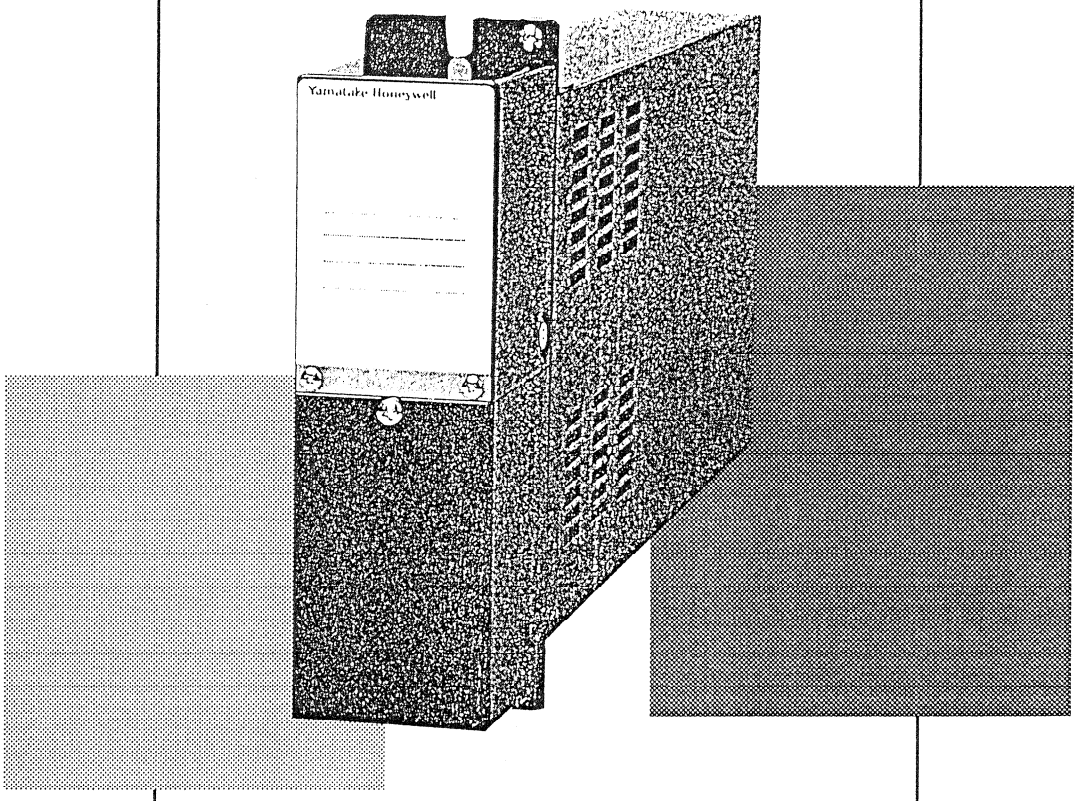
Yamatake Corporation

OM2-2260-0100

Distributor

Model J-DD

Operator's Manual



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1. GENERAL DESCRIPTION

The Distributor, with its isolated power supply, input and output circuits from each other, converts 4 to 20mA DC or 1 to 5V DC signal from a transmitter into 4 to 20mA DC or 1 to 5V DC signal. It can also supply 24V DC power to the transmitter simultaneously. The Distributor, by accepting a signal input from the transmitter, can send up to three outputs to control systems such as, for example, a process control system, a monitor system, and a computer system.

When the Distributor sends a single output, it serves as an isolator supplying power to an instrument. The Distributor is provided with, as an optional feature, a square root extraction function.

2. SPECIFICATIONS

2.1 Standard Specifications

Number of inputs:	1 or 2
Input signal:	4 to 20mA DC or 1 to 5V DC
Input bias current:	–1μA or less (voltage input)
Input impedance:	250Ω (current input)
Number of outputs:	1, 2, or 3
Output signal:	1 to 5V DC or 4 to 20mA DC
Output impedance:	20Ω or less (voltage output) 250Ω or more (current output)
External load:	0 to 600Ω (current output)
Accuracy:	w/o square-root extraction: ±0.2%FS w/ square-root extraction: ± 0.5%FS (10 to 100% of output) ± 2%FS (0 to 10% of output)
Power supply:	24V DC ± 15% or 80 to 135V AC, 50/60Hz
Transmitter power supply:	24V DC ± 10%, 25mA (w/ current limiter circuit 35mA)
Current consumption (DC supply):	160mA + 40 × (Input Number – 1)mA + 120 × (Output Number – 1)mA
Power consumption (AC supply):	15VA
Ambient temperature:	–5 to +55°C
Ambient humidity:	0 to 90%RF
Mounting:	Panel-mount
Front mask color:	Black
Weight:	2.5kg

Optional Specifications

Square-root extraction:	Voltage input;	$V_o - 1 = 2(\sqrt{Vin - 1})$ (V_o: Output signal, Vin: Input signal)
	Current input;	$I_o - 4 = 4(\sqrt{Iin - 4})$ (I_o: Output signal, Iin: Input signal)
Drop-out:	Setting range of drop output;	0.5 to 2%FS of input (adjustable) 0 ± 0.5%FS (input 0 to 0.5%)
	Drop-out signal;	0 ± 0.5%FS

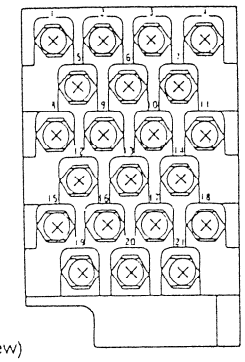
2.2 Model Number Table

Basic Model No.	Selection	Input Type		Description
		Input 1	Input 2	
J-DD □ 11				1-Input 1-Output
J-DD □ 12				1-Input 2-Output
J-DD □ 13				1-Input 3-Output
J-DD □ 22				2-Input 2-Output
	-A			100/110/115/120V AC
	-M			24V DC
		-1		4 to 20mA DC (Linear)
		-2		4 to 20mA DC (Square-root extraction)
		-3		1 to 5V DC (Linear)
		-4		1 to 5V DC (Square-root extraction)
			X	Input 1 only
			1	4 to 20mA DC (Linear)
			2	4 to 20mA DC (Square-root extraction)
			3	1 to 5V DC (Linear)
			4	1 to 5V DC (Square-root extraction)

Output Type

Output Type	Output			Description
	No. 1	No. 2	No. 3	
I	4 to 20mA DC	4 to 20mA DC	4 to 20mA DC	1-Output: No. 1 only 2-Output: No. 1, No. 2
V	1 to 5V DC	1 to 5V DC	1 to 5V DC	1-Output: No. 1 only 2-Output: No. 1, No. 2
A	1 to 5V DC	4 to 20mA DC	—	2-Output type
B	1 to 5V DC	4 to 20mA DC	4 to 20mA DC	3-Output type
C	1 to 5V DC	1 to 5V DC	4 to 20mA DC	3-Output type

2.3 Terminal Connection and Outline Dimensions

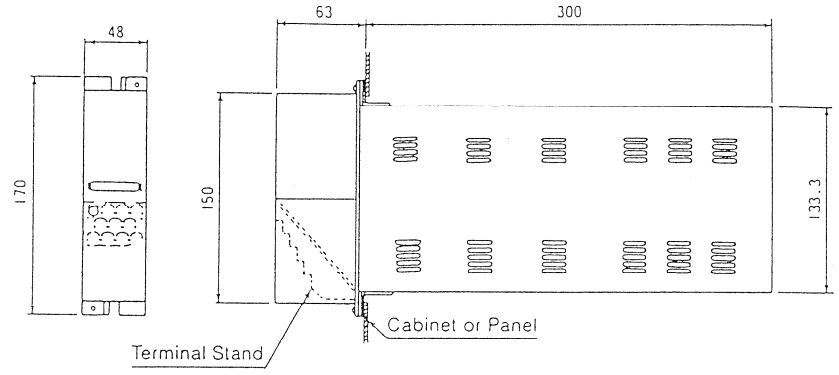


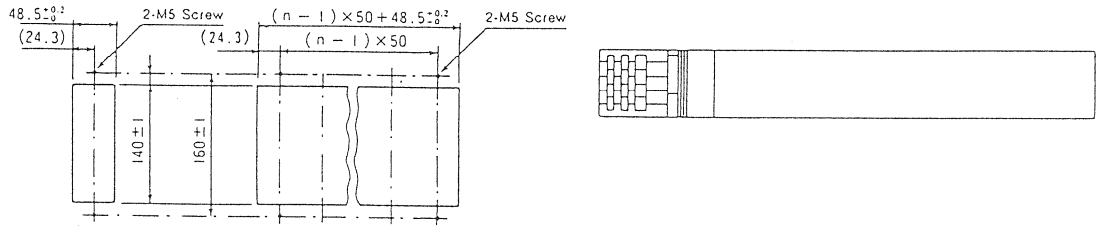
(M4 Terminal Screw)

1	Transmitter 1 (+)	12	Output 3 (+)
2	Input 1 (+)	13	Output 3 (−)
3	Transmitter 2 (+)	14	——
4	Input 2 (+)	15	——
5	Input 1 (−)	16	——
6	——	17	——
7	Input 2 (−)	18	——
8	Output 1 (+)	19	(+) DC or (H) AC
9	Output 1 (−)	20	(−) DC or (N) AC
10	Output 2 (+)	21	GND
11	Output 2 (−)		

Fig. 2.1 Connection Terminals

(Unit: mm)





Single Unit

Multi-Unit Side to Side

(n: No. of instruments)

Panel Cutout

Note: For maintenance, a space of 400 mm or more in front of the box is necessary.

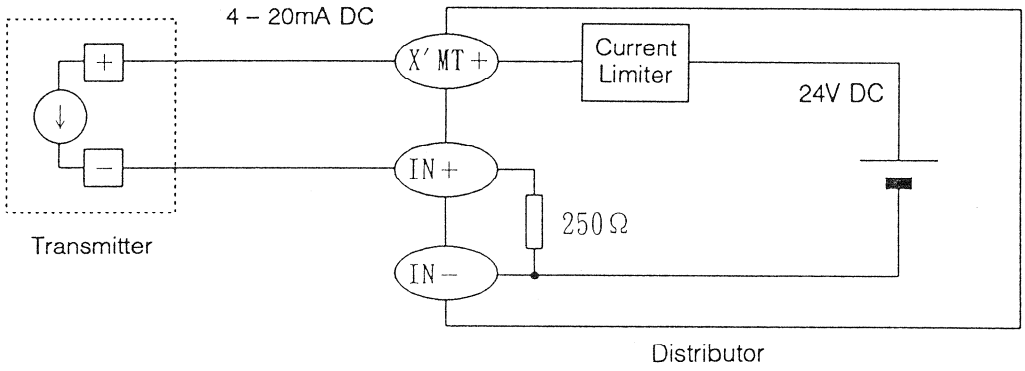
Fig. 2.2 Outline Dimensions

3. SIGNAL CONNECTION

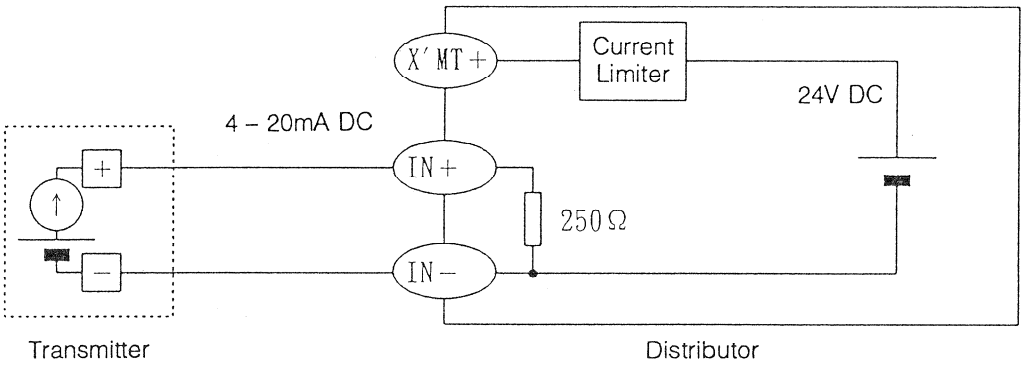
Connect the transmitter's signal to the Distributor as shown in Fig. 3.1 below.

3.1 When the Input Signal is 4 – 20mA DC

(1) In case that the Distributor supplies power to the transmitter



(2) In case that the Distributor is not required to provide power



3.2 When the Input Signal is 1 – 5V DC

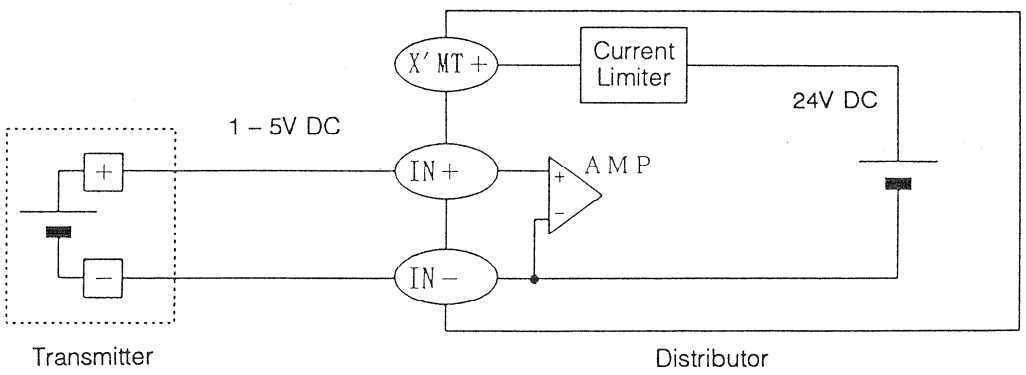


Fig. 3.1 Input Signal Connection

Refer to Fig. 2.1 for the connections of the Distributor's outputs.

4. THEORY OF OPERATION

A transmitter is powered from the 24V DC Power Supply Source provided in the Distributor.

A 4 to 20mA input signal corresponding to a measured value flows through the input circuit of the Distributor.

The Current Limiter is connected through the input circuit (namely, Power Supply for Transmitter) of the Distributor to protect against overcurrent due to short-circuiting the field signal.

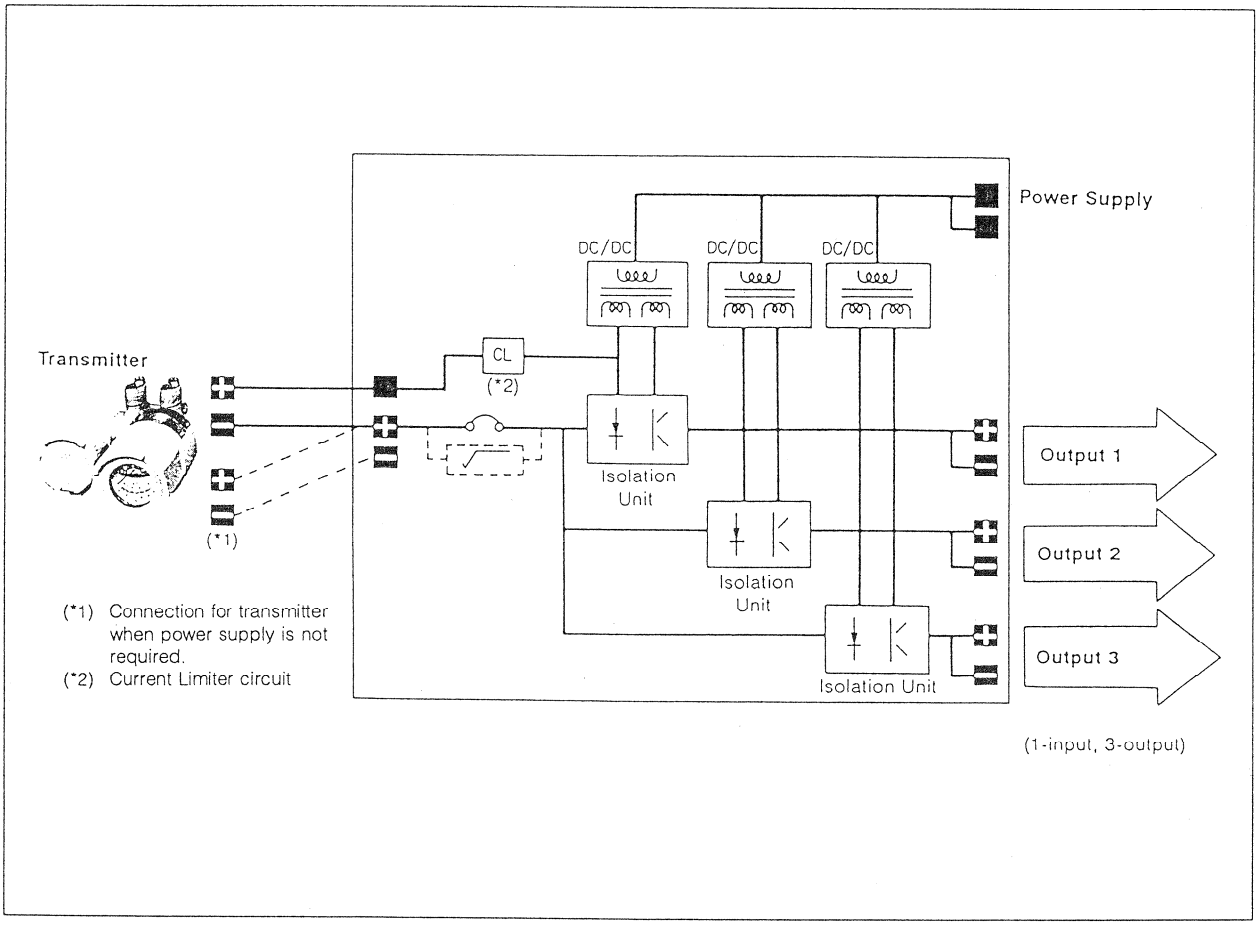
The built-in resistor (250 ohms) converts a 4 to 20mA DC current signal to a 1 to 5V DC voltage signal.

The input and output circuits are isolated by the Isolation Units (V/F and F/V converters).

The output signals from the Distributor are obtained from the Isolation Units.

The voltage signal is required, a 4 to 20mA current signal is converted into a 1 to 5V DC voltage signal.

Block Diagram



5. MOUNTING AND DEMOUNTING OF THE CHASSIS

When demounting the chassis from the case with wiring connected to the Distributor, turn off the power, loosen the screw ① of the customer terminal block, remove the screw ②, and then draw out the block laterally. Loosen the screw ③ and pull out the chassis completely. (See Fig. 5.1 below.)

When pulling out the chassis with the terminal block with the power applied, remove only screw ③.

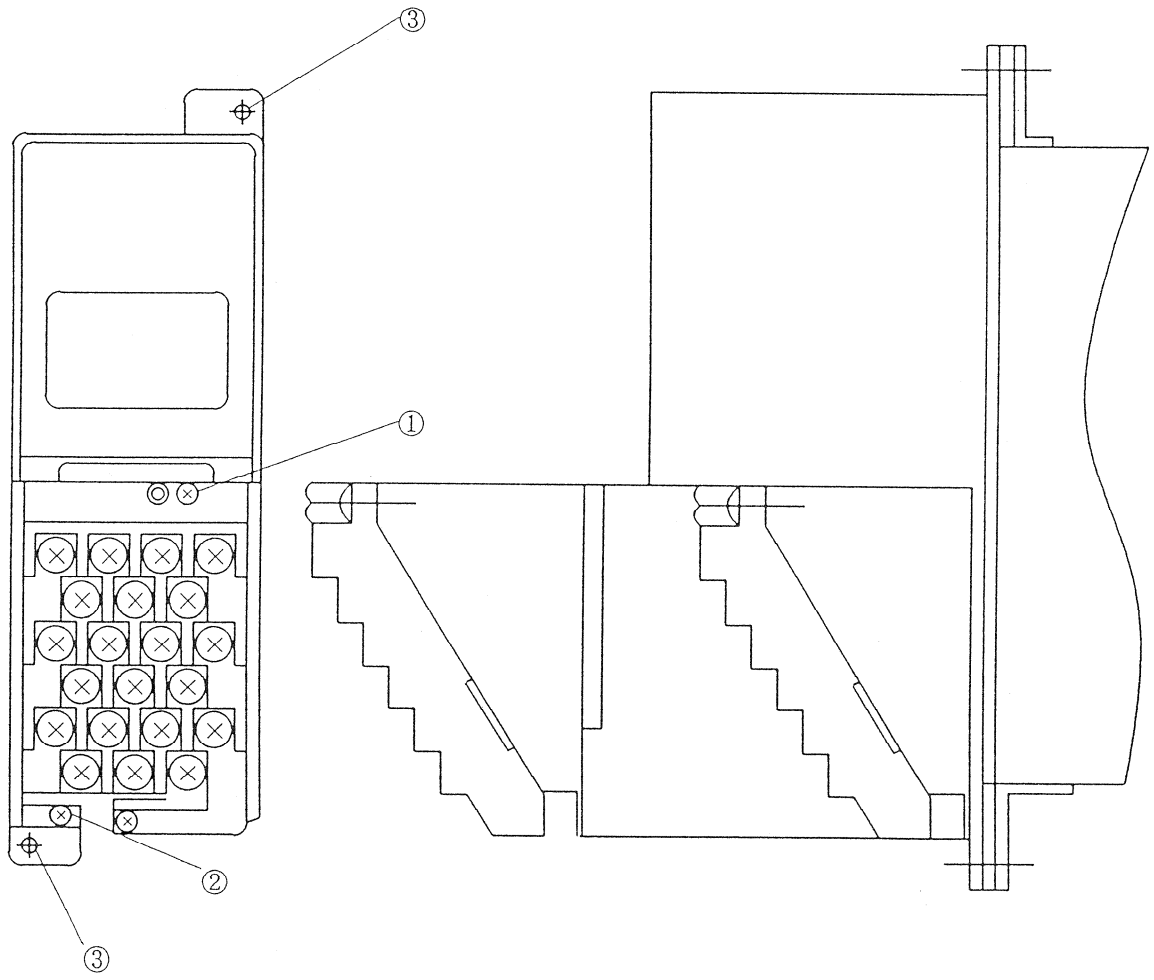


Fig. 5.1 Screws for Mounting and Demounting

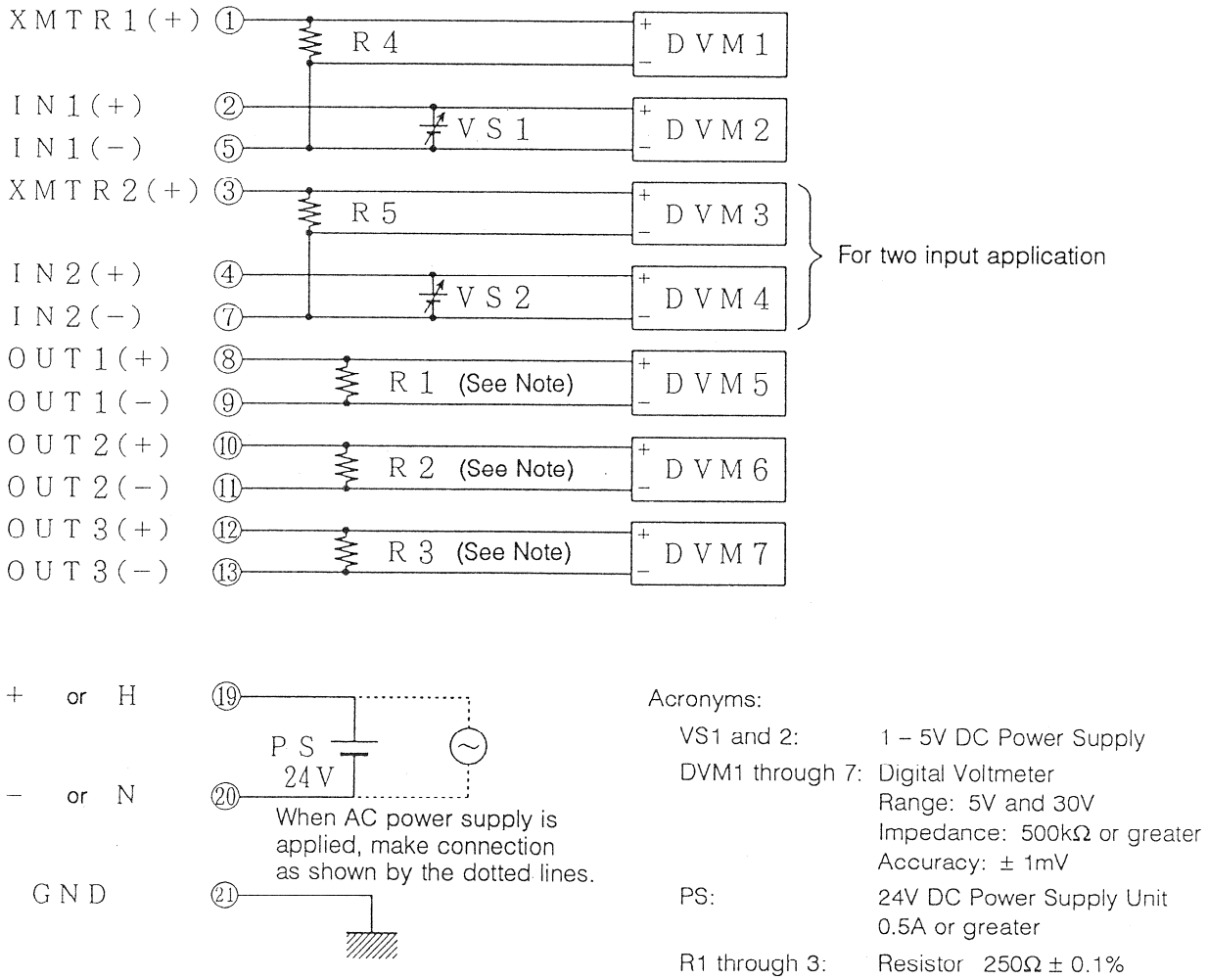
6. CALIBRATION AND ADJUSTMENT

6.1 Preparation

All the calibration and adjustment are performed with the power applied to the Distributor. Instructions for the calibration and adjustment are given for Model J-DDI13-□-40, a representative having the square root extraction function. Steps 4.2.3 and 4.2.4 are not required when the square root extraction function is not provided. Refer to Figs. 5.2 and 5.3 when the device should be adjusted.

1) Connect measuring instruments as shown in Fig. 6.1 below.

2) Warm up the Distributor for more than 15 minutes.



Acronyms:

VS1 and 2:	1 – 5V DC Power Supply
DVM1 through 7:	Digital Voltmeter Range: 5V and 30V Impedance: 500kΩ or greater Accuracy: ± 1mV
PS:	24V DC Power Supply Unit 0.5A or greater
R1 through 3:	Resistor 250Ω ± 0.1%
R4 and 5:	Resistor 1.2kΩ, 1/2W

Note: R1 through 3 are used only when the output is 4 – 20mA.

Fig. 6.1 Test Connection Setup

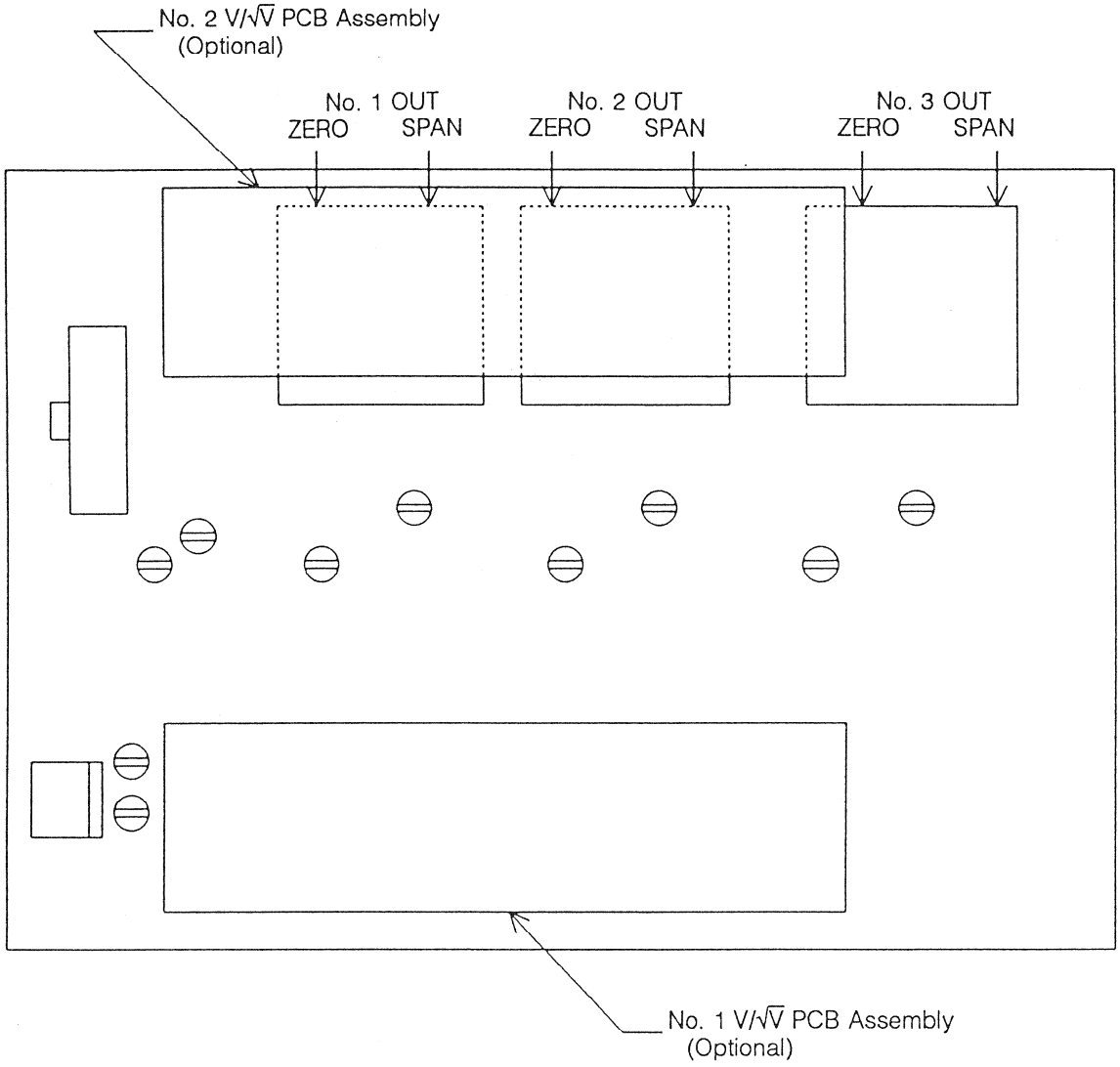
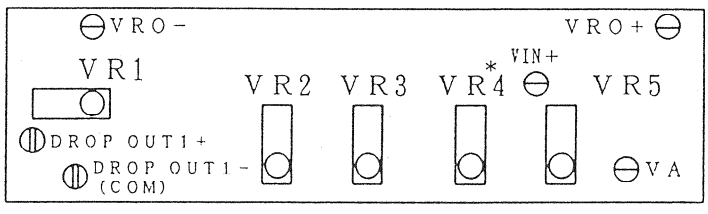


Fig. 6.2 Where to be Adjusted



∗: VR4 was factory-adjusted.

Fig. 6.3 V/√V PCB
Where to be Adjusted

6.2 Calibration and Adjustment

6.2.1 Output Adjustment (Adjustment of V/I Isolator unit)

When the Distributor is provided with a square root extraction function, the V/$\sqrt{V}$ Unit should be first adjusted (See 4.2.3). Table 6.1 shows I/O characteristics of the V/$\sqrt{V}$ Unit.

(1) Set VS1 to 1.000V.

(2) Adjust ZERO (Z) VR of No. 1 V/I Isolator Unit (placed on the Module) so that DDM5 indicates 1.000V ± 0.01V.

(3) Set VS1 to 5.000V.

(4) Adjust SPAN (S) VR of No. 2 V/I Isolator Unit (placed on the Module) so that DVM5 indicates 5.000V ± 0.01V. Repeat steps (1) through (4) until the specified accuracy is obtained.

(5) Adjust Output 2 and 3 by following steps (1) through (4).

6.2.2 Power Supply Voltage to Transmitter

(1) Set VS1 to 5.000V.

(2) Confirm that DVM1 indicates 24V ± 2.4V.

(3) Follow the same steps with two input type Distributor.

6.2.3 Adjustment of V/$\sqrt{V}$ Unit

(1) Adjust VR1 so that the drop-out voltage between Checking Terminals DROPOUT1+ and DROPOUT1–(COM) reaches 20mV or less (Drop-out Voltage Setting).

(2) Set Input 1 voltage (the voltage between IN1+ and IN1– Terminal) to 1.040 ± 0.001V (1%FS). Then adjust VR2 so that the voltage between Checking Terminal VIN+ and DROPOUT1–(COM) reaches 0.040 ± 0.004V. (Input Zero Adjustment)

(3) Set Input 1 voltage to 5.000 ± 0.001V (100% F.S.) and adjust VR5 to obtain 0.040 ± 0.004V between Checking Terminal VA and DROPOUT1–(COM). (Output Span Adjustment)

(4) Set Input 1 voltage to 1.040 ± 0.001 V and adjust VR2 to obtain 0.040 ± 0.004 V between Checking Terminal VA and DROPOUT1–(COM). (Input Zero Adjustment)

(5) Maintain Input 1 voltage at 1.040 ± 0.001V and adjust VR3 to obtain 1.400 ± 0.004 V between Checking Terminal VRO+ and VRO–. (Output Zero Adjustment)

(6) Maintain Input 1 voltage at 5,000 ± 0.001V and adjust VR5 to obtain 5,000 ± 0.004 V between Checking Terminal VRO+ and VRO–. (Output Span Adjustment)

(7) Repeat steps (5) and (6) until the specified accuracy is obtained.

(8) When Input 2 is provided with the square root extraction function, repeat steps (1) through (7) with No. 2 V/$\sqrt{V}$ Unit.

Table 6.1. I/O Characteristics when Provided with Square Root Extraction Function

Input			Output		
%F.S.	Voltage (V)	Current (mA)	%F.S.	Voltage (V)	Current (mA)
1	1.040	4.16	10	1.400	5.60
4	1.160	4.64	20	1.800	7.20
9	1.360	5.44	30	2.200	8.80
16	1.640	6.56	40	2.600	10.40
25	2.000	8.00	50	3.000	12.00
36	2.440	9.76	60	3.400	13.60
49	2.960	11.84	70	3.800	15.20
64	3.560	14.24	80	4.200	16.80
81	4.240	16.96	90	4.600	18.40
100	5.000	20.00	100	5.000	20.00

6.2.4 Dropout Voltage Setting (When setting 2% dropout)

(1) Adjust VS1 to set Input 1 to 1.360 ± 0.001V and confirm all of DVM5, 6 and 7 indicate 2.200 ± 0.010V.

(2) Adjust VR1 of V/$\sqrt{V}$ to set the dropout voltage between Checking Terminal DROPOUT1+ and DROPOUT–(COM) to 0.080V.

(3) Set Input 1 to the voltage 20mV lower than the dropout voltage (1.080V – 0.020V = 1.060V) and confirm with DVM5, 6 and 7 that the output voltage is 1.000V ± 0.020V.

If DVM5, 6 and 7 fail to indicate 1.000V ± 0.020V, adjust VR5 of V/$\sqrt{V}$ so that the DVMs indicate that specified value.

(4) Set Input 1 to the voltage 40m V higher than the dropout voltage (1.080V + 0.040V = 1.120V) and confirm that DVM5, 6 and 7 indicate 1.693V ± 0.010V.

(5) Follow steps (1) through (4) for Input 2 with square root extraction function.

Fig. 6.4 shows the differential gap due to the dropout action.

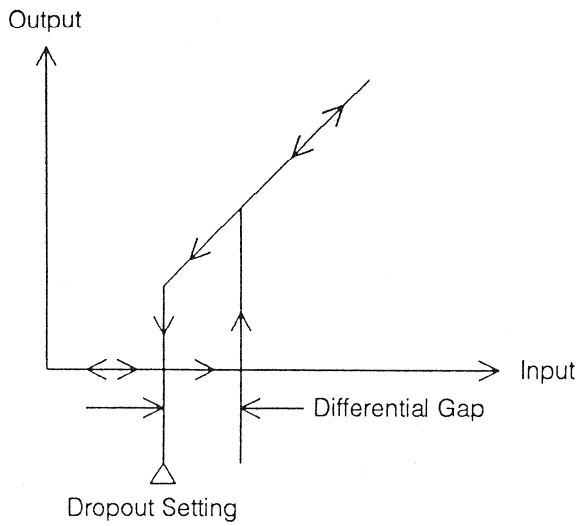
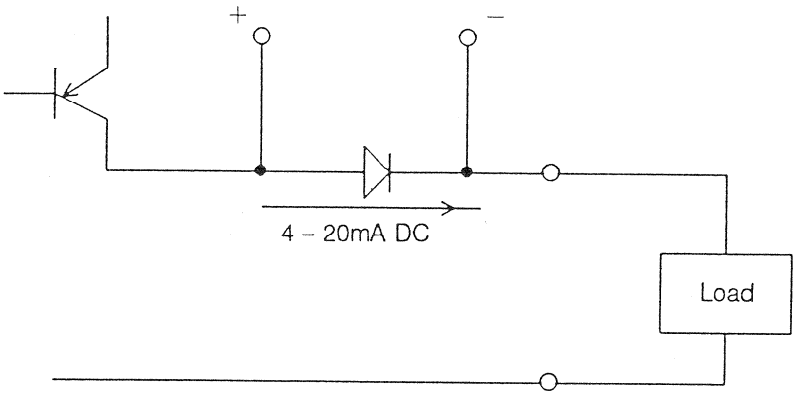


Fig. 6.4 Dropout Action

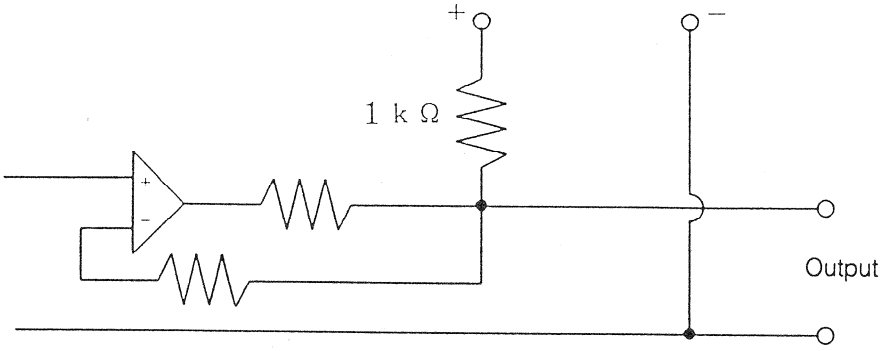
6.2.5 Precautions

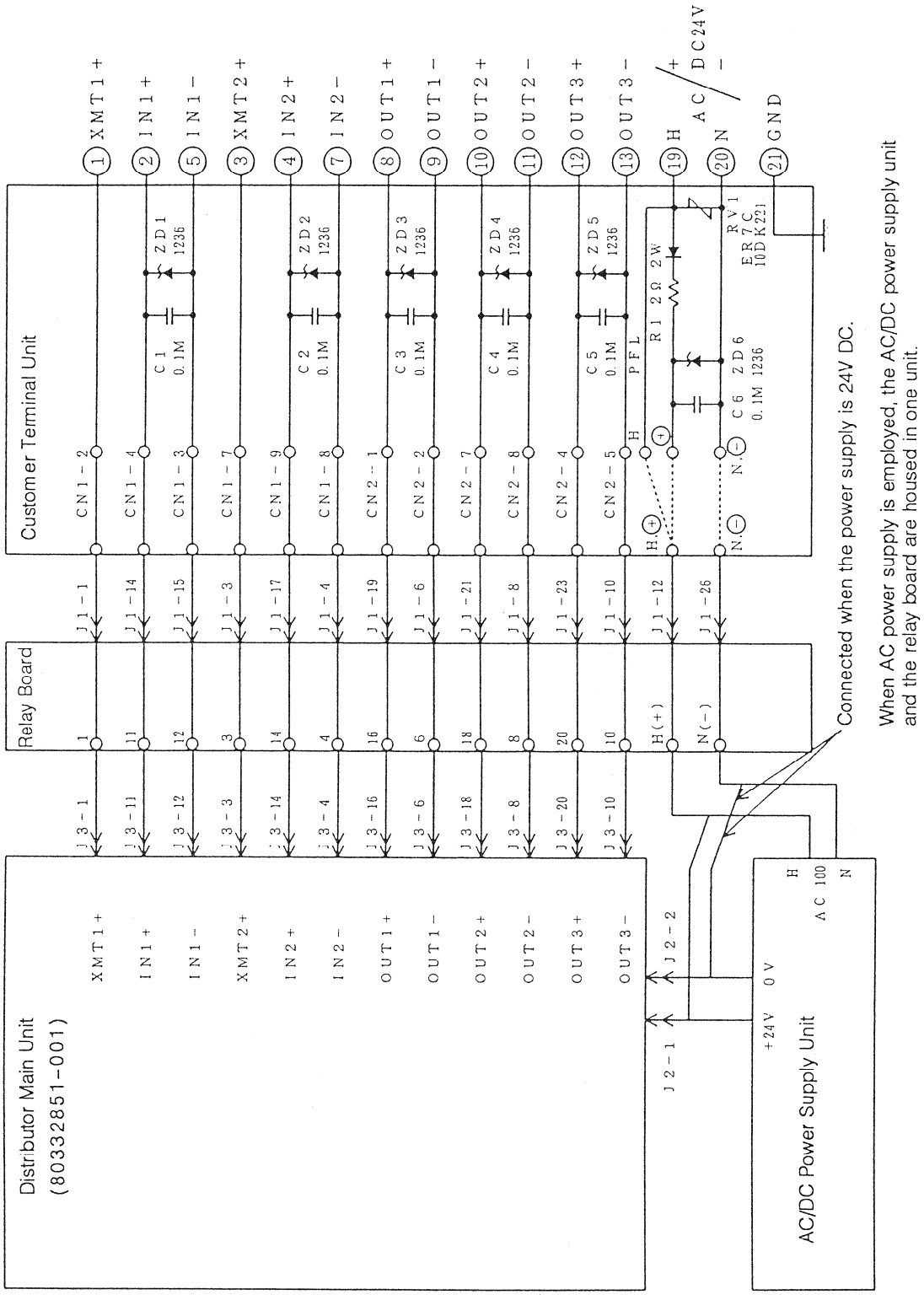
The signals from Checking Terminal on the main PCB are different depending on the type of its outputs, current or voltage.

When the output is current



When the output is voltage





Distributor Circuit (Single Case Type)

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