azbil

CM2-JTL100-2001

ALTJ™ 9000 Immersion Type Liquid-Level Transmitter

User's Manual

Azbil Corporation

NOTICE

While the information in this manual is presented in good faith and believed to be accurate, Azbil Corporation disclaims any implied warranty of merchantability or fitness for a particular purpose and makes no express warranty except as may be stated in its written agreement with and for its customer.

In no event shall Azbil Corporation be liable to anyone for any indirect, special or consequential damages. This information and specifications in this document are subject to change without notice.

Precautions for Use

■ For safe use of the product, the following symbols are used in this manual.

⚠WARNING	Warnings are indicated when mishandling the product might result in the death or serious injury of the user.
⚠CAUTION	Cautions are indicated when mishandling the product might result in minor injury to the user or damage to property.

■ In describing the product, this manual uses the icons and conventions listed below.

⚠	: Use caution when handling the product.
⃠	: The indicated action is prohibited.
❗	: Be sure to follow the indicated instructions.
Handling Precautions	: Handling Precautions indicate items that the user should pay attention to when handling the product.
Note	: Indicates information that may be helpful.
☞	: Indicates an item or page with related information.
(1), (2), (3)	: Indicate the relevant portions of the operation procedure or figure necessary for explanatory purposes.

Cautions regarding Safe Work

■ Installation Precautions

⚠WARNING

The weight of this product may exceed 10 kg, depending on the model. When transporting or installing this product, wear safety shoes and use a transportation device or have two or more workers carefully carry the product. If the product is raised or dropped carelessly, personal injury or damage to the product may occur.
Be sure to hold the chain when installing the product with the weight attached. Do not hold the hollow cable, since it is slippery and holding it may result in an accident.
Install this product in a location where the operating conditions (pressure rating, temperature, humidity, voltage (☞ specification sheet), mounting orientation, and ambient atmosphere (☞Chapter 3 Installation) are satisfied. Failure to do so may cause a fire or malfunction.
Only specialists should do the installation and wiring work. Otherwise a fire or electric shock may result. "Specialists" are those who are skilled in instrumentation and electrical work.

⚠CAUTION

After installing this product, do not use it as a scaffold or put your weight on it. Doing so may damage the product.
Be careful to avoid impact to the glass part of the display from tools, etc. Otherwise, damage to the product or personal injury may result.
Perform the grounding work in the correct manner in accordance with the instructions in this manual. Incorrect grounding may adversely affect the output or cause a malfunction.
Do not subject the product to any type of shock or impact. Doing so may damage the device.
Use a power supply with an overcurrent protection function (overcurrent value: 50 mA or less).
Do not install the probe in a location where the water current is strong or where there is vibration. Doing so may cause an output error.

■ Wiring Precautions

⚠WARNING

Do not perform wiring work with wet hands. Doing so may cause an electric shock.

Before starting wiring work, be sure to dry your hands or use appropriate gloves, and turn off the power. Failure to do so may cause an electric shock.

⚠CAUTION

Perform wiring work correctly while carefully checking the specifications. Incorrect wiring may damage the device or cause a malfunction.

Apply power correctly according to the specifications. If the power input is not according to specifications, the device may be damaged.

■ Maintenance Precautions

⚠WARNING

If signs of corrosion are found on a pressure-resistant part such as a bolt, nut, or flange, replace the affected part with a new one. Otherwise, the part's performance may be compromised, resulting in a dangerous situation. A damaged part may cause a cut or other injury.

⚠CAUTION

When moving the probe up or down, move it slowly while carefully checking the surroundings, and bundle and secure excess cabling. Failure to do so may cause cables to be caught, or objects to be measured may be knocked out of position.

When work is performed with the probe in an upright position, be sure to secure it firmly. Failure to do so may cause a personal injury or damage to the product.

Replace a damaged seal gasket or O-ring with a new one. If this product is operated with a damaged seal, it may malfunction.

Do not attempt to modify or disassemble this product in any way that is not described in this manual. Doing so may cause an electric shock or a malfunction.

When this product is no longer needed, dispose of it appropriately as industrial waste in accordance with the applicable local regulations. Additionally, do not reuse a part or all of this product.

Do not open the case of the junction box in strong wind or rain. Water entering the junction box can cause a malfunction.

Do not use SFN communication when the process measured by the liquid level transmitter is under automatic control. Doing so may cause the output to vary, resulting in hazardous operation.

Introduction

Thank you for purchasing the ALTJ9000 Immersion Type Liquid Level Transmitter.

■ The ALTJ9000 Series

	Setting span	
Application	**3 to 100 kPa (0.3 to 10 m)**	**70 to 700 kPa (7 to 70 m)**
For tap water	JTL320	JTL330
For sludge, waste water, and sewage	JTL321	JTL331
For seawater	JTL322	JTL332

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Terms and Conditions

Chapter 1 Precautions

⚠ WARNING

The weight of this product may exceed 10 kg, depending on the model. When transporting or installing this product, wear safety shoes and use a transportation device or have two or more workers carefully carry the product. If the product is raised or dropped carelessly, personal injury or damage to the product may occur.

⚠ CAUTION

Do not subject the product to any type of shock or impact. Doing so may damage the device.

■ Unpacking the Package and Checking the Product

- **Unpacking**

  This product is a precision device. To prevent an accident or damage, please handle the product with care.

- **Checking the Accessories**

  When opening the package, check that the product itself and the accessories listed below are included.

  - User's manual
  - Parts listed below

2inch pipe-mounted model (model No. option T)			Wall-mounted model (model No. option S)		
1.	Bracket for mounting the pipe	1	1.	Bracket for wall mounting	1
2.	U bolt	1	2.	Hexagon head bolt	2
3.	Hexagon nut	2	3.	Spring washer	2
4.	Hexagon head bolt	2			
5.	Spring washer	2			

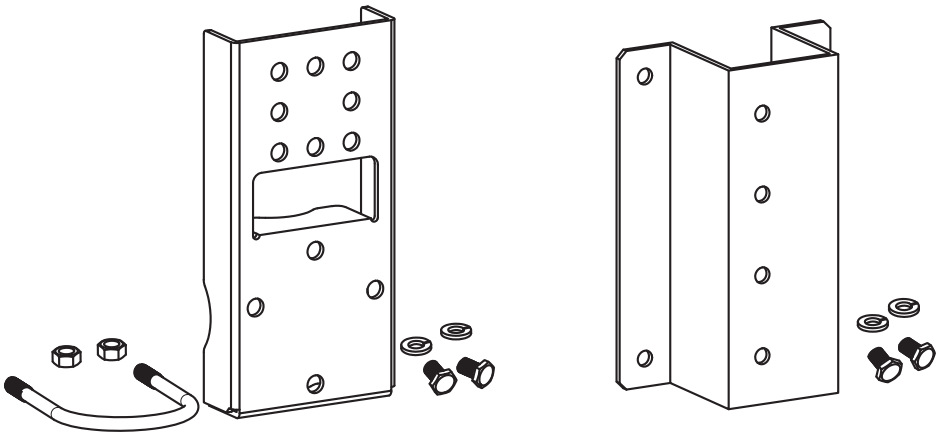

Fig. 1-1. Accessories

■ Parts of This Product

The following figure shows the structure and gives the part names for this product.

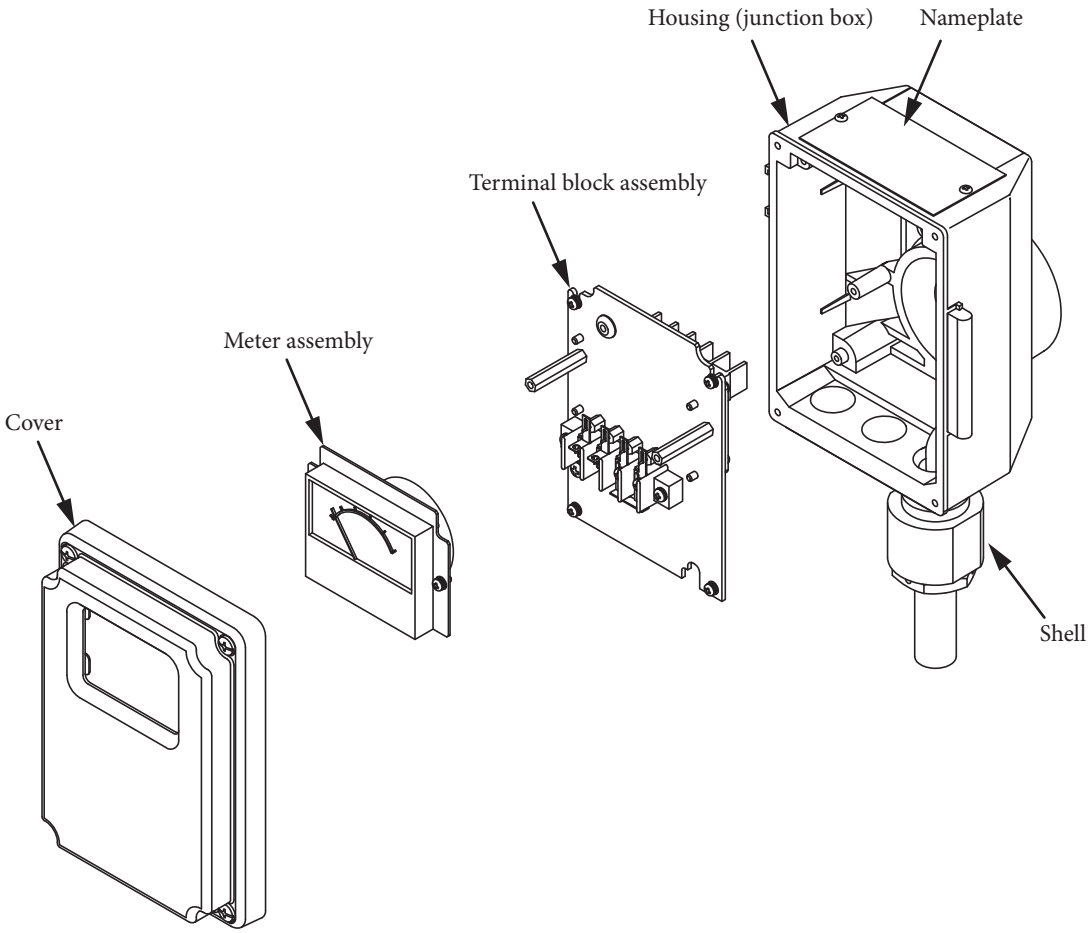

Fig. 1-2. Structure of junction box

Table 1-1. Main materials of junction box parts

Part	Main material		Weight of main material
Cover	Aluminum alloy	AC4A-T6	Approx. 480 g
Meter assembly plate	Carbon steel	SPCC	Approx. 20 g
Terminal block assembly plate	Carbon steel	SPCC	Approx. 170 g
Housing	Aluminum alloy	ADC 12	Approx. 660 g
Nameplate	Stainless steel	SUS 304	Approx. 15 g
Shell	Stainless steel	SUS 303	Approx. 180 g

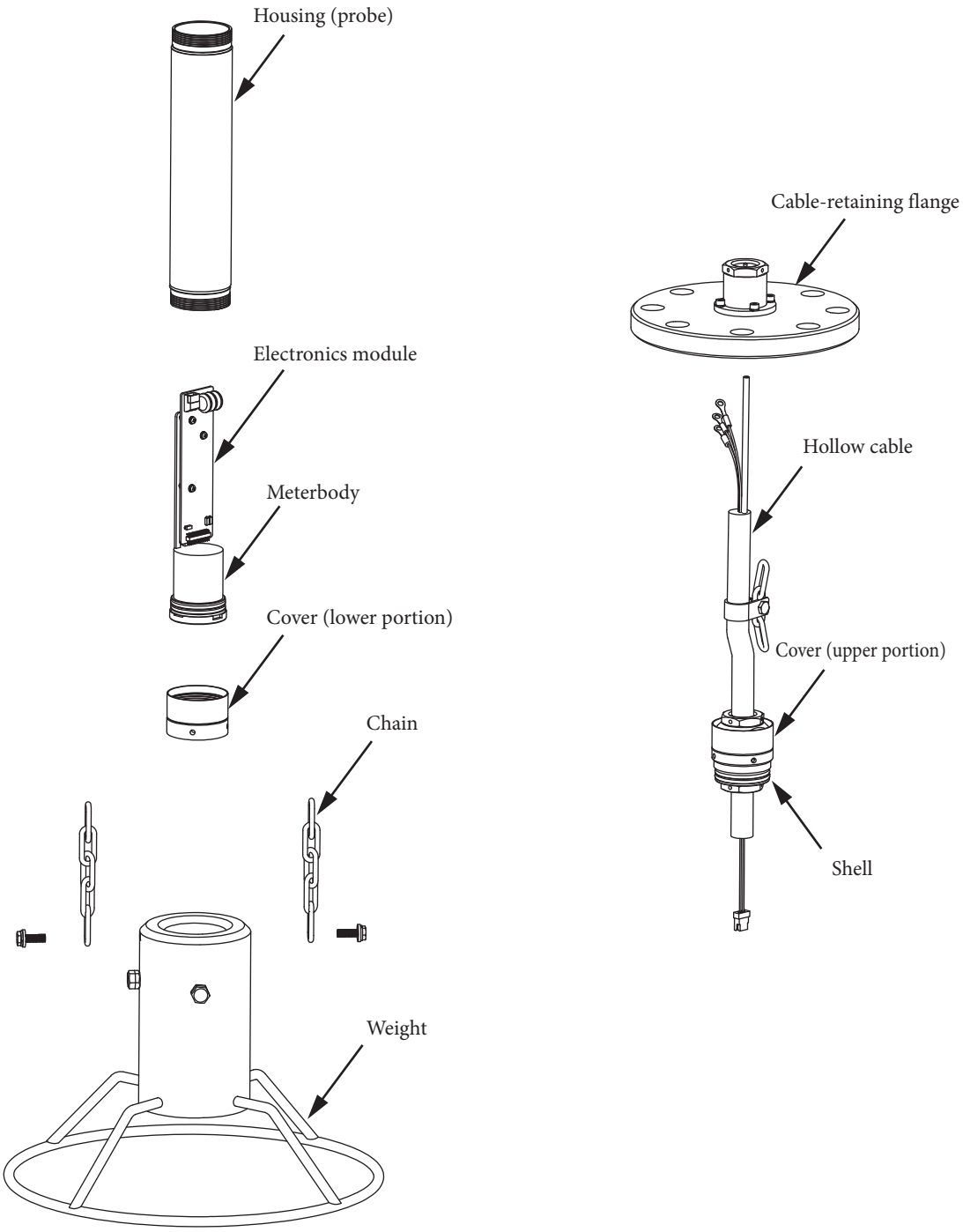

Fig. 1-3. Structure of probe and peripheral parts

Table 1-2. Main materials of probe and peripheral parts

Part	Main material		Weight of main material
Cable-retaining flange	Stainless steel	SUS F304	Approx. 2,000 g (for JIS 10K 50A)
Hollow cable	Polyethylene	--	Approx. 260 g/m
Housing with cover	Stainless steel	SUS 304	Approx. 1,060 g
Weight	Stainless steel	SUS 304	Approx. 6,000 g (for Φ300)
Chain	Stainless steel	SUS 304	Approx. 530 g/m

■ Checking the Specifications

The specifications of this product are written on the nameplate attached to the product, on the junction box. Check that the specifications you requested agree with those stated on the nameplate. In particular, be sure to check the specifications below.

- Tag No. (TAG NO. field)
- Model No. (MODEL field)
- Production No. (PROD. field)
- Range (RANGE field)

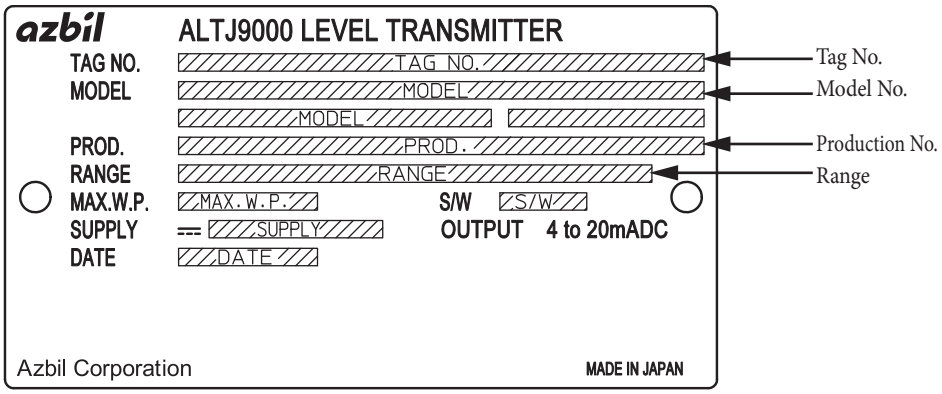

Fig. 1-4. Nameplate

- **Inquiry**

Please contact our branch office or sales office for inquiries regarding this product. When contacting our office, please inform us of the following numbers, which are written on the nameplate.

- Model No. (MODEL)
- Production No. (PROD.)

■ Storing

When storing the product for an extended period of time after purchase, strictly observe the following precautions.

- Store the product in a location that is subject to minimal vibration and shock.
- Do not store it in a location with a corrosive atmosphere such as a place where the chlorine concentration or humidity is high. Be sure to store the product in an indoor location subject to normal temperature and humidity.
- Store the product in the packaged state it was in at the time of delivery.

■ Transporting

To prevent any damage caused by an accident while transporting the device, keep it in the same packaged state it was in at the time of delivery.

■ Installing

Sufficiently investigate the ambient conditions and install the product while referring to ☞Chapter 3 Installation.

■ Disassembly of the Probe

As a rule, do not disassemble the probe, since it has already been adjusted at the factory. When disassembling the probe for maintenance or inspection purposes, be sure to follow the instructions (☞Chapter 9 Maintenance and Inspection).

■ About Wiring

- Be sure to ground devices (distributor and induced lightning surge prevention device, etc.) that are used for the junction box and power supply.
- In a location where a large induced lightning surge may occur, use shielded cables for the wiring between the junction box and power supply. In this case see the instructions for the ends of the shielded cable (☞Chapter 4 Electrical Wiring).

■ Cautions for Use of Communication Unit

When a communication device such as a mobile phone, PHS, or other wireless device is used near this product, the product may malfunction depending on the transmission frequency. Therefore, strictly observe the following precautions.

- Before using the communication device, check the distance at which it does not adversely affect the operation of this product, and keep the communication device at least that far away when it is used.
- Use the communication device after closing the case of the junction box.

■ Maintenance and Inspection

☞Chapter 9 Maintenance and Inspection

Chapter 2 Function and Configuration

■ Overview

The ALTJ9000 immersion type liquid level transmitter incorporates a microprocessor, uses a semiconductor pressure sensor to detect the water pressure, and outputs the current signal in proportion to the liquid level. This transmitter is composed of a probe and a junction box. The probe, which is installed underwater, is connected to the above-ground junction box by the hollow cable. The hollow cable contains a pipe with an inside diameter of 3 mm so that the output does not change due to variations in atmospheric pressure. Additionally, various settings of the liquid-level transmitter (range, damping time constant, constant current output, etc.) can be changed and set from the control room using a CommStaff communicator. Please also refer to the user's manual for the communicator listed below as a reference document for this liquid level transmitter.

- Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™ 9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014.

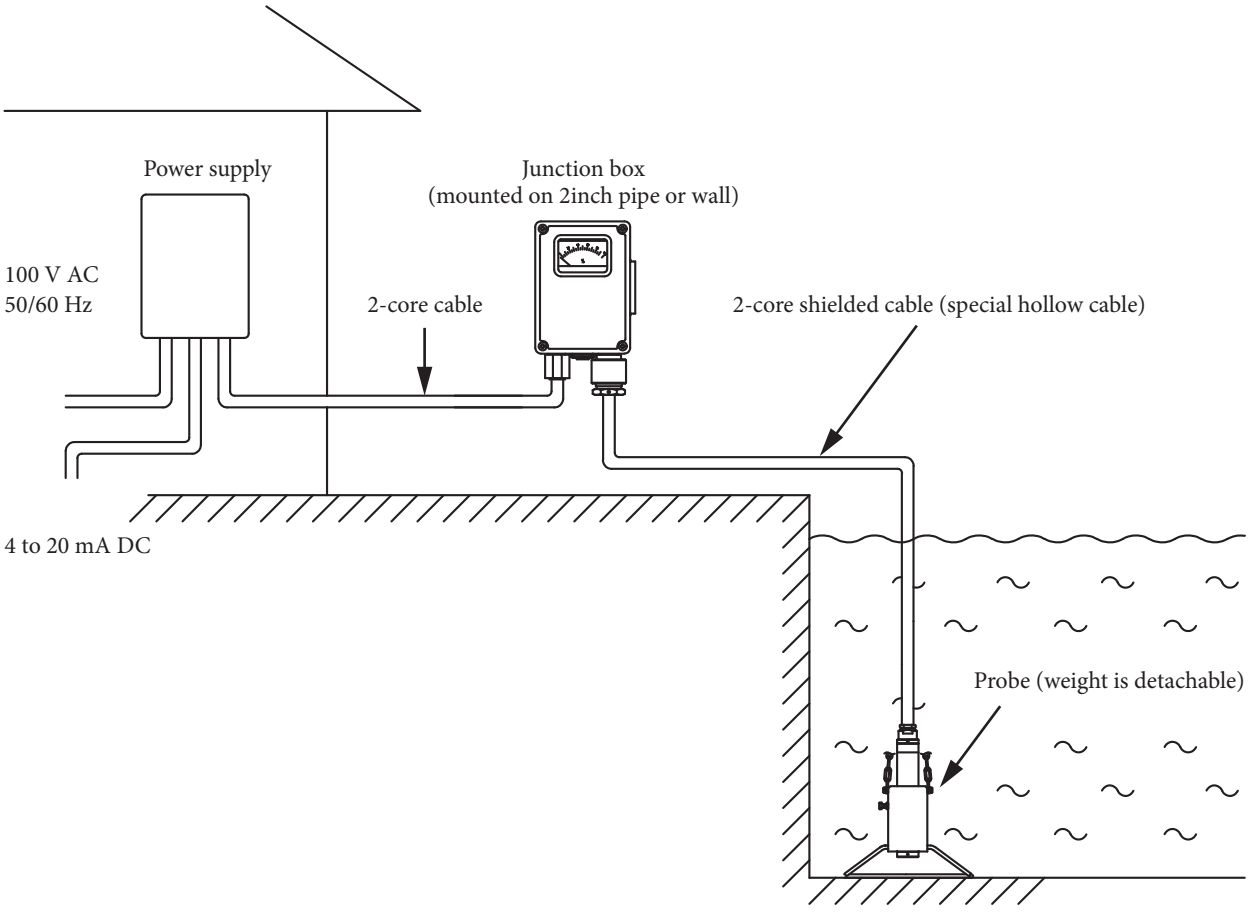

Fig. 2-1. System configuration diagram of ALTJ9000

■ Configuration

- **Probe**

  The probe, which consists of a pressure-receiving section and a transmission section, is installed underwater. The water pressure is transmitted to a semiconductor pressure sensor through a metallic diaphragm and sealed liquid. The transmission section processes the output of the semiconductor pressure sensor. It converts the output to a 4–20 mA DC signal in proportion to the liquid level, and then outputs the converted signal. The probe is equipped with a lightning arrestor as standard equipment. Additionally, an approximately 6 kg weight and chain can be mounted easily as optional specifications.

- **Junction Box**

  The junction box is installed above ground and connects to the hollow cable from the probe and to the cable from the power supply. The reference pressure side of the semiconductor pressure sensor is open to the atmosphere through the pipe of the hollow cable and the hole in the rear panel of the junction box. The output can be indicated using an analog meter. The junction box is also equipped with a lightning arrestor as standard equipment.

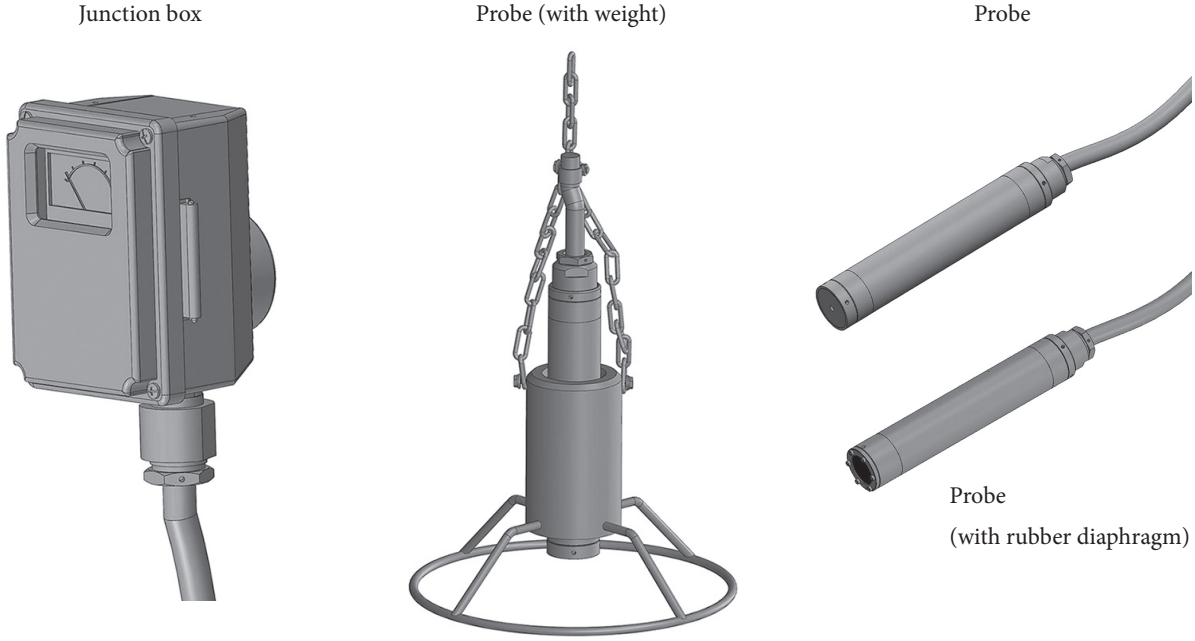

Fig. 2-2. External view of junction box and probe

■ Operating Principle

The pressure-receiving section transmits the water pressure through the metallic diaphragm and sealed liquid to the sensor section. In the sensor section, the sensor deforms to a degree that corresponds to the transmitted pressure, and the resistance value changes. A Wheatstone bridge circuit detects the resistance and sends it to the transmission section after A-D conversion. At the same time, the auxiliary sensor (temperature sensor), which is built onto the sensor chip, detects the ambient temperature and sends it to the transmission section. The digitalized signal that has been sent to the transmission section is processed by a microprocessor to convert it into a 4–20 mA DC analog signal proportional to the set range using D-A conversion. After that, the converted signal is output. All of the pressure and temperature data for the probe is obtained during manufacturing. In order to do the calculations necessary to correct the measured pressure to the true pressure, this data is stored in EEPROM. The microprocessor uses the information in EEPROM and outputs the result.

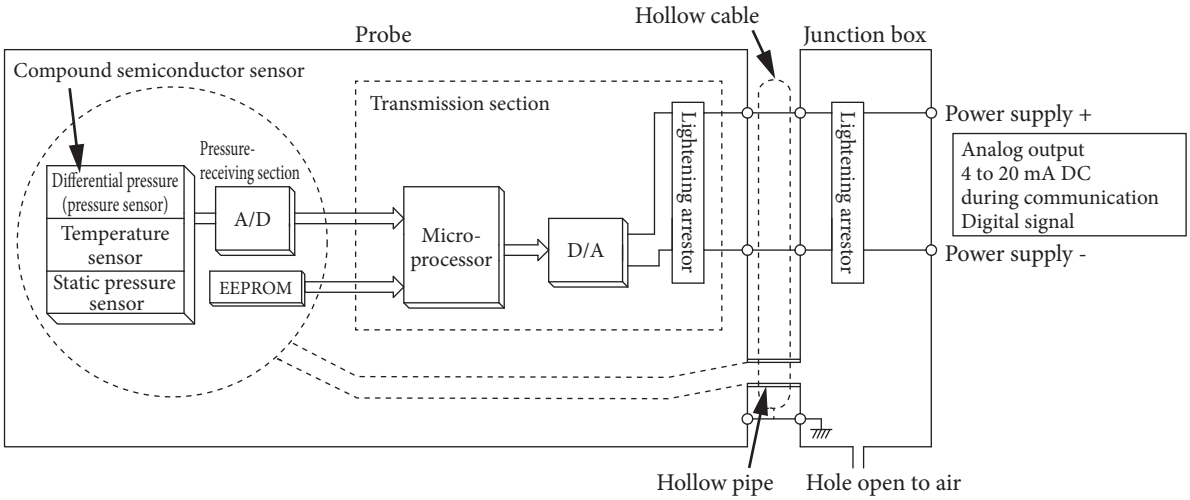

Fig. 2-3. Overall configuration diagram

Chapter 3 Installation

⚠ WARNING

Be sure to hold the chain when installing the product with the weight attached. Do not hold the hollow cable, since it is slippery and holding it may cause an accident.

Only specialists should do the installation and wiring work. Otherwise a fire or electric shock may result. "Specialists" are those who are skilled in instrumentation and electrical work.

⚠ CAUTION

After installing this product, do not use it as a scaffold or put your weight on it. Doing so may damage the product.

Do not install the probe in a location where the water current is strong or where there is vibration. Doing so may cause an output error.

■ Probe

- Install the probe in a location where the water temperature is -5 to +55 °C and changes in water temperature are minimized to as great a degree as possible.
- Do not install the probe in a location where the water current is strong or where there is vibration.
- If the weight is not attached to the probe, suspend the probe in the water. To prevent the probe from swinging, suspend the probe inside a protective pipe to as great a degree as possible.
- If the weight is attached to the probe, be sure to hold it by the chain and lower it gently to the bottom of the water. If the probe is held by the hollow cable as it is lowered, the wire may break or water may enter the probe. Therefore, never hold the hollow cable when the probe is suspended.
- If the weight is attached to the probe, select a level surface with a flat bottom. If the probe is tilted, an output error may occur.
- When using a cable-retaining flange, tighten the gland, compress the gasket, and fix the hollow cable. (☞Fig. 3-1)
- The bend radius of the hollow cable is 30 cm. Do not bend it to a smaller radius.

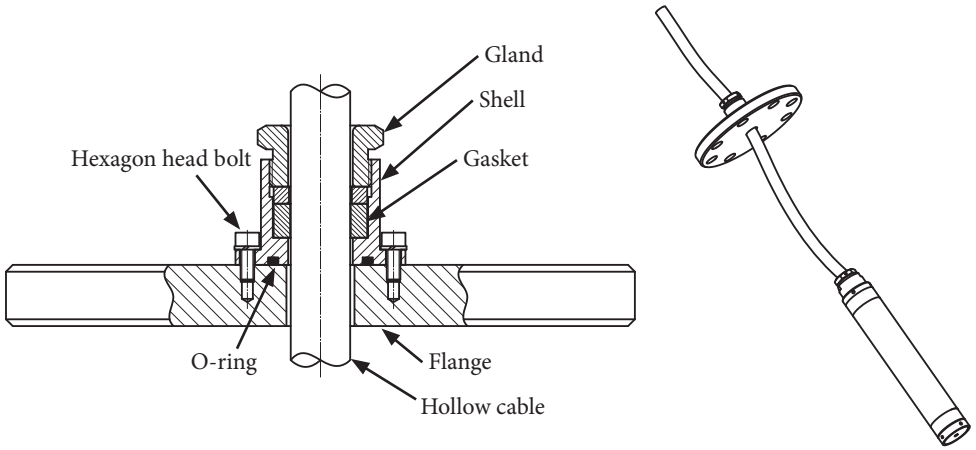

Fig. 3-1. Cable-retaining flange

■ Junction box

- Install the junction box in a location with an ambient temperature ranging from -5 to +55 °C.
- If the junction box is installed in a poor atmosphere with high chlorine gas concentration or high humidity, a contact failure or wire break may occur due to corrosion. Therefore, please avoid such environments.
- There is a rear cap on the rear panel of the junction box. The reference pressure is taken from the hole in the rear cap through the tube of the hollow cable. Therefore, if water enters the hole or if the hole is blocked, an output error or malfunction man occur. Take appropriate measures so that water does not enter the hole and so that the hole is not blocked.

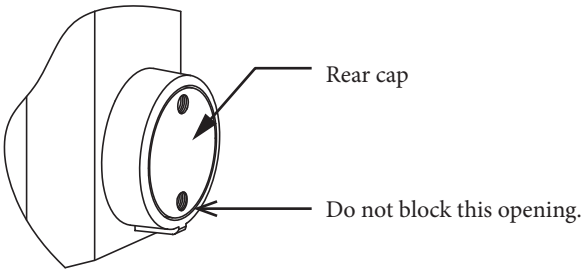

Fig. 3-2. Blocking of the hole in the rear cap

- For details about the installation dimensions, refer to the external dimensions given on the specification sheet or delivery specification.

- **Installation Procedure**

  - 2 inch pipe mounting model
    Attach the junction box to a vertical or horizontal 2 inch (50 A) pipe using the mounting bracket and U bolt. There are two bolt holes in the rear panel of the junction box. Attach the bracket using these bolt holes. Secure the foundation of the pipe firmly so that it does not shake.
  - Wall-mounted model
    Attach the junction box to a wall using the wall mounting bracket. There are two bolt holes in the rear panel of the junction box. Mount the bracket using these bolt holes. Bolts to attach the junction box to the wall are not supplied with the product. Please obtain appropriate bolts beforehand.

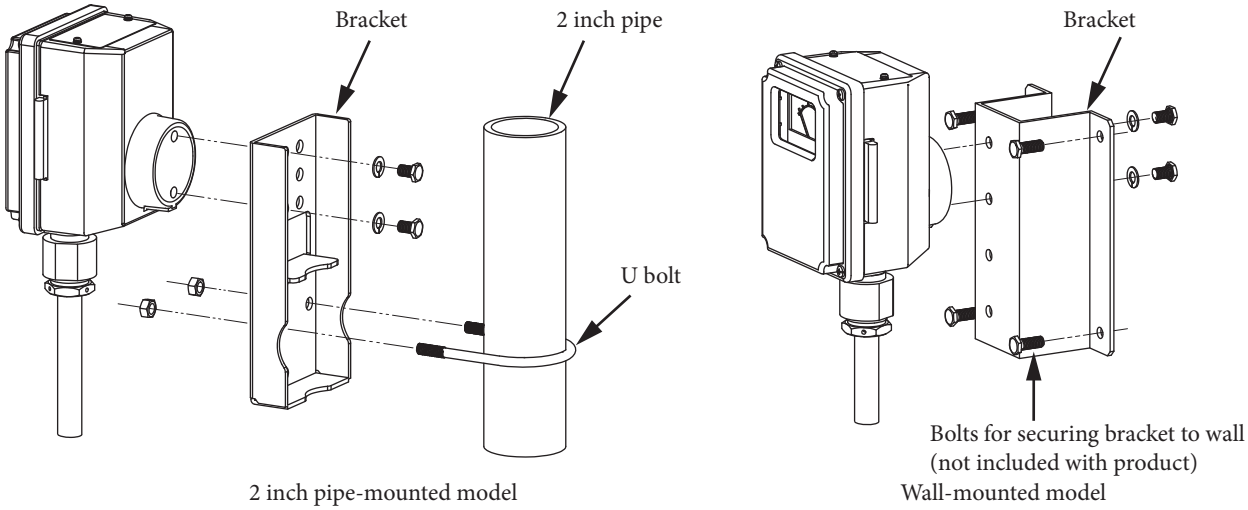

Fig. 3-3. Installation of junction box

Chapter 4 Electrical Wiring

⚠ WARNING
Only authorized engineers are permitted to perform the installation or wiring work. Failure to do so may cause a fire or electric shock. Authorized engineers are those who have instrumentation work and electrical work skills.
Do not perform wiring work with wet hands. Doing so may cause an electric shock.
Before starting wiring work, be sure to dry your hands or use appropriate gloves, and turn off the power. Failure to do so may cause an electric shock.

⚠ CAUTION
Perform the grounding work in the correct manner in accordance with the instructions in this manual. Incorrect grounding may adversely affect the output or cause a malfunction.
Use a power supply with an overcurrent protection function for this product. (Overcurrent value: 50 mA or less)
Perform wiring work correctly while carefully checking the specifications. Incorrect wiring may damage the device or cause an operation error.
Use the power supply correctly in accordance with the specifications. If a different power supply is input, this may damage the device.
Do not open the case of the junction box if there is strong wind or rain. Otherwise, water will enter the junction box, causing a malfunction.

■ Wiring

This device uses a 2-wire system. The power supply wire also serves as a signal wire. 24 V DC power is required for the power supply circuit. Wire the device while referring to the following.

- **General Wiring**

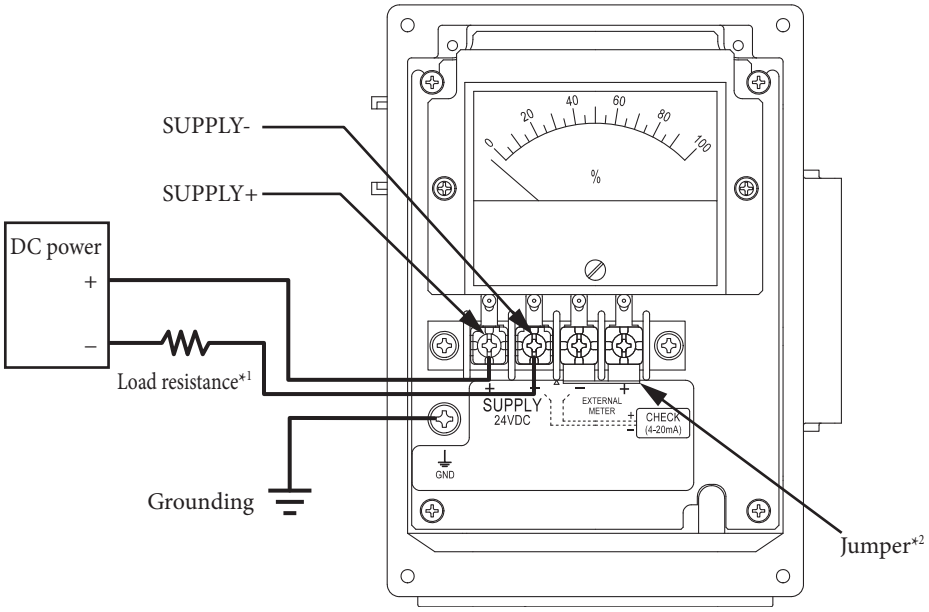

Fig. 4-1. General wiring

- **Connection and Wiring of External Meter**

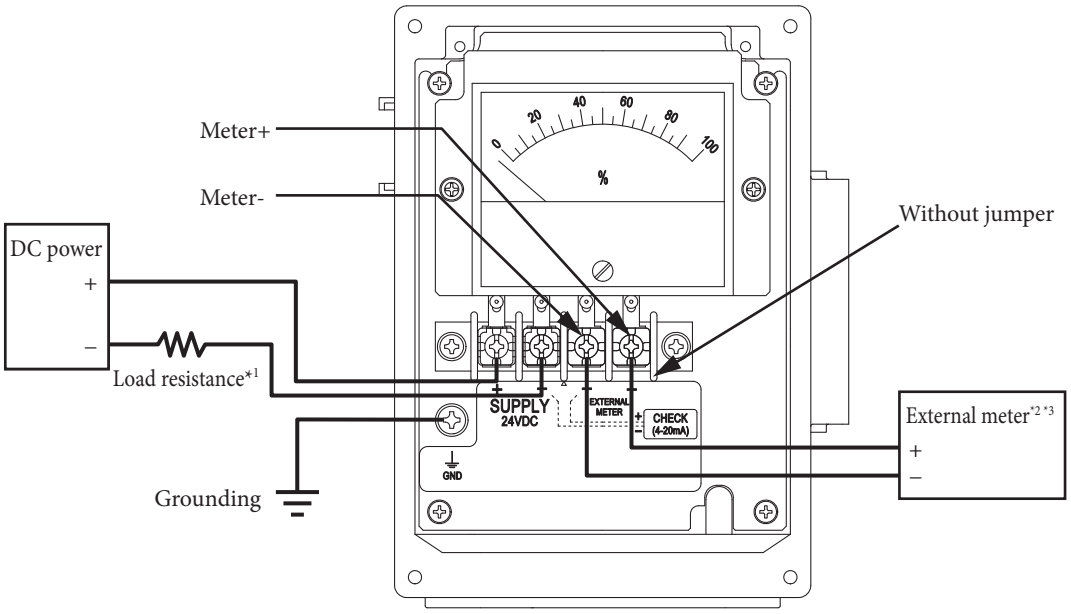

Fig. 4-2. Wiring when external meter is used

* 1 An external load resistance of 250 Ω or more is needed for communication. If the total load resistance on the receiving gauge side is less than 250 Ω, insert a resistor of the appropriate size into the loop.

* 2 To connect an external meter, first remove the jumper.

* 3 If an meter with an internal resistance of more than 10 Ω will be used, when ordering, select the specifications for mounting a field meter (high load resistance), additional specification 1: B07.

■ Piping for Wiring/Cable Gland

Run the cable into the case of the liquid level transmitter as described below.

- Attach the pipe serving as a conduit or the cable gland to the conduit for electrical wiring on the bottom left of this device.
- To prevent rainwater from entering inside this device, use sealant, etc., to waterproof the conduit connection. Additionally, for the cable gland, select an appropriate cable gland with guaranteed waterproof and dust-proof performance.

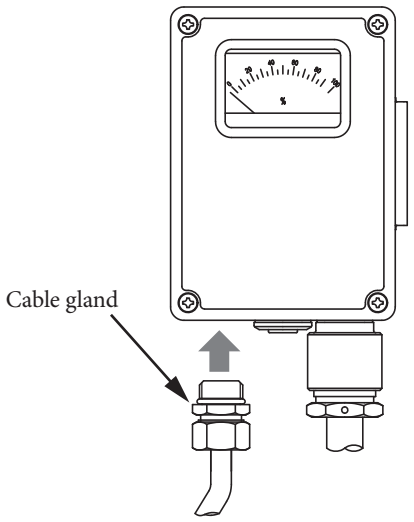

Fig. 4-3. Piping for wiring

■ Selection of Lead Wire (Between the Power Supply and Junction Box)

To reduce adverse effects from an induced lightning surge or electrical noise, use 2-core cabling with performance that is equal to or higher than CVVS PVC-insulated PVC sheath cable (JCS 258A) with 600 V annealed copper tape shielding for control use. The recommended outside dimension and strand cross-sectional area are given in Table 4-1.

Table 4-1.

Cable external dimension	Strand cross-sectional area
11.5 mm or less	1.25 to 2 mm^2

If it is absolutely necessary to use a cable or wire without shielding, use a cable composed of 3 solid wires or 3 stranded wires with performance that is equal to or higher than the 600 V PVC insulated wire (JIS C 3307), and then ground 1 wire at both ends.

Use a crimp type terminal lug with an insulator for the cable terminal. The outside dimension of the part of the crimp terminal lug that contacts the screw is shown in Table 4-1.

Table 4-2.

	Screw used	Outside dimension of screwing part
Crimp type terminal lug	3.5 mm-screw	8.9 mm max

In addition, use wires and cables suitable for the ambient atmosphere in terms of resistance to temperature and damage-causing gases and liquids.

■ Hollow Cable (Between the Probe and Junction Box)

Use the special cable in the hollow pipe (hollow cable) connected at the time of shipment for wiring. Do not use any other wire or cable. Additionally, since the wiring of this section was done at the factory, please use it as it is.

■ Grounding

Grounding is very important to prevent the device from being damaged by induced lightning surge. Be sure to do the grounding work.

- Ground the device with a resistance of less than 100 Ω. In a location where large induced lightning surge can be expected or frequently occurs, use more advanced grounding. This will ensure the sufficient performance of the built-in lighting arrestor.
- Use 600 V PVC-insulated wires for grounding.

- **Probe**

The probe does not need to be individually grounded because grounding the junction box grounds the probe.

- **Junction box**

  - Be sure to ground the junction box, since doing so effectively grounds the probe.
  - Ground terminals are located both on the inside (GND part of the terminal plate) and outside (case) of the junction box. Either terminal can be used.

■ Power Supply and External Load Resistance

It is necessary to determine the relationship between the power voltage and external load resistance used for this device within the range shown in the figure below. The external load resistance is the sum total of the resistance values connected to the output terminals of this device, such as the resistance of the cables that make up the loop and the internal resistance of connected gauges.

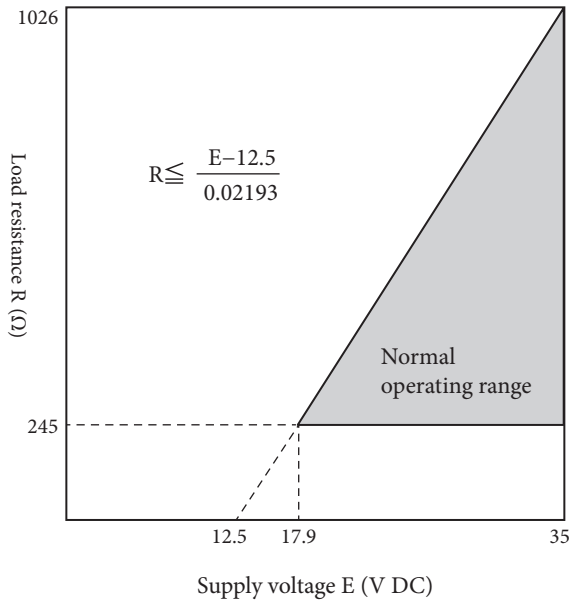

Fig. 4-4. Relationship between the power supply and external load resistance

Chapter 5 Function and Configuration of CommStaff

■ Introduction

CommStaff is a setup tool that communicates with Azbil smart devices (ALTJ9000 and others) to allow the user to change various settings. It runs on a Windows PC. CommStaff's communication interface connects to a USB port on the Windows PC, and the communication cable connects to the communication terminal on the smart device.
CommStaff supports SFN communication and uses a special communication interface.

■ Precautions

- **Precautions When the Connected Device Is Changed**

CommStaff continues to communicate with the device to update dynamic values while a dynamic value like pressure is displayed. If the cable is disconnected from the smart device in order to change the device, a communication error occurs in CommStaff. To prevent this error, exit from CommStaff temporarily before disconnecting the cable from the smart device. After connecting the cable to the new device, restart CommStaff.

- Do not use CommStaff when the PC is connected to AC power.
- Do not connect the communication interface before installing the CommStaff software on the PC. In such a case CommStaff will not operate correctly because drivers will not be found.

■ Configuration of CommStaff and Peripheral Devices

The configuration of CommStaff is shown below.

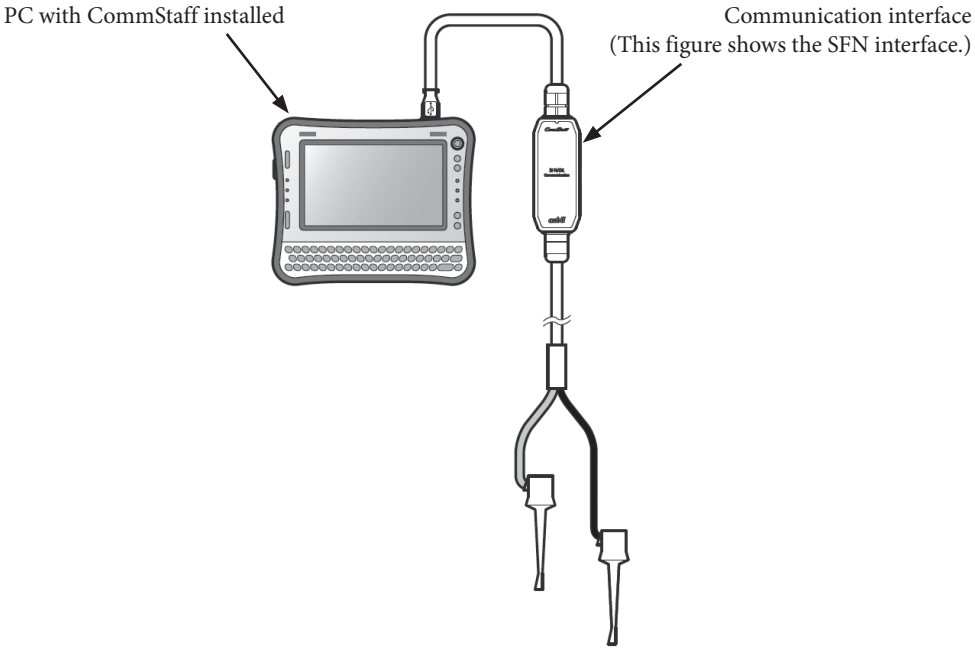

Fig. 5-1. Configuration of CommStaff and peripheral devices

■ Operating Environment

The operating environment of the communication interface (CFS100 SFN DE) is as follows.

- Operating temperature: 0 to 50 ℃
- Operating humidity: 5 to 95 %

However, note that if the environmental conditions for the PC are narrower than the conditions shown above, the communication interface should be used within the operating condition range of the PC.

■ Conditions for Connected Devices

- **PC**

Use a PC that satisfies the following conditions.

Table 5-1.

OS	Windows 7 Professional (32-bit version), Japanese or English
Free hard disk space	500 MB or more
Communication port	USB 2.0 or higher

Operation has not been verified with an OS other than the above.

- **Communication Interface**

Use a communication module that satisfies the following conditions.

Table 5-2.

SFN/DE communication interface	CFS100 SFN DE azbil product model No.: 80345962-001 80345962-002

Chapter 6 Configuration (Setting)

⚠ CAUTION

Do not perform the SFN communication when the process of the liquid level transmitter is in the automatic control status. Doing so may cause the output to vary, resulting in a hazardous operation status.

This chapter describes the settings that can be changed using the communicator.
For details about changing settingus, refer to the following user's manual for CommStaff.

- Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014.

Table 6-1. Settings that can be changed using CommStaff

Setting	Details	Notes
Registered Tag No.	You can set a Tag No. using up to 8 alphanumeric characters and symbols as shown below. • Alphanumeric characters: "A" to "Z", "0" to "9" • Symbols: " " (space), "." (period), "-" (hyphen), "/" (slash)	When changing a Tag No., make sure that the specifications set for this device comply with those at the installation location.
Pressure unit	Select one of the following. • inH_2O, inHg, mmH_2O, mmHg, psi, bar, mbar, g/Sqcm, kg/Sqcm, Pa, kPa, MPa	When using this device in Japan, be sure to select an SI unit.
Measurement range	LRV and URV must be set. • LRV: The value that outputs 4 mA. • URV: The value that outputs 20 mA.	Numeric values that can be input can have up to2 decimal places.
Damping time constant	Choose one of the ten steps below. • 0 s, 0.16 s, 0.32 s, 0.48 s, 1 s, 2 s, 4 s, 8 s, 16 s, 32 s	If any other value is set, it is replace with the nearest of the values on the left.
Forced writing	The setting is forcibly written to nonvolatile memory	--
Memo	A memo can consist of up to 32 of the alphanumeric characters and symbols shown below. • Alphanumeric character: "A" to "Z", "0" to "9" • Symbol: " " (space), "." (period), "-" (hyphen), "/" (slash)	--

Chapter 7 Operation

⚠ WARNING

Install this product in a location where the operating conditions (pressure rating, temperature, humidity, voltage (☞ specification sheet), mounting orientation, and ambient atmosphere (☞ Chapter 3 Installation) are satisfied. Failure to do so may cause a fire or malfunction.

⚠ CAUTION

Do not perform the SFN communication when the process of the liquid level transmitter is in the automatic control status. Doing so may cause the output to vary, resulting in a hazardous operation status.

This chapter describes the following matters.

- Connecting a communicator (CommStaff, etc.) to this device
- Checking the settings of the transmitter
- Preparations before measurement
- Starting and stopping measurement

For details about how to operate CommStaff, refer to the relevant user's manual below.

- Field Communication Software CommStaff Model: CFS100 (Common Edition) User's Manual, No. CM2-CFS100-2001
- Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™ 9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014

  Note Be sure to read the user's manual thoroughly before connecting to the transmitter.

7-1 Preparations for Operation

■ Connecting the Communicator (CommStaff)

The communication method ofthe transmitter is SFN communication.
The following figure shows the wiring for connection of a communicator and this device.
For SFN communication using CommStaff, be sure to connect the cable and terminals of this device as shown below.

- Red wire: SUPPLY+ (S+) terminal
- Black wire: SUPPLY- (S-) terminal

[!] Handling Precautions

- For communication with the communicator, an external load resistance of 250 Ω or more is needed. If the total load resistances on the receiver side is less than 250 Ω, insert a resistor of the appropriate size into the loop.

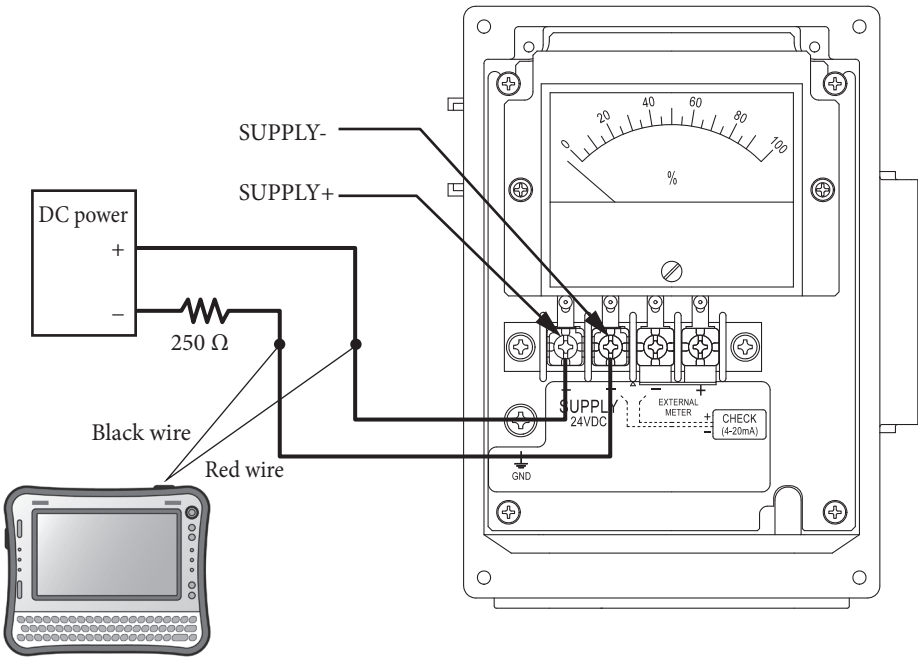

Fig. 7-1. Connecting with the communicator

■ Checking the Settings

Check using the communicator (CommStaff) that the settings necessary for operation are made correctly. When changing any setting, make sure that the specifications set for this device comply with those at the installation location.

- **Hardware Write Protection**

Hardware write protection is switched ON and OFF by sliding switch SW1 on the electronics module of the probe.
Hardware write protection is set to OFF at the factory to allow users to change the settings.
When hardware write protection is set to ON, the settings cannot be changed.

- Hardware write protection ON/OFF: SW1 (☞Fig. 7-2)
  ON side : Hardware write protection is ON.
  OFF side (not marked) : Hardware write protection is OFF.

- **Checking the Settings**

  - **Checking the Configuration (Settings)**

    Refer to ☞Chapter 6 Configuration (Setting), and correct any incorrect settings that are found.

  - **Checking the Burnout (B/O) Setting**

    Check using the communicator (CommStaff) that the burnout direction is correct. The burnout direction and whether it is used can be changed using SW2 and SW3 on the electronics module of the probe.
    ☞Table 7-1. Upper and lower limit current levels and burnout (B/O) current level (for details on upper and lower limit current values and burnout current settings)

    - Burnout (B/O) ON/OFF: SW3 (☞Fig. 7-2)
      Burnout indication can be set ON or OFF.
      ON (E side) : The burnout is enabled.
      OFF (D side) : This device will continue to output the measured results without burnout indication.
    - Burnout direction: SW2 (☞Fig. 7-2)
      The following shows output behavior in the case of a serious failure.
      Hi (H side) : The output goes above the upper limit.
      Low (L side) : The output goes below the lower limit.

Table 7-1. Upper and lower limit current levels and burnout (B/O) current level

	Lower limit current	Upper limit current	B/O DOWN	B/O UP
Output	3.6 mA	21.6 mA	Less than 3.6 mA	More than 21.6 mA

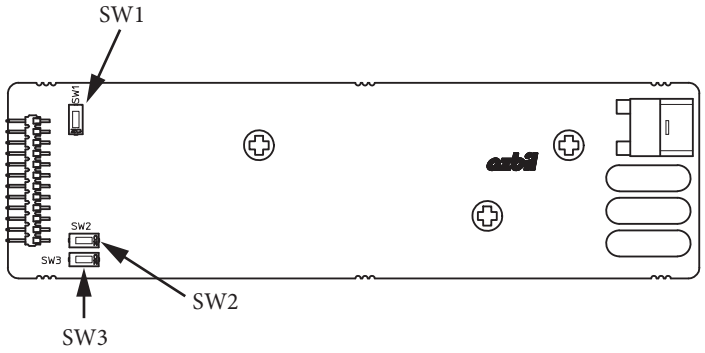

Fig. 7-2. Location of SW1, SW2, and SW3

  - **Checking the Self-Diagnosis**

    Check that the status of the self-diagnosis is OK.
    If the status of the self-diagnosis is not OK, take appropriate measures, referring to ☞Chapter 10 Self-diagnosis.

  - **Checking the Constant Current Output**

    The output is fixed within a range of 4–20 mA in the constant current mode. The constant current mode can be used for loop tests.

7-2 Starting and Stopping the Operation

■ Preparation Prior to Operation

- **Minimum Liquid Level Position (Zero Position)**

  The zero position of the liquid level is the diaphragm position on the bottom of the probe of this device. Therefore, the measuring range is from the diaphragm position (the groove in the probe cover) to the height of the operating range. To check the zero point, lower the liquid level below the level of the diaphragm.

- **Zero Adjustment**

  Communicate with the transmitter using the communicator.
  If the liquid level inside the tank can be adjusted to the lower range value (0 %) of the measuring range, perform zero-span adjustment using input pressure equivalent to the range (☞●Zero-span Adjustment Using Input Pressure Equivalent to the Range).
  If the liquid level inside the tank cannot be adjusted to the lower range value (0 %) of the measuring range, perform zero span adjustment using the actual level when measuring the liquid level (☞●Zero-span Adjustment Using Input Pressure Equivalent to the Range).

  - **Zero-span Adjustment Using Input Pressure Equivalent to the Range**

    You can set the LRV (input pressure at 0 % output) and URV (input pressure at 100 % output) corresponding to the actual pressure by applying a pressure equivalent to the desired range.
    The LRV and URV will be set automatically using the desired liquid level or input pressure, completing the zero-span adjustment. For details, refer to the user's manual for CommStaff shown below.

    - Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™ 9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014

  - **Zero Adjustment Using Actual Level when Measuring the Liquid Level**

    To adjust the zero point while measuring the liquid level, the liquid level is not actually set to zero, but rather is adjusted to the output value corresponding to the actual level from the liquid level as actually measured using a level gauge, etc. For details, refer to the user's manual for CommStaff shown below.

    - Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™ 9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014

- **Adjustment of Meter Pointer Position**

  Insert a flat-blade screwdriver into the groove at the lower portion of the meter (☞Fig. 7-3), and turn it to adjust the pointer position of the meter to the output value.

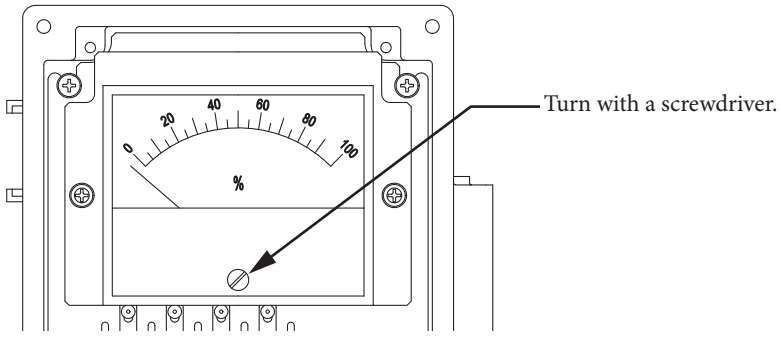

Fig. 7-3. Adjustment of meter pointer position

■ Beginning Operation

When the zero adjustment described previously is completed, the device is ready for use. Consequently, measured values can be checked.

- **Checking Measured Values**
  - Check the measured value using the communicator.
  - After checking of the measured value, disconnect the communication cable, tighten the cover of the junction box, and change the process to its normal operation.
  - If the output value or display value of the analog signal does not correspond to the process conditions, take the following measures. If the problem does not improved even after countermeasures have been taken, try the troubleshooting procedures.
    - Check the range
    - Re-calibrate
  - If the output or display of the measured value is not stable, adjust the damping time constant.

[!] Handling Precautions

- If the damping time constant is set to 0 s, this device will pick up minute fluctuations in the liquid level, thus showing an unstable output. It is recommended that the damping time constant be set to 1 s or longer.

- **After Checking the Measured Value**

After checking the measured value, make sure that the case and cover of this device are closed securely. If they are not closed securely, rainwater may enter the device, damaging the internal terminals and electronics module.

■ Stopping Device Operation

- **Stopping the Operation of This Device**

Turn off the power to this device.

Chapter 8 Calibration

This chapter describes the calibration work conducted by Azbil or a designated service station. Normally, calibration is not done by the user because a precision reference input device and measurement instrument are needed. However, calibration is described here in case the user has no choice but to do it. Two kinds of calibration are described below.

■ Calibrating the Output Signal

- **Preparation**

  Calibration of the output signal (adjustment of D/A conversion section) is not needed in normal operation. Therefore, this procedure should normally not be done. If this type of calibration is necessary, the following equipment is needed.

  - **Equipment**

    - Precision ammeter: 0.04 % F.S. or better
    - Precision resistor: 250 Ω
    - Communicator: CommStaff

- **Wiring for Calibration**

  Do the wiring while referring to the figure below. Inspect the connections to make sure that the wiring is connected correctly and that the device and communicator are communicating.

  ☞■Connecting the Communicator (CommStaff) (Page 7-2)

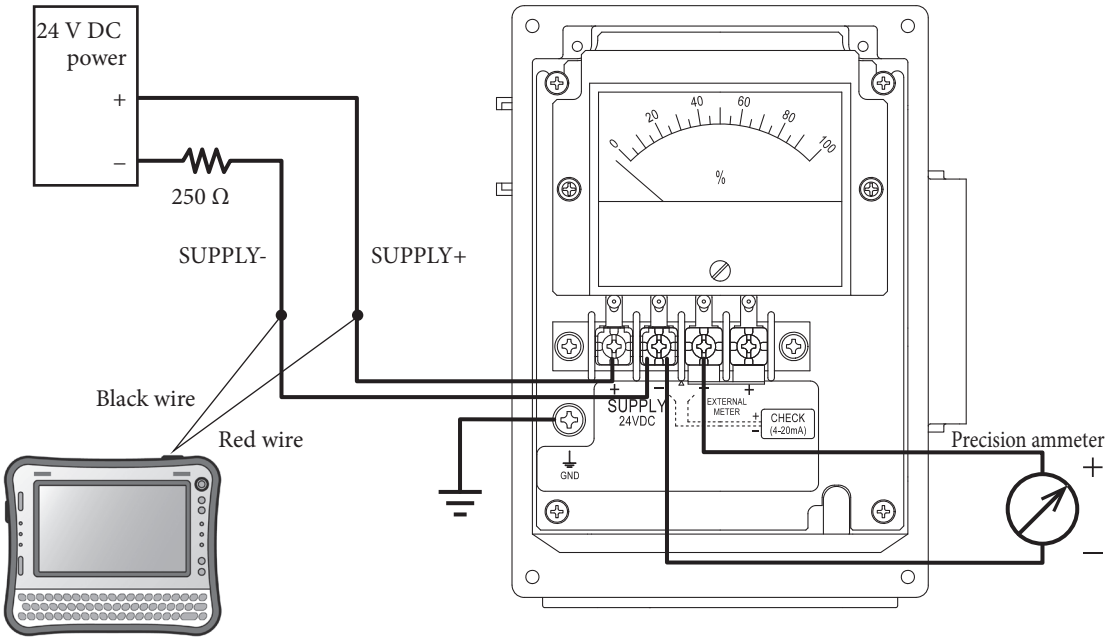

Fig. 8-1. Wiring for calibration of output signal

- **Calibration Procedure**

  Connect the output signal to the ammeter and compare the values in order to calibrate for 0 % and 100 % of the analog output. For details, refer to the user's manual for the communicator shown below.

  - Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™ 9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014

■ Calibrating the Setting Range Using Standard Input (Input Calibration)

- **Preparation**

  The following describes how to calibrate the lower range value (LRV) and upper range value (URV) of the measuring range by inputting the standard pressure to this device. First, calibrate the lower range value, and then calibrate the upper range value.

- **Equipment**

  The following equipment is needed for this calibration. The required performance of each device is described for reference purposes. It is desirable that the uncertainty of the instrument is four times larger than the accuracy of the liquid level transmitter to be calibrated.

  - Standard pressure generator (a generator that can generate the pressure of the measuring range of this device)
    Accuracy: ±0.04 % F.S. or better
  - Power supply: 24 V DC
  - Precision resistor: 250 Ω ± 0.005 %
  - Voltmeter: 10 V DC range ± 0.02 % + 1 digit
  - Communicator: CommStaff

- **Caution**

  The accuracy of this device after calibration depends on the performance levels of the devices used for the calibration.

- **Calibration Conditions**

  The calibration of the actual pressure is performed under the environmental conditions shown below.

  - Calibrate in a windless testing laboratory. If there is wind, pressure is applied to the pressure-receiving section where the hole open to the air is located, adversely affecting calibration accuracy.
  - Standard operating temperature 23 °C, humidity 65 %
    If there are no sudden changes, there are no significant effects within the normal ranges of 15 to 35 °C temperature and 45 to 75 % humidity.

- **Wiring and Piping for Calibration**

  Generally, follow the diagram below.

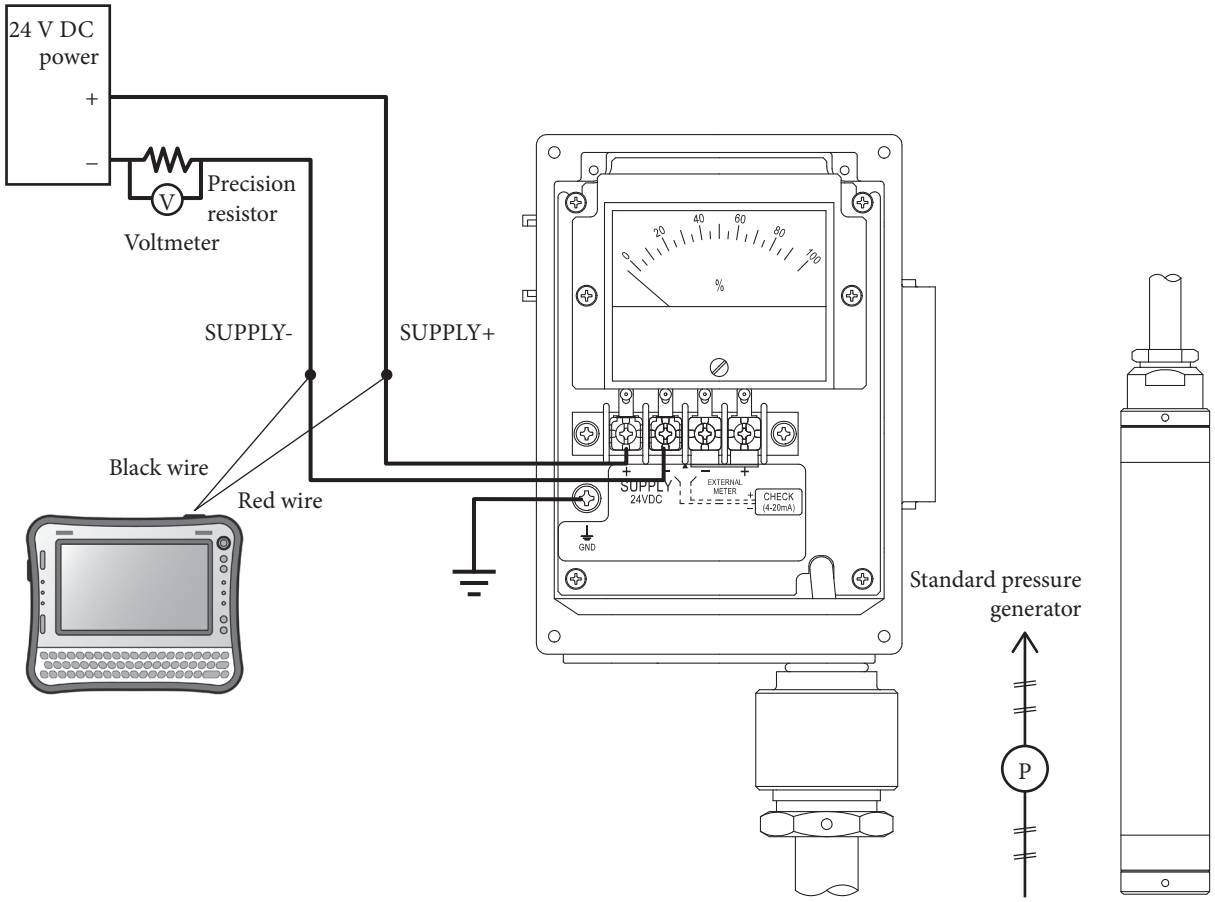

Fig. 8-2. Wiring and piping for calibration of input

- **Calibration Procedure for Measuring Range**

  After checking the measurement range using the communicator (☞Chapter 6 Configuration (Setting)), calibrate the measurement range at two locations, the lower range value (LRV) and upper range value (URV), using the standard pressure device. For details, refer to the user's manual for CommStaff shown below.

  - Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™ 9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014

■ Resetting the Calibration Value

Resetting the calibration value will put the calibration value in the noncalibrated status. At this time, the diagnosis display message "CORRECTS RESET" appears. For details about the diagnosis messages, refer to ☞Chapter 10 Self-diagnosis. For details about the operating procedure, refer to the user's manual for the communicator shown below.

- Field Communication Software CommStaff Model: CFS100 Instruction Manual (Smart ALTJ™ 9000 Immersion-type Liquid-Level Device Edition), No. CM2-CFS100-2014

Chapter 9 Maintenance and Inspection

9-1 Overview

⚠ WARNING
If a corrosion mark is found on a pressure resistance part such as a bolt, nut, or flange, replace the defective part with a new one. Otherwise, a part with reduced pressure resistance performance may be damaged and subsequently create a dangerous situation. Or, a damaged part may cause a bruise or rupture.

⚠ CAUTION
Do not apply any strong shock to the glass part of the display using any type of tool. Doing so may damage the product, resulting in a personal injury.
When moving the probe up or down, slowly move it while carefully checking the surroundings, and bundle and secure excess cables. Failure to do so may cause cables to be caught or measurement targets to be scattered.
When work is performed with the probe in an upright position, be sure to secure it firmly. Failure to do so may cause a personal injury or damage to this product.
Replace a damaged seal gasket or O-ring with a new one. If this product is operated with any damaged parts, sufficient sealing performance will not be able to be ensured, which will cause this product to malfunction.
Do not attempt to modify or disassemble this product in any way that is not described in this manual. Doing so may cause an electric shock or the product to malfunction.
When this product is no longer needed, dispose of it appropriately as industrial waste in accordance with relevant local government regulations. Additionally, do not reuse a part or all of this product.

Maintenance and inspection can be performed easily because each device making up this liquid level transmitter uses modularized parts. Check the seal (O-ring condition, moisture inside the probe housing) periodically, taking into account the operating conditions. This chapter gives the disassembly and assembly procedures necessary for maintenance of the liquid level transmitter.

9-2 Disassembly and Assembly

The following gives the procedure if each part must be disassembled or assembled to check the seal, replace parts, or clean the device.

■ Disassembling the Probe

Do not disassemble the probe if possible, in order to maintain airtightness. Before disassembling the probe, be sure to turn off the power. Additionally, before disassembling a probe that is pulled out of the water, be sure to wipe off all moisture.

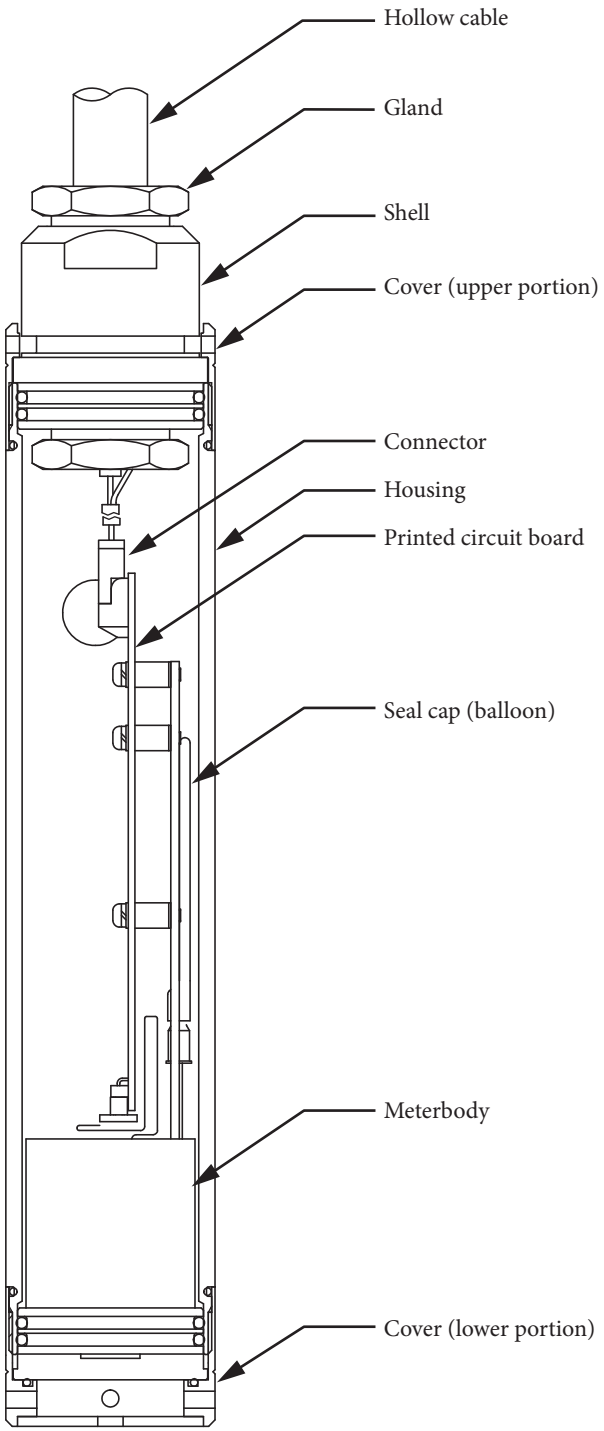

Fig. 9-1. Structure of the probe

- **Removing the Weight**

  (1) Loosen the two nuts near the weight.

  (2) Loosen the bolts and pull the probe out of the weight.

- **Disconnecting the Cable**

  (1) Turn the upper cover of the probe to remove it.

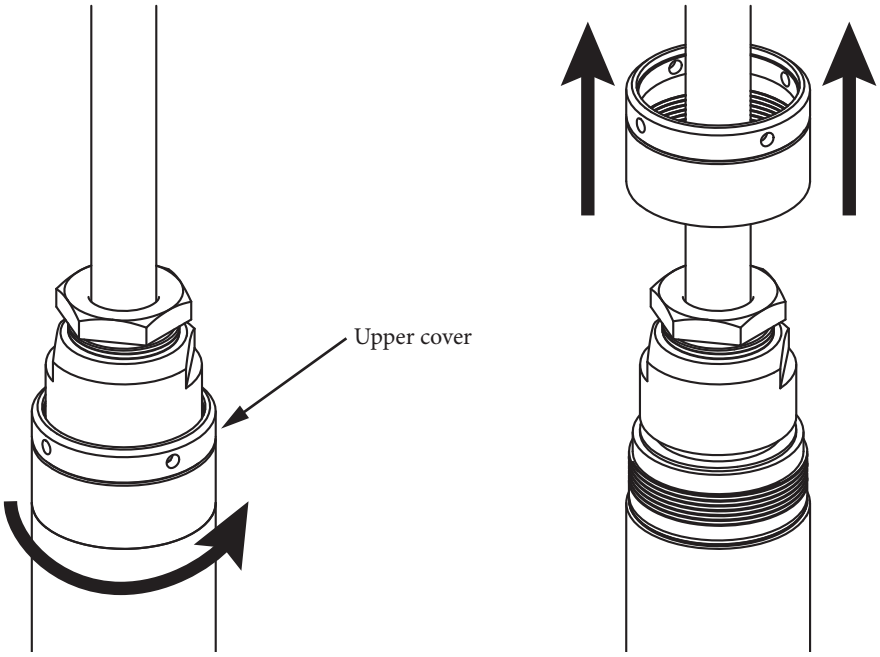

Fig. 9-2. Removing the upper cover

(2) Gently pull out the shell. Do not turn the shell one full turn or more.

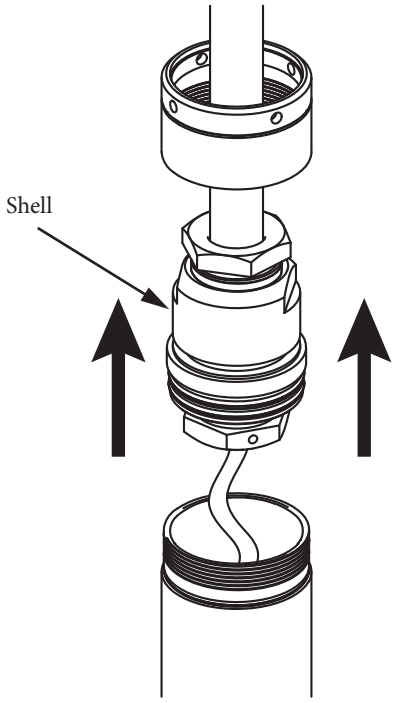

Fig. 9-3. Removing the shell

(3) Disconnect the connector from the printed circuit board inside the probe. When disconnecting the connector, be sure to hold the connector body. Pulling the lead wires may cause wire(s) to break.

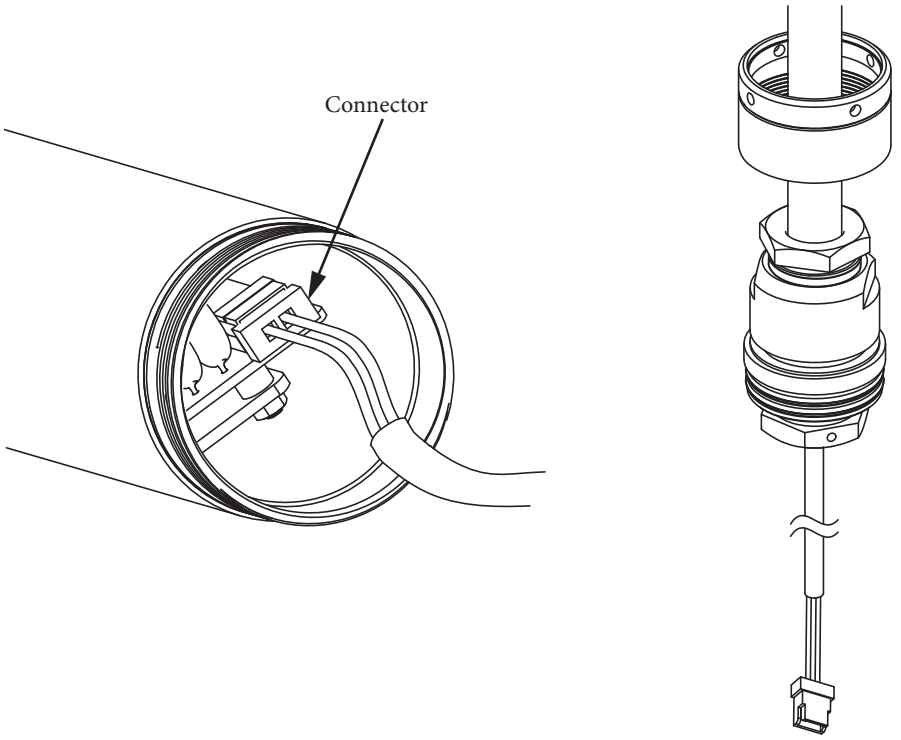

Fig. 9-4. Disconnecting the connector

- **Removing the Meterbody and Housing**

(1) Turn the lower cover of the probe to remove it.

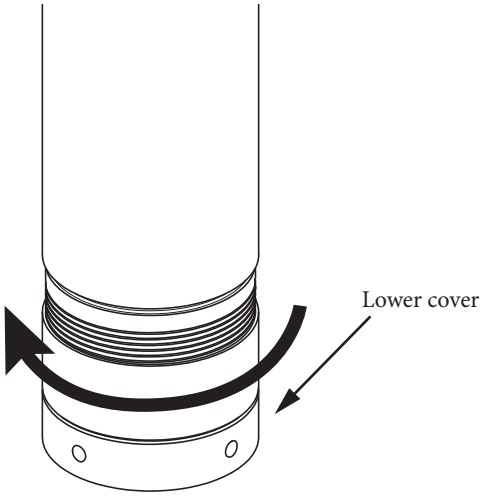

Fig. 9-5. Removing the lower cover

(2) As shown in Fig. 9-6 A, put a screwdriver in a groove (a groove with small vertical depth) and pry to slightly pull the meterbody out from the housing. (There are four grooves in total, two grooves with large vertical depth and two grooves with small vertical depth.) If the removal process is difficult, insert the blade of the screwdriver into another groove (one with a large vertical depth) and push out the body as shown in Fig. 9-6 B. Prying or pushing in grooves that are facing each other simultaneously or alternately will apply force evenly to ensure easy removal.

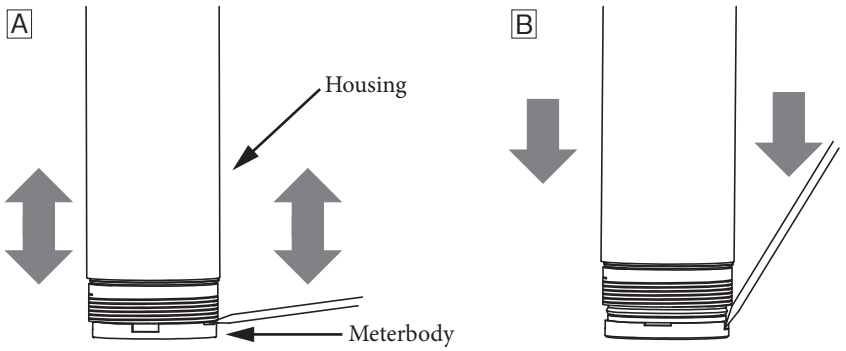

Fig. 9-6. Removing the meterbody

(3) When the meterbody is pulled out so that it can be held by hand, pull it out completely. To prevent any damage, be careful not to apply excessive force to the diaphragm. (☞Fig. 9-7)

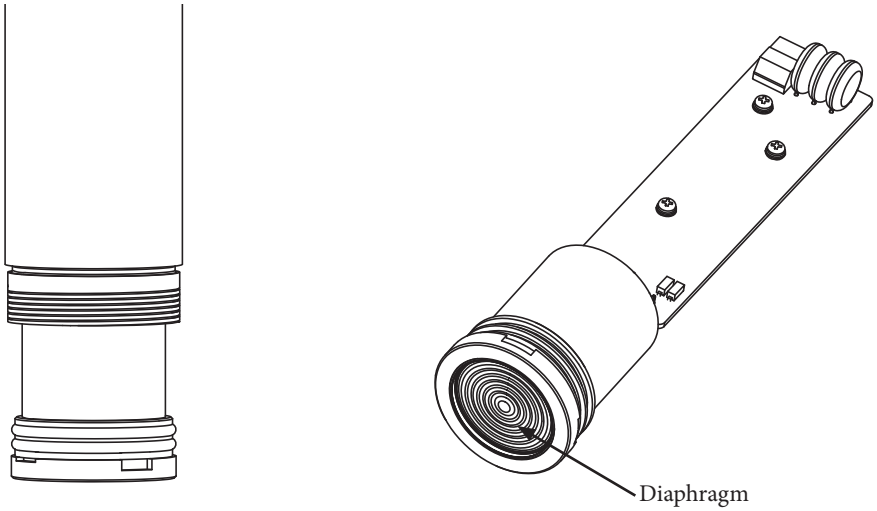

Fig. 9-7. Disassembling the housing and meterbody

■ Assembling the Probe

Basically, assemble the probe in the reverse order of disassembly.
When assembling the probe, be sure to check the O-ring and matching surface for scratches and contamination. If the O-ring or matching surface is dirty, wipe it off using a clean cloth and apply a thin layer of silicone grease. If the O-ring or matching surface is scratched, replace it with a new one.

- **Assembling the Meterbody and Housing**

(1) Put the meterbody in the housing and push it until its rim comes in contact with the housing. At this time, make sure that the seal cap stands upright, and does not droop down. (☞Fig. 9-8)

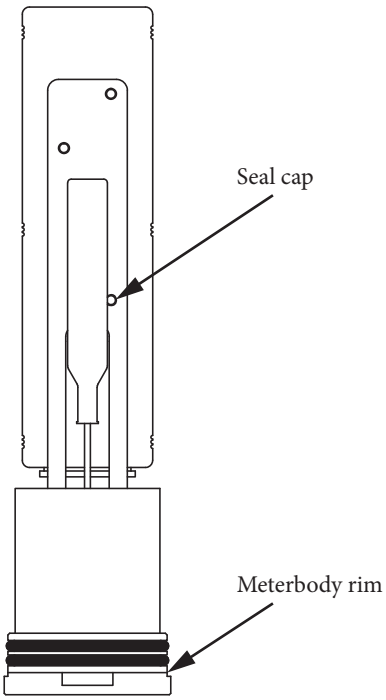

Fig. 9-8. Orientation of seal cap

(2) Screw in the cover until the O-ring attached to the housing is completely hidden.

- **Assembling the Cable**

(1) Insert the connector attached to the ends of the lead wires into the connector inside the probe.

(2) Put the lead wires inside the probe. Position the wires so that they will not get caught when they are pulled out the next time.

(3) Push in the shell until the flange comes in contact with the housing.

(4) Screw in the cover until the O-ring attached to the housing is completely hidden.

(5) To test for airtightness, follow the steps below.

(1) Apply a pressure of 50 to 100 kPa* from the pipe at the end of the hollow cable on the junction box side.

(2) Submerge the entire probe in water and check that no air bubbles are found.

* If excessive pressure is applied accidentally, the sensor may break. The maximum pressure to be applied from the hollow cable is 100 kPa.

■ Disassembling the Junction Box

Before disassembling the junction box, be sure to turn off the power.

- **Disconnecting the Hollow Cable**

(1) Loosen the four screws of the junction box cover to remove the cover.

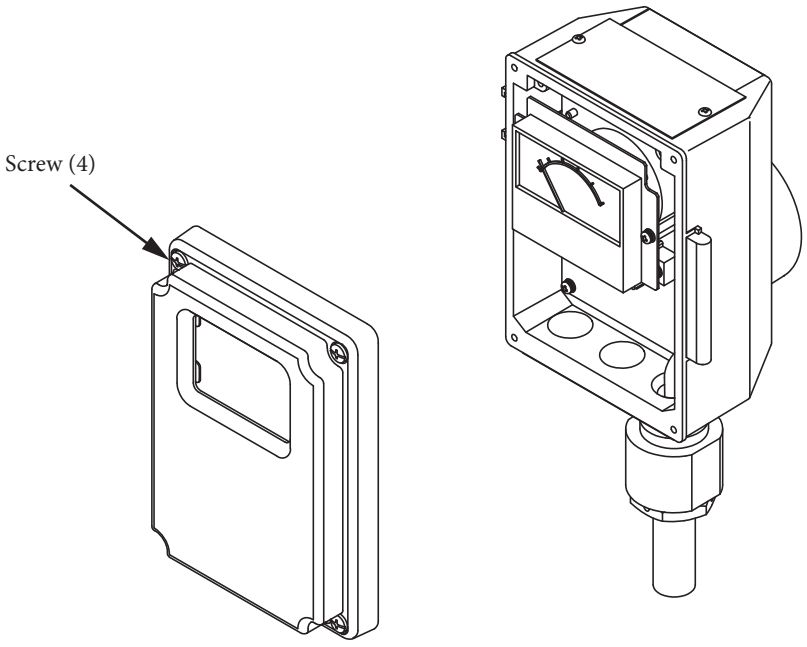

Fig. 9-9. Removing the cover

(2) Remove the lower two screws of the four screws that hold the plate (terminal block assembly) at the center of the junction box. Be careful not to drop the screws when removing them.

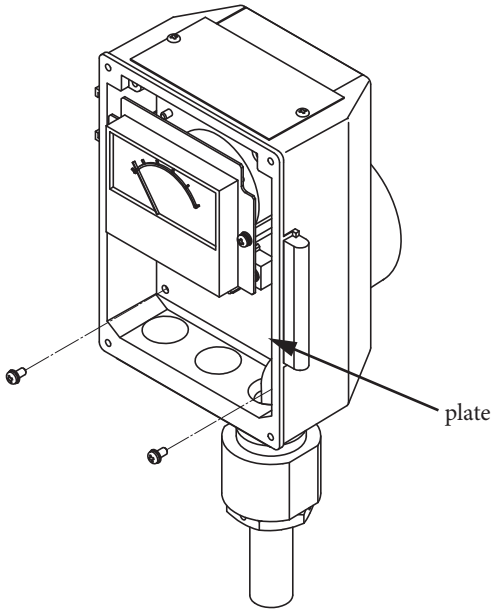

Fig. 9-10. Removing the terminal block assembly (the lower two screws)

(3) Loosen the remaining upper two screws that hold the terminal block assembly and remove the terminal block assembly by sliding the plate. Do not pull hard on the hollow cable since it is connected to the terminal block section on the rear panel of the plate. Excessive pulling may break the wires.

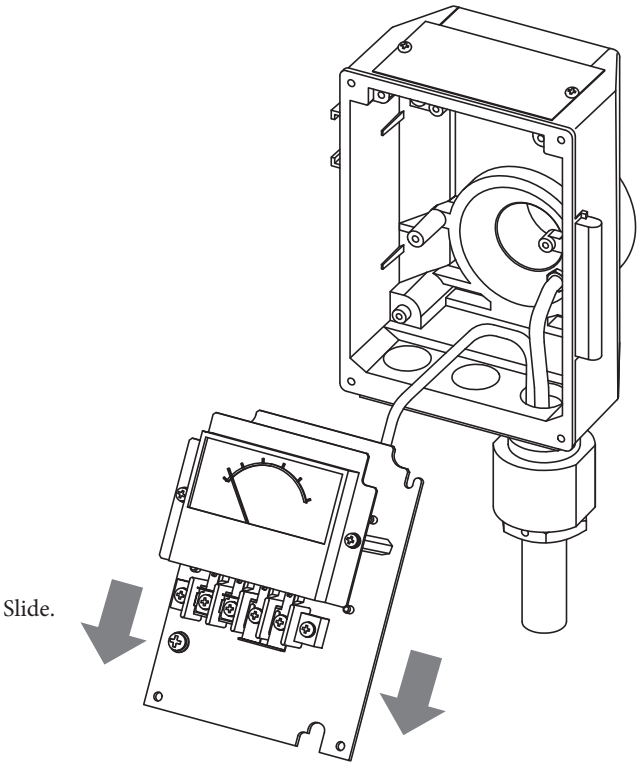

Fig. 9-11. Removing the terminal block assembly

(4) Disconnect the wires from the RED (+), BLK (-), and GND terminals of the terminal block on the rear panel of the plate.

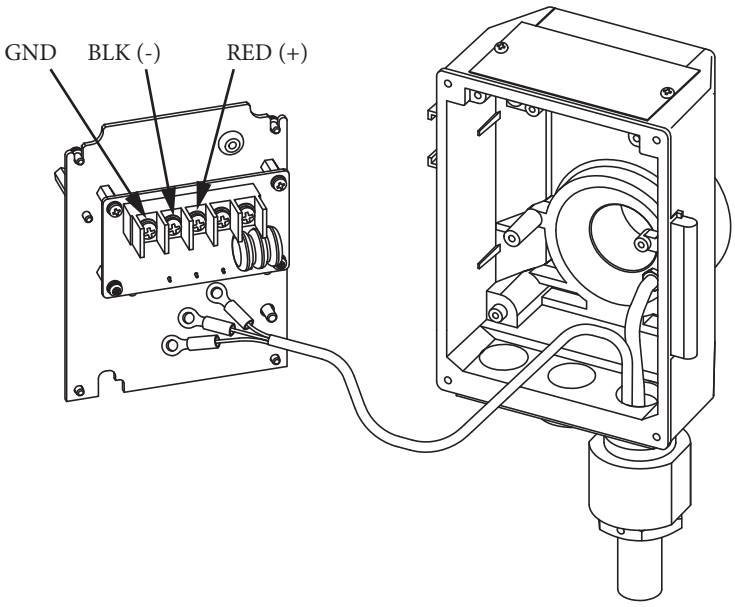

Fig. 9-12. Disconnecting the hollow cable terminals

(5) Disconnect the rubber tube from the fitting for the air hole in the junction box.

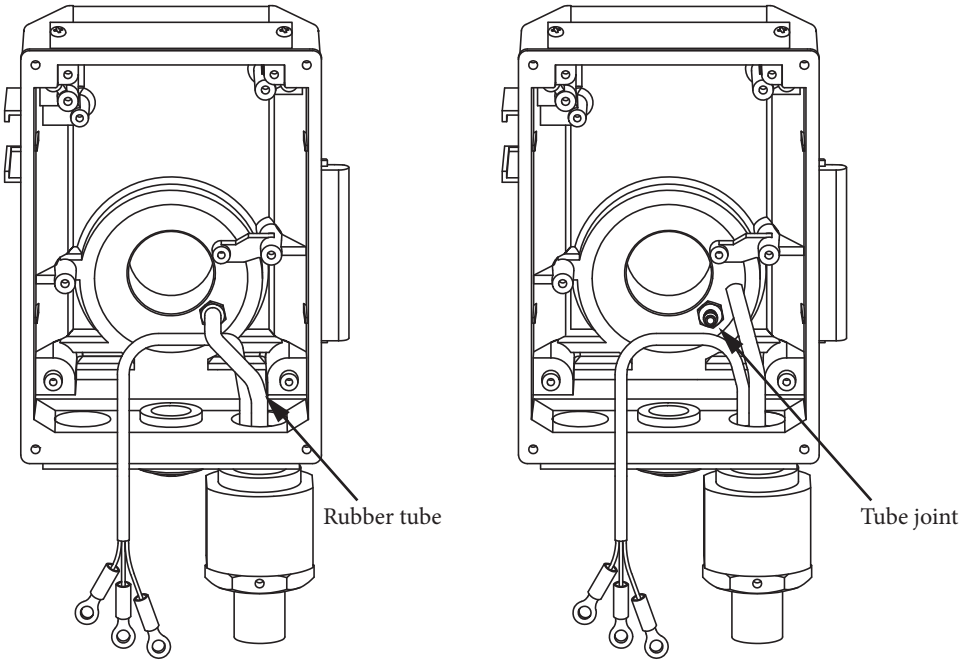

Fig. 9-13. Disconnecting the rubber tube

(6) After loosening the hexagon gland at the top end of the hollow cable mounting port with a wrench, gradually pull out the hollow cable.

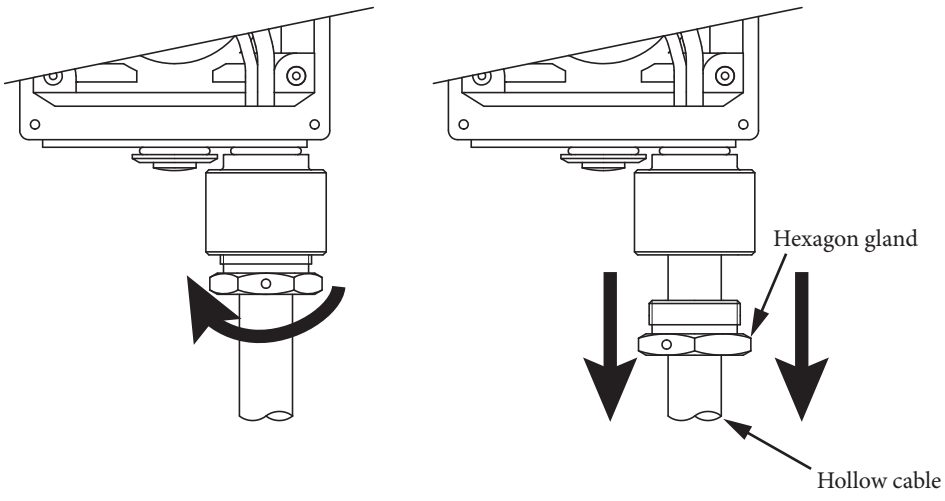

Fig. 9-14. Disconnecting the hollow cable

- **Removing the Optional Meter**

To replace or remove the meter, follow the steps below. It is not necessary to remove the meter when the hollow cable is disconnected.

(1) Loosen the four screws of the junction box cover to remove the cover. (☞Fig. 9-9)

(2) Remove the screws that attach the meter to the plate. Be sure not to drop the screws when removing them.

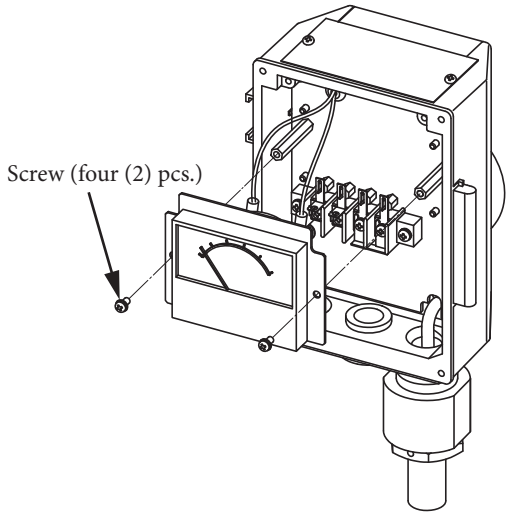

Fig. 9-15. Removing the meter and plate

(3) Disconnect the 2-wire cable (red, black) lugs connected to the rear panel of the meter.

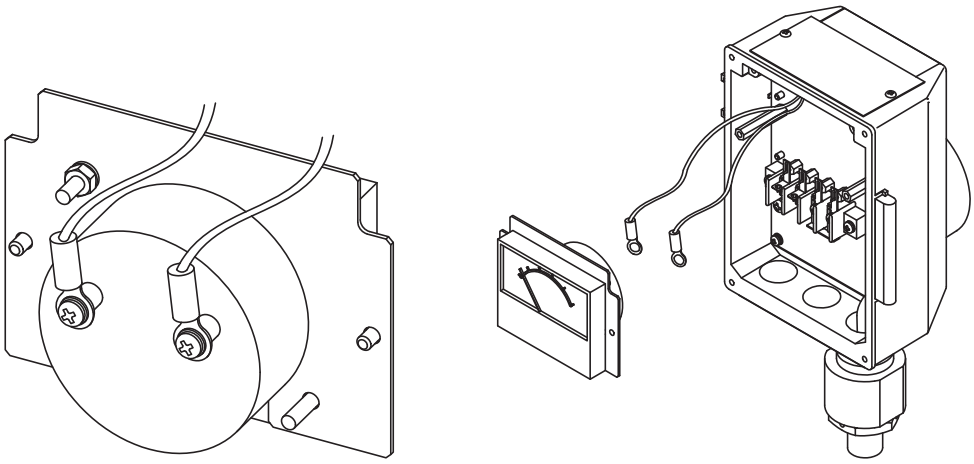

Fig. 9-16. Removing the meter

(4) Cover the lugs of the 2-wire (red, black) cable with insulation caps to prevent contact with other parts.

To operate the device with the meter removed, use either procedure (A) or (B). Since external electrical noise may have an adverse effect in the case of (B), use (A) if the output fluctuates.

(A) Do steps (1) through (3) in ● Disconnecting the Hollow Cable (Page 9-7) and disconnect the RED (+) and BLK (-) terminals of the METER terminals. After that, cut out the cable on the meter side.

(B) Secure the terminal cables to the plate or frame so that they are not shaken by vibration.

■ Assembling the Junction Box

- **Assembling the Hollow Cable**

(1) Tighten the shell with a wrench to secure it to the connection port at the lower right portion of the junction box.
Tightening torque: 4.0 ± 0.5 N·m

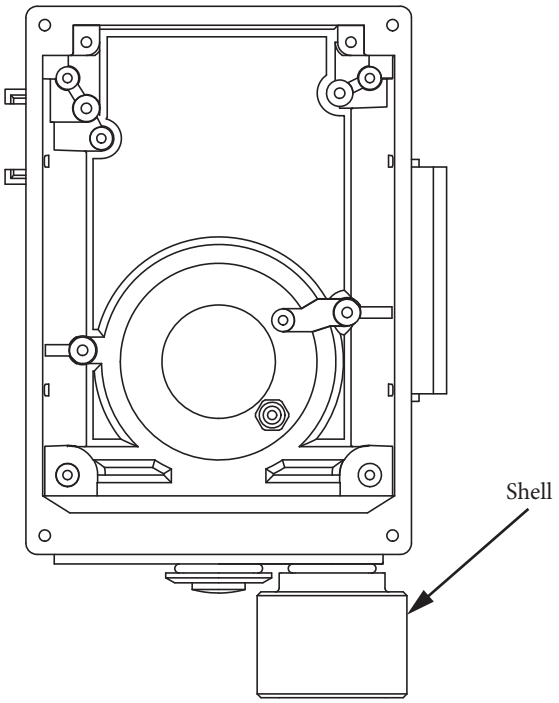

Fig. 9-17. Assembling the shell

(2) Pass the gland, washer, and gasket through the hollow cable.

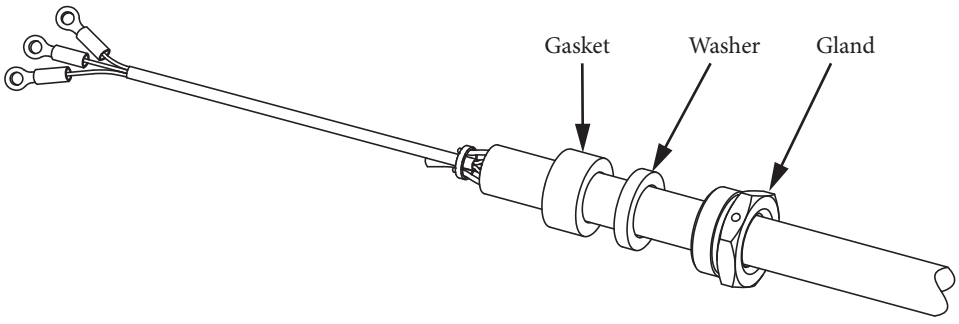

Fig. 9-18. Mounting the gland, washer, and gasket

(3) While pulling the lead wire from the hollow cable connection section at the lower portion of the junction box, gradually put the sheath portion of the hollow cable in the shell until it stops. Pay special attention so that the lead wire does not become caught.

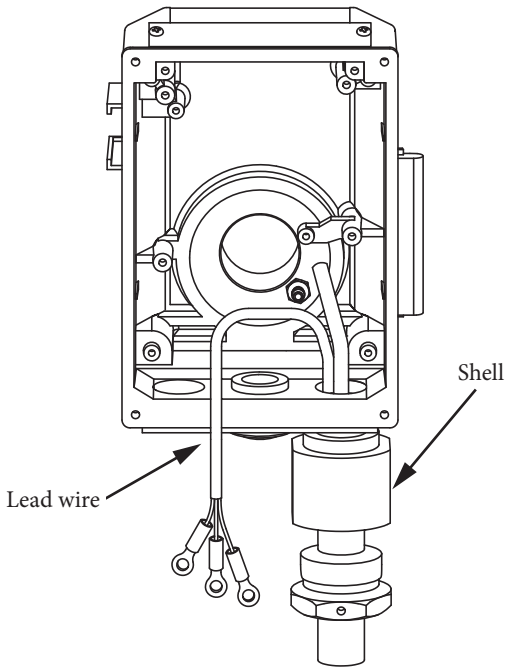

Fig. 9-19. Assembling the hollow cable

(4) Tighten the hexagon gland at the top end of the hollow cable connection section to secure the hollow cable.

(5) Connect the rubber tube to the hollow pipe and fitting for the hole of the rear cap inside the junction box. Be sure to connect it securely.

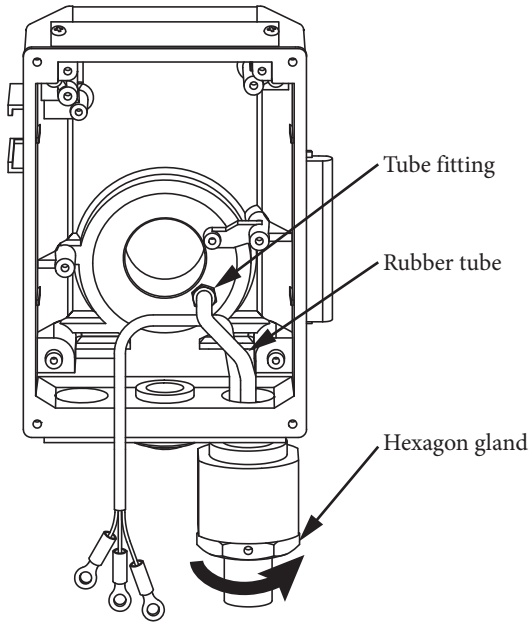

Fig. 9-20. Connecting the rubber tube

- **Assembling the Terminal Block Assembly and Hollow Cable**

(1) Connect the lead wires of the hollow cable to the RED (+), BLK (-), and GND terminals on the terminal block located on the board using screws.

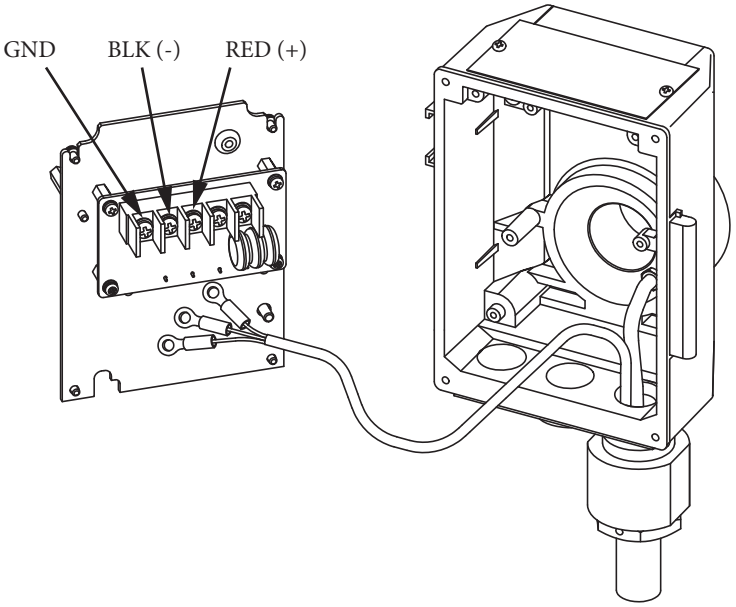

Fig. 9-21. Connecting the hollow cable terminals

(2) Temporarily attach the two upper left and right screws of the four screws that hold the terminal block assembly to the junction box.

(3) Push in the terminal block assembly all the way inside the junction box along the lower right groove of the terminal block assembly so that the lead wire and hollow pipe are not caught. At this time, slide and push the terminal block assembly up to the screws that have been attached temporarily.

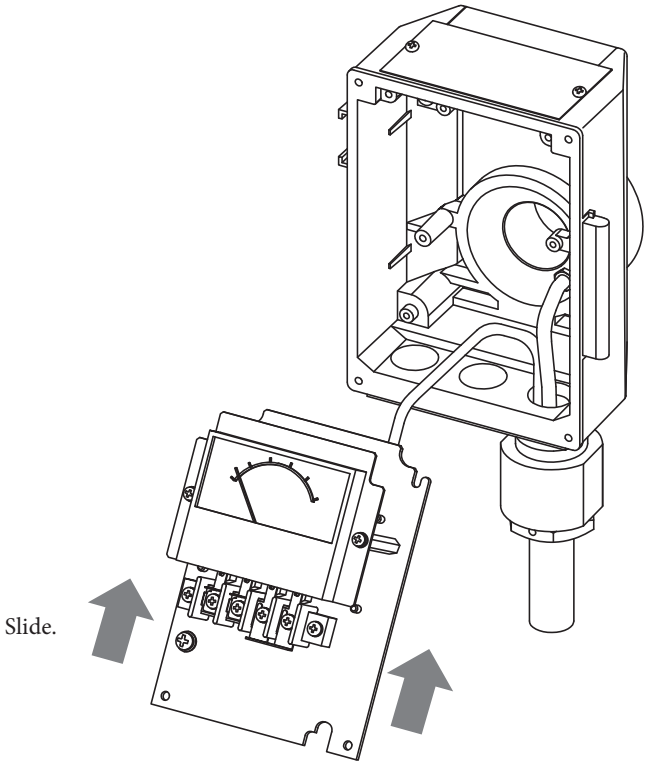

Fig. 9-22. Assembling the terminal block assembly

(4) Tighten the four screws, including the 2 temporarily attached ones, to secure the terminal block assembly.
Tightening torque: 1.0 ± 0.1 N·m

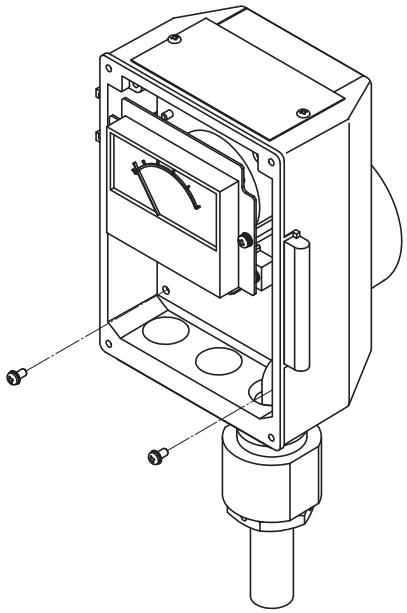

Fig. 9-23. Attaching the terminal block assembly

- **Assembling the Optional Meter**

If the meter has been removed, assemble it in the reverse of the disassembly order (● Removing the Optional Meter (Page 9-10)).

(1) Connect the 2-wire cable wires (red, black) to the rear panel of the meter using screws.
Tightening torque: 1.0 ± 0.1 N·m

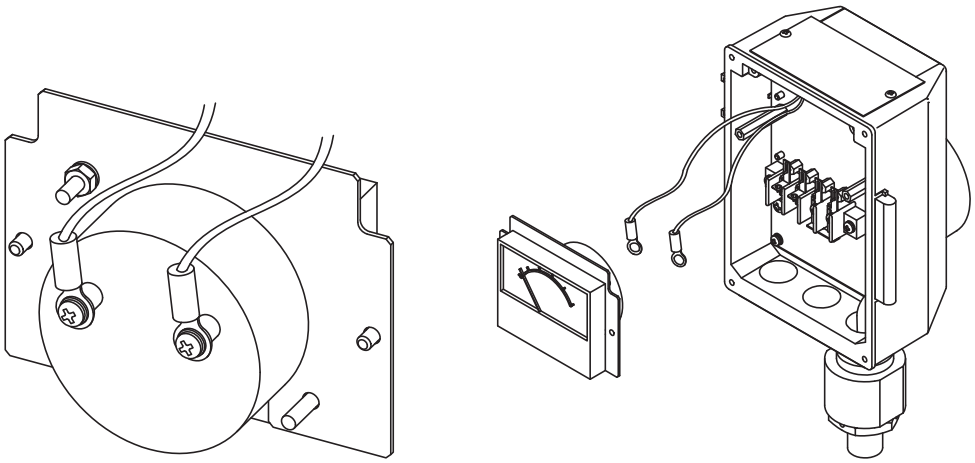

Fig. 9-24. Assembling the meter

(2) Attach the meter with the plate using screws.
Tightening torque: 1.0 ± 0.1 N·m

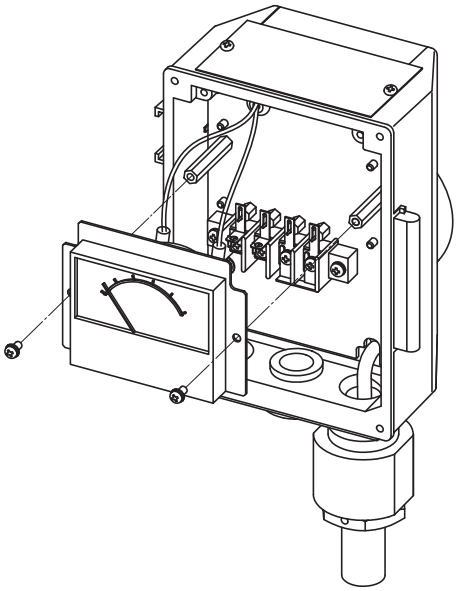

Fig. 9-25. Attaching the meter with the plate

- **Attaching the Cover**

Attach the cover firmly using screws until the gasket is tightly compressed.
Tightening torque: 1.2 ± 0.1 N·m

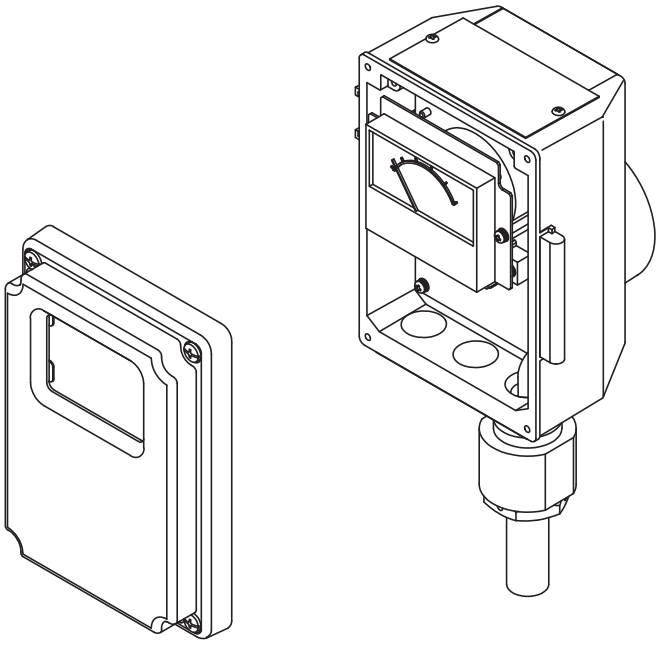

Fig. 9-26. Attaching the cover

9-3 Inspection

■ Insulation Resistance Test and Withstand Voltage Test

As a rule, do not test the insulation resistance or withstand voltage.
Lightning arrestors are incorporated into the probe and junction box. When these tests are conducted, the built-in lightning arrestors may be damaged.
If testing must be done, follow the steps below.

(1) Disconnect all of the external wiring completely from each device.

(2) The test locations are shown below. The tests can be conducted with the + and - terminals of the core wires of the hollow cable, connector terminals, and SUPPLY terminals shorted.

- Probe
  For the probe with the cable in the hollow pipe : between the core wires (+, -) of the hollow cable and the shielded wires
  For the probe alone : between the connector terminals (+, -) and the probe case
- Junction box
  Between the SUPPLY terminals (+, -) and the ground terminal of the junction box

(3) The applied voltages and judgment criteria are shown in the table below. To prevent the meter from being damaged, do not apply a voltage exceeding the value shown below.

	Insulation resistance test	Withstand voltage test
Probe and junction box	At 25 V DC 20 MΩ or more	50 V AC for 1 minute Set current 2 mA

9-4 Replacement Parts

To use the product in good condition, the following parts used for the probe need to be replaced periodically. Note that the replacement cycle may vary depending on the temperature and fluid measured.

Part name	Replacement cycle
Seal cap	2 years
O-ring (Probe)	2 years or Replace the O-ring whenever the probe is disassembled.
Rubber diaphragm (for sludge/seawater, optional specifications P-)	2 years or Replace the diaphragm in less than 2 years if it is removed.

9-5 Maintenance and Inspection of Liquid Level Transmitter for Sludge and Seawater

The liquid level transmitter for sludge and seawater (optional specifications 1: P00) has a structure in which a unit for protection of the pressure-receiving diaphragm is attached to the top of the probe. The following describes the procedure if the product needs to be disassembled or assembled to replace the rubber diaphragm or for cleaning.

■ Disassembly

(1) Loosen the six bolts at the top of the probe and remove them.

(2) Remove the ring, and then detach the rubber diaphragm. (☞Fig. 9-1)

(3) Turn the cover to remove it.

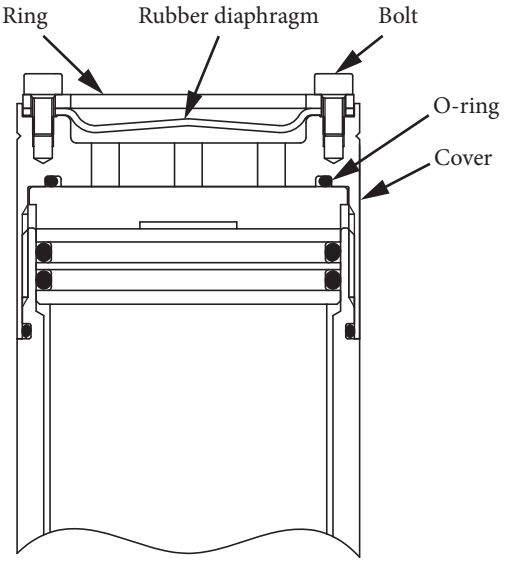

Fig. 9-27. Pressure-receiving diaphragm with rubber diaphragm

[!] Handling Precautions

- Exercise care not to scratch the metallic diaphragm when disassembling.

■ Assembly

(1) Point the top of the probe straight upward and pour silicone oil or distilled water onto the metallic diaphragm until it overflows.

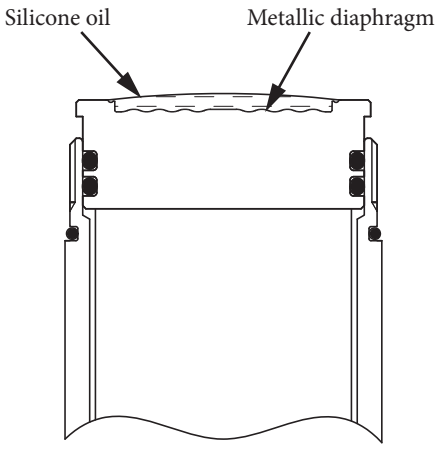

Fig. 9-28. Pour silicone oil onto the metallic diaphragm

(2) Attach the cover and inject silicone oil or distilled water with a syringe, etc., until it overflows

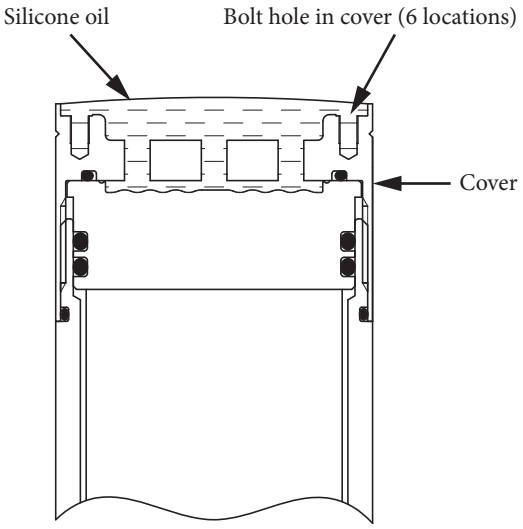

Fig. 9-29. Adding silicone oil after attaching the cover

(3) Remove the air remaining in the bolt holes in the cover with a clip.

(4) Gently replace the rubber diaphragm while carefully checking that no air bubbles remain in back of it.

(5) Add the ring and tighten the six bolts.
Tightening torque: 0.63 ± 0.1 N·m

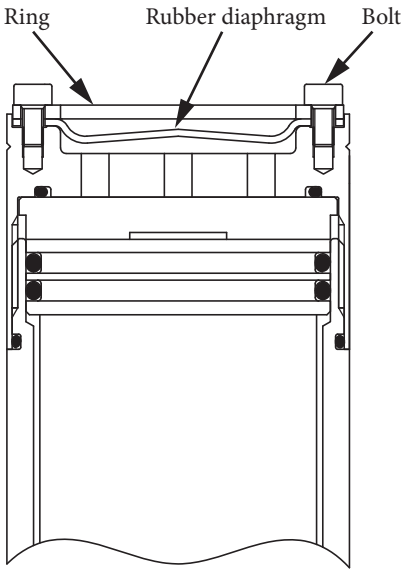

Fig. 9-30. Attaching the rubber diaphragm and tightening the bolts

Handling Precautions

- Exercise care that no air bubbles remain between the rubber diaphragm and the metallic diaphragm. If there are air bubbles, a measurement error may occur.
- Make sure that the center of the rubber diaphragm is approximately 1 mm higher than its periphery.

Chapter 10 Self-diagnosis

⚠ CAUTION

Do not perform the SFN communication when the process of the liquid level transmitter is in the automatic control status. Doing so may cause the output to vary, resulting in a hazardous operation status.

The self-diagnosis results saved into the liquid level transmitter are displayed using the communicator (CommStaff).

■ Serious Failure (Critical Status)

Diagnostic message	Meaning	Remedy
METER BODY FAULT	AD conversion error	The meterbody may be malfunctioning. Contact Azbil or your salesperson for assistance.
CHARA PROM FAULT	Character data error	
SUSPECT INPUT	Pressure sensor error	
MDU/DAC COMP FAULT	CPU error	The electronics module may be malfunctioning. Contact Azbil or your salesperson for assistance.
RAM FAULT	RAM error	
NVM FAULT	NVM error	
ROM FAULT	ROM error	
PAC FAULT	Output circuit error	
INVALID DATABASE	Device setting data error	

■ Minor Failure (Non-Critical Status)

Diagnostic message	Meaning	Remedy
SENSOR OVER TEMP	Pressure sensor temperature error	Modify the pressure sensor installation so that the meterbody temperature is within the operating range. Or, check the process.
EXCESS ZERO CORR	The zero calibration amount exceeds ±5 % when compared to the time of shipment.	Check if the input pressure is zero (atmospheric pressure), and then recalibrate.
EXCESS SPAN CORR	The span calibration amount exceeds ±5 % when compared to the time of shipment.	Check if the input pressure is span pressure , and then recalibrate.
IN OUTPUT MODE	Constant current mode	Cancel the constant current mode.
M.B. OVERLOAD OR	Excessive pressure or meterbody error	Check that the input pressure is within the specification range. If the input pressure is too great, reduce it or change the device to a model with a larger range.
METER BODY FAULT	Undefined*	--
CORRECTS RESET	Noncalibrated	Calibrate the lower range value and upper range value of the setting range.
NO DAC TEMP COMP	Undefined*	--
EXT.SWITCH FAULT	Undefined*	--

* This ALTJ9000 model does not use these items.

Chapter 11 Troubleshooting

If this liquid level transmitter does not operate correctly or malfunctions, check the items shown below.
If the problem does not improve even after the check is performed, immediately stop operation, disconnect the power supply, and contact Azbil or your salesperson for assistance.

Table 11-1. Troubleshooting

Symptom	Check
The meter does not indicate (or output).	• Check that the power supply voltage is correct. • Check that the wiring for the power and meter is correct.
The indication (or output) of the meter deviates.	• Check that ● Zero Adjustment and ● Adjustment of Meter Pointer Position (described in ■ Preparation Prior to Operation (Page 7-4)) were performed correctly. • Check that the rear cap on the rear panel (hole open to the air) of the junction box is not blocked by sludge, sand, etc. • Check that the probe is not excessively tilted.
The indication (or output) of the meter fluctuates.	• Check that the damping setting is appropriate.

In addition to the above, check the following.

- Check the self-diagnostic result that is obtained using the communicator. (☞Chapter 10 Self-diagnosis)
- Check the configuration (settings). (☞Chapter 6 Configuration (Setting))
- Check the piping connection section for leakage.
- Check the wiring for looseness or wire breakage.
- Check that the power supply voltage or load resistance conforms to the specifications.
- Check that the pressure and temperature conform to the specifications.
- Check if there is a strong magnetic field or source of electrical noise near the device.

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

   1.1 Warranty period

   Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

   1.2 Warranty scope

   In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

   (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
   (2) Failure caused for other reasons than Azbil Corporation's product;
   (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
   (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
   (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
   (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

   Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

   You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

   (1) Regulations and standards or laws that your Equipment is to comply with.
   (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
   (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
   Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

   *1. A design that is safe even if the user makes an error.
   *2. A design that is safe even if the device fails.
   *3. Avoidance of device failure by using highly reliable components, etc.
   *4. The use of redundancy.

3. Precautions and restrictions on application

   3.1 Restrictions on application

   Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality*5 not required
Within a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Can be used

   *5. Nuclear power quality: compliance with JEAG 4121 required
   *6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes,"etc.
   *7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

   Any Azbil Corporation's products shall not be used for/with medical equipment.

   The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

   3.2 Precautions on application

   you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
    * Nuclear energy/radiation related facilities
      [When used outside a radiation controlled area and where nuclear power quality is not required]
      [When the limit switch for nuclear power is used]
    * Machinery or equipment for space/sea bottom
    * Transportation equipment
      [Railway, aircraft, vessels, vehicle equipment, etc.]
    * Antidisaster/crime-prevention equipment
    * Burning appliances
    * Electrothermal equipment
    * Amusement facilities
    * Facilities/applications associated directly with billing
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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Date:	2nd edition: May 2022
Issued/Edited by:	Azbil Corporation

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