Minebea

Transmitter
CSA-521

Instruction Manual

EN294-1145-G

FOREWORD

Thank you very much for your purchasing our Transmitter CSA−521.

This manual explains installation procedures and connecting method and also operating method for the Transmitter CSA−521. Make use of it properly after reading through the manual carefully.

Be sure to deliver the manual to the end user. Moreover, the end user should keep the manual at hand after reading it over.

Marks and arrangements used in this manual

The following marks are attached to the explanation on the matters that indicate “Don’t do this.”, “Take care.” and “For reference”.
Be sure to read these items where these marks are attached.

Warning	● Warning may cause injury or accident that may harm to the operator. Don’t do these things described here.
	● Caution during operation and working. Be sure to read the item to prevent malfunction.

Mark during operation.

● Press the switch.

For safe operation

Be sure to read this instruction manual before use.

1. Installation place

● Use the instrument where the temperature/humidity specifies with the range as follows：

Environmental temperature ：−10 ℃ to 50 ℃
Environmental humidity ：Less than 85 %R.H. (Non condensing)

(1) Location where installation is not allowed.

Warning ● Don’t locate the instrument on the places as follows :
It may cause an unexpected faulty in the instrument.

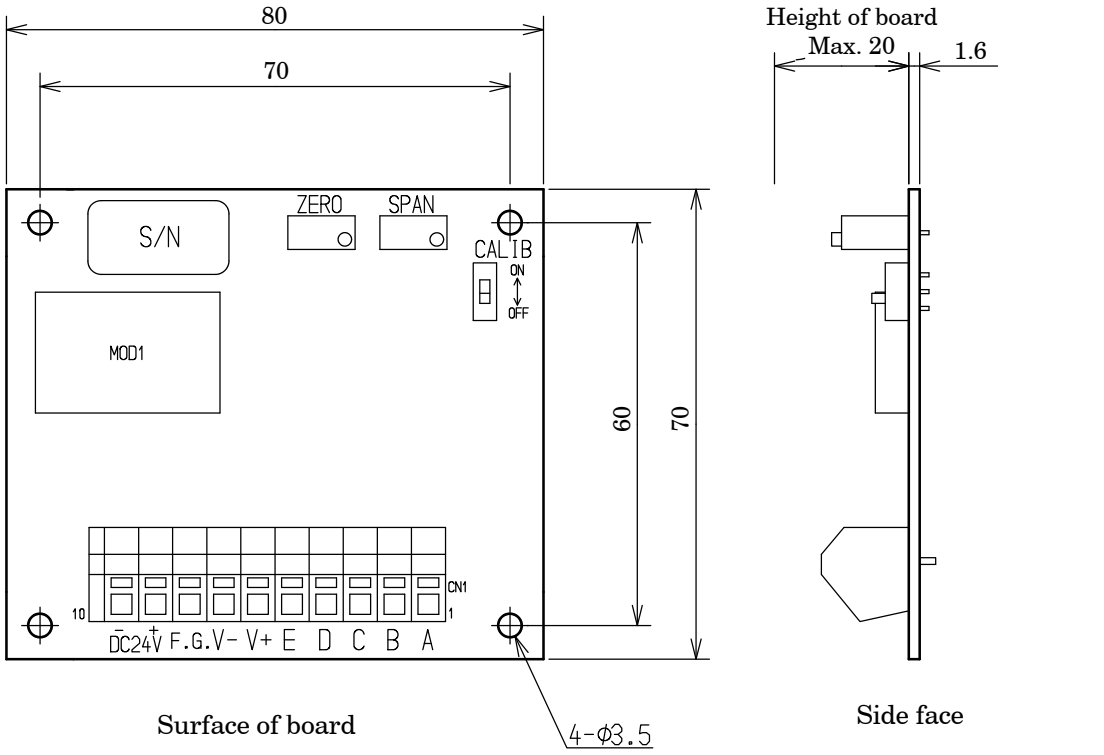
- Do not locate the instrument in direct and/or high temperature area.
- Do not use the instrument in a high humid area.
- Do not install the instrument where there are vibrations and shocks.
- Do not use the instrument where there is excess of dusts and fine particles.
- Do not use the instrument where there are corrosive gas and salt and like that.
- Do not install the instrument where there is rapid change of temperature and humidity.
- Do not install the instrument near the devices that are magnetized or generate an electromagnetic field.
- Do not install the instrument where the instrument may be affected by radioactivity or radial rays.
- Avoid the location where chemical reaction may take place such as in a laboratory, or like that.

(2) Installation

● When installing the instrument, install as referring to the following figures and secure the space around the instrument.

Each dimensions of the instrument and required dimensions for the environmental spaces are as follows:

Outline dimensions



Surface of board

Side face

Unit：mm

2. Power supply

Warning ● Be sure to check that the power supply is off in connecting each cable. If the work is done while the power is on, there may have the case that electric shock to the operator or even may have damage to the instrument.

Warning ● Before supplying the power, check that the indication of power supply voltage /specifications for the instrument and the power going to supply should be the same. If they are not equal, contact us.
If you use the instrument without checking them, it may cause a damage in the instrument or electric shock to the operator.

● Earth wire should be grounded securely.
When earth wire is not connected, it may cause a malfunction of the instrument or electric shock to the operator.

3. Application note

Warning ● Before using a new instrument or exchanging the strain gage applied transducer for a new one, be sure to make calibration. If calibration will not be made, the correct measuring results may not be obtained nor which may cause malfunction in the instrument and there may exist damage in peripheral equipments.
Besides, even though calibration has been made, there may occur the similar case when the results are not correct, so make calibration, again.

Warning ● In case of using the instrument, check that the connections are executed properly. If not connected properly, the correct measuring result will not be obtained, nor it may cause malfunctions of the instrument, damage to the peripheral equipments or even more serious accidents.

Warning ● When change of setting is made carelessly on the instrument during measurement, correct measured results may not be obtained and it may cause malfunction in the instrument and even have the possibility of damage in peripheral instruments.

Warning ● Do not shock the instrument such as throwing something on it.
If neglected, it may cause destruction of the parts and damage to the electrical circuits.

History of revision

Date	Instruction manual No.	Details of revised point
Dec. 2001	DRW. NO.EN294-1145	First Version
Apr. 2002	DRW. NO.EN294-1145-A	Due to ECN No.FN02−02045 − Addition − 4−2−2. 3.  Warning “～. The input range of this instrument is 0.5 mV/V to 1.5 mV/V.” 6−1. “ ・Input range 0.5 mV/V to 1.5 mV/V” − Correction − 6−2. ・Weight Approx.100 g → Approx.50 g
Apr. 2005	DRW.No.EN294-1145-B	Due to ECN No.FN05−02035 − Addition − At the warning column in the wiring section, the clause of ”As there is a case which standard wiring color is different, please confirm the inspection data sheet of the load cell being used.” is added.
Feb. 2010	DRW.No.EN294-1145-C	Due to ECN No.FN10−02026 − Change − Front cover’s logo is changed.
Oct. 2010	DRW.No.EN294-1145-D	Due to ECN No.FN10−02140 − Change − Minebea logo is changed.
Jun. 2012	DRW.No.EN294-1145-E	Due to ECN No.FN10−02140−D − Change − Minebea logo is changed.
Feb. 2013	DRW.No.EN294-1145-F	Due to ECN No.FN13−02032 − Addition − 6−3.Standard specifications at the time of shipment “10 V output at the input of 1 mV/V”
Feb. 2018	DRW.No.EN294-1145-G	Due to ECN FN17-02017 ・Delete the company name in the cover page. ・Delete the company name in the contents.

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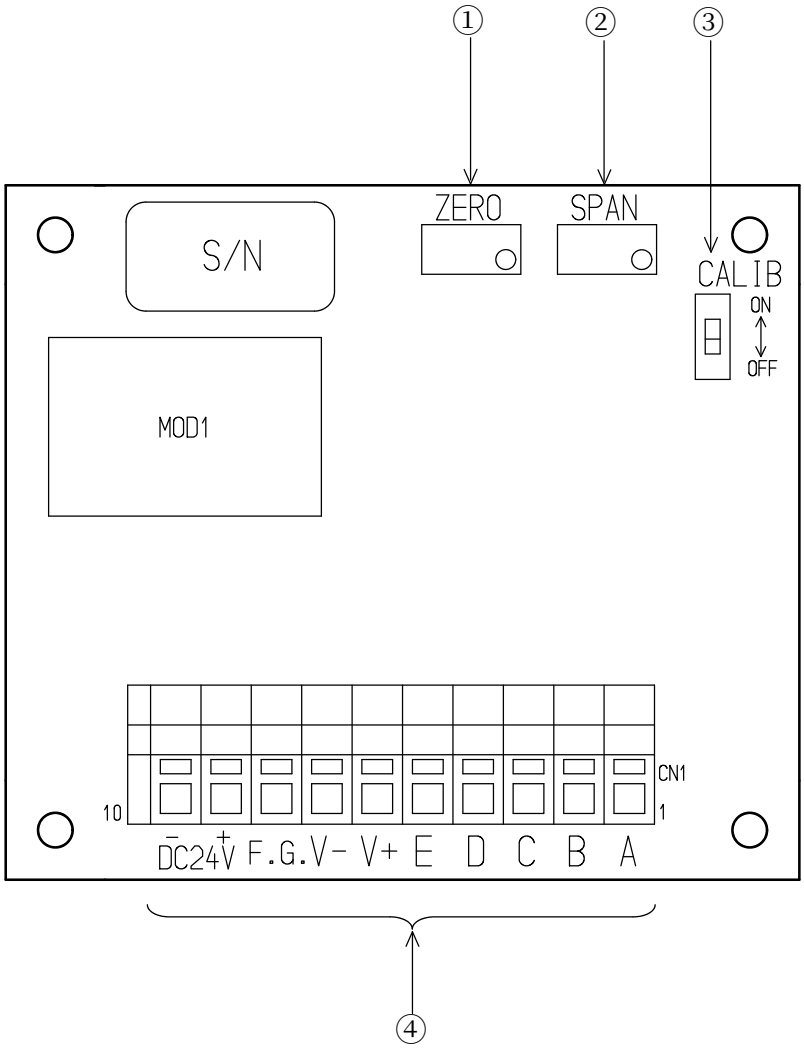
1. General

This instrument is a transmitter for the application of strain gage applied transducer.
It can obtain the analog output corresponding to the load, pressure, and the torque, etc., by amplifying the output of various strain gage applied transducers.

2. Name and function of each point



① “ZERO” trimmer

Trimmer for the zero point adjustment.

② “SPAN” trimmer

Trimmer for the amplification degree adjustment.

③ “CALIB” switch

Used when the CALIB value is turned on and off.

④ Terminals

DC power supply, the earthing conductor, the voltage output signal line, and the strain gage applied transducer are connected.

3. Connecting method

3−1. Layout of the terminal boards

There is the terminal boards, which has 10 points of terminals.
Layout of terminal boards are shown in the following figure.：

● Terminals(CN1)

	Name of terminals	Description	Applications
1	A	Bridge power supply(＋)	Strain gage applied transducer
2	B	Amplifier input(－)	
3	C	Bridge power supply(－)	
4	D	Amplifier input(＋)	
5	E	Shield	
6	V＋	Voltage output terminal(＋)	Voltage output
7	V－	Voltage output terminal(－)	
8	F.G.	Grounding terminal	Power supply
9	DC24 V(＋)	Power supply input terminal(＋)	
10	DC0 V(－)	Power supply input terminal(－)	

● “V－” of voltage output terminal and “DC0 V (－)” of power supply input terminal are insulated.

● “C” of bridge power supply (－) and “V－” of voltage output terminal are connected internally.

3−2. Note on connection


Warning ● In case of connection with the instrument, keep strictly to the following items. If neglected, it may cause an unexpected failure or a damage to the instrument.

- Be sure to set the power supply to OFF, when the connection is made.
- Since the terminal boards at front of the instrument is made of resin, take care not to drop it down or not to apply strong impact.
- The electric wire which suits the terminal block of this unit is 0.08 mm^2/AWG28～2.5 mm^2/AWG12.
- The electric wire bare length is 5 mm to 6 mm.
- Connecting cable with the instrument should be away from the noise source such as power supply line and/or I/O line for control and so on as far as possible.
- Conduit wiring should be the type of exclusive one, and avoid using with another line together.
- All of the connections should be executed securely by referring to the Instruction manual for the instrument.

3−3. Connection

※1 When tension is applied with the application of tension type or universal (compression /tension) type of load cell, and display of "+" direction is required, connect "Green" with Terminal No.4 and "Blue" with Terminal No.2 individually. As there is a case which standard wiring color is different, please confirm the inspection data sheet of the load cell being used.

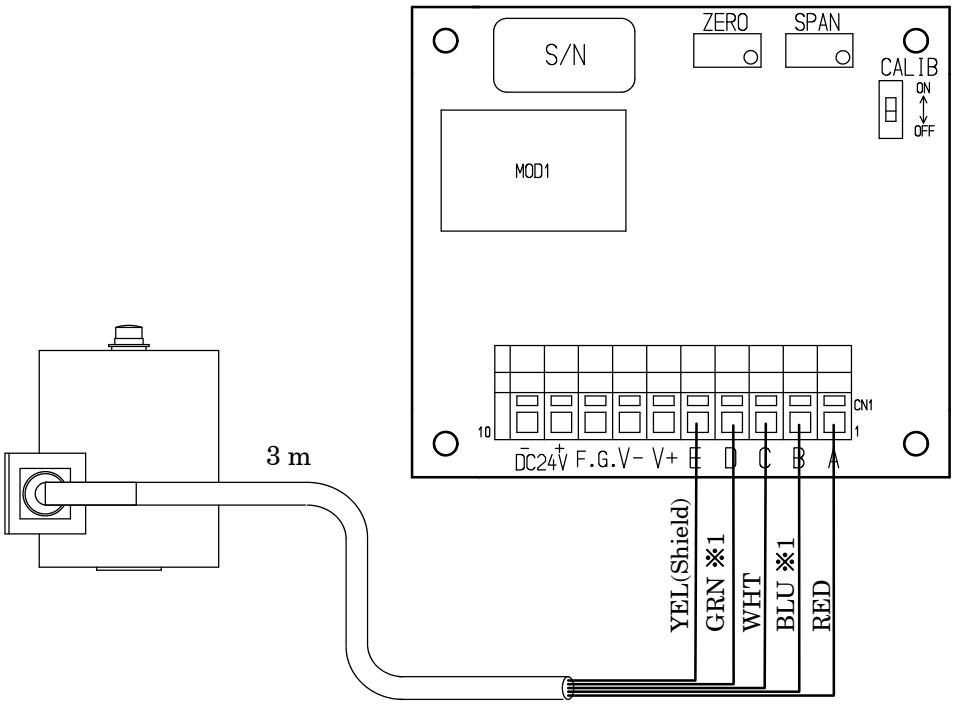
※2 When the length of CAB−502 is more than 30 m totally, there may have the case that the accuracy is out of warranty because the resistance of cable makes the input voltage of the instrument decreased.

※3 When the length of CAB−502 is more than 10 m totally, or the zener barrier is used in the system, CALIB is not applicable.

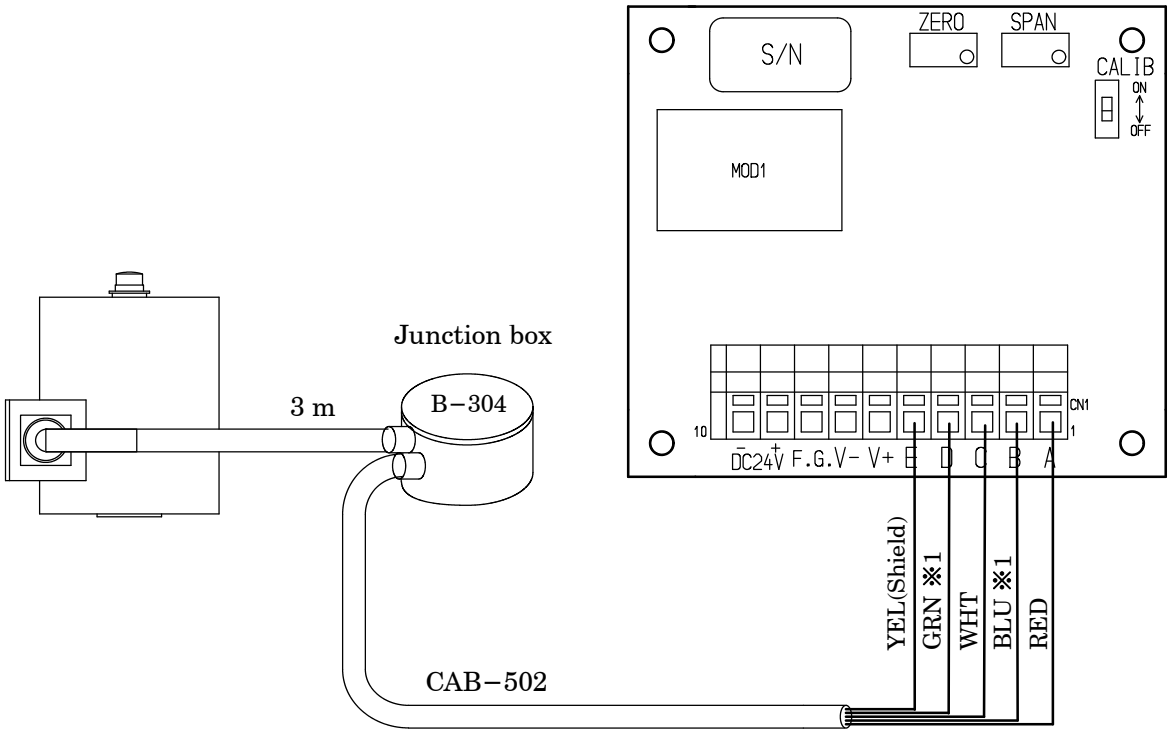
3−3−1. Connection with strain gage applied transducers

The instrument can connect with strain gage applied transducers, such as load cell, pressure transducer and so on. Here, we will describe the example of connections with load cell, so the connection with another type of strain gage applied transducers shall be proceeded in the same way.

① Connection with 1 piece of load cell and CSA−521

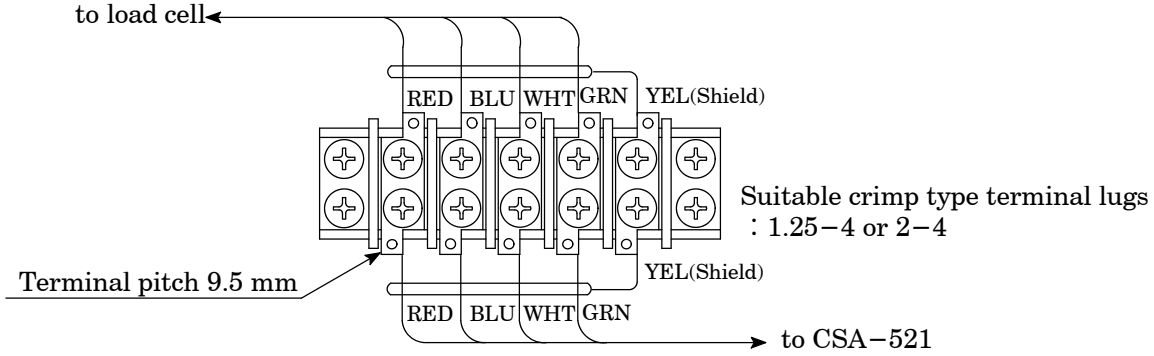


② Connection with 1 piece of load cell and a junction box for extension use(B−304) and CSD−521



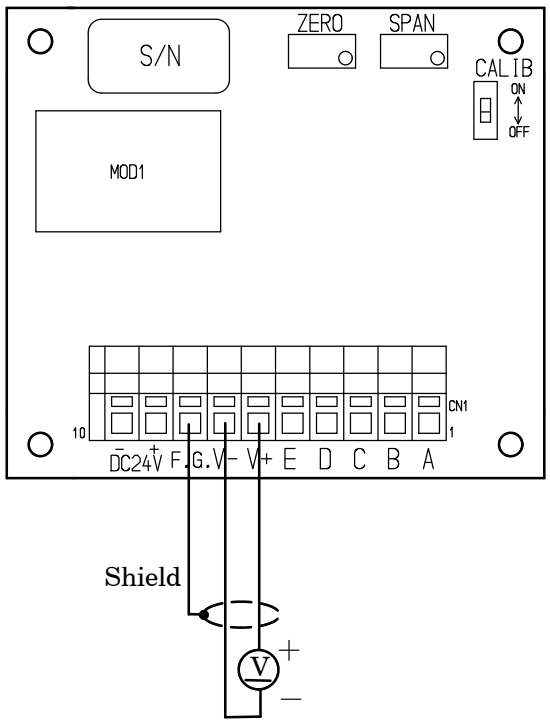
※2 (The length of CAB−502 is within 30 m totally.)

Internal wiring diagram of B−304



3−3−2. Connection of voltage output

Connections with voltage output should be made as the following figure.



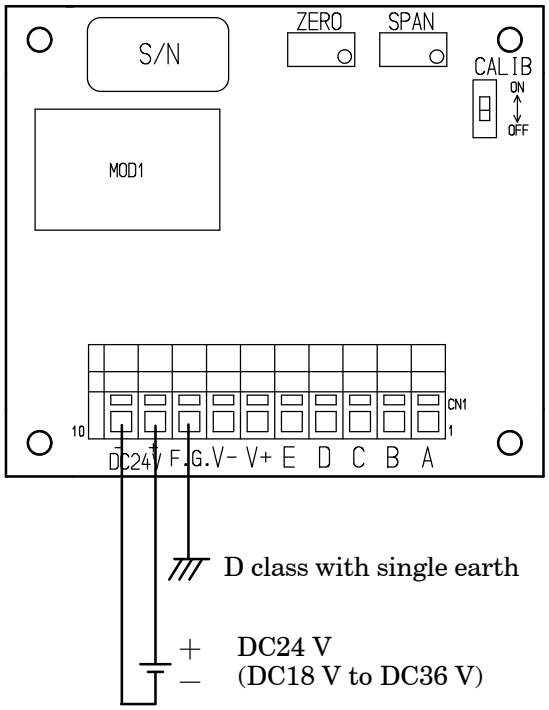
⚠ Warning	● Connections with voltage outputs should be made securely according to the figures and also within specified load resistance. If neglected, it may cause an unexpected failure and/or malfunction to the instrument.

	● For the connections with voltage outputs, be sure to apply shielded cable, and the shielded cable should be connected with the F.G. terminal of the instrument. If not connected, it may cause malfunction due to the effects from external noises and so on.

3−3−3. Connection with the power supply and the earth

Connections with the power supply and the earth should be made as the following figure.
Grounding should be the D class with single earth.

Power supply voltage	DC24 V (DC18 V to DC36 V)
Power consumption	Within approx.100 mA



Warning ● Connections with the power supply and the earth should be made securely according to the figures and also within the rated capacity of the instrument. If neglected, it may cause an unexpected cause of failure.

● Grounding should be the D class with single earth. If neglected, it may cause an unexpected malfunction due to the effects of noise from other equipments.

4. Calibration procedures

⚠Warning ● Before using the new instrument or after exchanging the strain gage applied transducer with a new one, be sure to make calibration.
If calibration is not made, correct measured results may not be obtained, or it may cause malfunction to the instrument and it may damage the peripheral equipment.
Moreover, even if calibration has made, there may occur the similar case as above when the result is not correct. So make precise calibration again.

4−1. Preparations

According to the Chapter 3. Connecting method, connect the instrument and the strain gage applied transducer properly, then supply the power.

4−2. Calibration procedures

Load calibration procedures for the instrument are two as follows:

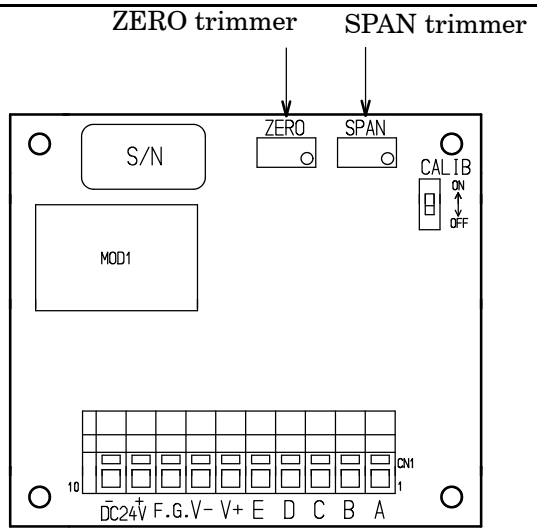
① Calibration by the actual load

② Electronic calibration by CALIB input.

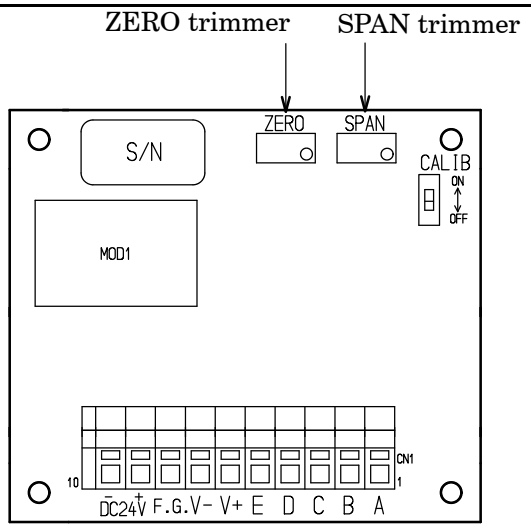
● The accuracy of calibration obtained from ① is 1/500 or so.

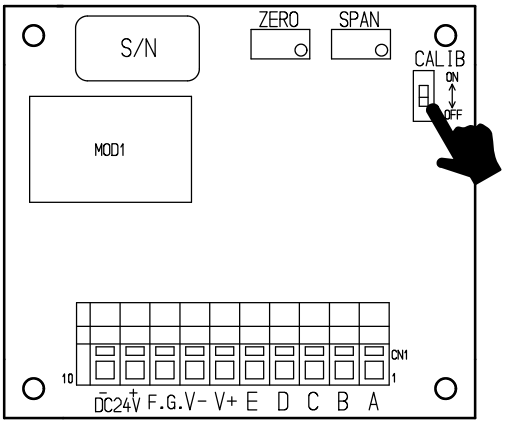
In the following paragraphs, we will describe each calibration procedure by showing the examples with load cell applied.

4−2−1. Calibration by the actual load

	Procedures	
1	Set the load cell to the condition at initial load (tare weight). When the initial load (tare weight) is exceeding the ±0.25 mV/V at the input conversion, cancel the initial load (tare weight) referring to the paragraph 4−3.	
2	ZERO adjustment Adjust the voltage output value to 0.000 V with "ZERO" trimmer.	
3	SPAN adjustment Put the standard load such as weights (use it as near rated capacity as possible) on the load cell, and adjusts the "SPAN" trimmer to become the voltage output value to be set.	
4	Zero adjustment After removing the standard weight set on step 3, confirm the voltage output value to be at 0.000 V. If not, return to the step 2.	
5	Complete the calibration.	

4−2−2. Electronic calibration by CALIB input

	Procedures	
1	Set the load cell in the condition of the initial load (tare weight). When the initial load (tare weight) is exceeding ±0.25 mV/V at the input conversion, cancel the initial load (tare weight) referring to the paragraph 4−3.	
2	ZERO adjustment Adjust the voltage output value to become at 0.000 V with ZERO trimmer.	

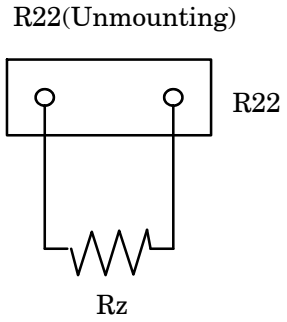
	Procedures	
3	SPAN adjustment Turn on the “CALIB” switch. Be able to get the output equivalent to the calibration value at 0.5 mV/V±0.001 mV/V “CALIB” switch is turned on by sliding up. The voltage output value corresponding to the CALIB value is calculated from the rated load value, the rated output value, the maximum load value, and the voltage output value of the connected load cell at that time. Adjust the voltage output value to become the calculated value by using the “SPAN” trimmer. Calculation example) The calculation example when the voltage output of 10.000 V is required at the maximum load of 0.34 t in the condition of using one point of load cell with the rated capacity 1 t, rated output 3 mV/V. Warning ： Set the rated output value of the load cell for calculation to the written value of each inspection data sheet. The input range of this instrument is 0.5 mV/V to 1.5 mV/V. Rated load value of the load cell 1 t Rated output value of the load cell 3 mV/V The maximum load value 0.34 t Voltage output value at Max. load 10.000 V CALIB value 0.5 mV/V (Load cell output value at Max. load) = (Rated output value of load cell)) × (Max. load value) / (Rate load value of load cell) = 3 mV/V × 0.34 t / 1 t = 1.02 mV/V (Voltage output value corresponding to CALIB value) = (Voltage output value at Max. load) × (CALIB value) / (Load cell output value at Max. load) = 10.000 V × 0.5 mV/V / 1.02 mV/V 4.902 V Therefore, the voltage output value in turning on “CALIB” switch is adjusted to 4.902 V	
4	ZERO adjustment Set the CALIB switch to OFF. Confirm the voltage output value to 0.000 V. If not, return to the step 2.	
5	Calibration is completed.	

4−3. Zero adjustment by mounting resistance

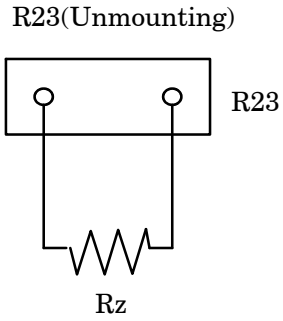
4−3−1. Mounting the resistance

The zero point adjustable range of this transmitter is 0.25 mV/V(±500 μst) or equivalent at the input conversion. Therefore, when an initial load exceeds this range, it is not possible to adjust it by this unit. In this case, mount resistance Rz on R22 (When an initial load is a plus) or R23 (When an initial load is a minus), and cancel an initial load as shown in the figure below. Moreover, because the resistance used exerts the influence directly on accuracy, resistance temperature coefficient less than 50 ppm/℃ is recommended. If the one with more excellent resistance temperature coefficient is used, the influence on accuracy by the temperature becomes small when used in the environment with a large temperature change.
The example of resistance for compensation corresponding to the input conversion strain is shown on the next page. However, the error is actually caused with the rose etc. of the I/O resistance of an actual strain gage applied transducer because this resistance is a theoretical value. Please think the standard to the end.

When the initial load is in plus
Rz is mounted on R22 on the P.C.board.



When the initial load is in minus
Rz is mounted on R23 on the P.C.board.



Resistance by which the zero adjustment of ±0.25 mV/V(±500 μst) or more is set can be requested by the undermentioned formula.

$$Rz = \frac{1}{E_T \times K} \times 10^3$$

Rz＝Resistance for compensation(kΩ)
E_T＝Tare weight(Initial load)(mV/V)
K＝146

The table below shows resistance for compensation corresponding to the input conversion strain.

		Resistance value(Rz)	
Input conversion strain		When the bridge resistance is 350 Ω	
μst	mV/V	Calculation value	Approximate value(E96)
200	0.1	68.5 kΩ	68.1 kΩ
400	0.2	34.2 kΩ	34.0 kΩ
600	0.3	22.8 kΩ	22.6 kΩ
800	0.4	17.1 kΩ	16.9 kΩ
1000	0.5	13.7 kΩ	13.7 kΩ
1200	0.6	11.4 kΩ	11.5 kΩ
1400	0.7	9.78 kΩ	9.76 kΩ
1600	0.8	8.56 kΩ	8.66 kΩ
1800	0.9	7.61 kΩ	7.68 kΩ
2000	1.0	6.85 kΩ	6.81 kΩ
2200	1.1	6.23 kΩ	6.19 kΩ
2400	1.2	5.71 kΩ	5.62 kΩ
2600	1.3	5.27 kΩ	5.23 kΩ
2800	1.4	4.89 kΩ	4.87 kΩ
3000	1.5	4.57 kΩ	4.53 kΩ
3200	1.6	4.28 kΩ	4.32 kΩ
3400	1.7	4.03 kΩ	4.02 kΩ
3600	1.8	3.81 kΩ	3.83 kΩ
3800	1.9	3.60 kΩ	3.60 kΩ
4000	2.0	3.42 kΩ	3.40 kΩ
4200	2.1	3.26 kΩ	3.24 kΩ
4400	2.2	3.11 kΩ	3.09 kΩ
4600	2.3	2.98 kΩ	2.94 kΩ
4800	2.4	2.85 kΩ	2.87 kΩ
5000	2.5	2.74 kΩ	2.74 kΩ

4−3−2. Confirmation of initial load

Please confirm it by the following procedure when an initial load (tare weight) is uncertain.

① Please prepare the digital voltmeter which can read 0.1mVDC.

② The voltage (power supply voltage of the bridge) between A and C of this unit (C is minus) is measured.

③ The voltage (input potential) between D and B of this unit (B is minus) is measured.

④ The input conversion value of an initial load is obtained by the undermentioned formula. If the obtained value is "＋ polarity", an initial load is plus, and if "− polarity", an initial load is minuses. Mount the resistance according to the paragraph 4−3−1.

$$\text{(Initial load input conversion value)} = \frac{\text{(Input voltage)}}{\text{(Power supply voltage of the bridge)}}$$

Calculation example)

Calculation example when power supply voltage of the bridge is 10.000 V and input voltage is 2.0 mV in the condition of the initial load(tare weight), is as follows:

Power supply voltage of the bridge 10.000 V

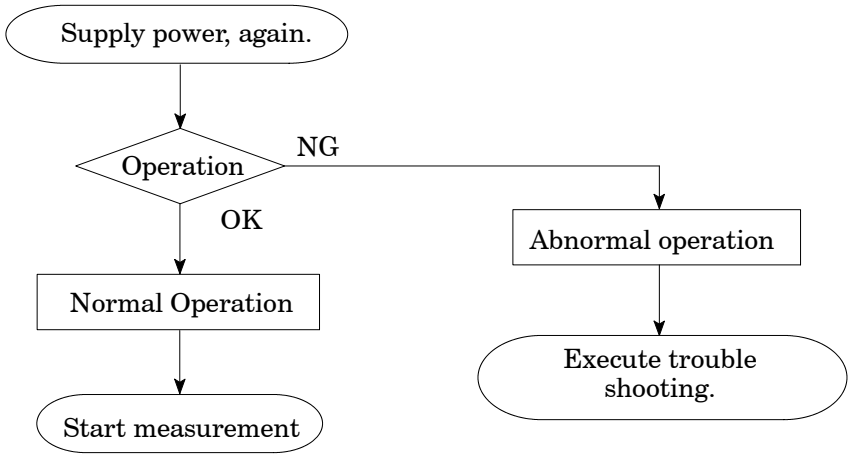
Input voltage 2.0 mV

$$\text{(Initial load input conversion value)} = \frac{2.0\ \text{mV}}{10.000\ \text{V}} = 0.2\ \text{mV/V}$$

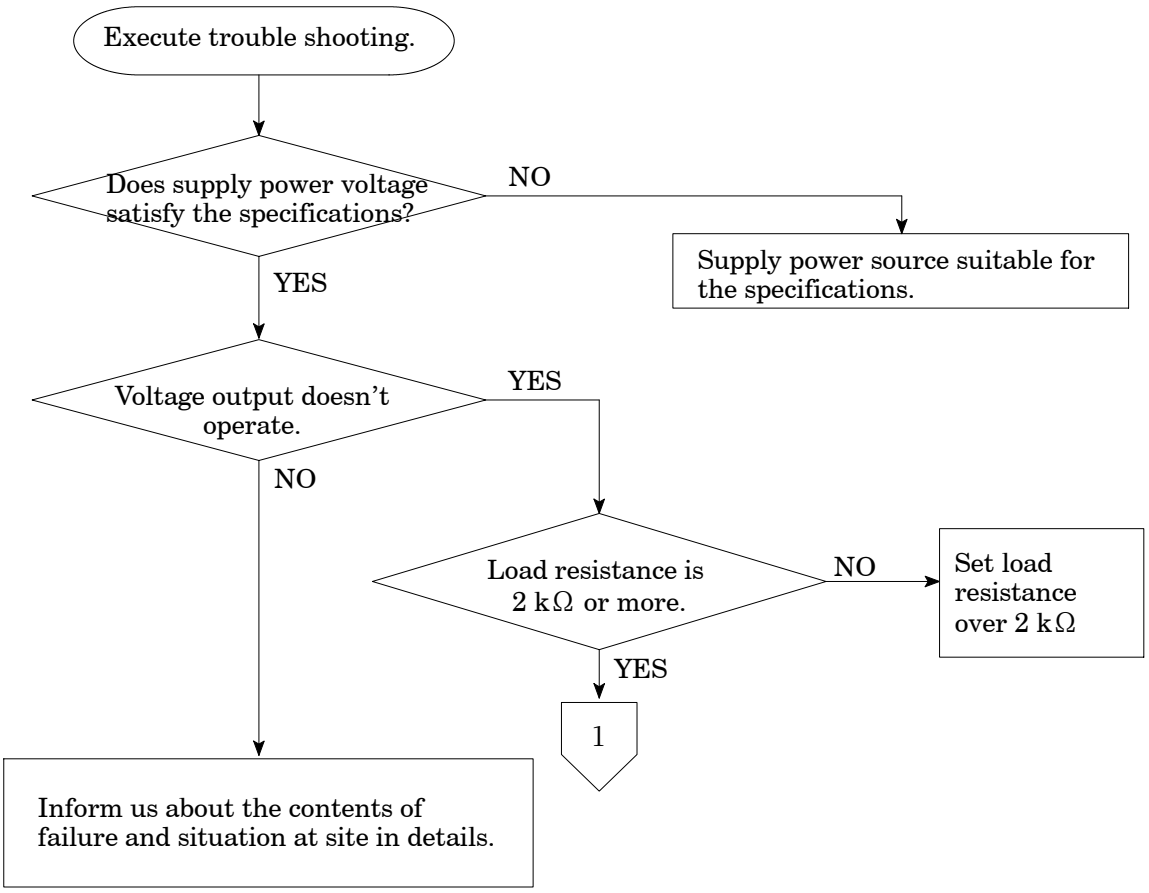
Therefore, according to the paragraph 4−3−1, Rz is calculated to 34.2 kΩ.

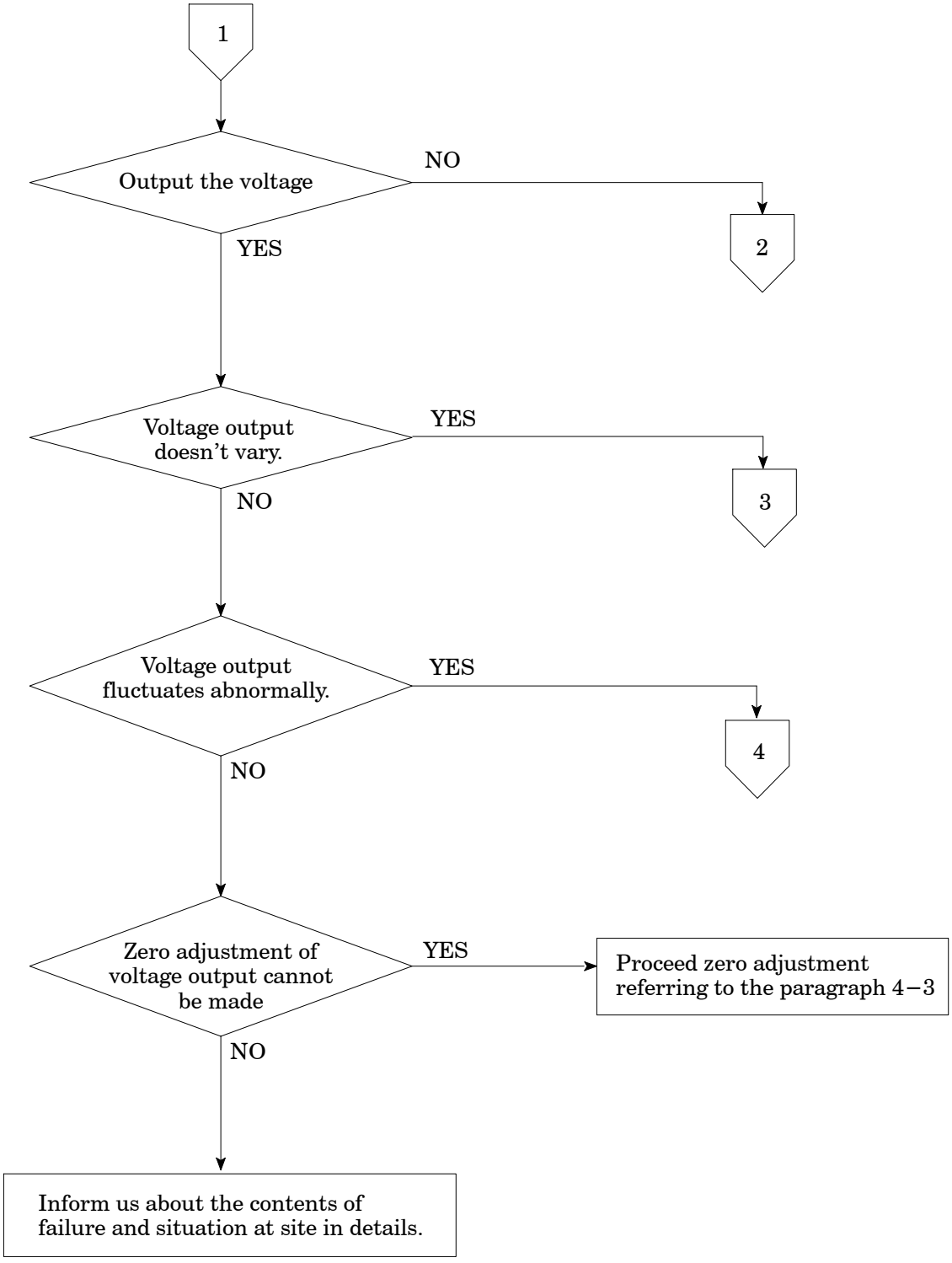
5. Trouble shooting

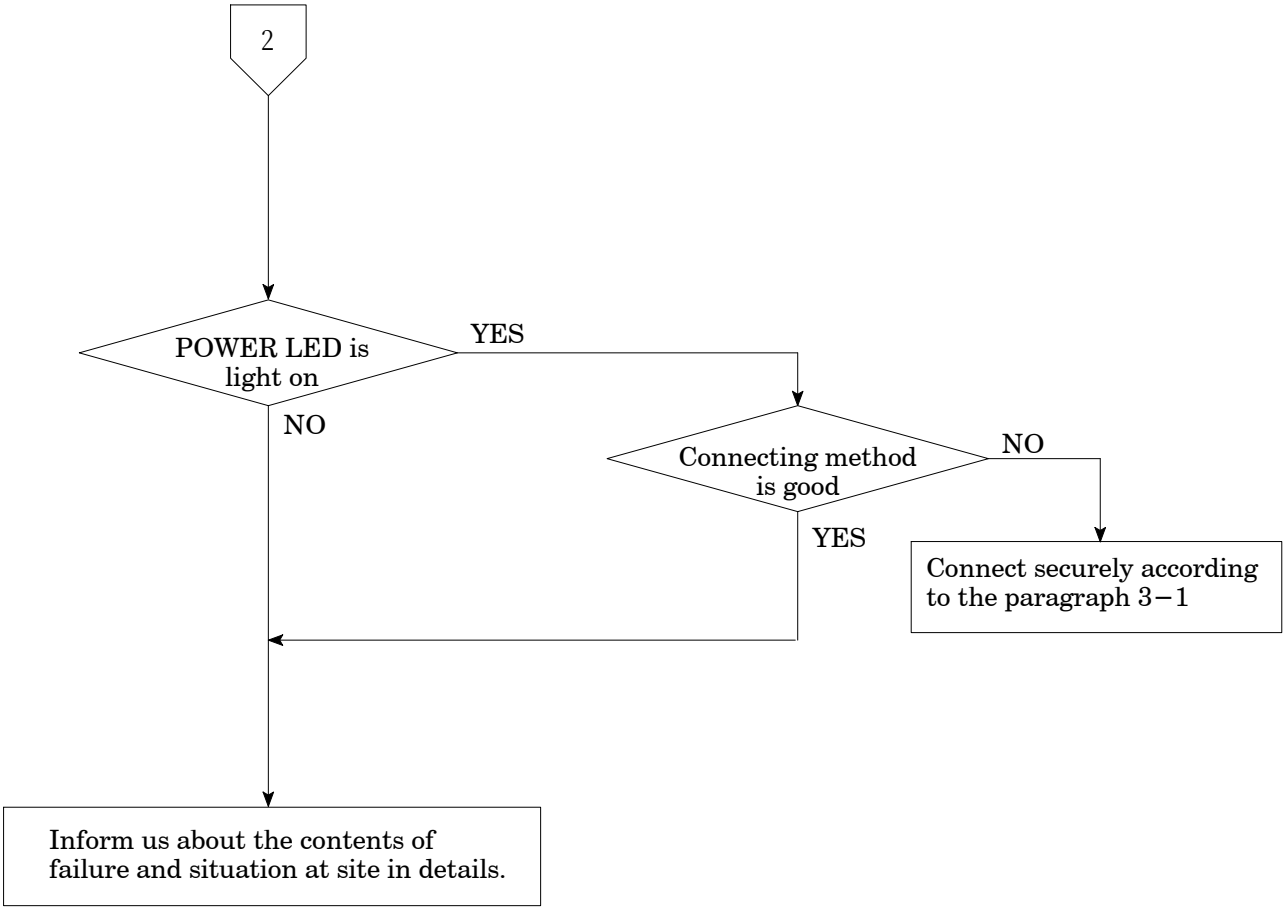
When abnormal point(s) is/are found during the operation of the instrument, check by the following procedures. However, when you can't find applicable item nor solve the symptom of trouble even after you have taken some measures, contact us.

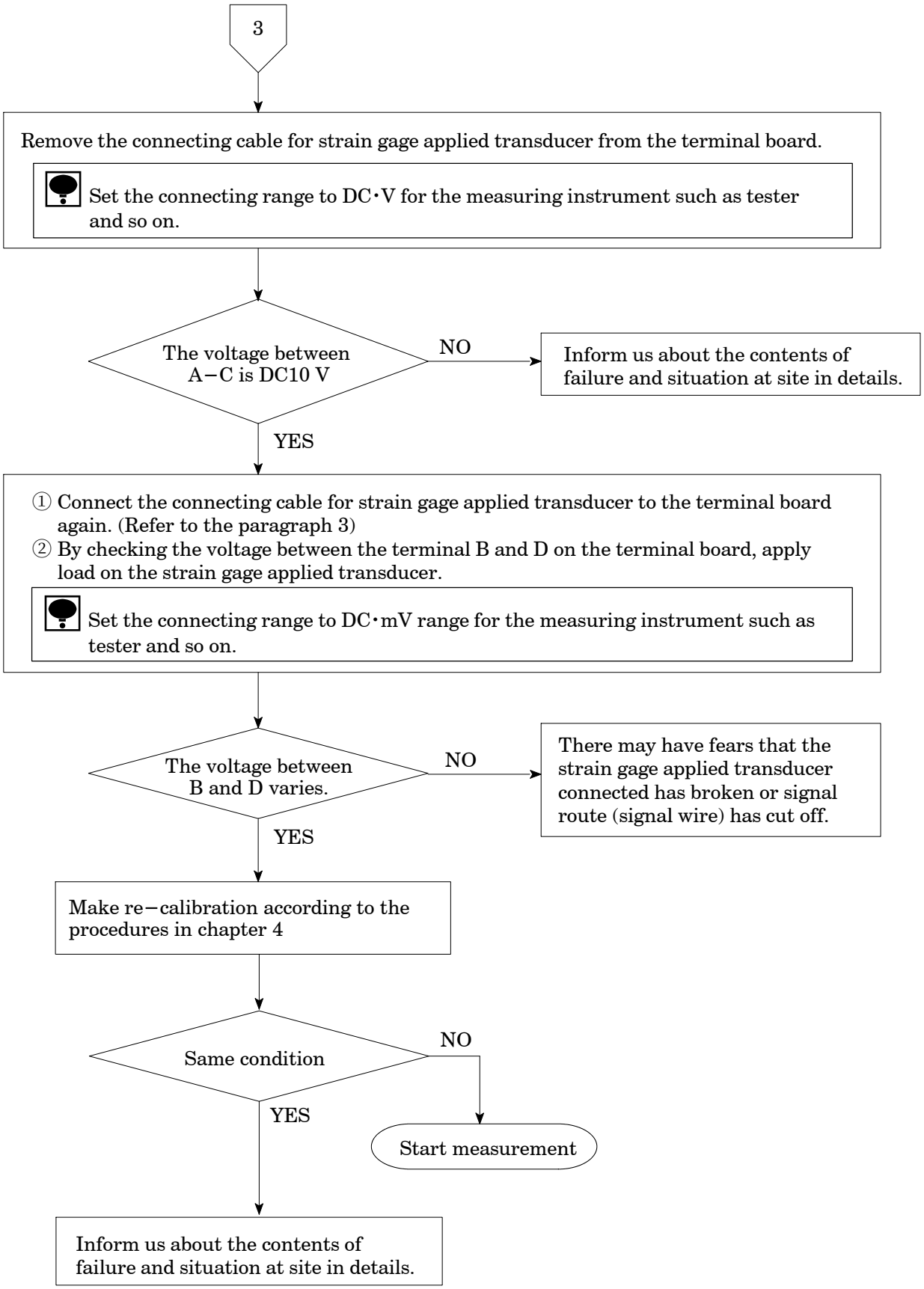


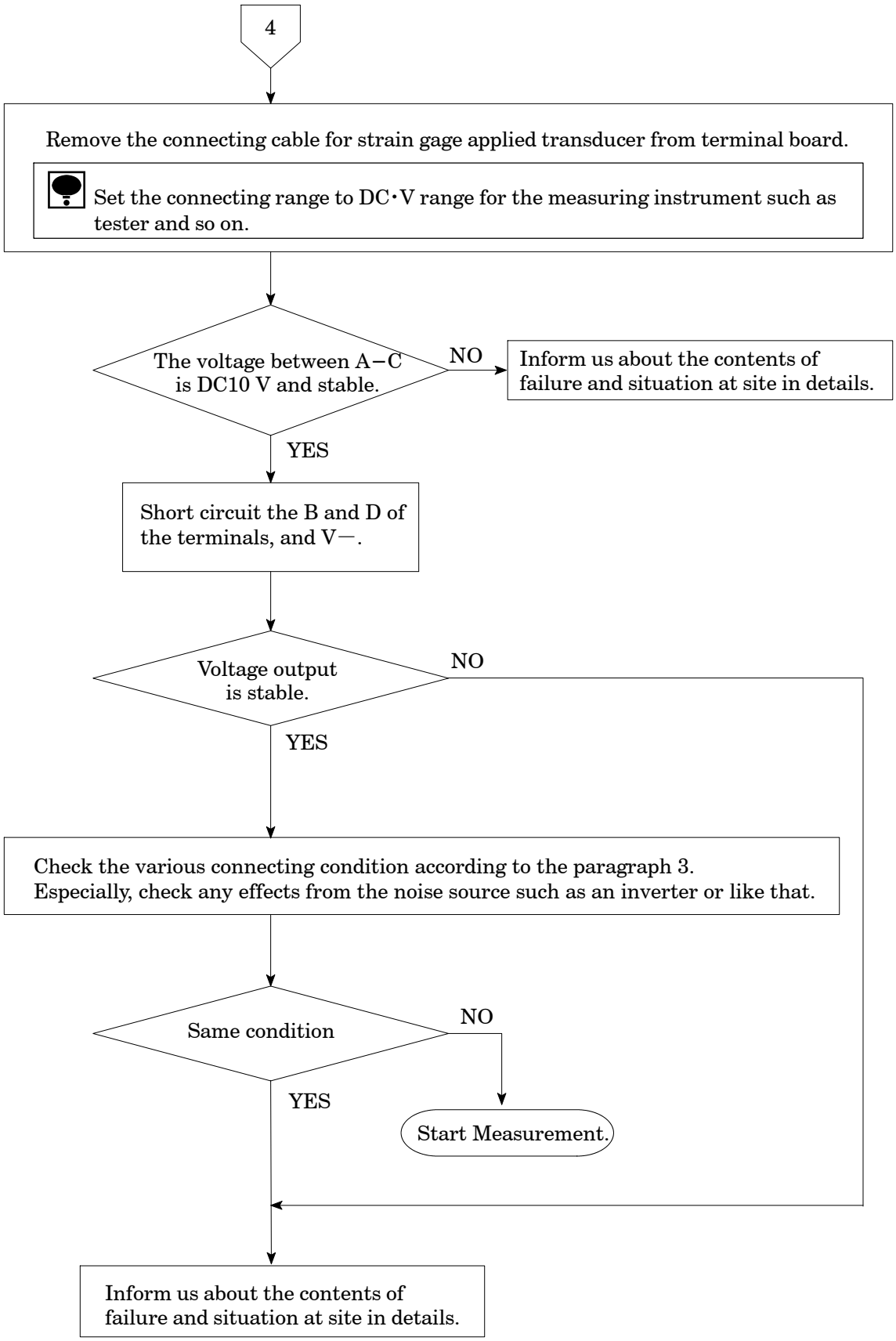
5−1. Execute trouble shooting




1
Output the voltage
NO
2
YES
Voltage output doesn't vary.
YES
3
NO
Voltage output fluctuates abnormally.
YES
4
NO
Zero adjustment of voltage output cannot be made
YES
Proceed zero adjustment referring to the paragraph 4−3
NO
Inform us about the contents of failure and situation at site in details.


2
POWER LED is light on
YES
NO
Connecting method is good
NO
YES
Connect securely according to the paragraph 3−1
Inform us about the contents of failure and situation at site in details.


3
Remove the connecting cable for strain gage applied transducer from the terminal board.
Set the connecting range to DC･V for the measuring instrument such as tester and so on.
The voltage between A−C is DC10 V
NO
Inform us about the contents of failure and situation at site in details.
YES
① Connect the connecting cable for strain gage applied transducer to the terminal board again. (Refer to the paragraph 3)
② By checking the voltage between the terminal B and D on the terminal board, apply load on the strain gage applied transducer.
Set the connecting range to DC･mV range for the measuring instrument such as tester and so on.
The voltage between B and D varies.
NO
There may have fears that the strain gage applied transducer connected has broken or signal route (signal wire) has cut off.
YES
Make re−calibration according to the procedures in chapter 4
Same condition
NO
YES
Start measurement
Inform us about the contents of failure and situation at site in details.


4
Remove the connecting cable for strain gage applied transducer from terminal board.
Set the connecting range to DC･V range for the measuring instrument such as tester and so on.
The voltage between A−C is DC10 V and stable.
NO
Inform us about the contents of failure and situation at site in details.
YES
Short circuit the B and D of the terminals, and V−.
Voltage output is stable.
NO
YES
Check the various connecting condition according to the paragraph 3.
Especially, check any effects from the noise source such as an inverter or like that.
Same condition
NO
YES
Start Measurement.
Inform us about the contents of failure and situation at site in details.

6. Specifications

6−1. Specifications

- Bridge power supply　DC10 V±0.3 V
- Applicable transducers　1 pieces of strain gage applied transducer(350 Ω) is connectable.
- Input range　0.5 mV/V to 1.5 mV/V
- Sensitivity　10 V output at the input of 0.5 mV/V
- Sensitivity adjustment range　2 000 times　adjustable from 1/1 to 1/4
- Output voltage　±10 V
- Output load resistance　2 kΩ or more
- Zero adjustment range　Adjustable ±0.25 mV/V by trimmer
  ※Adjustable the tare weight compensation by mounting the resistance.
- Non−linearity　0.02 %F.S.
- Temperature coefficient
  - Zero point　±1 μV/℃(Input conversion)
  - Sensitivity　±0.01 %F.S./℃
- CALIB　0.5 mV/V±0.001 mV/V
- Frequency response range　1 kHz(−3 dB±1 dB)

6−2. General specifications

- Operating temperature/humidity range
  - Temperature　−10 ℃ to 50 ℃
  - Humidity　Less than 85 %RH (Non condensing.)
- Power supply voltage　DC24 V　100 mA
- Outline dimensions(W×H×D)　80 mm×70 mm×20 mm
- Weight　Approx. 50 g
- Terminals　236−110(WAG0)：CN1

6−3. Standard specifications at the time of shipment

- Sensitivity　10 V output at the input of 1 mV/V

6−4. Accessories

- Instruction manual　1 piece
- Minus driver(small)　1 piece

7. Warranty

7−1. Warranty

- The instrument is covered by a warranty for a period of one year from the date of delivery.
- As for repairs and/or after service is required during the period of warranty, contact our sales office or sales agent from which you have purchased.

7−2. Repair

Before asking repairs, make checks once again that the connection, setting and adjustment for the instrument have finished properly by referring to 9. Trouble shooting.
Especially, make checks whether the connections of sensors are disconnected or cut off.
After that, still there may be found some defects in the instrument, contact our sales office or sales agency from which you have purchased.

●The contents of this manual may subject to change without notice.

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