
**User's
Manual**

**Magnetic Flowmeter
CA Series
Maintenance Manual**

IM 01E40A01-02EN

Magnetic Flowmeter

CA Series

Maintenance Manual

IM 01E40A01-02EN 1st Edition

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Revision Information

1. Introduction

This manual provides the basic guidelines for maintenance procedures of Magnetic Flowmeter CA Series.

For the items which are not covered in this manual, read the applicable user's manuals listed in "Table 1.1 Manual and General Specifications List" in Magnetic Flowmeter CA Series Installation Manual (IM 01E40A01-01EN).

For specifications or model codes, read Magnetic Flowmeter CA Series General Specifications (GS 01E40A01-01EN).

Website address:

<https://www.yokogawa.com/fld/doc/>

These manuals can be downloaded from the website of YOKOGAWA or purchased from the YOKOGAWA representatives.

■ Precautions Related to the Protection, Safety, and Alteration of the Product

The following safety symbol marks are used in this manual and product.



WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.



CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the product or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

The following symbols are used in the product and the manual to indicate the accompanying safety precautions:



Protective grounding terminal



Functional grounding terminal (This terminal should not be used as a protective grounding terminal.)



Alternating current



Direct current



Caution

This symbol indicates that the operator must read an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the product.

- For the protection and safe use of the product and the system in which this product is incorporated, be sure to follow the instructions and precautions on safety that is stated in user's manual whenever you handle the product. Take special note that if you handle the product in a manner that violated these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of product.
- Should use the parts specified by YOKOGAWA when replacing. Contact YOKOGAWA's service office for fuse replacement.
- Do not modify this product.
- YOKOGAWA will not be liable for malfunctions or damage resulting from any modification made to this product by the customer.
- The product should be disposed of in accordance with local and national legislation/regulations.

■ Regarding This User's Manual

- This manual should be provided to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without YOKOGAWA's written permission.
- YOKOGAWA makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, inform the nearest YOKOGAWA sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made product.
- Note that changes in the specifications, construction, or component parts of the product may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- This manual is intended for the following personnel;
Engineers responsible for installation and wiring of the product.
Personnel responsible for normal daily operation of the product.
- To ensure correct use, read this manual and the applicable manuals thoroughly before starting operation. Read the general specifications for its specification.

■ Trademarks:

- HART is a registered trademark of FieldComm Group.
- All the brands or names of Yokogawa Electric's products used in this manual are either trademarks or registered trademarks of Yokogawa Electric Corporation.
- All other company and product names mentioned in this manual are trade names, trademarks or registered trademarks of their respective companies.
- In this manual, trademarks or registered trademarks are not marked with TM or [®].

1.1 For Safe Use of Product

For the protection and safe use of the product and the system in which this product is incorporated, be sure to follow the instructions and precautions on safety that is stated in user's manual whenever you handle the product. Take special note that if you handle the product in a manner that violated these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA shall not be liable for any indirect or consequential loss incurred by either using or not being able to use the product.

■ Maintenance



WARNING

- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.
- The magnetic flowmeter is a heavy product. Be careful that no damage is caused personnel through accidentally dropping it, or by exerting excessive force on the magnetic flowmeter. When moving the magnetic flowmeter, always use a trolley and have at least two people carry it.
- When the magnetic flowmeter is processing hot fluids, the product itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the product has been taken off the piping line for maintenance and so forth.
- Do not apply excessive weight, for example, a person stepping on the magnetic flowmeter.
- Wiring and maintenance of the magnetic flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring and maintenance.
- Do not open the cover in wet weather or humid environment. When the cover is open, stated enclosure protection is not applicable.
- Ensure that the power supply is off in order to prevent electric shocks.
- When opening the cover, wait for more than 20 minutes after turning off the power. Only expert engineer or skilled personnel are permitted to open the cover.
- Ensure the protective grounding terminal is grounded before turning on the power.



WARNING

- Install an external switch or circuit breaker as a means to turn the power off (capacitance: 15A, conforming to EN/IEC60947-2 and EN/IEC60947-3. Locate this switch either near the product or in other places facilitating easy operation. Affix a "Power Off Equipment" label to this external switch or circuit breaker.
- When opening and closing the cover, be sure to handle the cover carefully so that there are no damage and foreign matter adhesion at its threads and O-ring. Keep checking their condition and clean the threads in case of adhering the foreign matter. Replace the cover in case the treads receive damages. Replace the O-ring if there is any scarring or transformation. And apply silicone based grease at the O-ring in case of the shortage and exhaustion of grease.
- If dirt, dust or other substances surfaces on the glass of display cover, wipe them clean with a soft dry cloth.
- Wiring work should be done adequate wire, sleeve crimp and torque force. Use terminal with insulating cover for the power supply wiring and protective grounding wiring. Do not pull the wires too much strongly in order to prevent electric shocks caused by their damage.
- This product employs the parts which are affected by a function damage caused by static electricity. Thus, you should do the antistatic work using an anti-static wrist band for it and be careful to avoid touching each electrical parts and circuitry directly.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this product before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- To prevent electric shocks, ensure the electrical wiring cover is completely attached after the wiring work.
- To prevent electric shocks, do not impress over rated voltage to each input/output terminals.



WARNING

- To prevent electric shocks, do not remove safety cover (Read chapter 3,4).
- If there is any unused cable entry, use the blanking plug to cover which comes with this product or which is supplied by YOKOGAWA. The blanking plug should be fastened into the unused cable entry without any mistake. If not, stated enclosure protection is not applicable.
- Maintenance of this flowmeter should be implemented in a maintenance service shop where the necessity tools and environment condition are provided.
The necessity of this environmental condition is that ambient temperature is 5 to 40°C (the maximum relative humidity is 80 % for temperature 5 to 31°C, and decreasing linearly to 50 % relative humidity at 40°C).
- Be sure to enable the write protect function to prevent the overwriting of parameters after finishing parameter setting.
In rare cases, the IR switches may respond unexpectedly to water drops or extraneous substances sticking on the surface of display panel, due to the operating principal. The possibility of malfunction arises after rain or cleaning operation near the place where the flowmeter is installed. Turning on and off the flashlight etc. towards the IR switch may also be a cause of malfunction.
Read Chapter 4 for the hardware write protect function, and the user's manual of applicable communication type for the software write protect function.
- Use our designated parts for replacement parts. For detailed information, contact our sales or service office and inform specifications of the product.

IMPORTANT

- When closing the cover, close it with both hands until the cover does not turn in order to bring the housing and cover into tight contact.
- Tighten the cover while confirming that it rotates smoothly.

1.2 Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurred during the warranty period shall basically be repaired free of charge.
- In case of problems, the customer should contact the YOKOGAWA representative from which the product was purchased, or the nearest YOKOGAWA office.
- If a problem arises with this product, inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible party for repair cost for the problems shall be determined by YOKOGAWA based on our investigation.
- The Purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
 - Improper and/or inadequate maintenance by the purchaser.
 - Failure or damage due to improper handling, use or storage which is out of design conditions.
 - Use of the product in question in a location not conforming to the standards specified by YOKOGAWA, or due to improper maintenance of the installation location.
 - Failure or damage due to modification or repair by any party except YOKOGAWA or an approved representative of YOKOGAWA.
 - Malfunction or damage from improper relocation of the product in question after delivery.
 - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

1.3 Regular Inspection Items

- (1) **Inspection of moisture-proofing inside the terminal box: Once/year**
- (2) **Retightening of piping joint screws: About twice/year**
- (3) **Inspection of lining (in case of adhesive and/or abrasive fluids, etc.)**

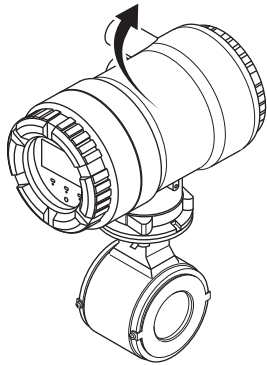
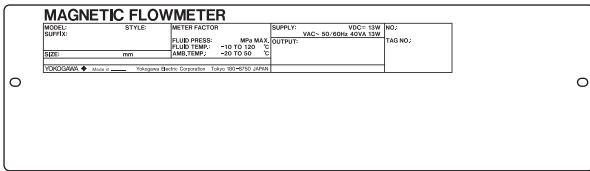
Determine the period of regular inspection as necessary.

Read also the Device Health Diagnosis by Verification Function in Chapter 5 together.

2. Model and Specifications Check

As shown in Figure 2.1, the model, suffix code, serial number, meter factor, fluid specification, and device information are found on the name plate located on the outside of the housing. And, this product can check their information from parameters. Read the user's manual of applicable communication type for checking device information from parameters. When checking the matching of model and specification you ordered, see the applicable general specifications. Be sure you have the model code and serial number available when contacting YOKOGAWA.

Note: Description on the nameplate
- Made in _____: Country of origin



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Figure 2.1 Name Plate

3. Transmitter Maintenance

3.1 Changing Direction of Display Unit

(1) Removing the Cover

- The following tool is required.
Hexagonal wrench (nominal size 3)
- Turn off the power to the flowmeter.
When opening the cover, wait for more than 20 minutes after turning off the power.
- Using the wrench, loosen the cover locking screw (1) (See Figure 3.1.1) clockwise to unlock the cover. Upon shipment from the factory the cover is locked. Hold the flowmeter with your hand. Remove the cover by rotating it counterclockwise.

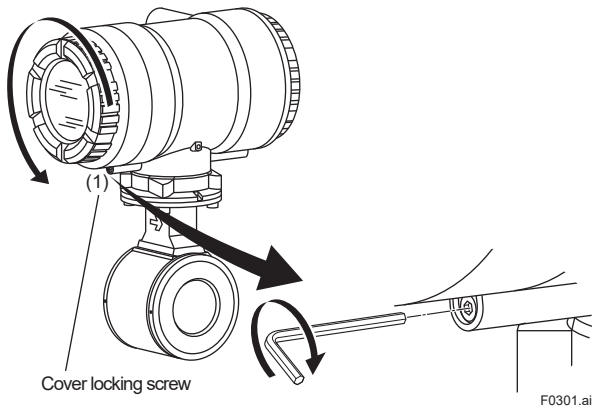


Figure 3.1.1 Removing the Display Cover



WARNING

To prevent electric shocks and maintain performance, do not remove safety cover.

(2) Changing Display Unit Direction 90 degrees

- Hold the display unit with your hand and loosen the two mounting screws.
- Rotate the display unit 90 degrees clockwise and confirm the assembling position, taking care of the connector and wire of the display unit.
At this time, do not remove the connector.
- Secure the display unit using its two mounting screws.

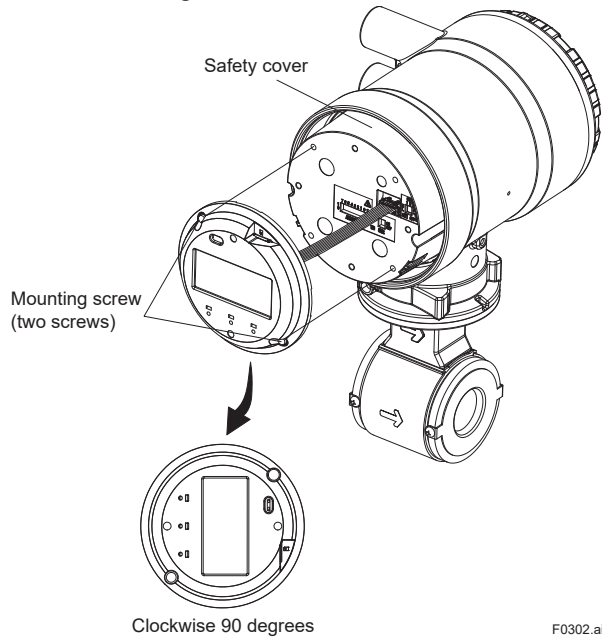


Figure 3.1.2 Changing Display Unit Direction 90 degrees

IMPORTANT

To preserve the safety, do not touch the electrical circuit and cable of shaded area.

(3) Installing the Cover

- Install the cover to the flowmeter by rotating the cover clockwise.
- Tighten cover locking screw (1) (See Figure 3.1.1) counterclockwise using a hexagonal wrench (nominal size 3) to lock the cover.

IMPORTANT

Be sure to screw the cover firmly into the housing without any space between them.

3.2 Maintenance of the Display

WARNING

- Before doing the maintenance work, be sure to turn off the power supply of the magnetic flowmeter.
- To prevent electric shocks and maintain performance, do not remove safety cover.

CAUTION

The display has certain lifespan and it may deteriorate during operation. In this case replace the display board. Contact our sales or service.

3.3 Removing and Installing of Display Board

(1) Removing the Display unit side cover

Read Section 3.1 and remove the cover.

(2) Removing the Display Board

Hold the display unit with your hand and loosen the two mounting screws.

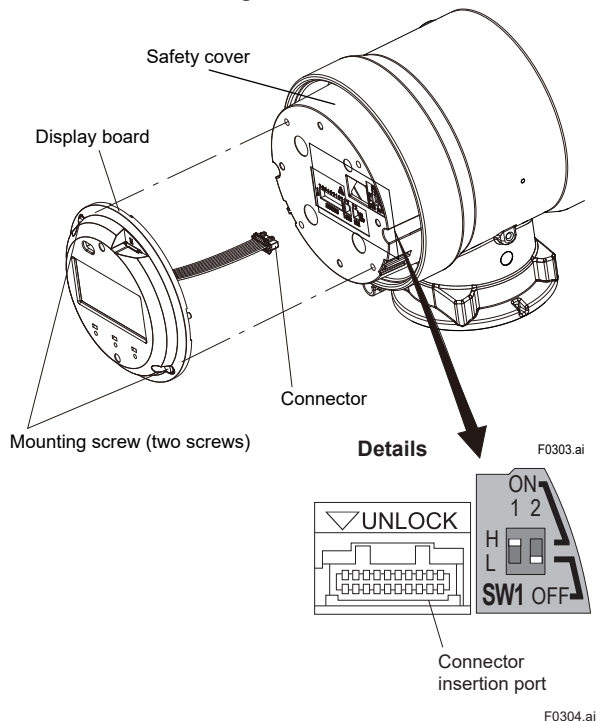


Figure 3.3 Connector Insertion Port of Display Board

WARNING

Do not use the insertion port of display board for other purposes, because some areas inside the connector insertion port have high voltages. Do not insert except the connector into the insertion port of display board.

(3) Removing the Connector

Because of lock type connector, according to “▽UNLOCK” as shown in Figure 3.3, unlock by pushing the lever in the direction of “▽” mark, and then remove the connector.

(4) Installing the Display Board

- Insert the connector into connector insertion port of display board.
- Taking care not to entangle the cables of connector, confirm the installation direction, and fix the display board with two screws. Torque of indicator fixing screw:
0.6±0.05 N·m

(5) Installing the Display unit side cover

Read Section 3.1 and install the cover.

WARNING

- When opening and closing the cover, be sure to handle the cover carefully so that there are no damage and foreign matter adhesion at its threads and O-ring. Keep checking their condition and clean the threads in case of adhering the foreign matter.
- Replace the cover in case the thread damages.
- Replace the O-ring if there is any scarring or transformation. And apply silicone based grease at the O-ring in case of the shortage and exhaustion of grease.

IMPORTANT

- When closing the cover, close it with both hands until the cover does not turn in order to bring the housing and cover into tight contact.
- Tighten with confirming that the cover rotates smoothly.

3.4 Parameter Backup/Restore/Duplicate

A backup of parameter setting can be stored to the built-in memory on the display unit (display board). The backup can be restored to the device and also be duplicated to other device with the same model, suffix code, hardware and software revision through the display board with the backup.

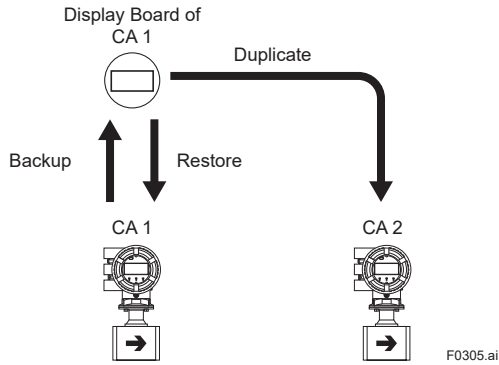


Figure 3.4 Parameter Transfer

Execution of “Restore” and “Duplicate” requires the matching on product specification as listed in following table.

M:Items to be Matched.

Device Information	Duplicate Data	Restore Data
Option Board ID	M	M
Transmitter Serial No		M
Sensor Serial No		M
Main Board Software Rev.	M	M
Sensor Board Software Rev.	M	M
Display Board Software Rev.	M	M
Model (Note)	M	M
Communication and I/O Code	M	M

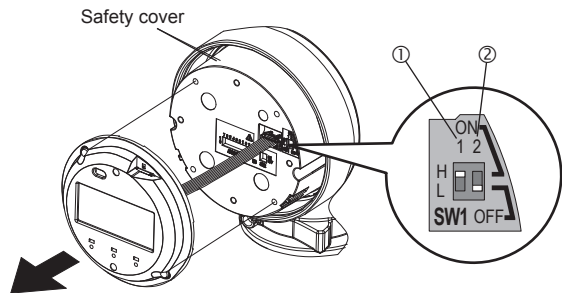
Note: Only between CA types can be duplicated or restored the data.

4. Hardware Switch Setting

IMPORTANT

- Removing and installing the cover are necessary for hardware switches. Perform removing and installing the cover as described in Section 3.1. When opening the cover, wait for more than 20 minutes after turning off the power. This work must be carried out by the trained personnel having knowledge of safety standard.
- To preserve the safety, do not touch the electrical circuit and the cables except the setting switches.
- When installing the cover, in order to contact the housing and the cover, be sure to screw it firmly into the housing without any space between them.

- (1) Remove the cover.
- (2) With holding the display by hand, loosen the two mounting screws.
- (3) With holding the display by hand (careful for connecting cable), set the switches. Never remove connector in this case.



① Burnout switch (SW1-1)
② Write protect switch (SW1-2)

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Figure 4.1 Hardware switches

- (4) Taking care not to entangle the cables, tighten the two screws on the display.
- (5) Install the cover.



WARNING

To prevent electric shock and maintain performance, do not remove the safety cover.

NOTE

The hardware switches are adjacent. Special care should be taken when making switch settings.

• Setting of Burnout Switch

The burnout function sets the direction of current output in situations where the CPU has become damaged. Upon shipment from the factory, the burnout direction is set to High (i.e., > 21.6 mA); however, in cases where the optional codes C1 or C2 have been specified, the output direction will be set to Low (i.e., < 2.4 mA). Modification of the burnout direction must be carried out using the burnout switch (SW1-1) (See Figure 4.1).

Table 4.1 Burnout switch (SW1-1)

Position of Switch	Burnout Direction	Burnout Output	Description
	High	> 21.6 mA	When optional code C1 or C2 is not specified, the setting is "High".
	Low	< 2.4 mA	When optional code C1 or C2 is specified, the setting is "Low".

• Setting of Write Protect Switch

The write protect function is to prevent the overwriting of parameters. Write protection can be carried out using either the write protection switch (SW1-2) (See Figure 4.1) or software function with parameter setting. If either of these items is activated, the overwriting of parameters will be prohibited.

Table 4.2 Write protect switch (SW1-2)

Position of Switch	Write Protect Function
	OFF (Factory setting) Parameter can be overwritten.
	ON Parameter can not be overwritten.

NOTE

- If the hardware switch is set to "ON", the condition of preventing parameter overwriting keeps until the switch is set to "OFF".
- For the software write protect function, read the user's manual of applicable communication type.

5. Device Health Diagnosis by Verification Function

This product incorporates the verification function and can self-diagnose the health of device by using it.

There are cases that a magnetic flowmeter does not perform normally by failure of magnetic, excitation or calculation circuit, or insulation deterioration of excitation coil. It is recommended to check the device's normal performance periodically (one or two years) by executing the verification function.

The verification function can diagnose circuits (magnetic, excitation, and calculation circuit) and device status (alarm occurrence), in approximately 6 minutes, without removing a flowmeter from the piping.

The verification function can be executed in both fluid statuses of the fluid flowing and the fluid not flowing. For accurate diagnosis, it is recommended to execute it in each fluid status. The diagnosis results can be stored on the device memory and compared with the previous diagnosis result.



CAUTION

Before executing the verification function, be sure to disconnect this product from the control loop.

NOTE

- Before using the verification function, always make sure that the sensor is in the full pipe state. If the sensor is in the empty pipe state, this function may not run normally.
- When using the verification function, be sure to correctly specify the fluid status.
- Before executing the verification function, confirm that any warning or alarm does not occur.
- For the following application, be careful that the verification function may not perform normally.
 - Flow rate is extremely low.
 - Conductivity of fluid is lower than the product specifications.
 - Fluid includes slurrys.
 - Fluid includes many bubbles.
 - Stray current occurs.

5.1 Parameter of Verification Function

The verification function can be executed from the display unit or the applicable communication tool. This chapter describes the parameters related with the verification function. For more details, read the user's manual of applicable communication type.

NOTE

The language on the display is set to "English" as default upon shipment from the factory. Select the adequate language read the installation manual. The display menu path on this manual is selected to "English".

Display Menu Path: Device setup ▶ Language

	Display	Description
(1)	Device setup ▶ Diag/Service ▶ Verification ▶ Mode	Specifies the fluid status to execute the verification function.*1
(2)	Device setup ▶ Diag/Service ▶ Verification ▶ Execute	Specifies the execution of the verification function.*2
(3)	Device setup ▶ Diag/Service ▶ Verification ▶ VF No	Specifies the diagnosis result display time.*3
(4)	Device setup ▶ Diag/Service ▶ Verification ▶ Result ▶ Failed/Passed	Displays the diagnosis result.*4
(5)	Device setup ▶ Diag/Service ▶ Verification ▶ Result ▶ Magnetic circuit	Displays the magnetic circuit diagnosis result.*4
(6)	Device setup ▶ Diag/Service ▶ Verification ▶ Result ▶ Excite circuit	Displays the excitation circuit diagnosis result.*4
(7)	Device setup ▶ Diag/Service ▶ Verification ▶ Result ▶ Calc circuit	Displays the calculation circuit diagnosis result.*4
(8)	Device setup ▶ Diag/Service ▶ Verification ▶ Result ▶ Device status	Displays the device alarm diagnosis result.*4

*1: From the table below, select the fluid status required to execute the verification function.

Selection	Description
No flow	Executes the verification function with the fluid not flowing.
Flow	Executes the verification function with the fluid flowing.

*2: From the table below, select whether to execute the verification function.

Selection	Description
Not execute	Does not execute the verification function.
Execute	Executes the verification function.

*3: From the table below, select the execution result of the verification function.

Selection	Description
Factory	Displays the result obtained upon shipment from the manufacturing factory.
Previous	Displays the previous result.
Present	Displays the result at this time.

*4: The diagnosis result is judged as shown below.

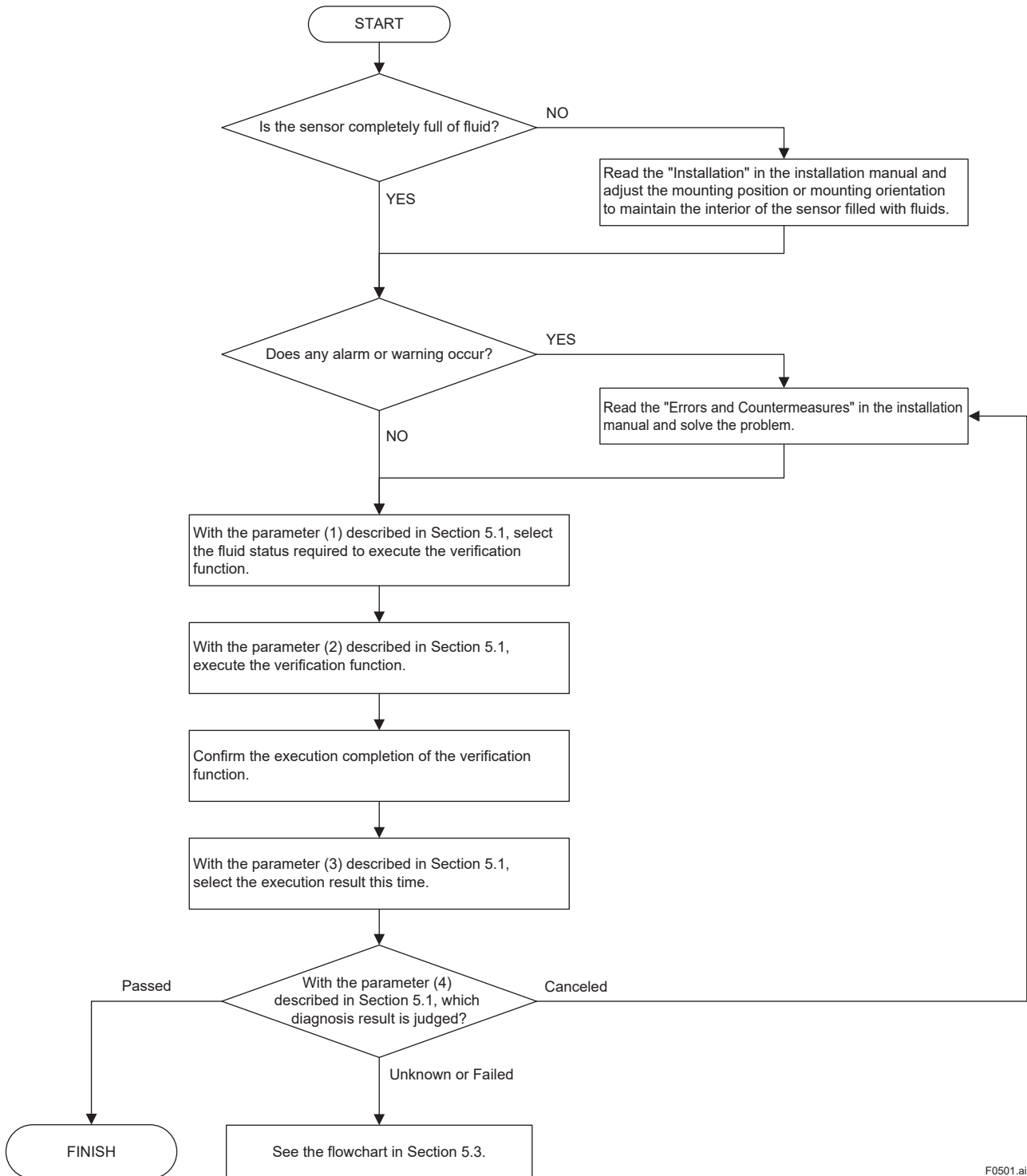
Result	Description
Passed	There are no problems concerning the diagnosis result.
Failed	There is a problem concerning the diagnosis result.
Canceled	Cancels the diagnosis.*5
No data	No diagnosis result data (The verification function is not used.)
Unknown	Cannot perform a diagnosis.
Skip	Out of verification target.

*5: When the alarms in the following table occur or big flow noise is detected while the diagnosis runs, the diagnosis will stop.

Display
010: Main CPU FAIL
014: Snr bd FAIL
015: Snr comm ERR
016: AD 1 FAIL[Sig]
017: AD 2 FAIL[Exct]
050: Signal overflow

5.2 Execution of Verification Function

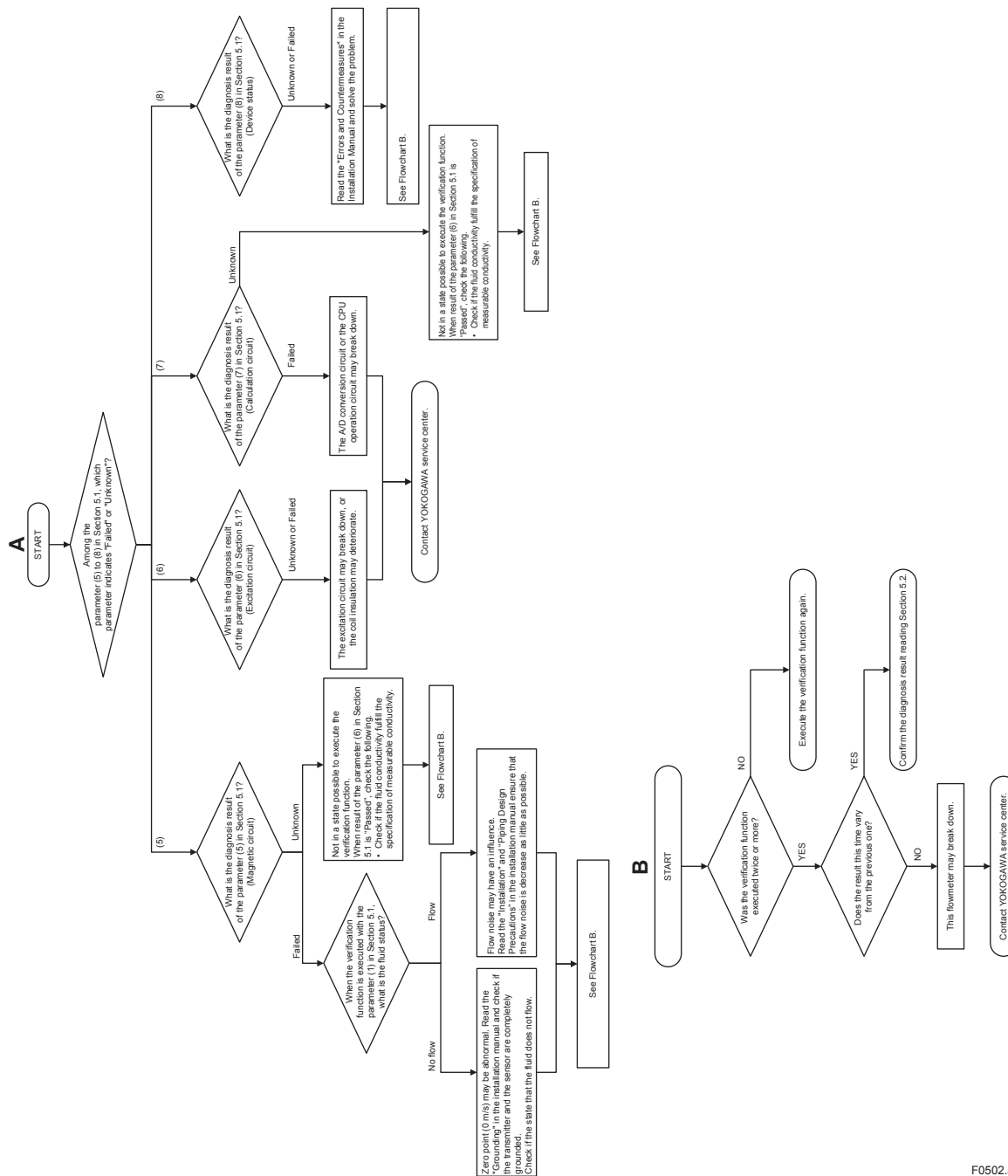
In accordance with the following flowchart, execute the verification function.



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5.3 Confirmation of Verification Function

In accordance with the following flowchart, confirm the diagnosis result.



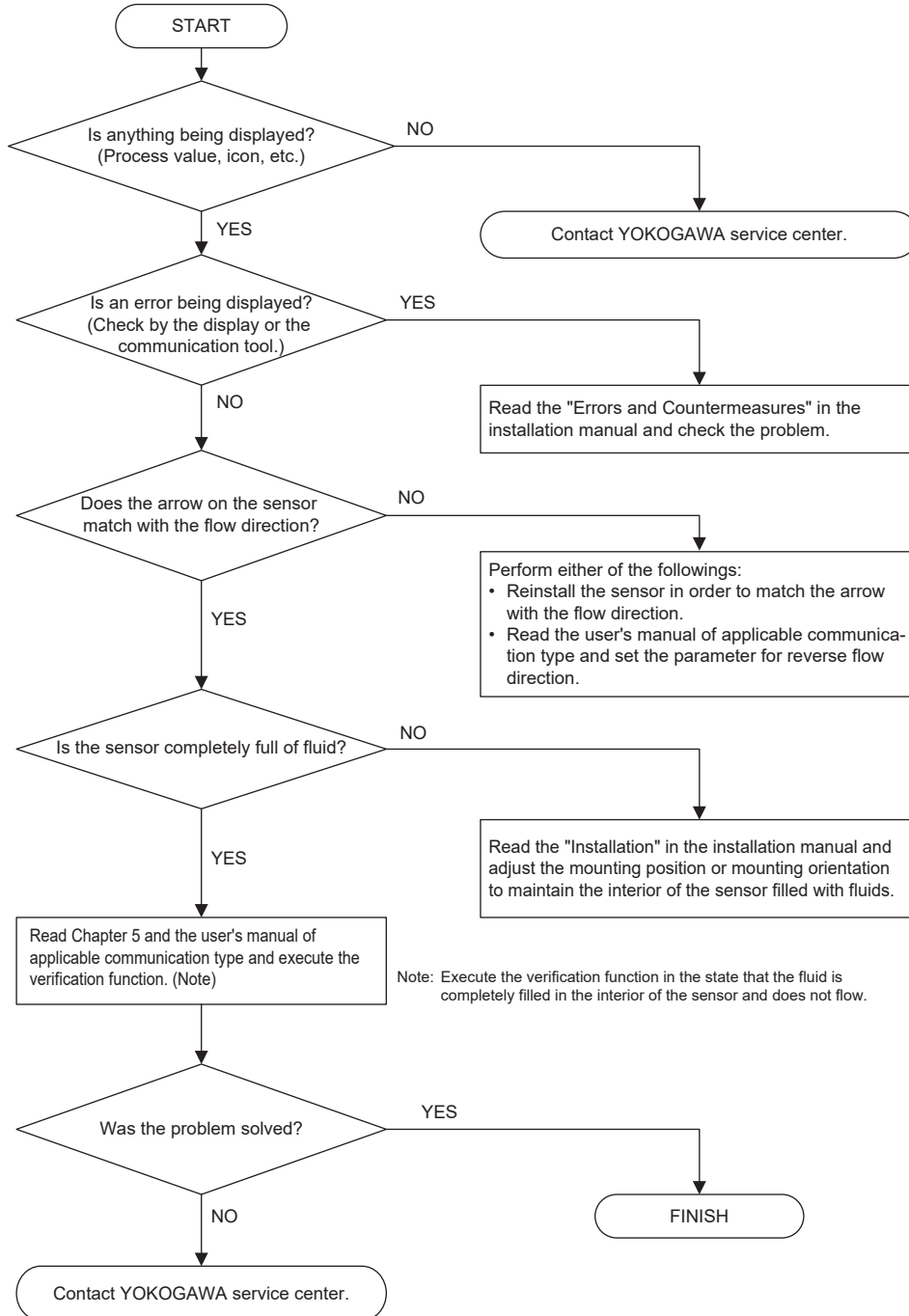
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6. Troubleshooting

This chapter describes troubleshooting procedures, when the trouble occurs in the magnetic flowmeter.

6.1 No Display

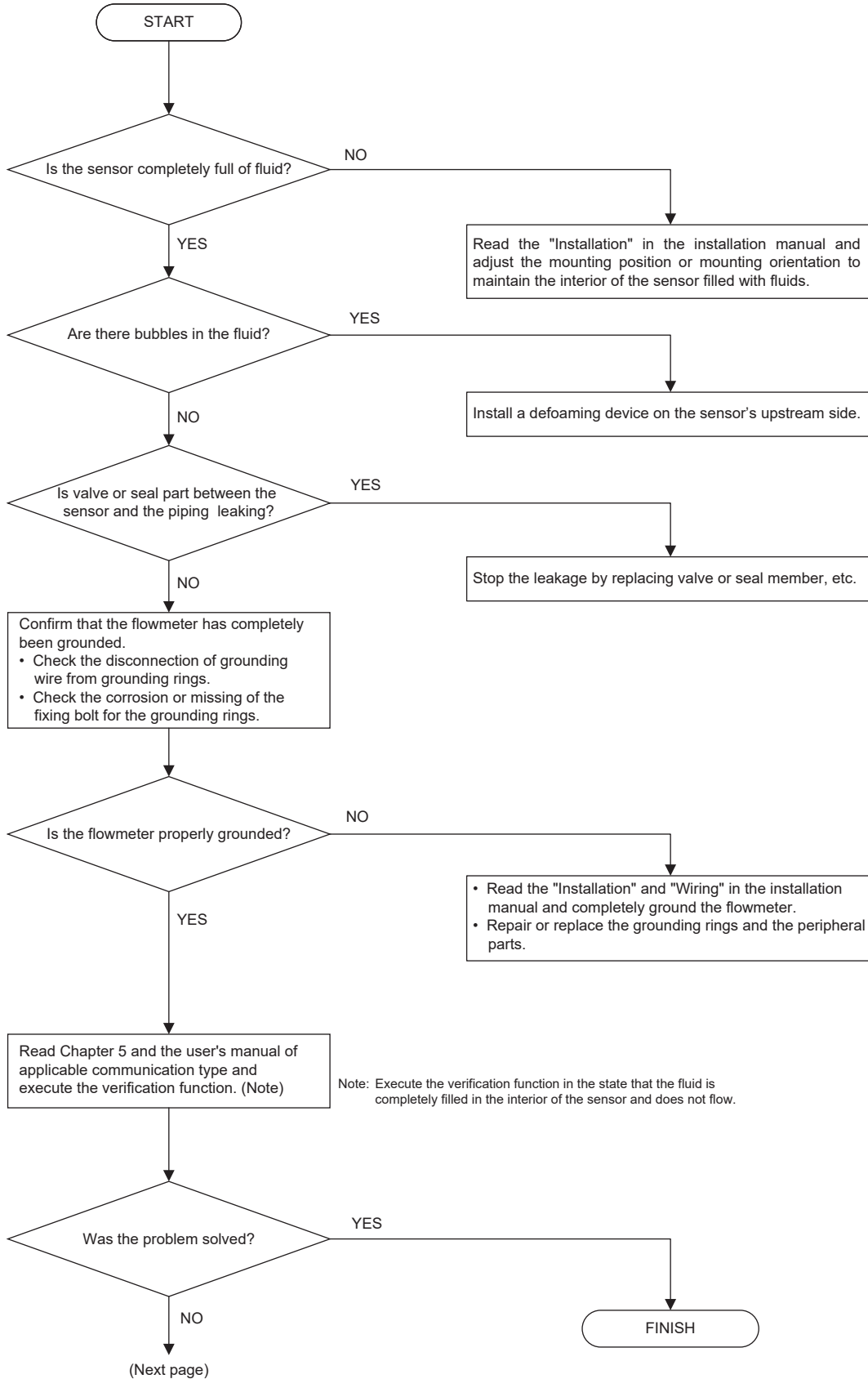
If nothing is displayed on the display even though the fluid is flowing, check according to the flowchart below.



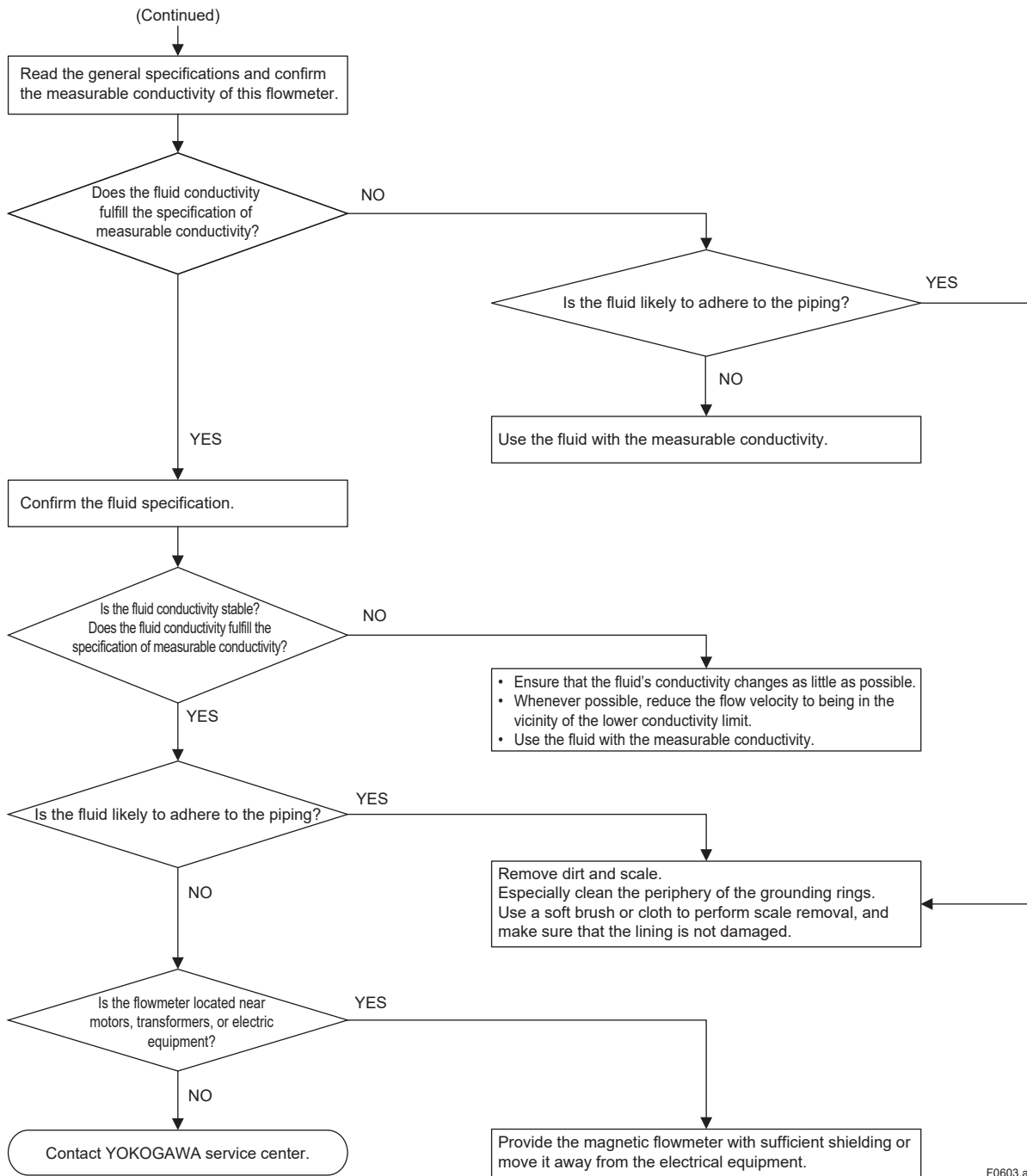
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6.2 Unstable Zero Point

if the adjustment value or output value of the zero point is unstable, check according to the flowchart below.



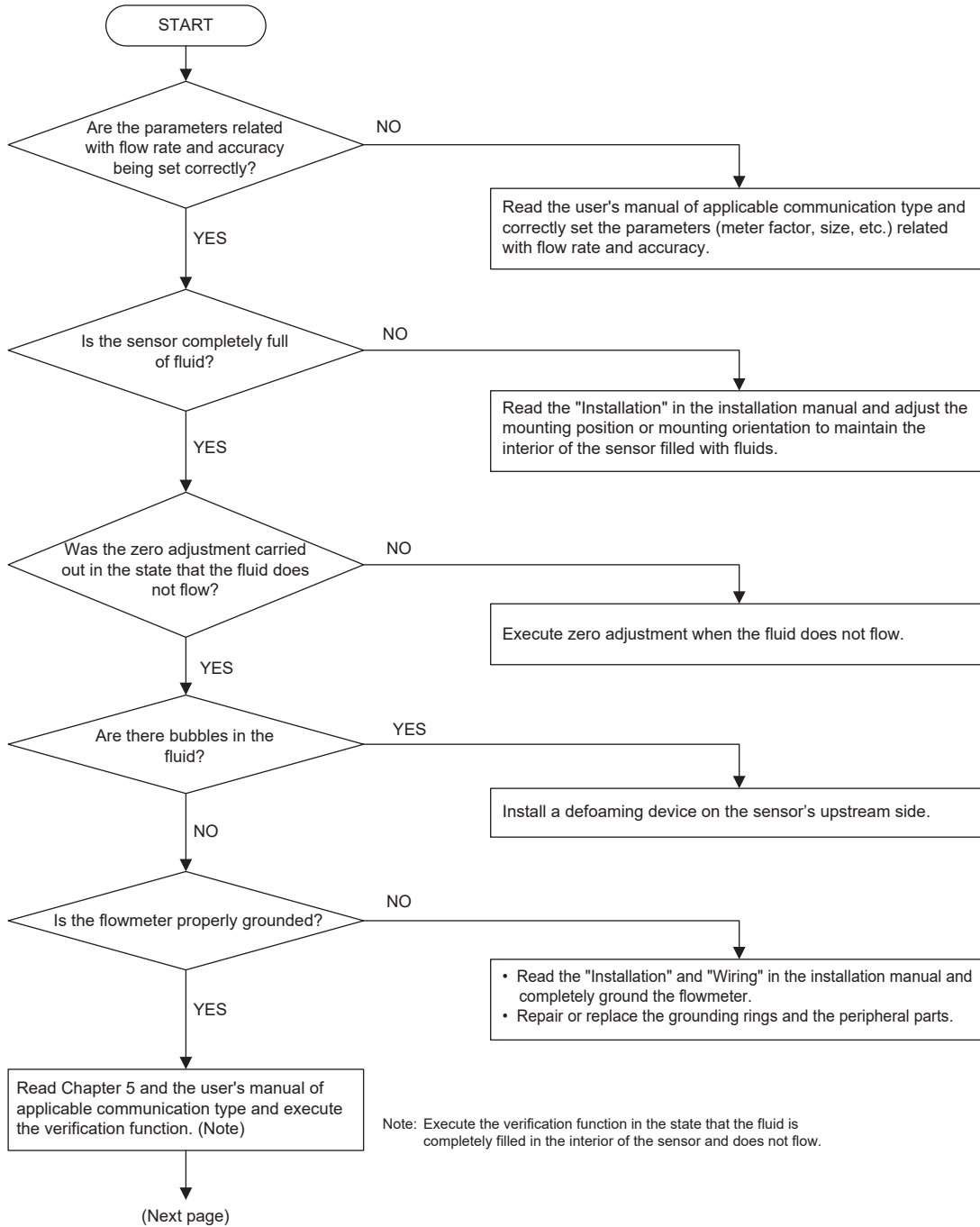
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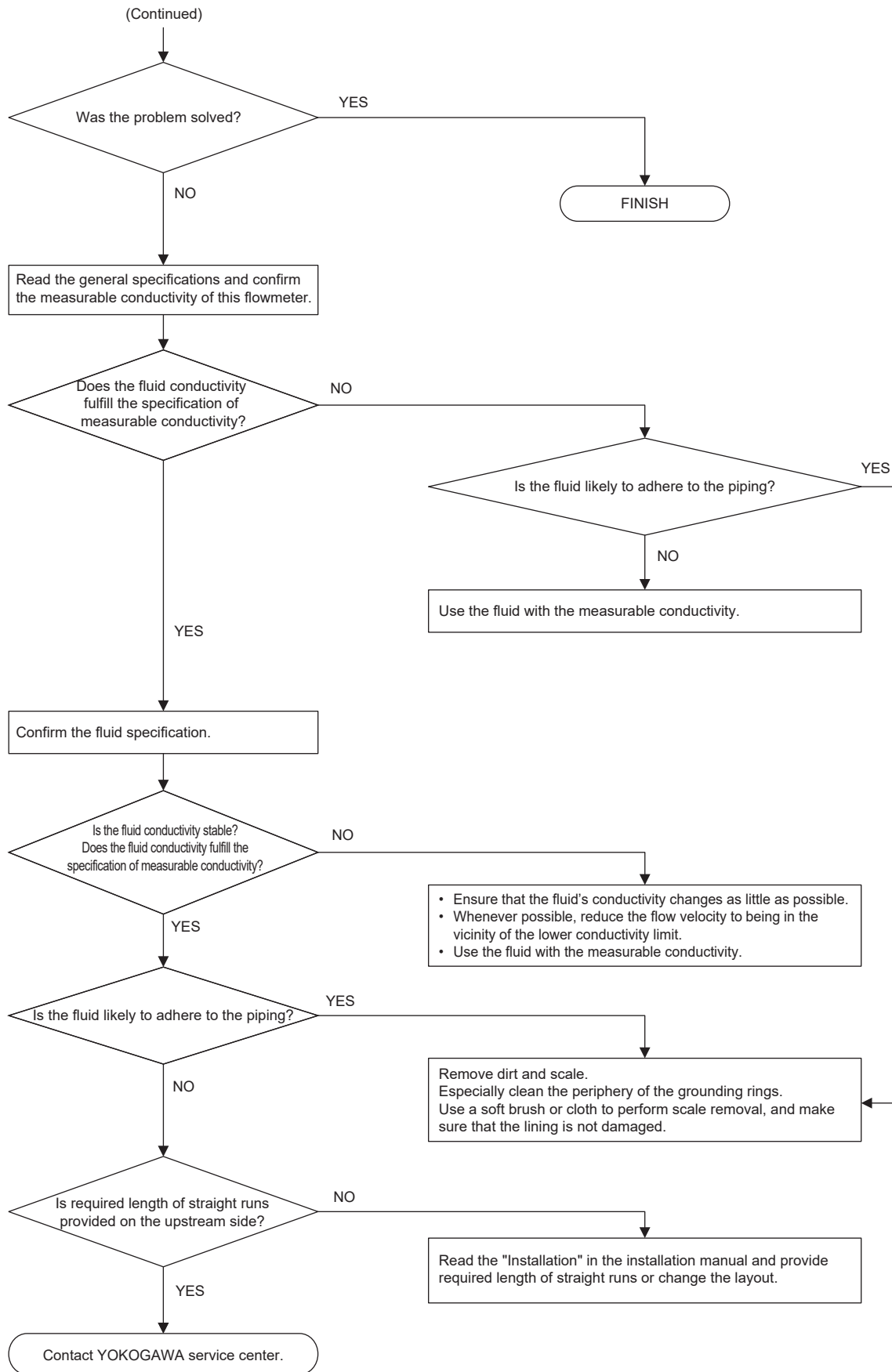
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6.3 Disagreement Between Displayed Flow Rate and Actual Flow Rate

If the displayed flow rate does not match the actual flow rate, check according to the flowchart below.



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Revision Information

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