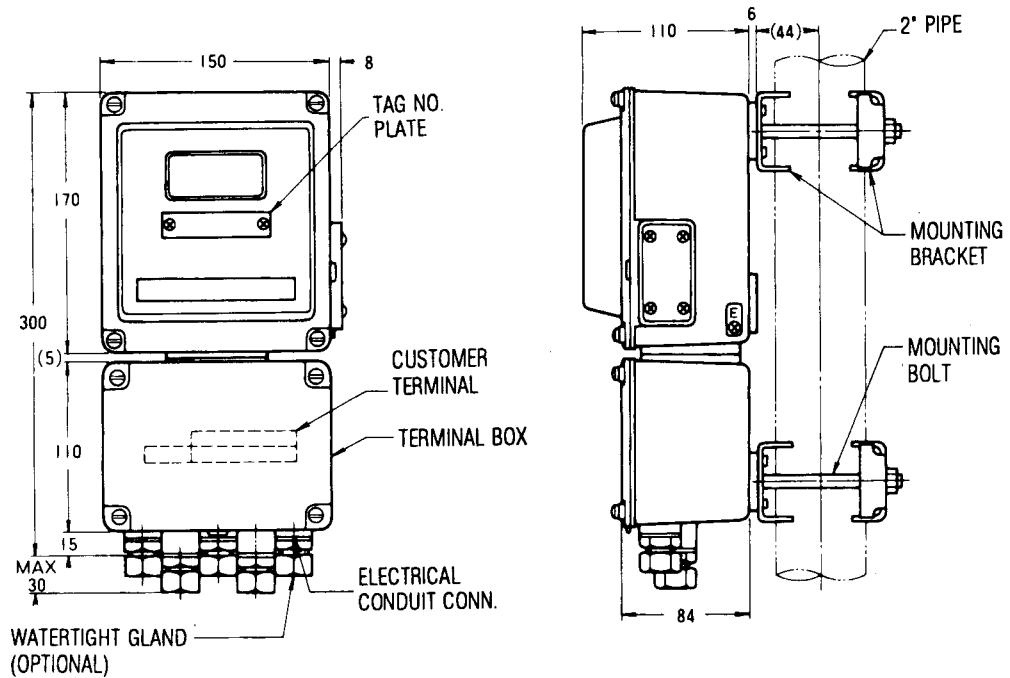


Figure 5-3. 2" Pipe Mounting

5.3 Installation of Converter

1) Notes for Installation of Converter

The ambient conditions of the place of installation of the converter must be as follows:

Temperature: -10 to 50°C

Humidity: 10 to 90% RH

Pay attention also to the following;

- (a) Select a place apart from electrical equipment (such as transformer) which may cause electromagnetic interference.
- (b) Select a place where is reasonably free from mechanical vibration.
- (c) Avoid, whenever avoidable, a place where is subjected to direct sunlight, rain, or other adverse weather.
- (d) Avoid, whenever avoidable, a dusty place.
- (e) Avoid, whenever avoidable, a place of corrosive atmosphere or high humidity.
- (f) Select a place where is convenient for service.

2) Mounting Method

The converter can be installed on a 2-inch pipe stanchion or on a wall. Install the converter in the position that its front cover is positioned vertically and its electrical cable connection ports are positioned at the bottom. When the converter has a built-in mercury relay, the position when in operation must be within 15 degrees of angle from the plumb.

5.4 Notes for Electrical Connections

1) Types of Cables

(a) Model KIW Cables Dedicated to MagneW

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

There are two types of signal cables: one is with shield drive and the other is without shield drive. The type of cable to be used depends on the detector size, electrical conductivity of measured fluid, and cable length as shown in Figures 5-4 and 5-5. Note that processing of cable terminals differs by the type of cable.

(1) Standard Specifications

Signal cable: 2-core individually-double-shielded cable
(nominal cross section 0.75 mm², OD 11.4 mm)

Exciting current cable: 2-core chloroprene-insulated cable
(nominal cross section 2 mm², OD 11.4 mm)

Weights: Signal cable Approx. 2 kg per 10 meters

Exciting current cable Approx. 1.5 kg per 10 meters

(2) Signal Cable With or Without Shield Drive

Whether a signal cable with or without shield drive should be used depends on the detector size, electrical conductivity of measured fluid and cable length as shown in Figures 5-11 and 5-12, where the clear sections are the areas which call for cables with shield drive and the shaded sections are the areas which do not call for shield drive. (See Table 5.1.)

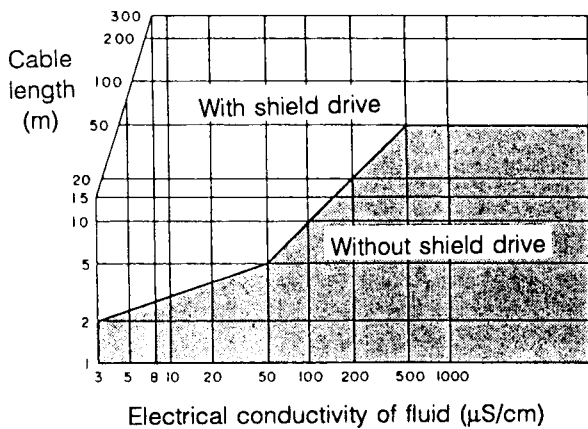


Figure 5-4. Detector Size 2.5 or 5 mm

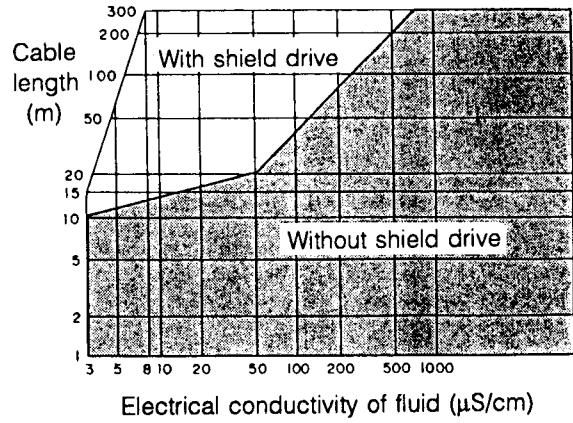



Figure 5-5. Detector Size 10 mm or Larger

(3) Model Number Table of KIW Cables Dedicated to MagneW

Table 5.1. Model Number Construction

Basic Model No.	Selections		Description	
	Cable Length (L)	End Processing		
		Detector Side		Converter Side
KIW			Dedicated cable for MagneW flowmeter	
	X1		Signal cable	
	1X		Exciting current cable	
	11		Signal/exciting current cable	
			3 digits. Unit: m	
		X		Without cable end terminal processing
		B	For Model KID□□B	
		X	Without cable end terminal processing	
		A	For Model NNX	Note 1
		B	For Model KIC10B	Note 1
		C	For Model KIC20B/33B	Note 1
		D	For Model KIC20B/33B	Note 2

Note 1: Specify when in the shaded section in Figure 5-4 or 5-5. (Without shield drive)

Note 2: Specify when in the clear section in Figure 5-4 or 5-5. (With shield drive)

(4) Model KIW Cable End Terminal Processing (For NNK Detectors)

DIMENSION DRAWING

Unit: mm

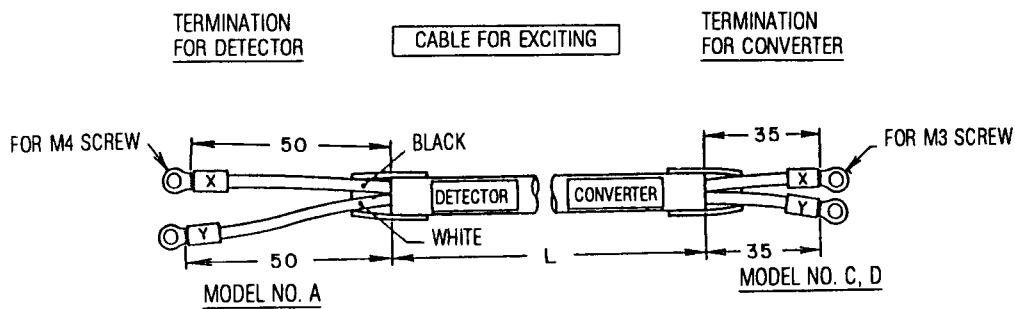
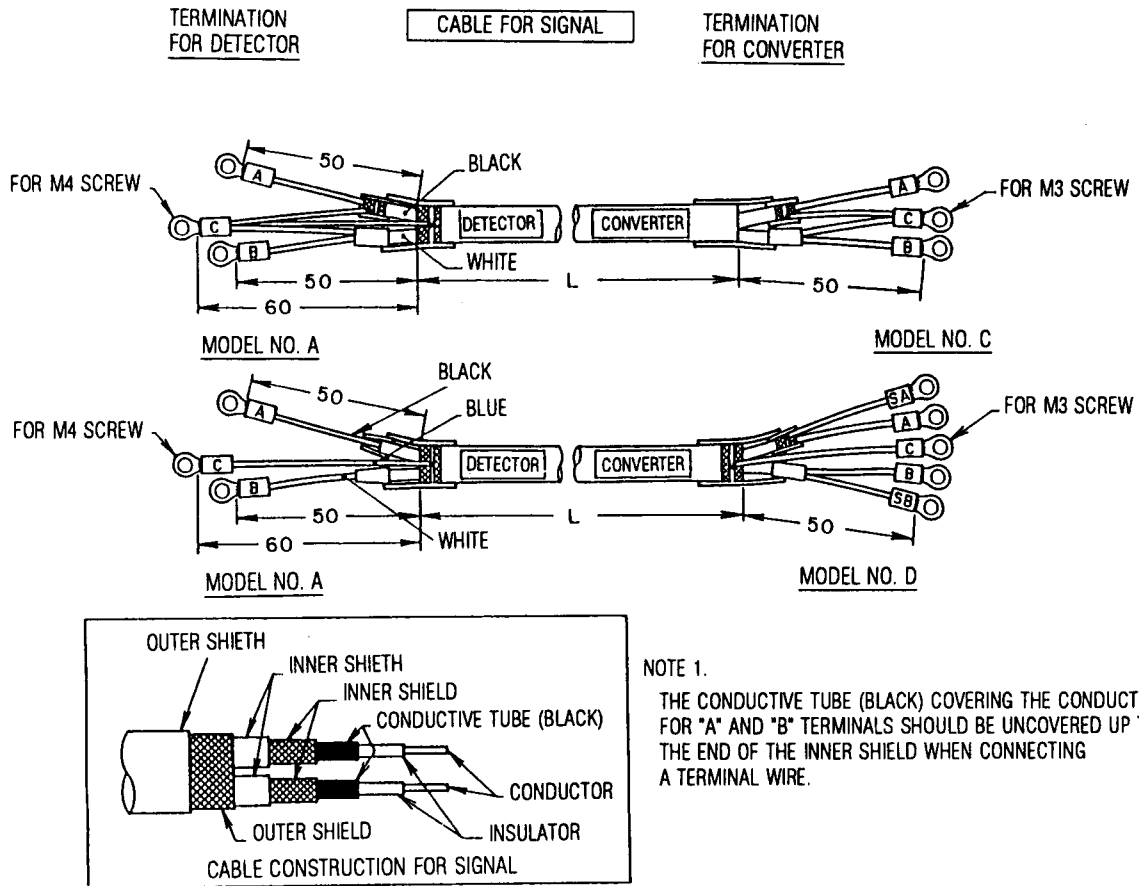
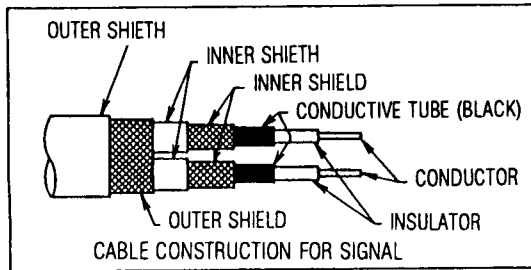
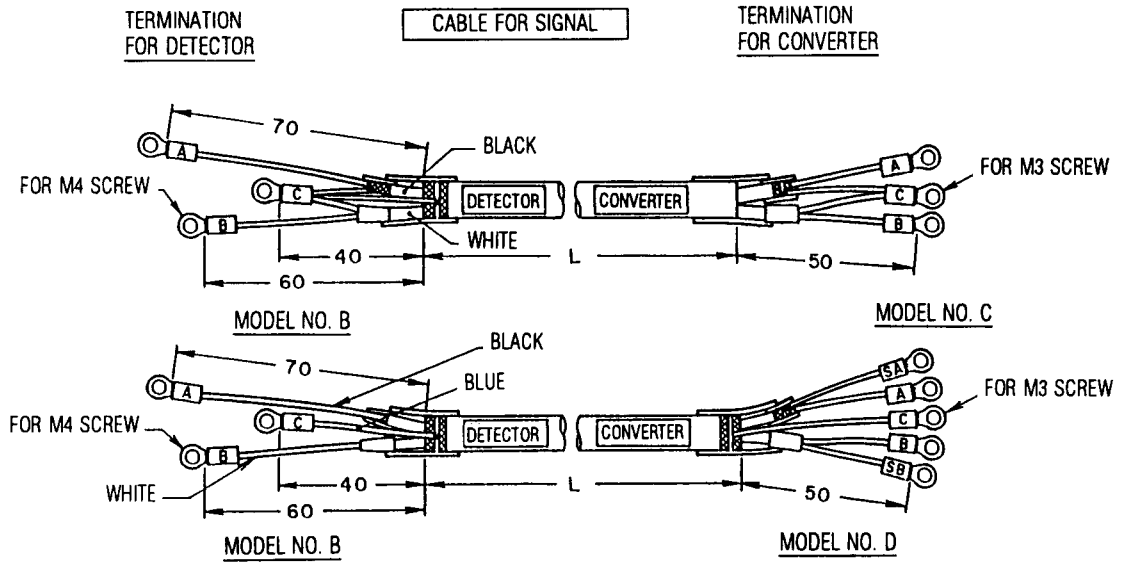


Figure 5-6. Model KIW Cable End Terminal Processing (For NNK)

(5) Model KIW Cable End Terminal Processing (For KID Detector)

DIMENSION DRAWING

Unit: mm



NOTE 1.

THE CONDUCTIVE TUBE (BLACK) COVERING THE CONDUCTOR FOR "A" AND "B" TERMINALS SHOULD BE UNCOVERED UP TO THE END OF THE INNER SHIELD WHEN CONNECTING A TERMINAL WIRE.

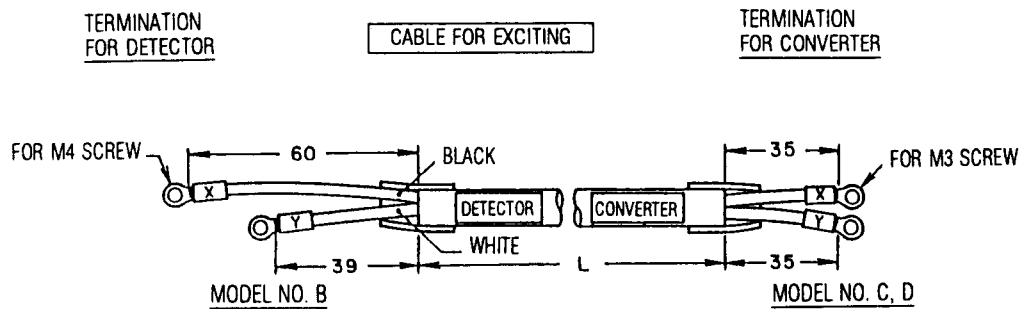


Figure 5-7. Model KIW Cable End Terminal Processing (For KID)

- (6) When using cables other than Model KIW dedicated to MagneW, use equivalent ones shown in Table 5.2 in the condition that they meet the requirements of the shaded sections shown in Figure 5-4 and 5-5.

Table 5.2. Types of Regular Cables Available on Market

Use	Type of cable (example)		Symbol (example)	Normal cross section	Finished OD	
Signal cable	2 cores, shielded	Control cable, polyethylene insulated, polyethylene sheathed, copper braid shielded	CEE-SB 2□ - 2 ^C	2 mm ²	11.4 mm	Capacitance between cores not greater than 200 PF
		Control cable, polyethylene insulated, vinyl sheathed, copper braid shielded	CEV-SB 2□ - 2 ^C			
Exciting current cable	2 cores	Control cable, polyethylene insulated, polyethylene sheathed	CEE 2□ - 2 ^C	2 mm ²	11.4 mm	Core resistance not greater than 6 Ω/300 m
		Control cable, polyethylene insulated, vinyl sheathed	CEV 2□ - 2 ^C			
Power cable (within 500 meters)	2 cores or 3 cores*	Control cable, vinyl insulated, vinyl sheathed	CVW 2□ - 2 ^C	2 mm ²	11.4 mm	
		Cross-linked polyethylene insulated and vinyl sheathed cable	CV			
Current output cable	2 cores (Shielded)	Control cable, vinyl insulated, vinyl sheathed (copper tape shielded)	CVW-S 2□ - 2 ^C CVW 2□ - 2 ^C	2 mm ²	11.4 mm	
Pulse output cables	2 cores (Shielded)	Instrumentation cable, polyethylene insulated vinyl sheathed, copper braid shielded	KPEV-SB 1.25□ - 1 ^P	1.25 mm ²	11.4 mm	

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

2) Laying of Cables

- (a) Do not lay the cables near a motor, a transformer or a large-current cable which may cause induction noise.
- (b) Lay the signal cable in a metallic conduit, a flexible tube or a duct, separately from the exciting current cable.
- (c) When a metallic conduit or a flexible tube is used, it is possible that dew is formed and water is entrapped in the tube. Lay the tube in such manner that no water gets into the instrument.
- (d) Do not employ any junction point for connection of the signal cable or the exciting cable between the detector and the converter. When it is unavoidable to employ a junction point, use the Cable Junction Box (Type NNZ002-X-X) which has been designed specifically for this purpose.

3) Grounding

- (a) At the detector side, be sure to ground the ground ring as per JIS Class 3 Grounding (grounding resistance 100 Ω or less.)
- (b) At the converter side, ground the E of the terminal block or the ground terminal of the case. The E terminal and the ground terminal are mutually connected in the instrument.
- (c) When a lightning arrester is incorporated, ground the grounding terminal as per JIS Class 3 Grounding (grounding resistance 10 Ω or less.)

4) Watertight Glands

- (a) Fully tighten the glands of the cable connection ports to make them watertight.
- (b) Watertight Gland Kit (optional)

To use the converter as a watertight unit, use watertight gland kits for the cable inlet/outlet. An exploded view of the watertight gland kit is shown in Figure 5-9. Pass the parts onto the cable in the order shown in Figure 5-8 and then tighten the gland.

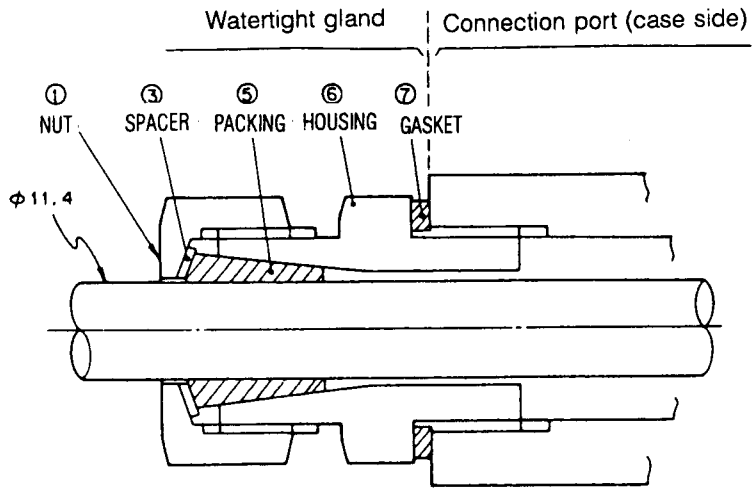


Figure 5-8. Structure of Watertight Gland

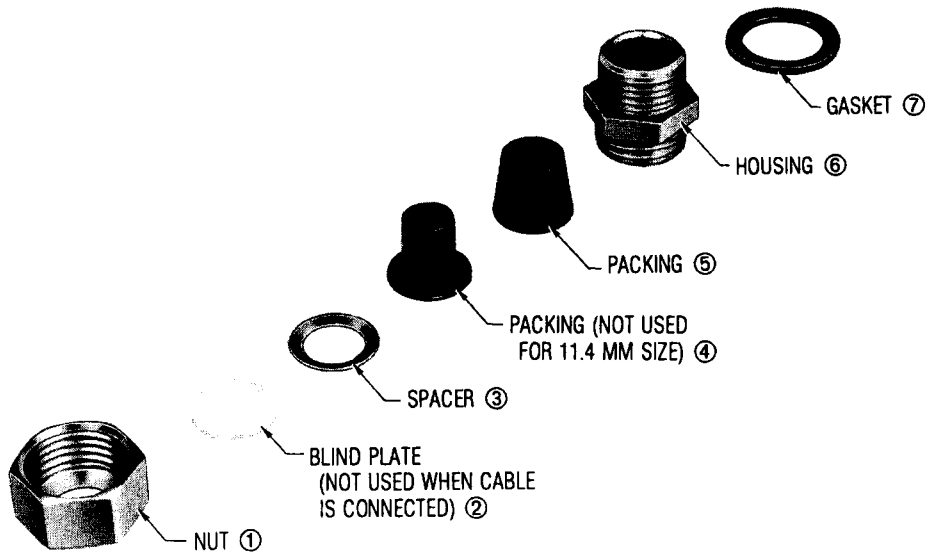
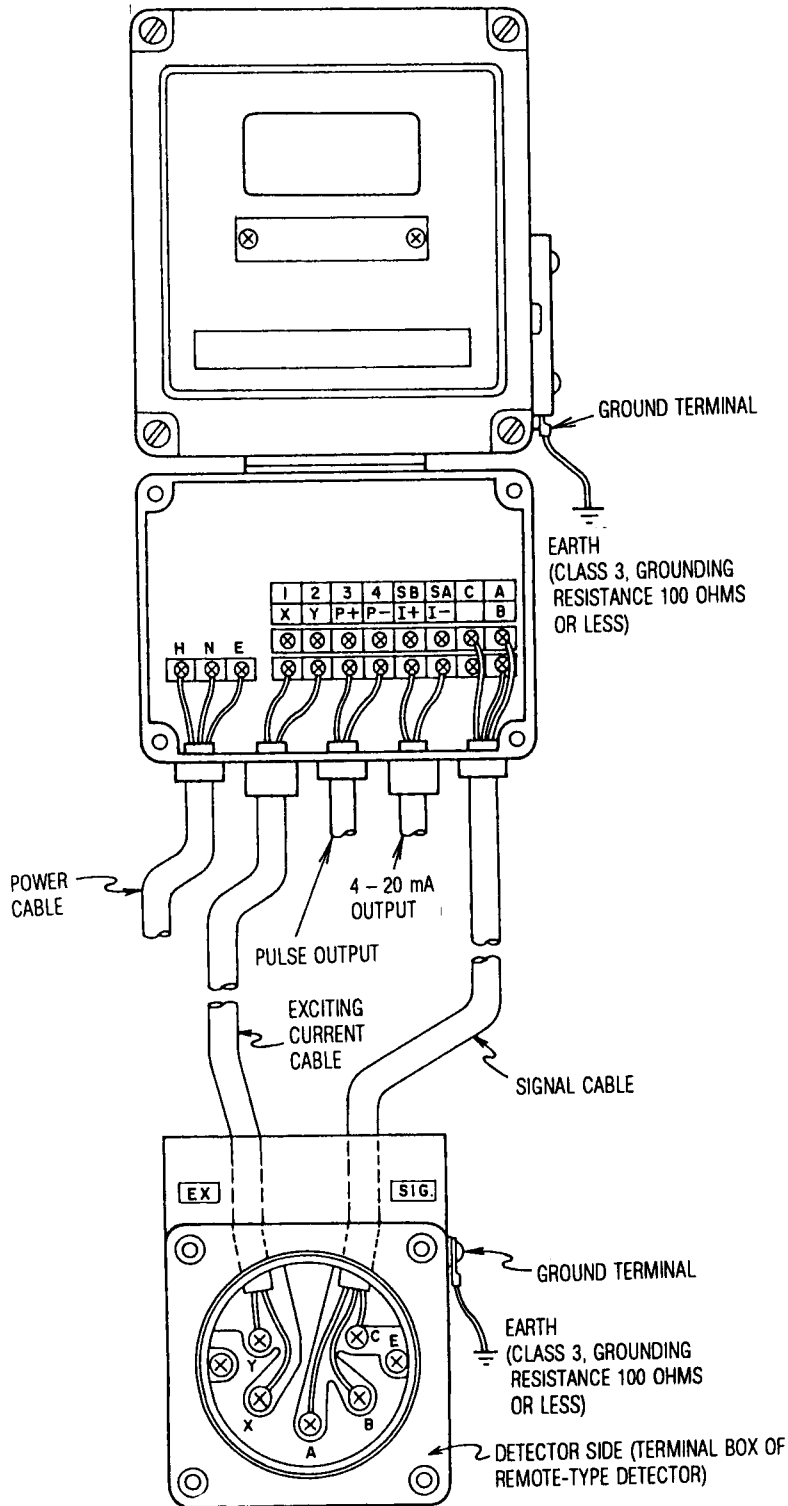


Figure 5-9. Watertight Gland Kit (Optional)

5.5 Cable Connections

1) Cable Connections for Detector and Converter

For connections of cables to the detector and converter, refer to Figure 5-10. Note that connections of signal cables differ depending on the detector size, electrical conductivity of measured fluid and cable length as mentioned in Section 5.4. For connections of signal cables, refer to Figure 5-11.



Converter (KIC20B) Terminals and Connections

Symbol	Connection
A	Flow signal input
B	
C	
SA	
SB	Current output
I +	
I -	Pulse output
P +	
P -	Exciting current output
X	
Y	
1	
2	
3	
4	

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

Detector (KID) Terminals and Connections

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

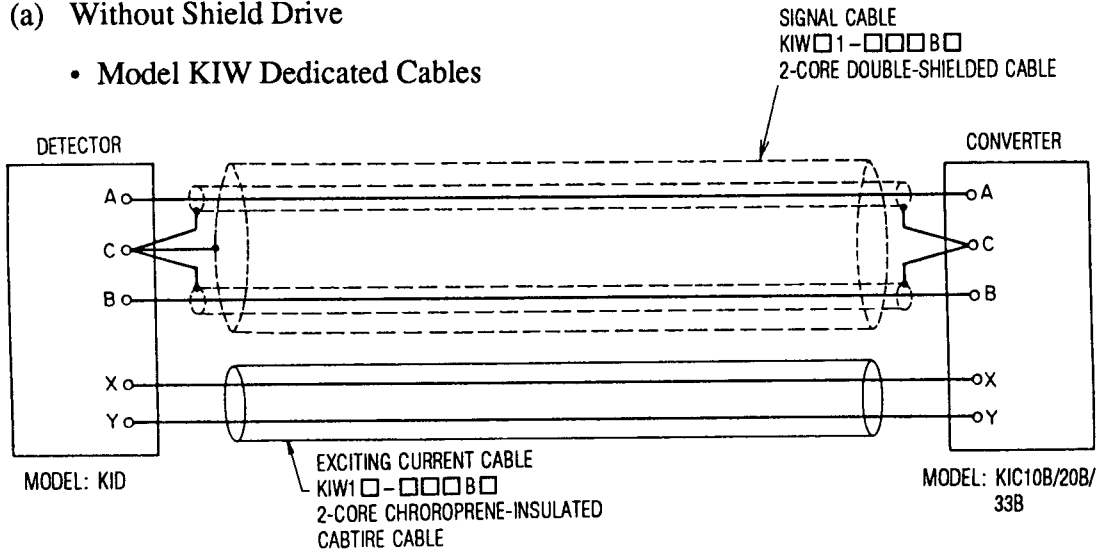
Figure 5-10. Cable Connections for Detector and Converter

2) Connections of Signal Cables

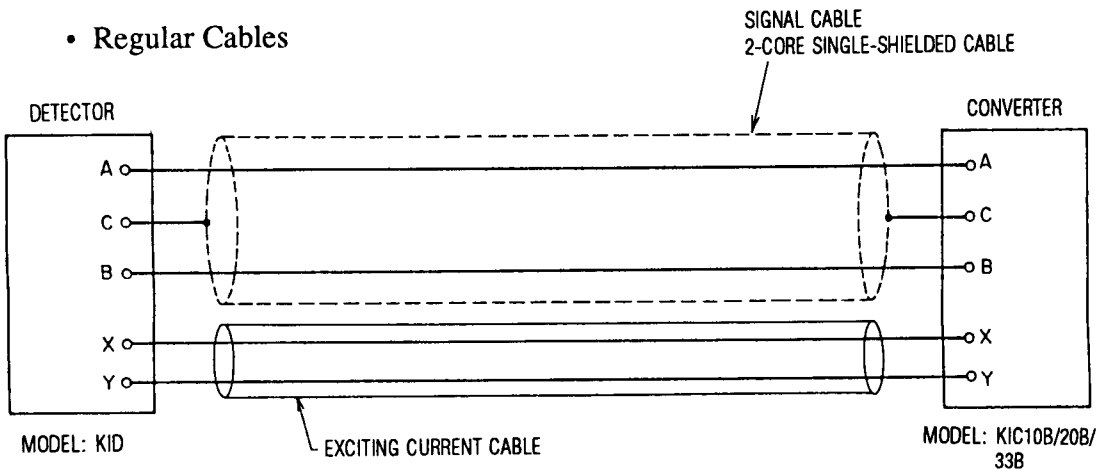
(For "shield drive," refer to Figures 5-4 and 5-5.)

(a) Without Shield Drive

- Model KIW Dedicated Cables



- Regular Cables



(b) With Shield Drive

- Model KIW Dedicated Cables

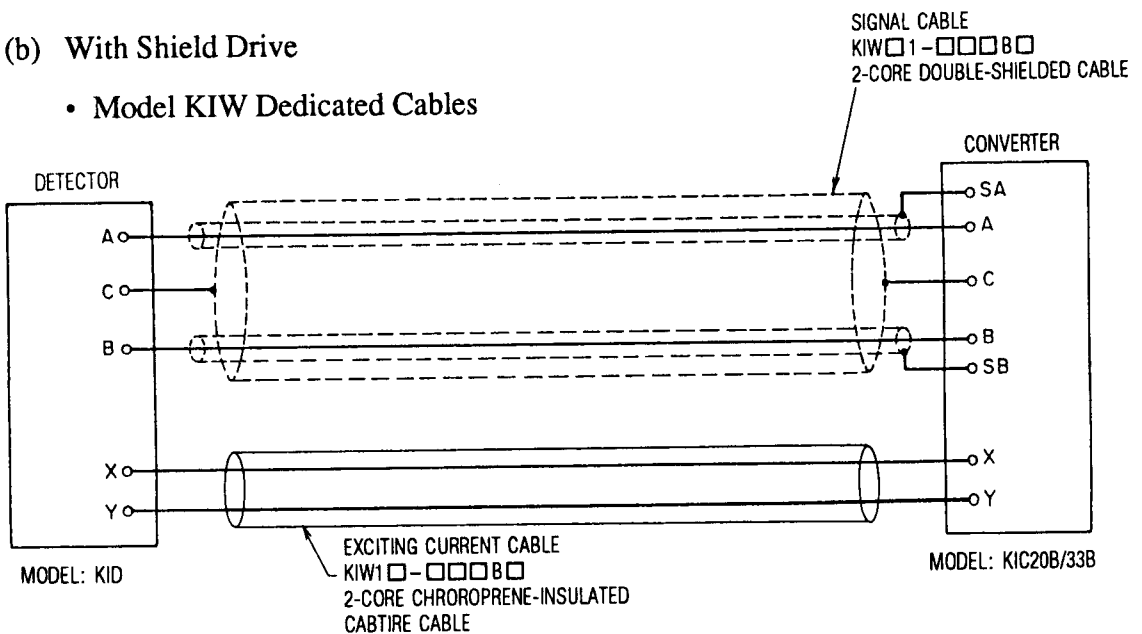


Figure 5-11. Connections of Signal Cables

6. OPERATION METHOD

6.1 Inspection

Inspect the items shown in Table 6.1.

Table 6.1

Section	Inspection Item
1. Overall flowmeter	<ol style="list-style-type: none">1) Check that the detector and converter are correctly installed.2) Check that the cables are correctly connected between detector and converter.
2. Detector flange section	<ol style="list-style-type: none">1) Check that gasket is properly set and not shifted.2) Check that all bolts are tightened.3) Check that the liquid is grounded.
3. Detector terminal section	<ol style="list-style-type: none">1) Check that the terminal screws are tightened.2) Check that the cables (cores) are not broken or shorted.3) Check that the cable inlet/outlet glands are tightened.4) Check that the terminal covers are securely installed.
4. Converter terminal section	Check the items the same as those of 3.
5. Converter case	Check that the case is grounded.

6.2 Preparation for Operation

- 1) Procedure before turning on power
 - (a) Fill the detector with stationary liquid.
 - (b) Turn on power of the converter. (Allow approximately 15 minutes of stabilization time after turning on power.)
- 2) Setting the detector constant (exciting current) and full-scale measuring flow velocity (measuring span).

When a detector and a converter are purchased in combination, the detector constant and the full-scale measuring flow velocity are set at the instrument manufacturer's factory before shipment.

When a detector or a converter alone is purchased, proceed as follows:

- Set the detector constant (exciting current) referring to Section 7.2, Item 2).
- Set the full-scale measuring flow velocity (measuring span) referring to Section 7.2.

- 3) Zero adjustment

When zero adjustment is unattainable with the FINE ZERO control alone, adjust the COARSE ZERO control.

- (a) When the display board is provided (see Figure 6-1), adjust the FINE ZERO control so that the average value of digital meter reading becomes 00.0%.

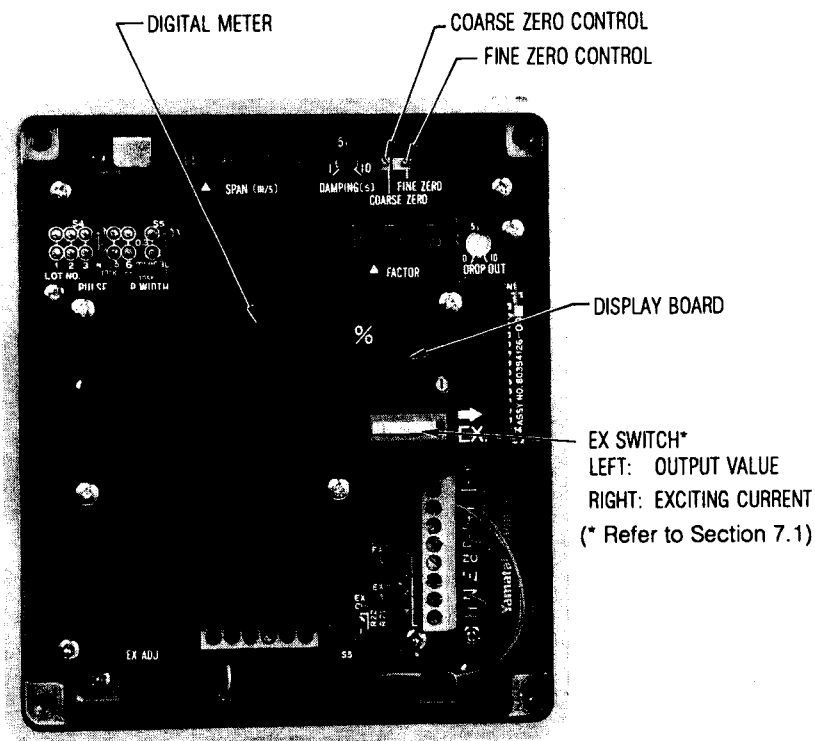


Figure 6-1. Zero Adjustment When Display Board is Provided

- (b) When no display board is provided (see Figure 7-2), connect a ammeter between current output terminals I+ and I-, and adjust the FINE ZERO control so that the output current becomes 4.000 mA.

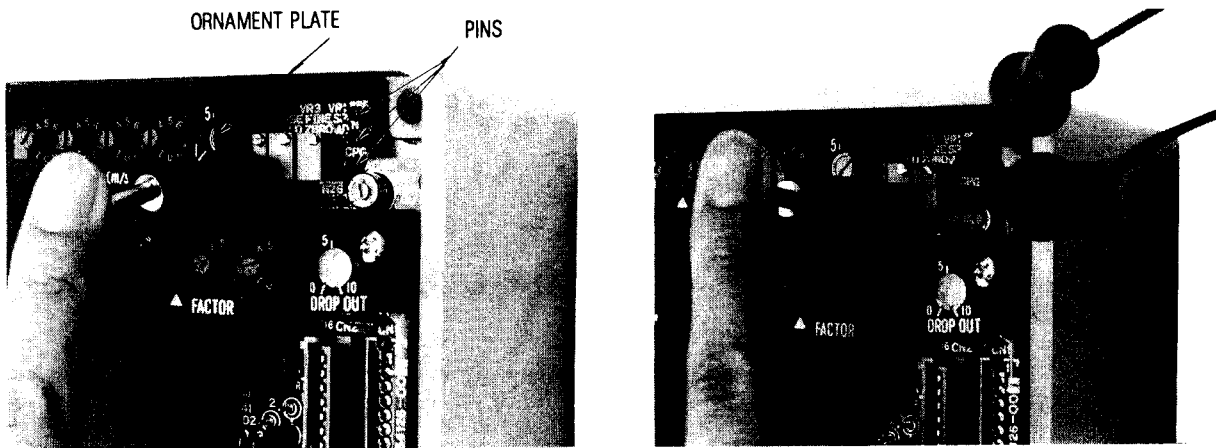


Figure 6-2. Location of the Pins

- (c) When the instrument is incorporated with the pulse output function alone (without 4 to 20mA DC output or display board), check that the voltage of the 0 to 1V CHECK pins on Figure 6-2 (CPG and ACOM pins) is 0.00V as measured with a digital voltmeter connected to these pins.

To gain access to the CHECK pins, loosen the screws at the top of the right-most position and raise the flexible ornament plate. The location of the pins is as shown in Figure 6-2. Of the three pins, use the green one "CPG" (+) and the black one "ACOM" (-).

If the voltage is not 0.00V adjust it to 0.00V by means of the FINE ZERO control potentiometer.

Note: Do not disturb the set condition of the SPAN control potentiometer.

6.3 Operation Method

Preparation for operation is complete by the above procedure. The instruments are ready to operate. Make the following adjustments as required.

- 1) Damping Adjustment (Refer to Figure 7-2)

When the output pulsates and requires smoothing, adjust the damping trimmer. The damping time constant is continuously variable for a range of 1 to 10 seconds.

2) Dropout Adjustment (Refer to Figure 7-4)

When the pulse output near the zero point is required to be cut off due to such reason as pulsation, adjust the dropout range with the dropout trimmer. The dropout point is continuously variable for a range of 0 to 10%.

Note: The damping time constant is as defined with the time required by the output for changing from 0 to 63.2% in response to 0 to 100% positive-going stepwise input change.

6.4 Simple Troubleshooting

If no correct output is delivered even when operation adjustments are made as explained in the above, check the following items.

1) When no output at all is delivered

- (a) Check the cable connections.
- (b) Check that the current output load is not greater than 600 ohms.
- (c) Check that the detector pipe is filled with liquid.
- (d) Check that the detector's direction conform with the fluid flow direction.

If no output is delivered even when the above items are correct, check the converter.

2) When the output deflects overscale

- (a) If the flow setting is too small, the output will deflect overscale. Set the instrument at a correct span by calculating the full-scale flow velocity (span) referring to Section 7.2.
- (b) Check that the detector pipe is filled with liquid.

3) When the output sways largely

- (a) Check that the signal cable is not laid near a heavy duty power cable.
- (b) If the flow itself is pulsation, adjust the damping trimmer. (Refer to Section 6.4,1)).
- (c) Check that no air bubbles are entrapped in the detector. If bubbles are entrapped, eliminate them.

7. ADJUSTMENT

7.1 Adjustment of Detector Constant (Exciting Current)

To check the exciting current, through the EX switch (refer to Figure 6-1) to the right-hand position so that the digital meter indicates the exciting current (mA). When no display board is provided, adjust by item 2).

1) Exciting Current Waveform Check

A fixed resistor ($1 \Omega \pm 0.1\%$) is connected between exciting current check terminals EX+ and EX- (Refer to Figure 7-3). This resistor is connected in series to the exciting coil. The exciting current waveform can be monitored by displaying the check terminal voltage using an instrument (such as an oscilloscope) which has a sufficiently large input impedance as compared with the detecting resistor resistance (1 ohm).

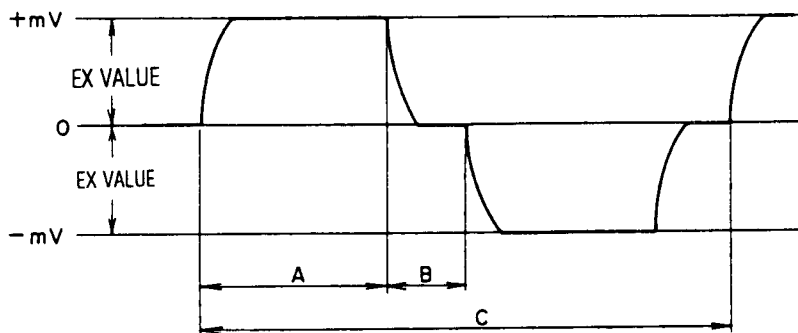


Figure 7-1. Exciting Current Waveform

- Abnormal if waveform fluctuates largely.
- Normal if waveform is symmetrical in the positive and negative directions.
- Normal if the values measured for the period of A – C is as shown in Table 7.1.

Table 7.1

KEY NO. \ Spec.	50 Hz	60 Hz	24V DC (40 Hz)
A	60 msec	50 msec	75 msec
B	20 msec	16.7 msec	25 msec
C	160 msec	133.3 msec	200 msec

2) Adjustment of Detector Constant (Exciting Current)

Since the exciting current when in the normal operating state deflects both in the positive and negative directions, it cannot be directly measured and adjusted. To measure the exciting current, change the exciting current check plug (S5)* to the EX CHK side so that the current deflects only in the positive or negative direction, measure the voltage between the exciting current check terminals using a digital voltmeter, and check terminals using a digital voltmeter, and check that the current conforms with that specified on the detector nameplate.

* Refer to Figure 7-2.

If the measured current does not conform with the specified current, adjust the exciting current trimmer EX ADJ (VR5). The current increases as you turn the trimmer clockwise.

Be sure to return the exciting current check plug to the NORMAL position after the check is over.

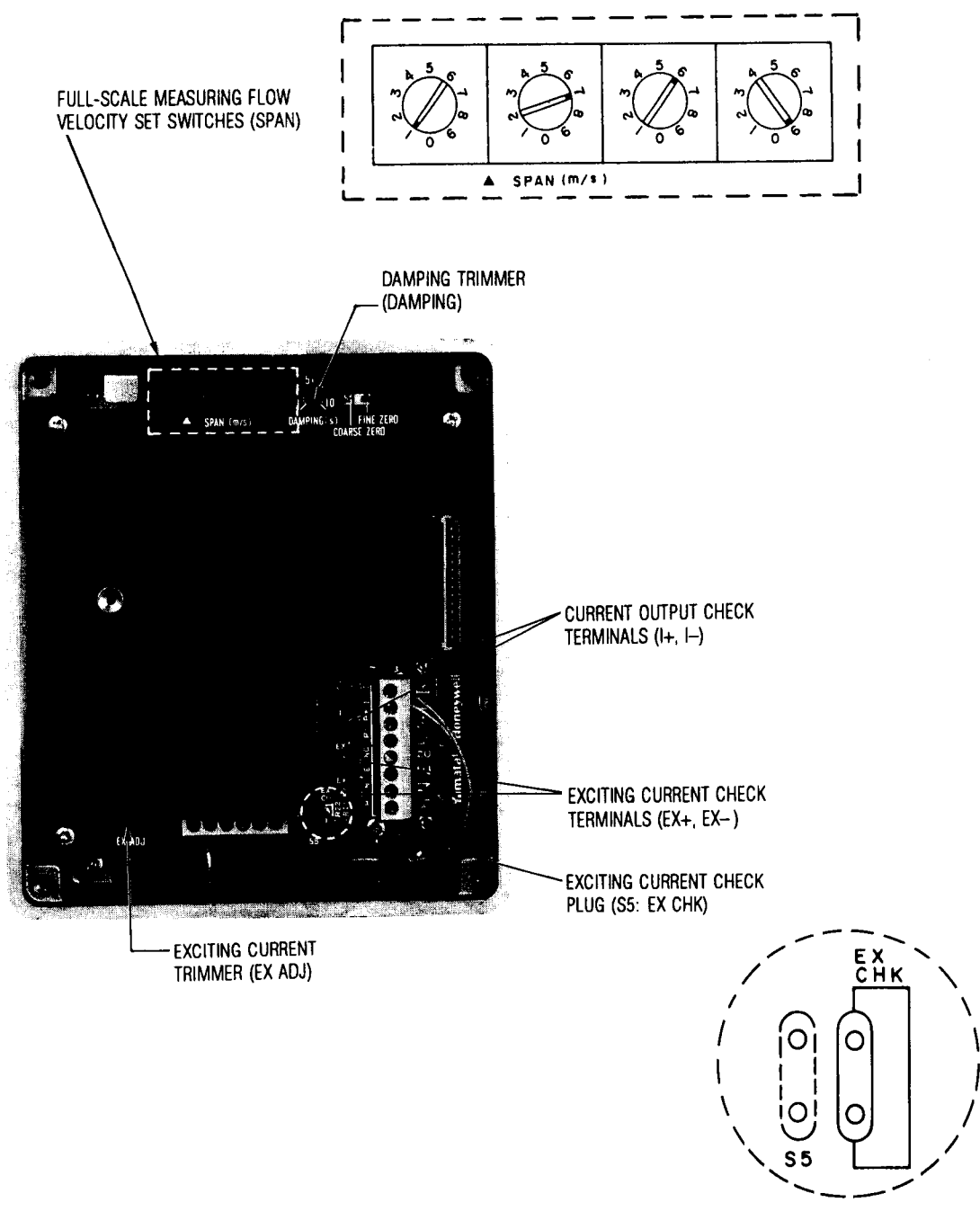


Figure 7-2. Main Board

7.2 Change of Full-scale Flow Velocity (Span)

The measuring span is an electromagnetic flowmeter is defined not with a flow rate but with a flow velocity. The full-scale flow velocity (V_{FS}) can be known by multiplying the maximum flow rate by a flow velocity span coefficient (K) as shown in Table 7.2.

$$V_{FS} \text{ (m/sec)} = K \times A \text{ (m}^3\text{/h)}$$

Example of calculation:

When the nominal size of the flowmeter is 100 mm and the full-scale flow rate (A) is 50 m³/hour, the full-scale measuring flow velocity (span) V_{FS} is calculated as follows:

$$\begin{aligned} V_{FS} \text{ (m/sec)} &= K \times A \text{ (m}^3\text{/h)} \\ &= 0.03537 \times 50 \\ &= 1.769 \text{ (m/sec)} \end{aligned}$$

where, V_{FS} (m/sec) : Full-scale flow velocity (span)

K : Flow span coefficient (0.03537 for nominal size 100 mm as shown in Table 7.1)

A (m³/h) : Full-scale flow rate 50 m³/h

Table 7.2. Flow Velocity Span Coefficient (K)

Nominal size (mm)	Flow velocity span coefficient K	Flow rate (m ³ /h) Q	Flow velocity (m/s) V
2.5	56.59	0.0053 to 0.177	0.3 to 10m/s
5	14.15	0.021 to 0.707	
10	3.537	0.085 to 2.83	
15	1.572	0.19 to 6.36	
25	0.5659	0.53 to 17.7	
40	0.2210	1.36 to 45.2	
50	0.1415	2.12 to 70.7	
80	0.05526	5.43 to 181	
100	0.03537	8.48 to 283	
150	0.01572	19.1 to 636	
200	0.008842	34.0 to 1,131	
250	0.005659	53.1 to 1,767	
300	0.003930	76.4 to 2,545	
350	0.002887	104 to 3,464	
400	0.002210	136 to 4,524	
500	0.001415	212 to 7,070	
600	0.0009824	305 to 10,179	

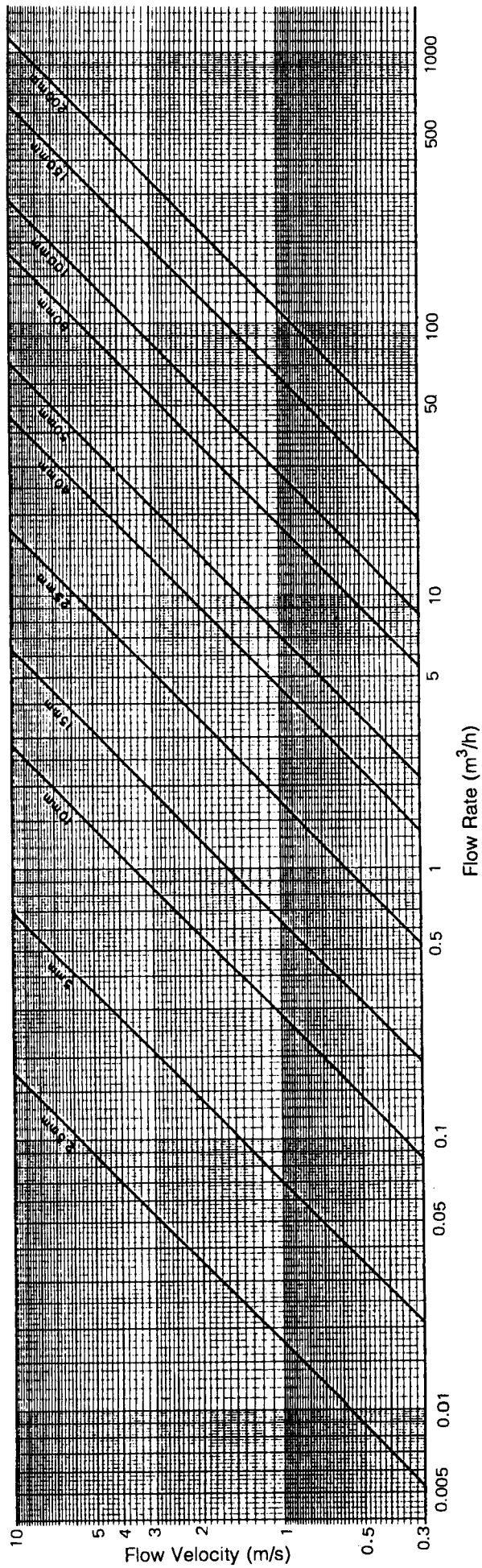


Table 7.3. Flow Rate/Velocity Conversion Chart

2) Setting of Full-scale Flow Velocity (Span)

Set the full-scale flow velocity with the SPAN (m/s) digital switches of the main board (see Figures 7-3 and 7-4). For the above calculation example where the full-scale flow velocity is 1.769 (m/sec), set the digital switches as shown in Figure 7-4.

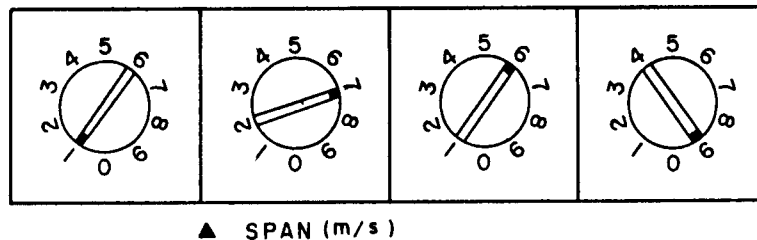


Figure 7-3. Digital Switches for Full-scale Flow Velocity (Span) Setting

7.3 Pulse Outputs

1) Type of Pulse Outputs

Four types of pulse outputs, namely, high speed voltage pulse, open collector pulse, magnetic counter drive pulse, and mercury relay contact pulse, are available. The former three pulses, namely, high speed voltage pulse, open collector pulse, and magnetic counter drive pulse, are provided on the same V/F board (Figure 7.4) and can be selected with the pulse output selector plugs (S6 and S7). However, they cannot be changed to the mercury relay contact pulse output.

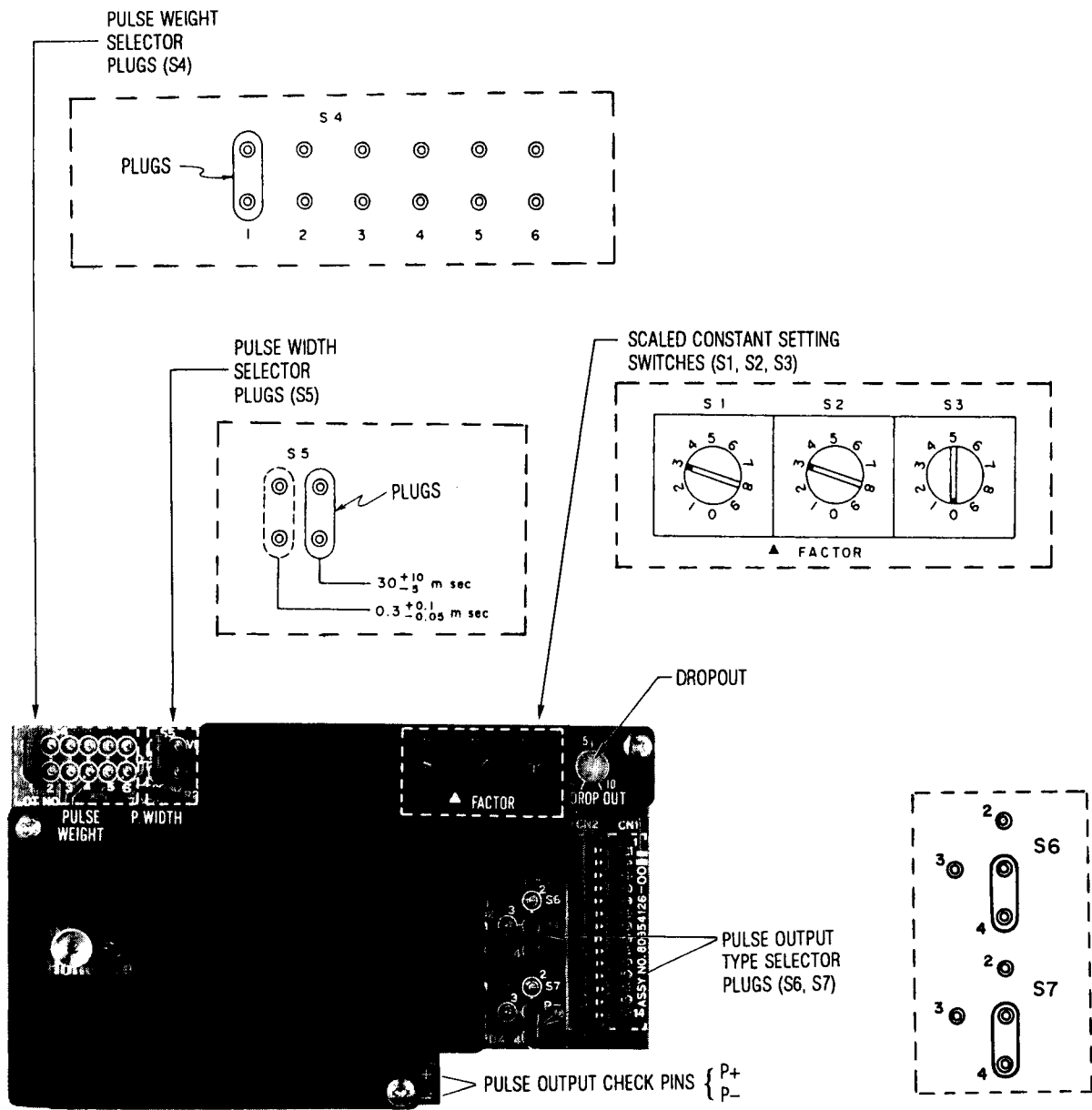
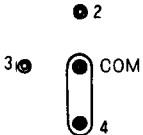
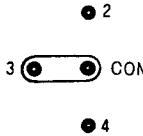
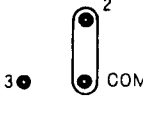
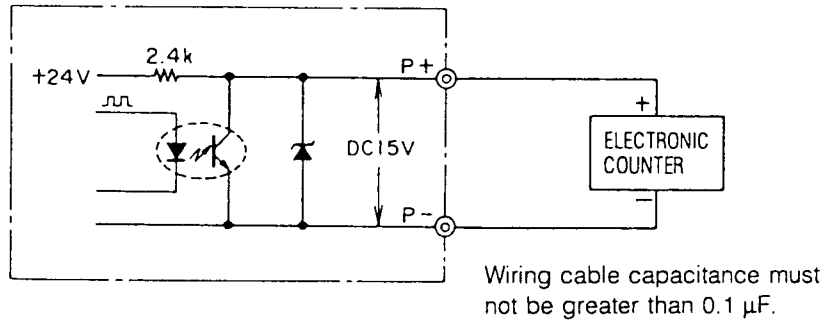


Figure 7-4. V/F Board

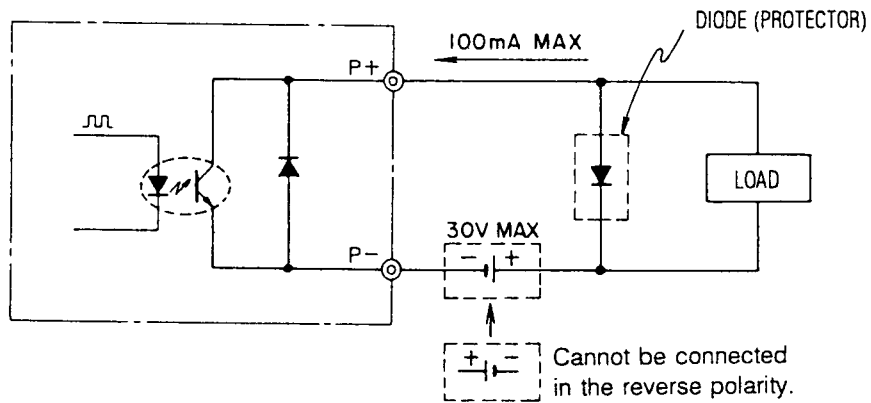
Table 7.4. Types of Pulse Outputs and Settings for Selection

Type of Pulse Output	Setting for Selection (Setting of S6, S7)	External Load and Connections	Remark
High-speed voltage pulse output		<ul style="list-style-type: none"> • 15V DC • Load resistance 5 kΩ or output <p style="text-align: right;">(Note 1)</p>	
Open-collector pulse output		<ul style="list-style-type: none"> • 30V DC MAX • 100mA MAX <p style="text-align: right;">(Note 2)</p>	<p>Since the high-speed voltage pulse, open-collector pulse, and magnetic counter drive pulse are generated by the same V/F board, they are selectable with the pulse output selector plugs (S6 and S7).</p>
Magnetic counter drive pulse output		<p>Requirements of magnetic counter:</p> <ul style="list-style-type: none"> • Coil voltage 24V DC • Coil resistance 210 ohms • Power consumption 3 watts • Resistance of wiring to and from magnetic counter must not be greater than 50 ohms. • Provide a spark killer in the external load circuit. <p style="text-align: right;">(Note 3)</p>	
Mercury relay counter pulse output		<ul style="list-style-type: none"> • 30V DC MAX • 300mA MAX • Provide a spark killer in the external load circuit. <p style="text-align: right;">(Note 4)</p>	

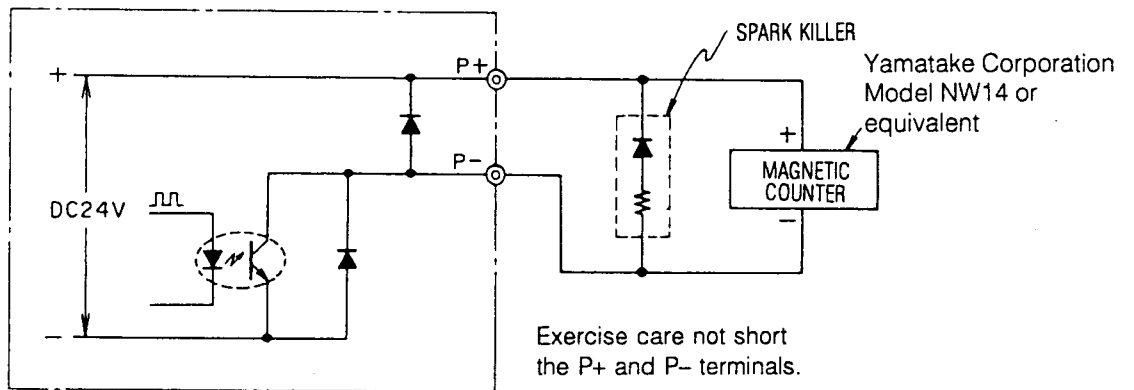
(Note 1): High-speed Voltage Pulse Output



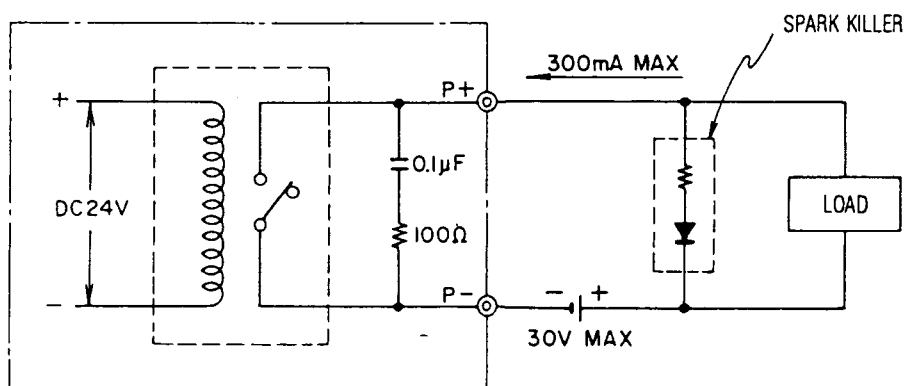
(Note 2): Open-collector Pulse Output



(Note 3): Magnetic Counter Drive Pulse Output



(Note 4): Mercury Relay Contact Pulse Output



2) Setting of Scaled Constant

- (a) The "scaled constant" is defined by converting the full-scale flow velocity (span) into the m³/h unit, calculating a value of

$$\text{Effective figure (3 digits)} \times 10^X$$

and employing the three most-significant digits of the calculated value. A scaled constant is needed for setting a pulse weight.

- (b) Calculation of scaled constant

Convert the full-scale flow rate (span) measuring unit into that of m³/h. For example, when the measuring unit is l/min, convert it into m³/h as follows:

$$Q \text{ (m}^3\text{/h)} = 0.06 \times Q \text{ (l/min)}$$

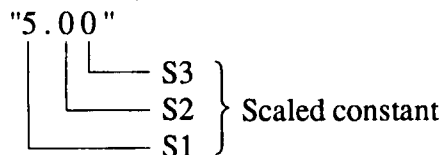
Calculation examples are given in the following:

(Note: Zero cannot be set for S1.)

Example 1: When $Q = 50 \text{ m}^3\text{/h}$, it can be written as

$$Q = 5.00 \times 10^1 \text{ m}^3\text{/h.}$$

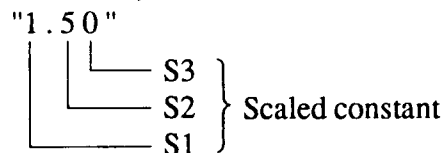
Therefore, set S1 to S3 for



Example 2: When $Q = 0.15 \text{ m}^3\text{/h}$, it can be written as

$$Q = 1.50 \times 10 \text{ m}^3\text{/h.}$$

Therefore, set S1 to S3 for



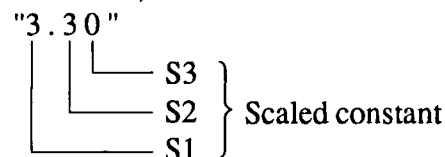
Example 3: When $Q_l = 550 \text{ l/min}$, convert it into a measuring unit of m³/h as follows:

$$Q = 0.06 \times Q_l = 0.06 \times 550 = 33 \text{ (m}^3\text{/h)}$$

$$Q = 33 \text{ m}^3\text{/h}$$

$$Q = 3.30 \times 10^1 \text{ m}^3\text{/h}$$

Therefore, set S1 to S3 for



(c) Setting of scaled constant (See Figures 7-4 and 7-5.)

For "3.30" which has been calculated in Example 3, set S1 to S3 as shown in Figure 7-6.

Note: Zero cannot be set for S1.

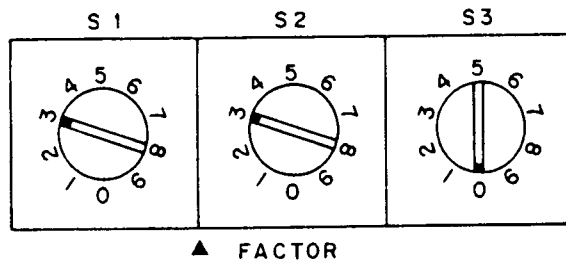


Figure 7-5. Example of Setting of Scaled Constant

3) Setting of Pulse Width

(a) Limit of pulse width

Pulse width is limited by the type of pulse output. See Table 7.5.

Table 7.5. Limit of Pulse Width

Type of Pulse Output	Pulse Width
Open-collector pulse or high-speed voltage pulse	30^{+10}_{-5} msec or $0.3^{+0.1}_{-0.05}$ msec
Magnetic counter drive pulse or mercury relay contact pulse	30^{+10}_{-5} msec

(b) Pulse width setting can be done with the pulse width selector plug (S5). See Figures 7-4 and 7-6.

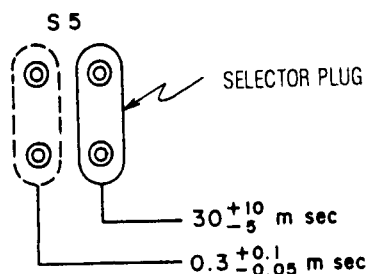


Figure 7-6. Pulse Width Selector Plug

4) Setting of Pulse Weight

- (a) Pulse weight setting can be done with the pulse weight selector plug (S4). See Figures 7-4 and 7-7.

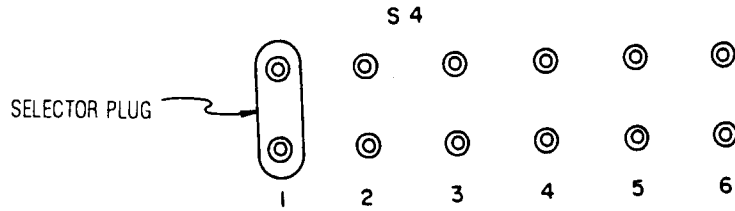


Figure 7-7. Pulse Weight Selector Plug

- (b) Pulse width setting conditions

There are certain conditions for setting of the pulse weight selector plug (S4). These conditions are type of output pulse, pulse width, and scaled constant.

Table 7.6. Pulse Weight Setting Conditions

Type of Pulse Output (S6, S7)	Pulse Width (S5)	Scaled Constant (S1, S2, S3)	Positions selectable with the pulse weight selector plug (S4). (The positions indicated by the circlets are selectable.)					
			1	2	3	4	5	6
Open-collector or high-speed voltage pulse output	30^{+10}_{-5} msec	1.00 to 6.00	—	—	○	○	○	○
		6.01 to 9.99	—	—	—	○	○	○
	$0.3^{+0.1}_{-0.05}$ msec	1.00 to 6.00	○	○	○	○	○	○
		6.01 to 9.99	—	○	○	○	○	○
Magnetic counter drive or mercury relay contact pulse output	30^{+10}_{-5} msec	1.00 to 6.00	—	—	○	○	○	○
		6.01 to 9.99	—	—	—	○	○	○

- (c) The selectable range of pulse weight depends on pulse width and the maximum measuring flow rate Q (m^3/h). Select a pulse weight with the selector plug (S4). Pulse width is limited by the type of the pulse output. (See Table 7.5.)

Table 7.7. Pulse Weight Selection Table (with pulsewidth 30 msec)

Position where pulse weight selector plug (S4) can be set Full-scale flow rate Q (m^3/h)	1	2	3	4	5	6
0.00100 to 0.00600	—	—	0.1 cc/p	1 cc/p	10 cc/p	100 cc/p
0.00601 to 0.00999	—	—	—			
0.0100 to 0.0600	—	—	1 cc/p	10 cc/p	100 cc/p	1 l/p
0.0601 to 0.0999	—	—	—			
0.100 to 0.600	—	—	10 cc/p	100 cc/p	1 l/p	10 l/p
0.601 to 0.999	—	—	—			
1.00 to 6.00	—	—	100 cc/p	1 l/p	10 l/p	100 l/p
6.01 to 9.99	—	—	—			
10.0 to 60.0	—	—	1 l/p	10 l/p	100 l/p	1 m^3/p
60.1 to 99.9	—	—	—			
100 to 600	—	—	10 l/p	100 l/p	1 m^3/p	10 m^3/p
601 to 999	—	—	—			
1000 to 6000	—	—	100 l/p	1 m^3/p	10 m^3/p	100 m^3/p
6010 to 9990	—	—	—			
10000 to 60000	—	—	1 m^3/p	10 m^3/p	100 m^3/p	1000 m^3/p
60100 to 99900	—	—	—			

Barred items are not selectable.

Table 7.8. Pulse Weight Selection Table (with pulsewidth 0.3 msec)

Position where pulse weight selector plug (S4) can be set Full-scale flow rate Q (m ³ /h)	1	2	3	4	5	6
0.00100 to 0.00600	0.001 cc/p	0.01 cc/p	0.1 cc/p	1 cc/p	10 cc/p	100 cc/p
0.00601 to 0.00999	—					
0.0100 to 0.0600	0.01 cc/p	0.1 cc/p	1 cc/p	10 cc/p	100 cc/p	1 l/p
0.0601 to 0.0999	—					
0.100 to 0.600	0.1 cc/p	1 cc/p	10 cc/p	100 cc/p	1 l/p	10 l/p
0.601 to 0.999	—					
1.00 to 6.00	1 cc/p	10 cc/p	100 cc/p	1 l/p	10 l/p	100 l/p
6.01 to 9.99	—					
10.0 to 60.0	10 cc/p	100 cc/p	1 l/p	10 l/p	100 l/p	1 m ³ /p
60.1 to 99.9	—					
100 to 600	100 cc/p	1 l/p	10 l/p	100 l/p	1 m ³ /p	10 m ³ /p
601 to 999	—					
1000 to 6000	1 l/p	10 l/p	100 l/p	1 m ³ /p	10 m ³ /p	100 m ³ /p
6010 to 9990	—					
10000 to 60000	10 l/p	100 l/p	1 m ³ /p	10 m ³ /p	100 m ³ /p	1000 m ³ /p
60100 to 99900	—					

Barred items are not selectable.

(d) Examples of pulse weight setting

Example 1: Unit-volume pulse weight

Conditions

Type of pulse output: Open collector

Pulse width: 30 msec

Scaled constant: 7.00

Full-scale flow rate Q (m³/h): 70 m³/h

The scaled constant for the full-scale flow rate Q (m³/h) can be determined as follows. For details, refer to 7.3, 2).

Q = 70 m³/h given condition

Q = 7.00 × 10¹ m³/h decimal-point adjust

Therefore, a scaled constant is found to be 7.00.

From the above conditions, the positions where the pulse weight selector plug (S4) can be set are found as shown in Table 7.9.

Table 7.9

Positions where pulse weight selector plug (S4) can be set. (The positions indicated by the circlets are selectable.)					
1	2	3	4	5	6
—	—	—	○	○	○

○ : Selectable

Thus, it can be known that positions 4 to 6 are selectable with the plug.

Since the full-scale flow rate Q (m³/h) is known to be 70 m³/h and the selectable positions of the plug to be 4 to 6, selectable pulse weights (with pulsewidth 30 msec) can be known to be as shown in Table 7.10 (referring to Table 7.7).

Table 7.10

Position where pulse weight selector plug (S4) can be set	1	2	3	4	5	6
Full-scale flow rate Q (m ³ /h)						
60.1 to 99.9	—	—	—	10 l/p	100 l/p	1 m ³ /p

Select one of 10 l/p, 100 l/p, and 1 m³/p.

Pulse weight setting can be made with the pulse weight selector plug (S4) shown in Figures 7-5 and 7-8.

Example 2: Unit-weight pulse weight

Assuming that the conditions are as shown in Example 1 and that the specific-gravity is 1.1, the scaled constant can be calculated by multiplying the maximum measuring flow rate Q [m³/h] by specific-gravity as follows:

$$\text{Scaled constant} = 7.00 \times 1.0 = 7.70$$

Therefore, the scaled constant should be set at 7.70.

7.4 AC Line Voltage Setting Change

When the power units are changed, check that the AC line voltage change jumper is set in the correct position as shown in Table 7.11.

Table 7.11

Parts No.	80354246-001	80354246-002
Jumper Position		
1	100 V	200 V
2	110 V	220 V
3	120 V	240 V

8. CALIBRATION

Check of Converter

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

8.1 Calibration of Converter with Calibrator KIZ006

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

(a) General

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

(b) Calibration Setup

To calibrate the converter using the calibrator, prepare a setup as shown in Figure 8-1.

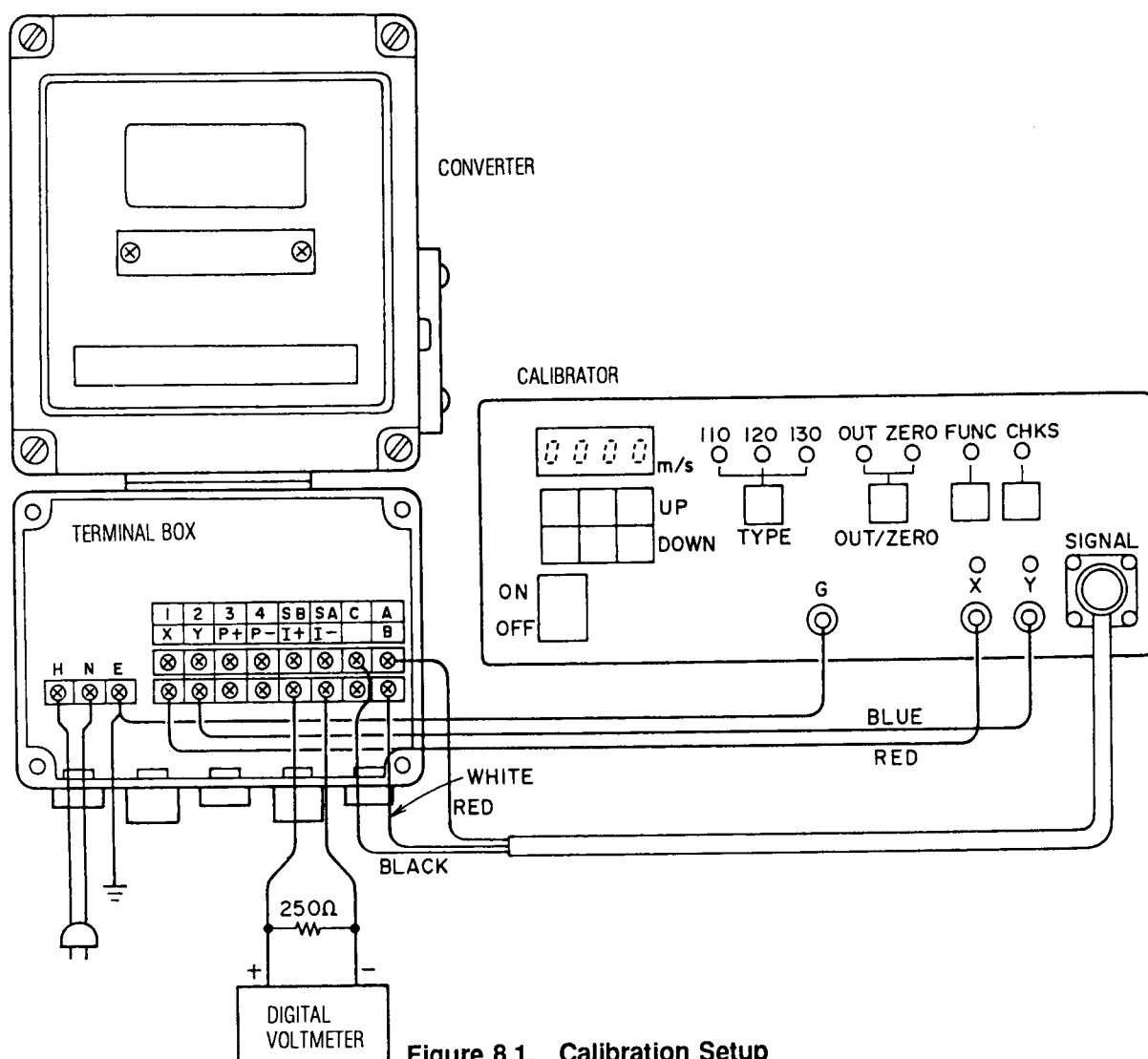


Figure 8.1. Calibration Setup

(c) Nomenclature of Panel Items and Operation of Calibrator

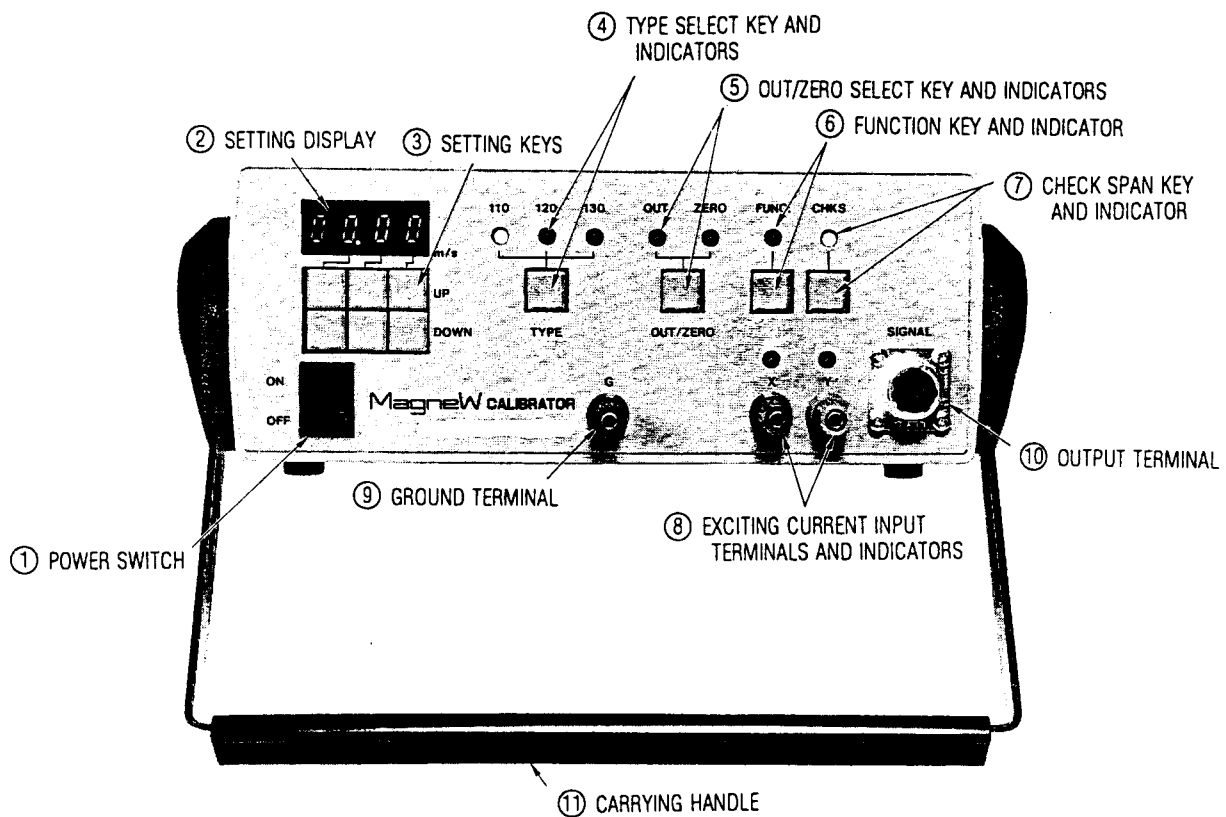


Figure 8-2. Calibrator Panel

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

8.2 Check of Converter with Checker NNZ007

For details of checker NNZ007, refer to OM2-5610-2700 "Operator's Manual for Checker." To check the converter using the checker, prepare a setup as shown in Figure 8-3.

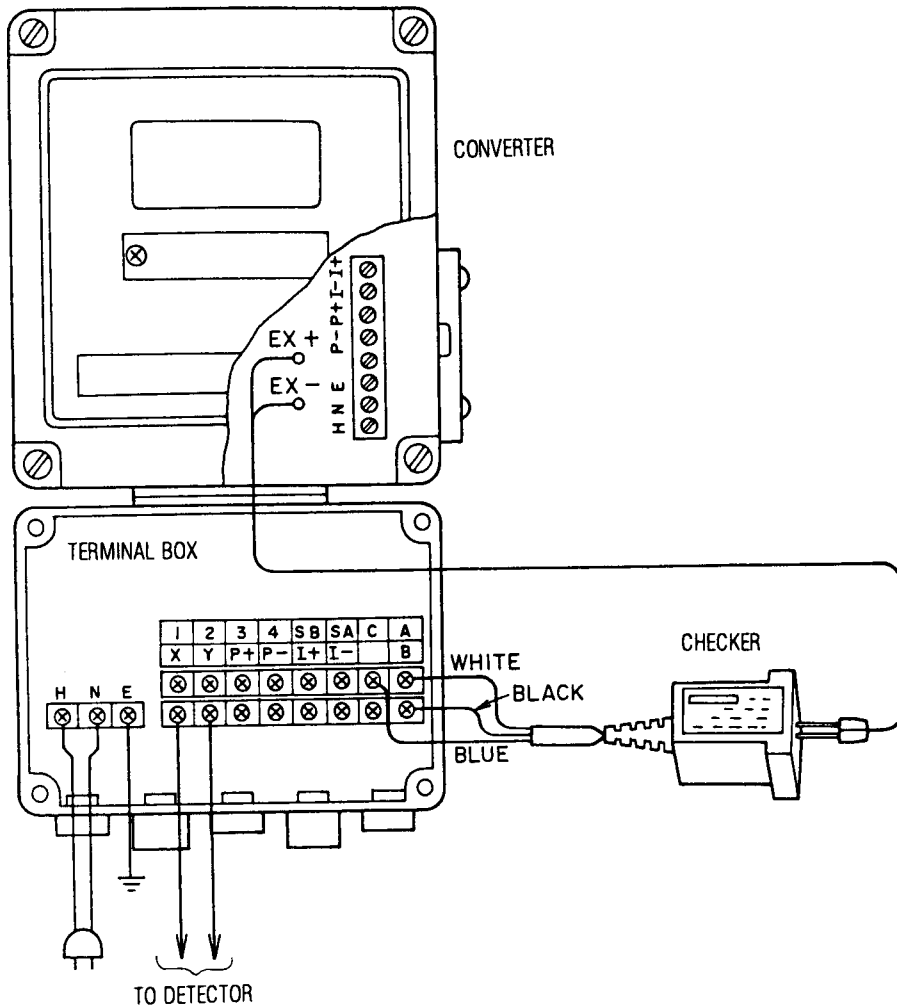


Figure 8-3. Checking Setup

Note: Set the exciting current at 240 mA and the full-scale flow velocity (span) at 6 m/sec, and check that the display board reads $100\% \pm 1\%$. If the reading is negative, interchange the connections between check terminals EX+ and EX-.

9. TABLE OF STANDARD ACCESSORIES

	<u>Q'ty</u>
Fuse, tubular glass, 3A	1
Mounting brackets	1 set

Document Number : OM2-5661-0010
Document Name : MagneW3000 Electromagnetic
Flowmeter Converter
Model: KIC20B (Remote type)

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

YAMATAKE