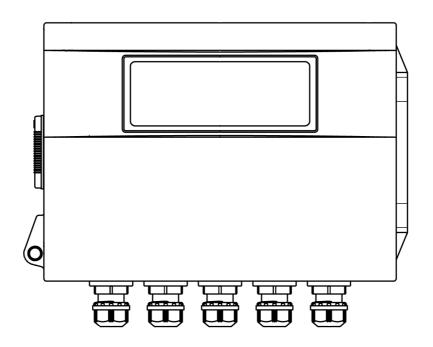
# ON-SITE Type Conductivity Meter FEB-102-ECH (High Concentration) FEB-102-ECM (Low Concentration) Instruction Manual





## **Preface**

Thank you for purchasing our FEB-102-ECH, ECM, ON-SITE Type Conductivity Meter.

This manual contains instructions for the mounting, functions, operations and notes when operating the FEB-102-ECH, ECM. To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.

To prevent accidents arising from the misuse of this instrument, please ensure the operator receives this manual.



## Caution

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow all of the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- The contents of this instruction manual are subject to change without notice.
- Care has been taken to ensure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be wall-mounted. Measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos Co., Ltd. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

## Safety Precautions (Be sure to read these precautions before using our products.)

The safety precautions are classified into 2 categories: "Warning" and "Caution".

Depending on the circumstances, procedures indicated by  $\triangle$  Caution may result in serious consequences, so be sure to follow the directions for usage.



# **∆ Warning**

Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.



Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.



# Warning

- To prevent an electrical shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electrical shock, fire or damage to the instrument, parts replacement may only be undertaken by Shinko or other qualified service personnel.

## SAFETY PRECAUTIONS

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after purpose-of-use consultation with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protective equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

## **Caution with respect to Export Trade Control Ordinance**

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

## **PRECAUTIONS**

## 1. Installation Precautions



## Caution

This instrument is intended to be used under the following environmental conditions (IEC61010-1):

Overvoltage category 
 II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of -20 to 50°C (-4 to 122°F) that does not change rapidly, and no icing
- An ambient non-condensing humidity of 35 to 95 %RH
- No large capacity electromagnetic switches or cables through which large current is flowing.
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit
- The ambient temperature of the unit must be kept to under 50°C. Otherwise the life of electronic parts (especially electrolytic capacitors) of the unit will be shortened.

Note: Do not install this instrument on or near flammable material even though the case of this instrument is made of flame-resistant resin.

## 2. Wiring Precautions



## Caution

- Use a ring-type solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the FEB-102-ECH, ECM.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw may be damaged.
- This instrument does not have a built-in power switch, circuit breaker and fuse. It is necessary to install a power switch, circuit breaker and fuse near the instrument. (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor.
- Use the 4-electrode/2-electrode conductivity sensor in accordance with the sensor input specifications of the FEB-102- ECH, ECM.
- Keep the sensor cables and power cables separate, do not put them in the same cable clamp.

## Note about the 4-electrode/2-electrode Conductivity Sensor Cable

The 4-electrode/2-electrode conductivity sensor cable is a highly-insulated (electrical) cable. Please handle it with utmost care as follows.

- Do not allow terminals and socket of the 4-electrode/2-electrode conductivity sensor cable to come in contact with moisture or oil of any kind. Likewise, ensure fingers are clean, otherwise the insulation will deteriorate, resulting in unstable indication.
  - Be sure to keep the cable dry and clean at all times.
  - If the cable is stained, clean it with alcohol, and dry it completely.
- For calibration or electrode checking/replacement, the 4-electrode/2-electrode conductivity sensor cable should be wired with sufficient length.
- Keep the 4-electrode/2-electrode conductivity sensor cable and junction cable away from electrical devices, such as motors or their power lines from which inductive interference emanates.

## Connection

The 4-electrode conductivity sensor cable has the following terminals.

Symbol	Terminal
1	Conductivity sensor terminal
2	Conductivity sensor terminal
3	Conductivity sensor terminal
4	Conductivity sensor terminal
A, B, B	Temperature compensation electrode terminals (Pt100 or Pt1000)
E	Shield wire terminal

The 2-electrode conductivity sensor cable has the following terminals.

Symbol	Terminal
1	Conductivity sensor terminal
2	Conductivity sensor terminal
A, B, B	Temperature compensation electrode terminals (Pt100 or Pt1000)
Е	Shield wire terminal

For the 4-electrode/2-electrode conductivity sensor with no temperature compensation, A, B, B cables are not available.

E cables are available depending on the sensor type.

# 3. Operation and Maintenance Precautions

# **⚠** Caution

- Do not touch live terminals. This may cause an electrical shock or problems in operation.
- Turn the power switch OFF when retightening the terminal or cleaning. Working on or touching the terminal with the power switched ON may result in severe injury or death due to electrical shock.
- Use a soft, dry cloth when cleaning the instrument. (Alcohol based substances may tarnish or deface the unit.)
- As the display section is vulnerable, do not strike or scratch it with a hard object or put pressure on it.

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## 1. Model

## 1.1 Model

FEB-10	2-	EC		,			
Input Points	2				2 points		
Input		EC			4-electrode conductivity sensor:		
					(Temperature element: Pt100 or Pt1000)		
					2-electrode conductivity sensor:		
					(Temperature element: Pt100 or Pt1000)		
Concentration H M		Н		High concentration			
		М		Low concentration			
Supply Voltage		Supply Voltage			100 to 240 V AC		
		C5		C5	Serial communication RS-485 (*1)		
Option				EVT3	EVT3 output (Contact output 3) (*2)		
		EVT4 EVT3, EVT4 output (Contact outputs 3, 4) (*1)					

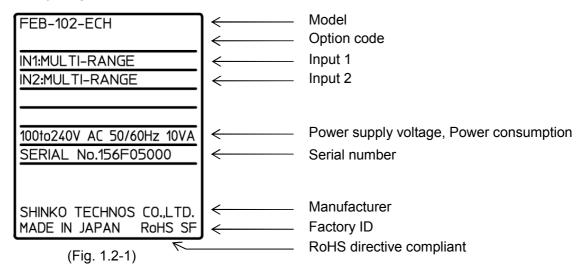
<sup>(\*1)</sup> If C5 or EVT4 option is ordered, Transmission output 1 and 2 are not available.

## 1.2 How to Read the Model Label

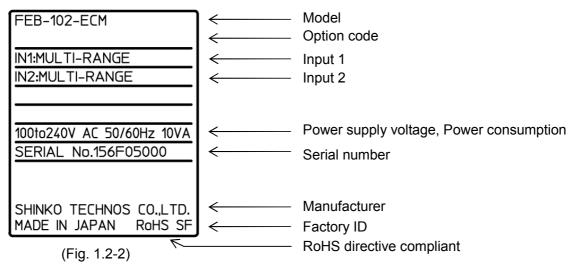
The model label is attached on the inside of the cover.

Model label differs depending on the model.

FEB-102-ECH:



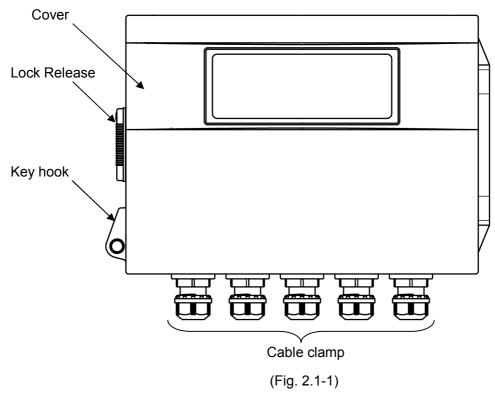
## FEB-102-ECM:



<sup>(\*2)</sup> If EVT3 is ordered, Transmission output 1 is not available.

# 2. Names and Functions of Sections

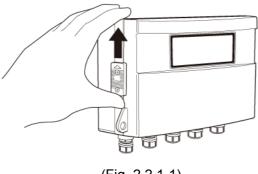
## 2.1 Main Body



## 2.2 How to Open/Close the Cover

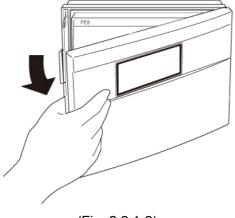
## 2.2.1 Open the Cover

(1) Push the Lock Release up to unlock it.



(Fig. 2.2.1-1)

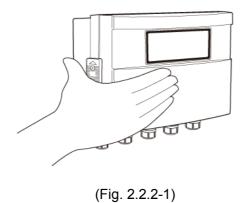
(2) Pull the cover toward you to open it.



(Fig. 2.2.1-2)

## 2.2.2 Close the Cover.

(1) Close the cover tightly by pushing firmly until no gap remains between the body and cover.



,

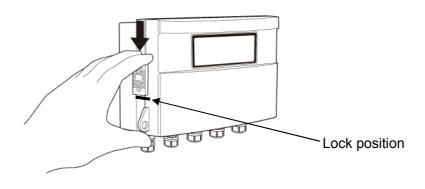
(2) Lock the unit by pulling the Lock Release down completely.



# Caution

• Confirm that the Lock Release is securely locked.

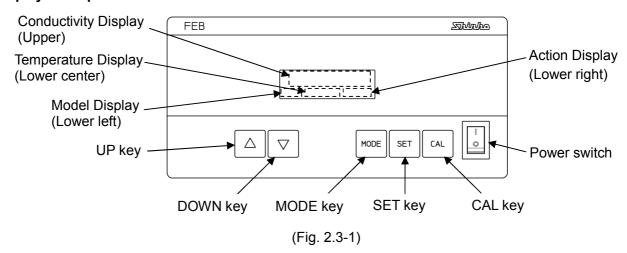
If it is not locked, Drip-proof/Dust-proof specification (IP65) may be compromised.



(Fig. 2.2.2-2)

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## 2.3 Display and Operation Panel



## Conductivity Display (Upper),

## **Temperature Display (Lower center):**

In Conductivity/Temperature Display Mode, the Conductivity Display indicates conductivity, and the Temperature Display indicates temperature.

In Setting mode or Calibration mode, the Conductivity Display indicates a setting item or calibration item, and the Temperature Display indicates a set value or calibration value.

Indication differs depending on the selection in [Display selection] or [Temperature Display when no temperature compensation (p.49)].

## **Model Display (Lower left)**

Indicates the model:

**[ECH]**: Indicated for the FEB-102-ECH.

**[ECM**]: Indicated for the FEB-102-ECM.

## **Action Display (Lower right)**

EV1: Indicated when EVT1 output (Contact output 1) is ON.

EV2: Indicated when EVT2 output (Contact output 2) is ON.

EV3: Indicated when EVT3 output (Contact output 3) is ON.

(When EVT3 option or EVT4 option is ordered)

EV4: Indicated when EVT4 output (Contact output 4) is ON (When EVT4 option is ordered).

T/R: Indicated while in Serial communication TX output (transmitting) (When C5 option is ordered).

## **Keys**

UP key: Increases the numeric value.

DOWN key: Decreases the numeric value, or selects a group.

MODE key: Moves to the group selection, or returns to Conductivity/Temperature Display

Mode from a setting item.

SET key: Switches the setting modes, and registers the set value.

CAL key: Moves to the Conductivity Calibration Mode.

By pressing the riangle and riangle key together, the unit reverts to Temperature

Calibration Mode.

### **Switch**

Power switch: Turns the power to the instrument ON/OFF.

: Turns ON.

©: Turns OFF.

# 3. Mounting

## 3.1 Site Selection

# **⚠** Caution

Use within the following temperature and humidity ranges.

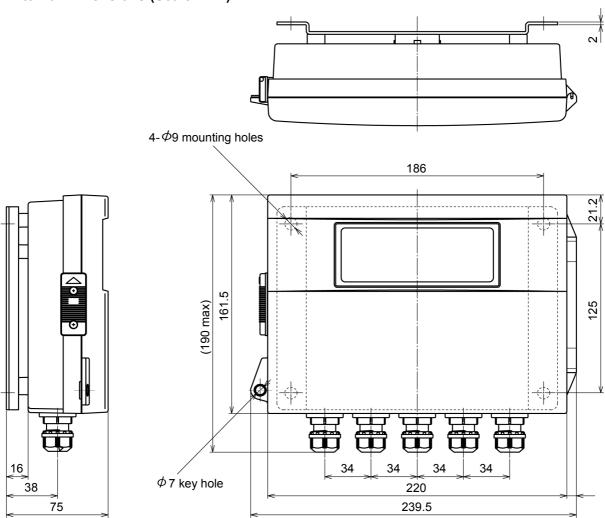
Temperature: -20 to 50°C (-4 to 122°F) (No icing), Humidity: 35 to 95 %RH (Non-condensing) The ambient temperature of the unit must be kept to under 50°C. Otherwise the life of electronic parts (especially electrolytic capacitors) of the unit will be shortened.

# This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category II, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- · A minimum of dust, and an absence of corrosive gases
- · No flammable, explosive gases
- · No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of -20 to 50°C (-4 to 122°F) that does not change rapidly
- An ambient non-condensing humidity of 35 to 95%RH
- No large capacity electromagnetic switches or cables through which large current is flowing
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

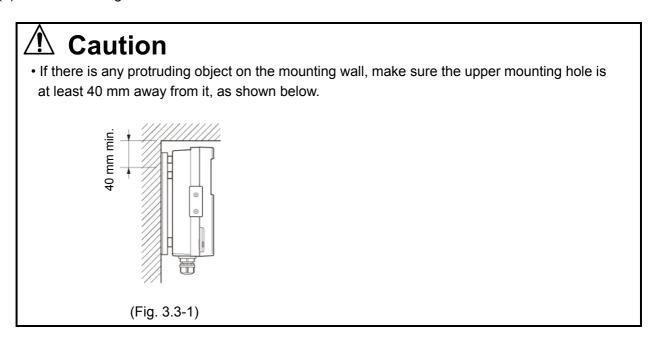
## 3.2 External Dimensions (Scale: mm)



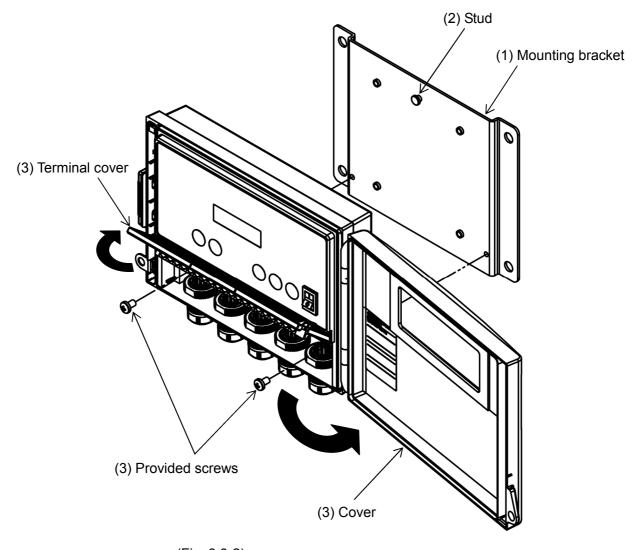
(Fig. 3.2-1)

## 3.3 Mounting

(1) Fix the mounting bracket to the wall.



- (2) Hook this instrument on the stud of the mounting bracket.
- (3) Open the cover and the terminal cover, and mount the instrument with the provided screws.



(Fig. 3.3-2)

# 4. Wiring

# Marning

Turn the power supply to the instrument OFF before wiring or checking. Working on or touching the terminal with the power switched on may result in severe injury or death due to electrical shock.

# ♠ Caution

- Use a ring-type solderless terminal with an insulation sleeve in which the M3 screw fits when wiring the unit.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the terminal screw may be damaged.
- This instrument does not have a built-in power switch, circuit breaker and fuse. It is necessary to install a power switch, circuit breaker and fuse near the instrument. (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- Do not apply a commercial power source to the sensor which is connected to the input terminals nor allow the power source to come into contact with the sensor.
- Use the 4-electrode/2-electrode conductivity sensor in accordance with the sensor input specifications of this unit.
- Keep the sensor cables and power cables in separate groups, do not put them in the same cable clamp.

## Note about the 4-Electrode/2-Electrode Conductivity Sensor Cable

The 4-electrode/2-electrode conductivity sensor cable is a highly-insulated (electrical) cable. Please handle it with utmost care as follows.

- Do not allow terminals and socket of the 4-electrode/2-electrode conductivity sensor cable to come in contact with moisture or oil of any kind. Likewise, ensure fingers are clean, otherwise the insulation will deteriorate, resulting in unstable indication. Be sure to keep the cable dry and clean at all times. If the cable is stained, clean it with alcohol, and dry it completely.
- For calibration or electrode checking/replacement, the 4-electrode/2-electrode conductivity sensor cable should be wired with sufficient length.
- Keep the 4-electrode/2-electrode conductivity sensor cable and junction cable away from electrical devices, such as motors or their power lines from which inductive interference emanates.

#### Connection

The 4-electrode conductivity sensor cable has the following terminals.

Symbol	Terminal
1	Conductivity sensor terminal
2	Conductivity sensor terminal
3	Conductivity sensor terminal
4	Conductivity sensor terminal
A, B, B	Temperature compensation electrode terminals (Pt100 or Pt1000)
E	Shield wire terminal

The 2-electrode conductivity sensor cable has the following terminals.

Symbol	Terminal
1	Conductivity sensor terminal
2	Conductivity sensor terminal
A, B, B	Temperature compensation electrode terminals (Pt100 or Pt1000)
E	Shield wire terminal

For the 4-electrode/2-electrode conductivity sensor with no temperature compensation, A, B, B cables are not available.

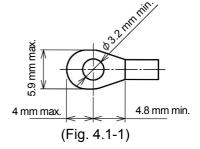
E cables are available depending on the sensor type.

## **4.1 Lead Wire Solderless Terminal**

Use a ring-type solderless terminal with an insulation sleeve in which an M3 screw fits as follows.

The tightening torque should be 0.5 N•m.

Solderless Terminal	Manufacturer	Model
Ding type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25-3
Ring-type	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3



## 4.2 Terminal Arrangement

Terminal arrangement differs depending on the model.

#### 4.2.1 FEB-102-ECH

E: 4-electrode conductivity sensor, Shield wire terminal (1)

1, 2, 3, 4: 4-electrode conductivity sensor, Sensor terminals ((2 - (3 - (4 - (5)))))

A, B: Temperature element: Pt100 (2-wire), Pt1000 (2-wire) Temperature compensation sensor terminals  $(^{\textcircled{6}} - ^{\textcircled{7}})$ 

A, B, B: Temperature element: Pt100 (3-wire) Temperature compensation sensor terminals (6 – 7 – 8)

TRANSMIT OUTPUT1: Transmission output 1 terminals (10 - 11)

(Not available if C5, EVT3 or EVT4 option is ordered)

TRANSMIT OUTPUT2: Transmission output 2 terminals (12 - 13)

(Not available if C5 or EVT4 option is ordered.)

EVT1: EVT1 output (Contact output 1) terminals (14 - 15)

EVT2: EVT2 output (Contact output 2) terminals (16 - 17)

EVT3: EVT3 output (Contact output 3) terminals ((0 - (1))) (When EVT3 or EVT4 option is ordered)

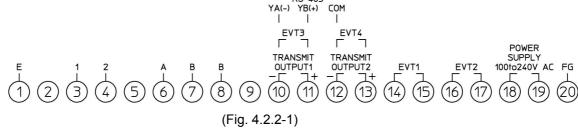
EVT4: EVT4 output (Contact output 4) terminals (10 - 11) (When EVT4 option is ordered)

RS-485: Serial communication terminals (10 - 11 - 12) (When C5 option is ordered)

POWER SUPPLY: Power terminals (18 - 19)

FG: Ground terminals (20)

## 4.2.2 FEB-102-ECM



E: 2-electrode conductivity sensor Shield wire terminals (①)

1, 2: 2-electrode conductivity sensor Sensor terminals ( $^{\circ}$ )

A, B: Temperature element: Pt100 (2-wire), Pt1000 (2-wire) Temperature compensation sensor terminals ( $^{\textcircled{6}}$  –  $^{\textcircled{7}}$ )

A, B, B: Temperature element: Pt100 (3-wire) Temperature compensation sensor terminals (6 – 7 – 8)

TRANSMIT OUTPUT1: Transmission output 1 terminals (10 - 11)

(Not available if C5, EVT3 or EVT4 option is ordered)

TRANSMIT OUTPUT2: Transmission output 2 terminals (<sup>1</sup>/<sub>2</sub> – <sup>1</sup>/<sub>3</sub>)

(Not available if C5 or EVT4 option is ordered.)

EVT1: EVT1 output (Contact output 1) terminals (4 - 15)

EVT2: EVT2 output (Contact output 2) terminals (16 - 17)

EVT3: EVT3 output (Contact output 3) terminals ( 0 - 0 ) (When EVT3 or EVT4 option is ordered)

EVT4: EVT4 output (Contact output 4) terminals (10 - 11) (When EVT4 option is ordered)

RS-485: Serial communication terminals (0 - 0 - 0) (When C5 option is ordered)

POWER SUPPLY: Power terminals (18 - 19)

FG: Ground terminals (20)

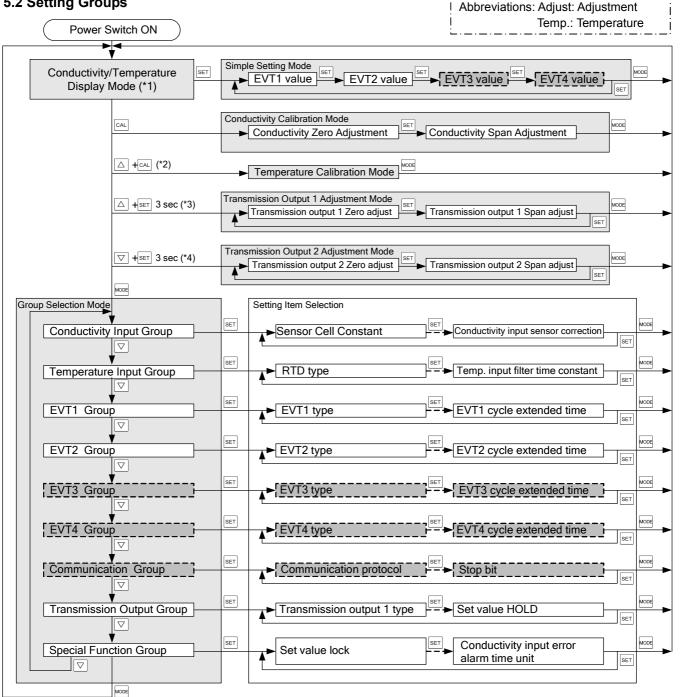
# 5. Outline of Key Operation and Setting Groups

## **5.1 Outline of Key Operation**

There are Simple Setting Mode, and Group Selection Mode into which setting items are divided.

To enter Simple Setting mode, press the $^{\text{\tiny SET}}$ key in Conductivity/Temperature Display Mode. To enter Group Selection mode, press the $^{\text{\tiny MODE}}$ key in Conductivity/Temperature Display Mode. Select a group with the $^{\text{\tiny $\nabla$}}$ key, then press the $^{\text{\tiny $SET$}}$ key. The unit will move to the each setting item.
Make settings with the $ riangle$ key or $ riangle$ key, and register settings with the $ riangle$ key.
By pressing the key in Simple Setting Mode, Group Selection Mode or at any setting item, the unit reverts to Conductivity/Temperature Display Mode.

## 5.2 Setting Groups



#### **About Each Mode and Setting Items**

- (\*1) In Conductivity/Temperature Display Mode, indicates items selected in [Display selection] and [Temperature display when no temperature compensation (p.49)].
- (\*2) If **OFF** (No temperature compensation) is selected in [Temperature compensation method (p.23)], the unit will not proceed to Temperature Calibration mode.
- (\*3) If C5, EVT3 or EVT4 option is ordered, the unit will not move to Transmission Output 1 Adjustment Mode.
- (\*4) If C5 or EVT4 option is ordered, the unit will not move to Transmission Output 2 Adjustment Mode.
- : Available only when option is ordered.

#### **Key Operation**

- SET : Press the SET key until the desired setting mode appears.
- 🗀 + 🖾 : Press the 🛆 and 🖾 keys (in that order) together. The unit will enter Temperature Calibration Mode.
- 🛆 + 🖭 (3 sec): Press and hold the 🛆 and 🖭 keys (in that order) together for 3 seconds. The unit will enter Transmission Output 1 Adjustment Mode.
- $\nabla$ +set (3 sec): Press and hold the  $\nabla$  and set keys (in that order) together for 3 seconds. The unit will enter Transmission Output 2 Adjustment Mode.
- If the key is pressed at each setting item, the unit will revert to Conductivity/Temperature Display Mode.

# 6. Setup

Setup should be done before using this instrument according to the user's conditions:

Setting Conductivity input, Temperature input, EVT1 to EVT4 types, Communication, Transmission output, Display setting, etc.

Setup is performed in the following groups.

- (1) Conductivity input group
- (2) Temperature input group
- (3) EVT1 group
- (4) EVT2 group
- (5) EVT3 group (EVT3, EVT4 options)
- (6) EVT4 group (EVT4 option)
- (7) Communication group (C5 option)
- (8) Transmission output group
- (9) Special function group

If the user's specification is the same as the factory default value of this instrument, or if user's instrument has already been installed in a system after setup was complete, initial setup is not necessary. Proceed to Section '7. Calibration' (p.50).

## 6.1 Turn the Power Switch ON.

For approx. 4 seconds after the power switch is turned ON, the input type is indicated in the Conductivity Display and Temperature Display.

## FEB-102-ECH

Conductivity Display	Item Selected in [Measurement Unit (p.20)]	Temperature Display
CONV	Conductivity (mS/cm)	PT100
SI	Conductivity (S/m, mS/m)	or
SEA	Seawater salinity (%)	PT1000
SALT	NaCl salinity (%)	
TDS	TDS conversion (g/L)	

## FEB-102-ECM

Conductivity Display	Item Selected in [Measurement Unit (p.20)]	Temperature Display
CONV	Conductivity (µS/cm)	PT100
SI	Conductivity (mS/m)	or
TDS	TDS conversion (mg/L)	PT1000

After that, measurement starts, indicating items selected in [Display selection] and [Temperature Display when no temperature compensation (p.49)].

This status is called Conductivity/Temperature Display Mode.

## **6.2 Conductivity Input Group**

То	enter the	Conductivity	Input	Group.	follow the	procedure below.

1	G_EC	Press the Mode	key in	Conductivity	//Temperature	Display Mode.

② CELL Press the set key.

The unit will proceed to the Conductivity Input Group, and 'Sensor cell constant' will appear.

Character	Setting Item, Function, Setting Range	Factory Default		
CELL	Sensor cell constant	FEB-102-ECH : 1.0/cm		
1.0		FEB-102-ECM: 0.01/cm		
	Selects sensor cell constant.			
	If the cell constant is changed, the Conductivi	ity Zero adjustment value, Span		
	adjustment value, and Cell constant correctio	n value are cleared.		
	Set the Cell constant correction value again, a	and re-calibrate the Conductivity		
	Zero adjustment and Span adjustment values			
	Selection items differ depending on the model.			
	FEB-102-ECH:			
	<b>1.0</b> : 1.0/cm			
	<b>10.0</b> : 10.0/cm			
	FEB-102-ECM:			
	<b>0.01</b> : 0.01/cm			
	<b>1.0</b> : 1.0/cm			
COEF	Cell constant correction value	1.000		
1.000	Sets sensor cell constant correction value.			
1.000	COEF and conductivity are displayed alternately	W.		
	• Setting range: 0.001 to 5.000	y.		
UNIT	Measurement unit	FEB-102-ECH: Conductivity (mS/cm)		
CONV	FEB-102-ECM: Conductivity ( $\mu$ S/cm			
	Selects the conductivity unit.			
	If the conductivity unit is changed, the Conductivity Zero adjustment value, Span			
	adjustment value and Cell constant correction value will be cleared.			
	Set the Cell constant correction value again, and re-calibrate the Conductivity Zero			
	adjustment and Span adjustment values.			
	If the following is changed, the Conductivity Span adjustment value and Cell constant			
	correction value will not be cleared.			
	Re-calibrate <i>only</i> the Conductivity Zero adjustment value.			
	Changing from Conductivity (mS/cm, S/m) to Sea	awater salinity (%) or NaCl salinity (%).		
	Changing from Seawater salinity (%) or NaCl sal	inity (%) to Conductivity (mS/cm, S/m).		
	Changing from Seawater salinity (%) to NaCl sales.	alinity (%).		
	Selection items differ depending on the model.			
	FEB-102-ECH:			
	CONV : Conductivity (mS/cm)			
	SI : Conductivity (S/m, mS/m)			
	SEA : Seawater salinity (%)			
	SALT : NaCl salinity (%)			
	TDS:: TDS conversion (g/L)			
	FEB-102-ECM:			
	<b>CONV</b> □ : Conductivity (µS/cm)			
	SI Conductivity (mS/m)			
	TDS : TDS conversion (mg/L)			

Character	Setting Item, Function, Setting Range	Factory Default
MRNG		FEB-102-ECH: 0.00 to 20.00 mS/cm FEB-102-ECM: 0.00 to 20.00 $\mu$ S/cm (Fixed)
20.00		1 LD-102-LCW. 0.00 to 20.00 ~3/GH (1 IXed)

- Selects the measurement range of conductivity.
- If the measurement range is changed, the Conductivity Zero adjustment value, Span adjustment value and Cell constant correction value are cleared. Set the Cell constant correction value again, and re-calibrate the Conductivity Zero adjustment and Span adjustment values.
- Selection items differ depending on the model.

## FEB-102-ECH:

Selection items differ depending on [Sensor cell constant] and [Measurement unit]. When sensor cell constant 1.0/cm is selected:

Measurement Unit	Selection Item	Measurement Range
	20.00	0.00 to 20.00 mS/cm
Conductivity (mS/cm)	200.0	0.0 to 200.0 mS/cm
Conductivity (mo/cm)	500.0	0.0 to 500.0 mS/cm
	500	0 to 500 mS/cm
	2.000	0.000 to 2.000 S/m
Conductivity	20.00	0.00 to 20.00 S/m
(S/m, mS/m)	50.00	0.00 to 50.00 S/m
(5/111, 1115/111)	50.0	0.0 to 50.0 S/m
	2000	0 to 2000 mS/m
Seawater salinity (%)	4.00	0.00 to 4.00 %
NaCl salinity (%)	20.00	0.00 to 20.00 %
	20.0	0.0 to 20.0 g/L
TDS conversion (g/L)	200	0 to 200 g/L
	500	0 to 500 g/L

## When sensor cell constant 10.0/cm is selected:

when sensor cen constant 10.0/cm is selected.					
Measurement Unit	Selection Item	Measurement Range			
	200.0	0.0 to 200.0 mS/cm			
Conductivity (mS/cm)	500.0	0.0 to 500.0 mS/cm			
	2000	0 to 2000 mS/cm			
	20.00	0.00 to 20.00 S/m			
Conductivity (S/m)	50.00	0.00 to 50.00 S/m			
	200.0	0.0 to 200.0 S/m			
Seawater salinity (%)	4.00	0.00 to 4.00 %			
NaCl salinity (%)	20.00	0.00 to 20.00 %			
	200	0 to 200 g/L			
TDS conversion (g/L)	500	0 to 500 g/L			
	2000	0 to 2000 g/L			

## FEB-102-ECM:

Measurement range is fixed by selecting Sensor cell constant and Measurement unit.

Measurement Unit	Sensor Cell Constant	Item	Measurement Range
	0.01/cm	20.00	0.00 to 20.00 µS/cm
Conductivity ( $\mu$ S/cm)	0.1/cm	200.0	0.0 to 200.0
	1.0/cm	2000	0 to 2000
	0.01/cm	2.000	0.000 to 2.000 mS/m
Conductivity (mS/m)	0.1/cm	20.00	0.00 to 20.00 mS/m
	1.0/cm	200.0	0.0 to 200.0 mS/m
	0.01/cm	20.0	0.0 to 20.0 mg/L
TDS conversion (mg/L)	0.1/cm	200	0 to 200 mg/L
	1.0/cm	2000	0 to 2000 mg/L

Character	Setting Item, Function, Setting Range	Factory Default		
TDSK	TDS conversion factor	0.50		
0.50	Sets TDS conversion factor.			
	Available only when <b>TDS</b> [TDS conversion (g/L) or (mg/L)] is selected in			
	[Measurement unit (p.20)].			
	Setting range: 0.30 to 1.00			
FIT1	Conductivity input filter time constant	0.0 sec		
0.0	Sets Conductivity input filter time constant.  Even when the Conductivity measurement value che the filter time constant "T" is set, the Conductivity it can reach 63% of the Conductivity measurement (Fig. 6.2-2).  If the value is set too large, it adversely affects EVT response.  (e.g.) If the lowest digit of the Conductivity measure is fluctuating, the fluctuation can be suppress.	measurement value changes so that value in T seconds as shown in action due to the delay of ment value before filtering process		
	Conductivity measurement value  (Fig. 6.2-1)	Time (second)  (Fig. 6.2-2)		
	Setting range: 0.0 to 10.0 seconds			
ESO.	Conductivity input sensor correction	0.00		
0.00	Sets conductivity input sensor correction value.  This corrects the input value from the conductivity set at the exact location where measurement is de sensor may deviate from the conductivity in the desired conductivity can be obtained by adding a self-through the desired conductivity can be obtained by adding a self-through the desired conductivity can be obtained by adding a self-through the desired conductivity after sensor correction to conductivity after sensor correction Current C	sired, conductivity measured by the measured location. In this case, ensor correction value.  t range regardless of the sensor		

 $<sup>(\</sup>mbox{\ensuremath{^{\star}}})$  Measurement unit and decimal point place follow the measurement range.

## **6.3 Temperature Input Group**

To enter the Temperature Input group, follow the procedure below.

- ① **G\_EC** Press the key in Conductivity/Temperature Display Mode.
- ③ **SENS**□ Press the <sup>SET</sup> key.

The unit will enter the Temperature Input Group, and 'RTD type' will appear.

Character	Setting Item, Function, Setting Range	Factory Default			
SENS	RTD type	Pt100			
PT100	Selects RTD type of the Conductivity sensor.				
	• PT100: Pt100				
	PT1000: Pt1000				
TCM	Temperature compensation method FEB-102-ECH: NaCl				
NACL	Parada and	FEB-102-ECM: NaCl			
	Selects Temperature compensation calculation m	nethod.			
	Selection items differ depending on the model.				
	FEB-102-ECH:				
	NACL:: Temperature compensation is conducted	ed using temperature characteristics of			
	NaCl. Select when the main ingredien	t of salt included in a sample is NaCl.			
	TC0E:: Temperature compensation is conduc	ted using temperature coefficient			
	(%/°C) and randomly selected reference	ce temperature.			
	<b>OFF</b> : No temperature compensation				
	FFR 102 FCM:				
	FEB-102-ECM:	ad using townsorting about the state of			
	NACL : Temperature compensation is conducted.				
		nt of salt included in a sample is NaCl.			
	<b>TC0E</b> : Temperature compensation is conduc				
	(%/°C) and randomly selected referen	•			
	PURE : Temperature compensation is conduct	ted using temperature characteristics			
	of pure (deionized) water. <b>0FF</b> : No temperature compensation				
KCOE	Temperature coefficient 2.00 %/°C				
2.00	Sets temperature coefficient.				
iii	If Temperature coefficient is set to 2.00 %/°C, this value can be used for most aqueous				
	solutions.				
	If Temperature coefficient of an aqueous solution is known, set the value.				
	If Temperature coefficient is set to 0.00 %/°C, conductivity without temperature				
	compensation will be indicated.				
	• Not available if NACL (NaCl) or OFF (No temperature compensation) is				
	selected in [Temperature compensation method].				
	• Setting range: -5.00 to 5.00 %/°C				
STND	Reference temperature 25.0°C				
25.0	• Sets the reference temperature for temperature compensation.				
ii <b></b>	• Setting range: 5.0 to 95.0°C (*)	Somponoution.			
DP2	Decimal point place	1 digit after decimal point			
0.0	Selects decimal point place.	- 3			
	•				
	D.0.1 digit after decimal point				
CNECT	Pt100 input wire type	3-wire type			
3WIRE	• When <b>PT100</b> (Pt100) is selected in [RTD type], selects the input wire type of Pt100.				
	• Available only when <b>PT100</b> (Pt100) is selected				
	• 2WIRE: 2-wire type	a [. (1.5 typo].			
	3₩IRE□: 3-wire type				
L	THE TIME OF WITH LYPE				

<sup>(\*)</sup> The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default	
CABLE	Cable length correction	0.0 m	
0.0	Sets the cable length correction value.		
	• Available only when <b>2WIRE</b> (2-wire type) is s	elected in [Pt100 input wire type (p.23)].	
	Setting range: 0.0 to 100.0 m		
CSEC	Cable cross-section area	0.30 mm <sup>2</sup>	
0.30	Sets the cable cross-section area.		
	<ul> <li>Available only when ZWIRE (2-wire type) is s</li> <li>Setting range: 0.10 to 2.00 mm²</li> </ul>	elected in [Pt100 input wire type (p.23)].	
FIT2	Temperature input filter time constant	0.0 sec.	
0.0	<ul> <li>Sets filter time constant of the temperature input.</li> <li>Even when the Temperature measurement value changes as shown in (Fig. 6.3-1), if the filter time constant "T" is set, the Temperature measurement value changes so that it can reach 63% of the Temperature measurement value in T seconds as shown in (Fig. 6.3-2).</li> <li>If the value is set too large, it adversely affects EVT action due to the delay of response.</li> <li>(e.g.) If the lowest digit of the Temperature measurement value before filtering process is fluctuating, the fluctuation can be suppressed by using the filter time constant.</li> </ul>		
	Temperature measurement value  Temperature measurement value  100% 63%  Time (second)  (Fig. 6.3-1)  • Setting range: 0.0 to 10.0 seconds	Time (second) (Fig. 6.3-2)	

## 6.4 EVT1 Group

To enter EVT1 Group, follow the procedure below.

- ① G\_EC☐ Press the will be recorded below.
  ② G\_EO1 Press the ∀ key in Conductivity/Temperature Display Mode.
  ③ EVT1F Press the set key.

The unit will enter EVT1 Group, and 'EVT1 type' will appear.

Character		ting Item, Function, Set		Factory Default	
EVT1F	EVT1 ty	pe		No action	
	Selects an EVT1 output (Contact output 1) type. (Fig. 6.4-1) (p.29)				
	Note: If EVT1 type is changed, EVT1 value will default to 0.00 or 0.0.				
	• If <b>OFF</b> (No temperature compensation) is selected in [Temperature compensation				
	method (p.23)], and if <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>				
				here, EVT1 action differs depending on	
				emperature compensation (p.49)].	
				mperature) is selected, the unit	
		ates based on the value			
			•	the unit operates based on the	
		surement value.	,	•	
		: No action			
		: Conductivity input log			
		: Conductivity input his			
		<u> </u>			
		: Temperature input hi		5 7 (T     0 4 4)	
	EKVU		ne error type is "	Error" (Table 6.4-1), the output is	
	FOTI	turned ON.]	orror typo is "Eail"	(Table 6.4-1), the output is turned ON.]	
		: Conductivity input er		(Table 6.4-1), the output is turned Oiv.]	
		•	ioi alaitii output		
		output, Fail output			
	(Table				
	Error Type	Error Contents	Description		
	Fail	Temperature	Temperature sensor lead wire is burnt out.		
	I all	Sensor Burnout	Temperature sensor lead wire is built out.		
	Fail	Temperature	Temperature sensor lead wire is short-circuited.		
		Sensor Short-circuited			
	Error	Outside Temperature	Measured temp	perature has exceeded 110.0℃.	
		Compensation Range			
	Error	Outside Temperature	Measured temp	perature is less than 0.0℃.	
		Compensation Range			
ESV1	EVT1 va	alue	Conducti	vity input: Measurement range low limit	
0.00		s an EVT1 value.		ture input: 0.0℃	
0.00				v limit action), <b>EC_H</b> (Conductivity	
				nput low limit action) or <b>TEMPH</b> □	
		erature input high limit ac	•	•	
	<ul> <li>Setting</li> </ul>	range:			
	Conduc	ctivity input: Measuremer	nt range low limit	to Measurement range high limit (*1)	
	Tempe	rature input: 0.0 to 100.0	°C (*2)		
EP1	EVT1 pi	roportional band	Conducti	vity input: Measurement range low limit	
0.00	• Sets E	VT1 proportional band.	Tempera	ture input: 0.0℃	
	ON/OF	F control when set to 0.0	0 or 0.0.		
	<ul> <li>Availab</li> </ul>	• Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity			
	input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>				
	(Temperature input high limit action) is selected in [EVT1 type].				
	<ul> <li>Setting</li> </ul>	range:			
	Conductivity input: 0 to Measurement span (*1)				
		rature input: 0.0 to 100.0°	-		
	Measurement unit and decimal point place follow the Measurement range.				

- (\*1) Measurement unit and decimal point place follow the Measurement range.
- (\*2) The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default		
E1RST	EVT1 reset	Conductivity input: 0		
0.00		Temperature input: 0.0℃		
	<ul> <li>Sets the EVT1 reset value.</li> <li>Available when EC_L (Conductivity input low input high limit action), TEMPL (Temperature in (Temperature input high limit action) is selected in Not available for ON/OFF control.</li> <li>Setting range:         <ul> <li>Conductivity input: ±10% of Measurement span Temperature input: ±100.0°C (*2)</li> </ul> </li> </ul>	nput low limit action) or <b>TEMPH</b>		
E1DIF		Reference Value		
SD IF	<ul> <li>Selects EVT1 output hysteresis type (Medium or Available when EC_L (Conductivity input low input high limit action), TEMPL (Temperature in (Temperature input high limit action) is selected in Not available for P control.</li> <li>CDIF : Medium Value         Sets the same value for both ON and Only ON side needs to be set.</li> <li>SDIF : Reference Value</li> </ul>	IF :: Medium Value Sets the same value for both ON and OFF sides in relation to EVT1 value. Only ON side needs to be set.  IF :: Reference Value Sets individual values for ON and OFF sides in relation to EVT1 value.		
E1DF0				
0.01	• Sets the span of EVT1 ON side. (Fig. 6.4-1)(p.29	Temperature input: 1.0℃		
	<ul> <li>input high limit action), TEMPL□ (Temperature ir (Temperature input high limit action) is selected in</li> <li>Not available for P control.</li> <li>Setting range:</li> </ul>	when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity imit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b> ire input high limit action) is selected in [EVT1 type]. le for P control. ge: ity input: 0 to 20% of Measurement range high limit (*1)		
E1DFU	EVT1 OFF side	Conductivity input: 0.01		
0.01		Temperature input: 1.0℃		
	<ul> <li>Sets the span of EVT1 OFF side. (Fig. 6.4-1)(p.29)</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT1 type].</li> <li>Not available for P control. Available when SD IF (Reference Value) is selected in [EVT1 hysteresis type].</li> <li>Setting range: Conductivity input: 0 to 20% of Measurement range high limit (*1) Temperature input: 0.0 to 10.0°C (*2)</li> </ul>			
E10NT	EVT1 ON delay time	0 sec		
	1	0 sec.		
·	<ul> <li>Sets EVT1 ON delay time.         The EVT1 output does not turn ON (under the conditions of turning ON) until the time set in [EVT1 ON delay time] elapses.     </li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT1 type].</li> <li>Not available for P control.</li> <li>Setting range: 0 to 10000 seconds</li> </ul>			
	ent unit and decimal point place follow the Measurement range			

<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.
(\*2) The placement of the decimal point does not follow the selection. It is fixed.

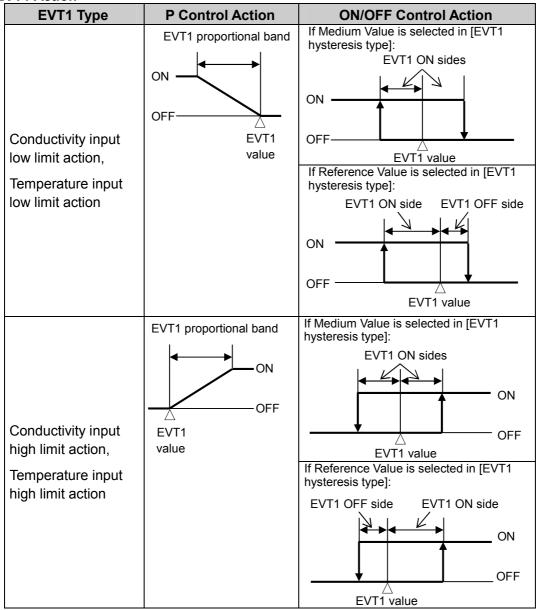
Character	Setting Item, Function, Setting Range	Factory Default		
E10FT	EVT1 OFF delay time	0 sec.		
9	Sets EVT1 OFF delay time.			
	•	output does not turn OFF (under the conditions of turning OFF) until the time		
	set in [EVT1 OFF delay time] elapses.			
		nen EC_L (Conductivity input low limit action), EC_H (Conductivity		
		action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>		
	(Temperature input high limit action) is selected in	[EVI1 type].		
	Not available for P control.     Setting report 0 to 10000 accords.			
F10	• Setting range: 0 to 10000 seconds	20.000		
E1C	<ul><li>EVT1 proportional cycle</li><li>Sets proportional cycle for EVT1.</li></ul>	30 sec.		
30	• Available when <b>EC_L</b> (Conductivity input low I	limit action) <b>FC H</b> (Conductivity		
	input high limit action), <b>TEMPL</b> (Temperature input			
	(Temperature input high limit action) is selected in	•		
	Not available for ON/OFF control.	[= 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
	Setting range: 1 to 300 seconds			
E10LH	EVT1 output high limit	100%		
	Sets EVT1 output high limit value.			
100	• Available when <b>EC_L</b> (Conductivity input low I	imit action), <b>EC_H</b> (Conductivity		
	input high limit action), TEMPL (Temperature inp	out low limit action) or <b>TEMPH</b>		
	(Temperature input high limit action) is selected in	[EVT1 type].		
	Not available for ON/OFF control.			
	Setting range: EVT1 output low limit value to 1009	<u>/</u> 6		
E10LL	EVT1 output low limit	0%		
	Sets EVT1 output low limit value.	<u> </u>		
	Available when EC_L     (Conductivity input low I)			
	input high limit action), <b>TEMPL</b> (Temperature input	,		
	(Temperature input high limit action) is selected in • Not available for ON/OFF control.	[EV11 type].		
	Setting range: 0% to EVT1 output high limit value			
OONT1	<u> </u>	0 sec.		
	Output ON time when EVT1 output ON • Sets Output ON time when EVT1 output is ON.	0 300.		
2	If ON time and OFF time are set, EVT1 output can	he turned ON/OFF in a configured		
	cycle when EVT1 output is ON. (Fig. 6.4-2)(p.29)	Γ1 output is ON. (Fig. 6.4-2)(p.29)		
	• Available when <b>EC_L</b> (Conductivity input low I	imit action). <b>EC_H</b> (Conductivity		
	input high limit action), <b>TEMPL</b> (Temperature inp			
	(Temperature input high limit action) is selected in	input high limit action) is selected in [EVT1 type].		
	Not available for P control.			
	Setting range: 0 to 10000 seconds			
00FT1	Output OFF time when EVT1 output ON	0 sec.		
	Sets Output OFF time when EVT1 output is ON.			
	If ON time and OFF time are set, EVT1 output can	be turned ON/OFF in a configured		
	cycle when EVT1 output is ON. (Fig. 6.4-2)(p.29)	· · · · · · · · · · · · · · · · · · ·		
	• Available when <b>EC_L</b> (Conductivity input low I			
	input high limit action), <b>TEMPL</b> (Temperature input high limit action) is selected in			
	(Temperature input high limit action) is selected in • Not available for P control.	[EVII type].		
	Setting range: 0 to 10000 seconds			
E1CS	EVT1 conductivity input error alarm EVT type	No action		
L103	• Selects an EVT□ type (except EVT1 type) in ord			
	error alarm.	20. to abbood Evil i conductivity input		
	Available only when <b>EEUL</b> (Conductivity input erro	or alarm output) is selected in IFVT1 type1		
	• ===== : No action			
	EVT2 : EVT2 type			
	<b>EVT3</b> : EVT3 type (*1)			
	EVT4 : EVT4 type (*2)			
(+4) A	en EVT3 or EVT4 option is ordered			

<sup>(\*1)</sup> Available when EVT3 or EVT4 option is ordered. (\*2) Available when EVT4 option is ordered.

Character	Setting Item, Function, Setting Range	Factory Default		
E1E0	EVT1 conductivity input error alarm span	Measurement range low limit		
0.00	when EVT□ output ON			
	• Sets span to assess EVT1 conductivity input error alarm when EVT□ output is ON −			
	which is selected in [EVT1 conductivity input error alarm EVT type].			
	• Available only when <b>EEUL</b> (Conductivity input error alarm output) is selected in			
	[EVT1 type]			
	Setting range: Measurement range low limit to Me	easurement range high limit (*1)		
	When set to 0.00, Conductivity input error alarm is			
E1E0T	EVT1 conductivity input error alarm time	0 sec.		
9	when EVT⊡ output ON			
Towns I format I format I format I	Sets time to assess EVT1 conductivity input error	alarm when EVT□ output is ON –		
	which is selected in [EVT1 conductivity input error			
	Available only when <b>EEUL</b> (Conductivity input)			
	[EVT1 type]	,		
	Setting range: 0 to 10000 seconds or minutes			
	Time unit follows the selection in [Conductivity inp	ut error alarm time unit].		
	When set to 0, Conductivity input error alarm is di	sabled.		
E1EC	EVT1 conductivity input error alarm span	Measurement range low limit		
0.00	when EVT□ output OFF	_		
	Sets span to assess EVT1 conductivity input error	alarm when EVT□ output is OFF−		
	which is selected in [EVT1 conductivity input error	alarm EVT□ type].		
	Available only when <b>EEUL</b> (Conductivity input)	error alarm output) is selected in		
	[EVT1 type]			
	• Setting range: Measurement range low limit to Measurement range high limit (*1)			
	When set to 0.00, Conductivity input error alarm is	s disabled.		
EIECT	EVT1 conductivity input error alarm time	0 sec.		
0	when EVT⊡ output OFF			
	Sets time to assess EVT1 conductivity input error			
	which is selected in [EVT1 conductivity input error	, <u> </u>		
	Available only when <b>EEUL</b> (Conductivity input)	error alarm output) is selected in		
	[EVT1 type]			
	Setting range: 0 to 10000 seconds or minutes			
	(Time unit follows the selection in [Conductivity input error alarm time unit].)			
	When set to 0, Conductivity input error alarm is di			
MVZN1	EVT1 cycle variable range	50.0%		
50.0	• Sets EVT1 cycle range to be changed.	limit action) FC U (Conductivity		
	<ul> <li>Available when EC_L (Conductivity input low input high limit action), TEMPL (Temperature in</li> </ul>			
	(Temperature input high limit action) is selected in	•		
	Not available for ON/OFF control.	i∟vii typej.		
CENT1	• Setting range: 1.0 to 100.0%	0.000		
	EVT1 cycle extended time     Sets time to extend EVT1 cycle.	0 sec.		
	Available when <b>EC_L</b> (Conductivity input low	limit action) <b>FC_H</b> (Conductivity		
	input high limit action), <b>TEMPL</b> (Temperature in			
	(Temperature input high limit action) is selected in			
	Not available for ON/OFF control.	[, 250].		
	Setting range: 0 to 300 seconds			

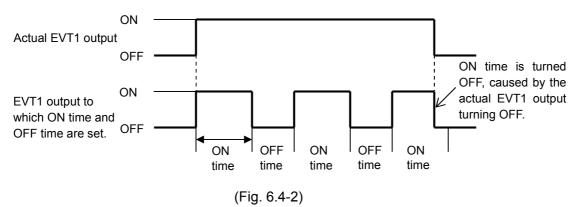
<sup>(\*1)</sup> Measurement unit and decimal point place follow the measurement range.

## **EVT1 Action**



(Fig. 6.4-1)

## Timing chart of EVT1 output ON time and OFF time while in EVT1 output ON



## 6.5 EVT2 Group

To enter EVT2 Group, follow the procedure below.

- ① **G\_EC** Press the key in Conductivity/Temperature Display Mode.
- ② **G\_E02** Press the ☑ key 3 times in Conductivity Input Group.
- ③ **EVT2F** Press the <sup>SET</sup> key.

The unit will enter EVT2 Group, and 'EVT2 type' will appear.

Character	Setting Item, Function, Setting Range		Factory Default		
EVT2F	EVT2 type				No action
	Selects	• Selects an EVT2 output (Contact output 2) type. (Fig. 6.5-1) (p.34)			
	Note: If EVT2 type is changed, EVT2 value will default to 0.00 or 0.0.				
	• If <b>OFF</b> (No temperature compensation) is selected in [Temperature compensation				
	method (p.23)], and if <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>				
	(Tempe	(Temperature input high limit action) is selected here, EVT2 action differs depending on			
	the sele	ection in [Temperature D	isplay wh	en no tei	mperature compensation (p.49)].
	If OF	F (Unlit) or STD	(Refere	ence tem	nperature) is selected, the unit
	opera	ates based on the value	set in [Re	ference t	temperature (p.23)].
	If PV	(Measurement va	alue) is se	elected, t	he unit operates based on the
	Meas	surement value.			•
	•	: No action			
		: Conductivity input lover			
	EC_H	: Conductivity input his	gh limit ac	ction	
	LMPL	■ : Temperature input lo	w limit ac	tion	
	FDALL	: Temperature input hi	ign ilmit a	Ction	""" (Table 6.5.1) the cutout is
	ENVUI	turned ON.]	ne error t	ype is E	error" (Table 6.5-1), the output is
	FOIL		error type	is "Fail" /	(Table 6.5-1), the output is turned ON.]
		: Conductivity input er			(Table 0.5 1), the output is turned Oiv.]
		• •	ror alaini	output	
	(Table	output, Fail output 6.5-1)			
	Error	Error			Description
	Type	Contents			
	Fail	Temperature Sensor Burnout	Tempera	ature ser	nsor lead wire is burnt out.
	Fail	Temperature	Tempera	ature ser	nsor lead wire is short-circuited.
		Sensor Short-circuited			
	Error	Outside Temperature	Measure	ed tempe	erature has exceeded 110.0℃.
		Compensation Range	1		
	Error	Outside Temperature	Measure	ed tempe	erature is less than 0.0℃.
		Compensation Range			
ESV2	EVT2 va	alue	C	onductiv	rity input: Measurement range low limit
0.00	00.000	s an EVT2 value.			ure input: 0.0℃
1					limit action), <b>EC_H</b> (Conductivity
	input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>				
	(Temperature input high limit action) is selected in [EVT2 type].				
	Setting range:				
			_	ow limit t	o Measurement range high limit (*1)
	Temperature input: 0.0 to 100.0°C (*2)				
EP2	-	roportional band			rity input: Measurement range low limit
0.00		VT2 proportional band.		emperatu	ure input: 0.0℃
		F control when set to 0.0			, , , , <b>FAIR</b> ,
		•	•	•	limit action), <b>EC_H</b> (Conductivity
	-	input high limit action), <b>TEMPL</b> □ (Temperature input low limit action) or <b>TEMPH</b> □			•
		(Temperature input high limit action) is selected in [EVT2 type].			
	_	Setting range:			
		Conductivity input: 0 to Measurement span (*1)			
(*4) \$4		Temperature input: 0.0 to 100.0℃ (*2)			
(*1) Measuremer	) Measurement unit and decimal point place follow the Measurement range.				

- (\*1) Measurement unit and decimal point place follow the Measurement range.
- (\*2) The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default	
E2RST	EVT2 reset	Conductivity input: 0	
0.00		Temperature input: 0.0℃	
EDIE	<ul> <li>Sets the EVT2 reset value.</li> <li>Available when EC_L (Conductivity input low input high limit action), TEMPL (Temperature in (Temperature input high limit action) is selected in Not available for ON/OFF control.</li> <li>Setting range:         <ul> <li>Conductivity input: ±10% of Measurement spartemperature input: ±100.0°C (*2)</li> </ul> </li> </ul>	nput low limit action) or <b>TEMPH</b> n [EVT2 type]. n (*1)	
E2DIF	EVT2 hysteresis type	Reference Value	
SDIF	<ul> <li>Selects EVT2 output hysteresis type (Medium or Reference Value). (Fig. 6.5-1)(p.34)</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT2 type].</li> <li>Not available for P control.</li> <li>CDIF : Medium Value  Sets the same value for both ON and OFF sides in relation to EVT2 value.  Only ON side needs to be set.</li> <li>SDIF : Reference Value  Sets individual values for ON and OFF sides in relation to EVT2 value.  Both ON and OFF sides need to be set individually.</li> </ul>		
E2DF0	EVT2 ON side	Conductivity input: 0.01 Temperature input: 1.0°C	
0.01	<ul> <li>Sets the span of EVT2 ON side. (Fig. 6.5-1)(p.34)         If CD IF</li></ul>		
E2DFU	EVT2 OFF side	Conductivity input: 0.01 Temperature input: 1.0°C	
0.01	<ul> <li>Sets the span of EVT2 OFF side. (Fig. 6.5-1)(p.34)</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT2 type].</li> <li>Not available for P control.         Available when SD IF (Reference Value) is selected in [EVT2 hysteresis type].</li> <li>Setting range:         Conductivity input: 0 to 20% of Measurement range high limit (*1)         Temperature input: 0.0 to 10.0°C (*2)</li> </ul>		
E20NT	EVT2 ON delay time	0 sec.	
	<ul> <li>Sets EVT2 ON delay time. The EVT2 output does not turn ON (under the conditions of turning ON) until the time set in [EVT2 ON delay time] elapses.</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT2 type].</li> <li>Not available for P control.</li> <li>Setting range: 0 to 10000 seconds</li> </ul>		
(*4) 14	nt unit and decimal point place follow the Measurement range		

<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.
(\*2) The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default		
E20FT	EVT2 OFF delay time	0 sec.		
8	Sets EVT2 OFF delay time.			
	The EVT2 output does not turn OFF (under the conditions of turning OFF) until the time			
	set in [EVT2 OFF_delay time] elapses.			
	Available when EC_L (Conductivity input low I)			
	input high limit action), <b>TEMPL</b> (Temperature input			
	(Temperature input high limit action) is selected in	[EV12 type].		
	Not available for P control.     Setting report 0 to 10000 accords.			
	Setting range: 0 to 10000 seconds  EVT2 properties all evels	20.000		
E2C	<ul><li>EVT2 proportional cycle</li><li>Sets proportional cycle for EVT2.</li></ul>	30 sec.		
30	• Available when <b>EC_L</b> (Conductivity input low I	limit action) <b>FC H</b> (Conductivity		
	input high limit action), <b>TEMPL</b> (Temperature input			
	(Temperature input high limit action) is selected in	•		
	Not available for ON/OFF control.	[2 v · 2 vypo].		
	Setting range: 1 to 300 seconds			
E20LH	EVT2 output high limit	100%		
	Sets EVT2 output high limit value.			
100	• Available when <b>EC_L</b> (Conductivity input low I	imit action), <b>EC_H</b> (Conductivity		
	input high limit action), TEMPL (Temperature inp	out low limit action) or <b>TEMPH</b>		
	(Temperature input high limit action) is selected in	[EVT2 type].		
	Not available for ON/OFF control.			
	Setting range: EVT2 output low limit value to 1009	<u>/</u> 6		
E20LL	EVT2 output low limit	0%		
	Sets EVT2 output low limit value.	<u> </u>		
	Available when EC_L     (Conductivity input low I)			
	input high limit action), <b>TEMPL</b> (Temperature input	,		
	(Temperature input high limit action) is selected in • Not available for ON/OFF control.	[EV12 type].		
	Setting range: 0% to EVT2 output high limit value			
00NT2	<del> </del>	0 sec.		
	Output ON time when EVT2 output ON • Sets Output ON time when EVT2 output is ON.	0 300.		
2	If ON time and OFF time are set, EVT2 output is ON.	he turned ON/OFF in a configured		
	cycle when EVT2 output is ON. (Fig. 6.5-2)(p.34)	r be turned Gry Gri in a comigured		
	• Available when <b>EC_L</b> (Conductivity input low I	imit action). <b>EC_H</b> (Conductivity		
	input high limit action), <b>TEMPL</b> (Temperature inp			
	(Temperature input high limit action) is selected in			
	Not available for P control.			
	Setting range: 0 to 10000 seconds			
00FT2	Output OFF time when EVT2 output ON	0 sec.		
	Sets Output OFF time when EVT2 output is ON.			
	If ON time and OFF time are set, EVT2 output can	be turned ON/OFF in a configured		
	cycle when EVT2 output is ON. (Fig. 6.5-2)(p.34)			
	• Available when <b>EC_L</b> (Conductivity input low I			
	input high limit action), <b>TEMPL</b> (Temperature input high limit action) is selected in			
	(Temperature input high limit action) is selected in • Not available for P control.	[EV12 type].		
	Setting range: 0 to 10000 seconds			
E2CS	EVT2 conductivity input error alarm EVT type	No action		
	• Selects an EVT□ type (except EVT2 type) in ord			
	error alarm.	LV 12 Conductivity input		
	Available only when <b>EEUL</b> (Conductivity input erro	or alarm output) is selected in IFVT2 tyne1		
	• EVT1 : EVT1 type			
	: No action			
	<b>EVT3</b> : EVT3 type (*1)			
	<b>EVT4</b> : EVT4 type (*2)			
(*4) A !	en EVT3 or EVT4 option is ordered			

<sup>(\*1)</sup> Available when EVT3 or EVT4 option is ordered. (\*2) Available when EVT4 option is ordered.

Character	Setting Item, Function, Setting Range	Factory Default		
E2E0	EVT2 conductivity input error alarm span	Measurement range low limit		
0.00	when EVT□ output ON			
tooned tooned bound	• Sets span to assess EVT2 conductivity input error alarm when EVT□ output is ON			
	which is selected in [EVT2 conductivity input error alarm EVT□ type].			
	• Available only when <b>EEUL</b> (Conductivity input error alarm output) is selected in			
	[EVT2 type]			
	• Setting range: Measurement range low limit to Measurement range high limit (*1)			
	When set to 0.00, Conductivity input error alarm is	• • • • • • • • • • • • • • • • • • • •		
E2E0T	EVT2 conductivity input error alarm time	0 sec.		
2	when EVT⊡ output ON			
Laurel La	Sets time to assess EVT2 conductivity input error	alarm when EVT□ output is ON –		
	which is selected in [EVT2 conductivity input error	•		
	Available only when <b>EEUL</b> (Conductivity input)			
	[EVT2 type]	,		
	• Setting range: 0 to 10000 seconds or minutes			
	Time unit follows the selection in [Conductivity inp	ut error alarm time unit].		
	When set to 0, Conductivity input error alarm is di	<del>-</del>		
E2EC	EVT2 conductivity input error alarm span	Measurement range low limit		
0.00	when EVT□ output OFF	, and the second		
l	<ul> <li>Sets span to assess EVT2 conductivity input error</li> </ul>	alarm when EVT output is OFF-		
	which is selected in [EVT2 conductivity input error	·		
	Available only when <b>EEUL</b> (Conductivity input)			
	[EVT2 type]	,		
	• Setting range: Measurement range low limit to Measurement range high limit (*1)			
	When set to 0.00, Conductivity input error alarm is disabled.			
E2ECT	EVT2 conductivity input error alarm time	0 sec.		
2	when EVT□ output OFF			
	Sets time to assess EVT2 conductivity input error	alarm when EVT□ output is OFF−		
	which is selected in [EVT2 conductivity input error	alarm EVT□ type].		
	Available only when <b>EEUL</b> (Conductivity input)	error alarm output) is selected in		
	[EVT2 type]			
	Setting range: 0 to 10000 seconds or minutes			
	(Time unit follows the selection in [Conductivity input error alarm time unit].)			
	When set to 0, Conductivity input error alarm is di	sabled.		
MVZN2	EVT2 cycle variable range	50.0%		
50.0	Sets EVT2 cycle range to be changed.			
	• Available when <b>EC_L</b> (Conductivity input low			
	input high limit action), <b>TEMPL</b> (Temperature in	•		
	(Temperature input high limit action) is selected in	[EV12 type].		
	Not available for ON/OFF control.			
AFNITO	• Setting range: 1.0 to 100.0%	Γ_		
CENT2	EVT2 cycle extended time	0 sec.		
	• Sets time to extend EVT2 cycle.	limit action) FP II I (0 - 1 - 1 ' '		
	• Available when <b>EC_L</b> (Conductivity input low			
	input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>			
	(Temperature input high limit action) is selected in [EVT2 type].			
	Not available for ON/OFF control.  Outline and the 200 as a solution.			
	Setting range: 0 to 300 seconds			

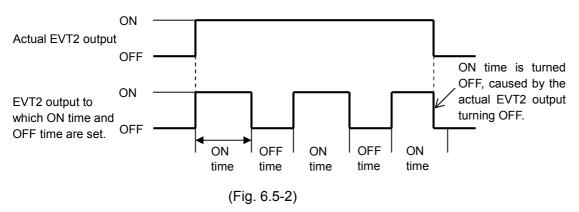
<sup>(\*1)</sup> Measurement unit and decimal point place follow the measurement range.

## **EVT2 Action**

EVT2 Type	P Control Action	ON/OFF Control Action
Conductivity input low limit action, Temperature input low limit action	ON OFF  EVT2 value	If Medium Value is selected in [EVT2 hysteresis type]:  EVT2 ON sides  ON  EVT2 value  If Reference Value is selected in [EVT2 hysteresis type]:  EVT2 ON side  EVT2 OFF side
Conductivity input high limit action, Temperature input high limit action	EVT2 proportional band ON OFF EVT2 value	If Medium Value is selected in [EVT2 hysteresis type]:  EVT2 ON sides  OFF  EVT2 value  If Reference Value is selected in [EVT2 hysteresis type]:  EVT2 OFF side  EVT2 ON side  ON  OFF  EVT2 Value

(Fig. 6.5-1)

## Timing chart of EVT2 output ON time and OFF time while in EVT2 output ON



## 6.6 EVT3 Group

Available when EVT3 or EVT4 option is ordered.

To enter EVT3 Group, follow the procedure below.

- ① **G\_EC** Press the key in Conductivity/Temperature Display Mode.
- ② **G\_E03** Press the ☑ key 4 times in Conductivity Input Group.
- 3 EVT3F Press the set key.

The unit will enter EVT3 Group, and 'EVT3 type' will appear.

Character		3 Group, and EV13 type ting Item, Function, Set		Factory Default
EVT3F			ung ivange	No action
	EVT3 type			
	• Selects an EVT3 output (Contact output 3) type. (Fig. 6.6-1) (p.39)			
	Note: If EVT3 type is changed, EVT3 value will default to 0.00 or 0.0.			
	• If <b>OFF</b> (No temperature compensation) is selected in [Temperature compensation method (p.23)], and if <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>			
		/-	• •	•
			•	nere, EVT3 action differs depending on
				emperature compensation (p.49)].
		, ,	•	nperature) is selected, the unit
		ates based on the value	-	
		•	ilue) is selected,	the unit operates based on the
	Meas	surement value. : No action		
	FC	: Conductivity input lov	w limit action	
		: Conductivity input his		
		■: Temperature input lo		
		: Temperature input hi		
				Error" (Table 6.6-1), the output is
		turned ON.]	,,	, , , , , , , , , , , , , , , , , , , ,
				(Table 6.6-1), the output is turned ON.]
	EEUL	: Conductivity input er	ror alarm output	
	• Error o	output, Fail output		
	(Table			
	Error	Error		Description
	Type	Contents		Description
	Fail	Temperature	Temperature se	nsor lead wire is burnt out.
		Sensor Burnout		
	Fail	Temperature	Temperature se	nsor lead wire is short-circuited.
i	_	Sensor Short-circuited		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Error	Outside Temperature	Measured temp	erature has exceeded 110.0℃.
		Outside Temperature Compensation Range	•	
	Error	Outside Temperature Compensation Range Outside Temperature	•	erature has exceeded 110.0℃. erature is less than 0.0℃.
	Error	Outside Temperature Compensation Range Outside Temperature Compensation Range	Measured temp	erature is less than 0.0℃.
ESV3	Error	Outside Temperature Compensation Range Outside Temperature Compensation Range	Measured temp	erature is less than 0.0°C.
	Error  EVT3 va • Selects	Outside Temperature Compensation Range Outside Temperature Compensation Range  alue s an EVT3 value.	Measured temp  Conductive Temperat	erature is less than 0.0°C.  vity input: Measurement range low limit cure input: 0.0°C
ESV3	EVT3 va • Selects • Availab	Outside Temperature Compensation Range Outside Temperature Compensation Range  Alue s an EVT3 value. Ole when EC_L (Cond	Measured temp  Conductivity input low	vity input: Measurement range low limit cure input: 0.0°C v limit action), <b>EC_H</b> (Conductivity
	EVT3 va • Selects • Availab	Outside Temperature Compensation Range Outside Temperature Compensation Range  Ilue San EVT3 value. Die when EC_L (Congh limit action), TEMPL	Measured temp  Conductivity input low  (Temperature in	vity input: Measurement range low limit cure input: 0.0°C  vilimit action), EC_H (Conductivity input low limit action) or TEMPH
	EVT3 va • Selects • Available input his (Temps	Outside Temperature Compensation Range Outside Temperature Compensation Range  alue s an EVT3 value. ble when EC_L (Congh limit action), TEMPL erature input high limit action	Measured temp  Conductivity input low  (Temperature in	vity input: Measurement range low limit cure input: 0.0°C  vilimit action), EC_H (Conductivity input low limit action) or TEMPH
	EVT3 va • Selects • Available input his (Tempse) • Setting	Outside Temperature Compensation Range Outside Temperature Compensation Range  Alue S an EVT3 value. Die when EC_L (Concept limit action), TEMPL Erature input high limit action range:	Conductive Temperate ductivity input low (Temperature in tion) is selected in	vity input: Measurement range low limit cure input: 0.0°C (Conductivity nput low limit action) or <b>TEMPH</b> n [EVT3 type].
	EVT3 va • Selects • Available input his (Temper of Setting Conductions)	Outside Temperature Compensation Range Outside Temperature Compensation Range  Ilue San EVT3 value. See when EC_L (Concept limit action), TEMPL Erature input high limit action range: Ctivity input: Measuremen	Conductive Temperate ductivity input low (Temperature intion) is selected interaction.	vity input: Measurement range low limit cure input: 0.0°C  vilimit action), EC_H (Conductivity input low limit action) or TEMPH
0.00	EVT3 va • Selects • Available input his (Tempe Conductor Tempe	Outside Temperature Compensation Range Outside Temperature Compensation Range  Illue San EVT3 value. Illue San	Conductive Temperate ductivity input low (Temperature in tion) is selected in trange low limit CC (*2)	vity input: Measurement range low limit cure input: 0.0°C  vilimit action), EC_H (Conductivity input low limit action) or TEMPH  n [EVT3 type].  to Measurement range high limit (*1)
	EVT3 va • Selects • Available input his (Temper Conduct Temper EVT3 preserved)	Outside Temperature Compensation Range Outside Temperature Compensation Range  alue s an EVT3 value. ble when EC_L (Concentrature input high limit activity input: Measurement rature input: 0.0 to 100.06 coportional band	Conductive Temperature in trange low limit CC (*2)  Conductive Temperature in trange low limit CC (*2)  Conductive Temperature in Temperature in trange low limit CC (*2)	vity input: Measurement range low limit rure input: 0.0°C  / limit action), EC_H (Conductivity nput low limit action) or TEMPH  to Measurement range high limit (*1)  vity input: Measurement range low limit
0.00	Error  EVT3 va • Selects • Available input his (Temper of Setting Conduct Temper EVT3 presented in Sets E	Outside Temperature Compensation Range Outside Temperature Compensation Range  Illue San EVT3 value. See when EC_L (Concept limit action), TEMPL Erature input high limit activity input: Measurementature input: 0.0 to 100.06  Toportional band VT3 proportional band.	Conductive Temperature in trange low limit C (*2)  Conductive Temperature in trange low limit C (*2)  Conductive Temperature in trange low limit C (*2)	vity input: Measurement range low limit cure input: 0.0°C  vilimit action), EC_H (Conductivity input low limit action) or TEMPH  n [EVT3 type].  to Measurement range high limit (*1)
EP3	Error  • Selects • Available input his (Temper of Setting Conduct Temper every proper of Sets E ON/OF	Outside Temperature Compensation Range Outside Temperature Compensation Range  Illue San EVT3 value. See when EC_L (Concentrature input high limit action), TEMPL Concentrature input: Measurementature input: 0.0 to 100.0000000000000000000000000000000000	Conductive Temperate ductivity input low (Temperature in tion) is selected in trange low limit C (*2)  Conductive Temperature in Temperature	vity input: Measurement range low limit cure input: 0.0°C  // limit action), EC_H (Conductivity input low limit action) or TEMPH  to Measurement range high limit (*1)  vity input: Measurement range low limit cure input: 0.0°C
EP3	Error  EVT3 va • Selects • Available input his (Temper Conduct Temper EVT3 pr • Sets E ON/OF • Available	Outside Temperature Compensation Range Outside Temperature Compensation Range  Illue San EVT3 value. Illue San	Conductive Temperate in trange low limit Temperate Conductive in trange low limit Conductive Temperate Conductive Temperate Conductive Itemperate Conductive Itemperate Conductive Itemperate Itempera	vity input: Measurement range low limit rure input: 0.0°C  / limit action), EC_H (Conductivity input low limit action) or TEMPH  to Measurement range high limit (*1)  vity input: Measurement range low limit rure input: 0.0°C  / limit action), EC_H (Conductivity
EP3	Error  EVT3 va • Selects • Available input his (Tempel • Setting Conduct Tempel EVT3 pr • Sets E ON/OF • Available input his	Outside Temperature Compensation Range Outside Temperature Compensation Range  alue San EVT3 value.  Ole when EC_L (Concentrature input high limit action), TEMPL  crature input: Measurement of the control when set to 0.0 of the control when set to	Conductivity input low Conductivity input low It range low limit Conductivity input low Conductivity input low Conductivity input low Itemperature in Conductivity Itemperature Itemp	vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b> no (EVT3 type].  to Measurement range high limit (*1) vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b>
EP3	Error  EVT3 va  Selects Available input hi (Tempel Setting Conduct Tempel EVT3 pi Sets E ON/OF Available input hi (Tempel	Outside Temperature Compensation Range Outside Temperature Compensation Range  Alue San EVT3 value.  Ole when EC_L (Concentrature input high limit action), TEMPL  cativity input: Measuremer rature input: 0.0 to 100.0000  Toportional band  VT3 proportional band.  F control when set to 0.00000  Ole when EC_L (Concentrature input high limit action), TEMPL  Concentrature input high limit action), TEMPL  Control when set to 0.00000  Ole when EC_L (Concentrature input high limit action)	Conductivity input low Conductivity input low It range low limit Conductivity input low Conductivity input low Conductivity input low Itemperature in Conductivity Itemperature Itemp	vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b> no (EVT3 type].  to Measurement range high limit (*1) vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b>
EP3	Error  EVT3 va • Selects • Available input his (Temper EVT3 proper	Outside Temperature Compensation Range Outside Temperature Compensation Range  Illue San EVT3 value. Die when EC_L (Concentrature input high limit action), TEMPL Concentrature input: Measurementature input: 0.0 to 100.0000 Coportional band OVT3 proportional band. F control when set to 0.0000 Cole when EC_L (Concentrature input high limit action), TEMPL Concentrature input high limit action (Concentrature input high limit action).	Conductive Temperate ductivity input low (Temperature in trange low limit of the Conductive Temperature in temperature in trange low limit of the Conductive Temperature in trange low limit of the Conductive Temperature in trange low limit of the Conductive Temperature in the Conductivity input low of the	vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b> no (EVT3 type].  to Measurement range high limit (*1) vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b>
EP3	Error  EVT3 va • Selects • Available input his (Temper Conduct Temper Conduct Tem	Outside Temperature Compensation Range Outside Temperature Compensation Range  Alue San EVT3 value.  Ole when EC_L (Concentrature input high limit action), TEMPL  cativity input: Measuremer rature input: 0.0 to 100.0000  Toportional band  VT3 proportional band.  F control when set to 0.00000  Ole when EC_L (Concentrature input high limit action), TEMPL  Concentrature input high limit action), TEMPL  Control when set to 0.00000  Ole when EC_L (Concentrature input high limit action)	Conductive Temperate ductivity input low (Temperature in trange low limit Temperature)  Conductive Temperature in trange low limit Temperature in trange low limit Temperature in trange low in trange low limit Temperature in transport low limit Temperature in transport l	vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b> no (EVT3 type].  to Measurement range high limit (*1) vity input: Measurement range low limit rure input: 0.0°C // limit action), <b>EC_H</b> (Conductivity input low limit action) or <b>TEMPH</b>

<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.

<sup>(\*2)</sup> The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default	
E3RST	EVT3 reset	Conductivity input: 0	
0.00		Temperature input: 0.0°C	
	<ul> <li>Sets the EVT3 reset value.</li> <li>Available when EC_L (Conductivity input low input high limit action), TEMPL (Temperature ir (Temperature input high limit action) is selected in Not available for ON/OFF control.</li> <li>Setting range:         <ul> <li>Conductivity input: ±10% of Measurement span Temperature input: ±100.0°C (*2)</li> </ul> </li> </ul>	nput low limit action) or <b>TEMPH</b> n [EVT3 type].	
E3DIF	EVT3 hysteresis type	Reference Value	
SDIF	<ul> <li>Selects EVT3 output hysteresis type (Medium or Reference Value). (Fig. 6.6-1)(p.39)</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT3 type].</li> <li>Not available for P control.</li> <li>CDIF : Medium Value         Sets the same value for both ON and OFF sides in relation to EVT3 value.         Only ON side needs to be set.</li> <li>SDIF : Reference Value         Sets individual values for ON and OFF sides in relation to EVT3 value.         Both ON and OFF sides need to be set individually.</li> </ul>		
E3DF0	EVT3 ON side	Conductivity input: 0.01	
0.01	Temperature input: 1.0°C  • Sets the span of EVT3 ON side. (Fig. 6.6-1)(p.39)  If CD IF (Medium Value) is selected in [EVT3 hysteresis type], the span of ON/OFF side will be the same value.  • Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT3 type].  • Not available for P control.  • Setting range:  Conductivity input: 0 to 20% of Measurement range high limit (*1)  Temperature input: 0.0 to 10.0°C (*2)		
E3DFU	EVT3 OFF side	Conductivity input: 0.01 Temperature input: 1.0°C	
0.01	<ul> <li>Sets the span of EVT3 OFF side. (Fig. 6.6-1)(p.39)</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT3 type].</li> <li>Not available for P control.         Available when SD IF (Reference Value) is selected in [EVT3 hysteresis type].</li> <li>Setting range:         Conductivity input: 0 to 20% of Measurement range high limit (*1)         Temperature input: 0.0 to 10.0°C (*2)</li> </ul>		
E30NT	EVT3 ON delay time	0 sec.	
	<ul> <li>Sets EVT3 ON delay time.         The EVT3 output does not turn ON (under the conditions of turning ON) until the time set in [EVT3 ON delay time] elapses.     </li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT3 type].</li> <li>Not available for P control.</li> <li>Setting range: 0 to 10000 seconds</li> </ul>		

<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.
(\*2) The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default	
E30FT	EVT3 OFF delay time	0 sec.	
9	Sets EVT3 OFF delay time.		
tomothomal tomothomal tomot	The EVT3 output does not turn OFF (under the co	nditions of turning OFF) until the time	
	set in [EVT3 OFF delay time] elapses.	<b>3</b> ,	
	• Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity		
	input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>		
	(Temperature input high limit action) is selected in	[EVT3 type].	
	Not available for P control.		
	Setting range: 0 to 10000 seconds		
E3C	EVT3 proportional cycle	30 sec.	
30	Sets proportional cycle for EVT3.		
	Available when <b>EC_L</b> (Conductivity input low I)	limit action), <b>EC_H</b> (Conductivity	
	input high limit action), <b>TEMPL</b> (Temperature inp		
	(Temperature input high limit action) is selected in	[EVT3 type].	
	Not available for ON/OFF control.		
	Setting range: 1 to 300 seconds		
E30LH	EVT3 output high limit	100%	
100	Sets EVT3 output high limit value.		
	Available when EC_L (Conductivity input low I)		
	input high limit action), <b>TEMPL</b> (Temperature inp		
	(Temperature input high limit action) is selected in	[EV13 type].	
	Not available for ON/OFF control.  Outline and a FV/T2 author benefit value to 4000.	.,	
FOOL	Setting range: EVT3 output low limit value to 100%		
E30LL	EVT3 output low limit	0%	
0	Sets EVT3 output low limit value.		
	Available when EC_L (Conductivity input low I)		
	input high limit action), <b>TEMPL</b> (Temperature input		
	(Temperature input high limit action) is selected in	[EV13 type].	
	• Not available for ON/OFF control.		
CONTO	• Setting range: 0% to EVT3 output high limit value	0 sec.	
00NT3_	Output ON time when EVT3 output ON	0 500.	
	• Sets Output ON time when EVT3 output is ON.	he turned ONIOFF is a configured	
	If ON time and OFF time are set, EVT3 output can	be turned ON/OFF in a configured	
	cycle when EVT3 output is ON. (Fig. 6.6-2)(p.39)	limit action) <b>FC U</b> (Conductivity	
		Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity nput high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>	
	(Temperature input high limit action) is selected in		
	Not available for P control.	[2110 typo].	
	• Setting range: 0 to 10000 seconds		
00FT3	Output OFF time when EVT3 output ON	0 sec.	
00, 10	• Sets Output OFF time when EVT3 output is ON.		
	If ON time and OFF time are set, EVT3 output can	be turned ON/OFF in a configured	
	cycle when EVT3 output is ON. (Fig. 6.6-2)(p.39)	i bo tarrioù erwer i m'a comigarea	
	Available when <b>EC_L</b> (Conductivity input low I	imit action). <b>EC_H</b> (Conductivity	
	input high limit action), <b>TEMPL</b> (Temperature inp		
	(Temperature input high limit action) is selected in	•	
	Not available for P control.		
	Setting range: 0 to 10000 seconds		
E3CS	EVT3 conductivity input error alarm EVT□ type	No action	
	Selects an EVT□ type (except EVT3 type) in ord		
	error alarm.		
	Available only when <b>EEUL</b> (Conductivity input erro	or alarm output) is selected in [EVT3 type]	
	• EVT1 : EVT1 type		
	<b>EVT2</b> : EVT2 type		
	: No action		
	<b>EVT4</b> : EVT4 type (*1)		

<sup>(\*1)</sup> Available when EVT4 option is ordered.

Character	Setting Item, Function, Setting Range	Factory Default
E3E0	EVT3 conductivity input error alarm span	Measurement range low limit
0.00	when EVT□ output ON	Ğ
Learned become the control of the co	<ul> <li>Sets span to assess EVT3 conductivity input error</li> </ul>	alarm when EVT□ output is ON –
	which is selected in [EVT3 conductivity input error alarm EVT□ type].	
	• Available only when <b>EEUL</b> (Conductivity input error alarm output) is selected in	
	[EVT3 type]	
	Setting range: Measurement range low limit to Me	easurement range high limit (*1)
	When set to 0.00, Conductivity input error alarm is	• • • • • • • • • • • • • • • • • • • •
E3E0T	EVT3 conductivity input error alarm time	0 sec.
0	when EVT□ output ON	
_	Sets time to assess EVT3 conductivity input error	alarm when EVT□ output is ON –
	which is selected in [EVT3 conductivity input error	alarm EVT□ type].
	Available only when <b>EEUL</b> (Conductivity input)	error alarm output) is selected in
	[EVT3 type]	
	Setting range: 0 to 10000 seconds or minutes	
	Time unit follows the selection in [Conductivity inp	ut error alarm time unit].
	When set to 0, Conductivity input error alarm is di	sabled.
E3EC	EVT3 conductivity input error alarm span	Measurement range low limit
0.00	when EVT□ output OFF	
	Sets span to assess EVT3 conductivity input error	r alarm when EVT□ output is OFF–
	which is selected in [EVT3 conductivity input error	alarm EVT□ type].
	Available only when <b>EEUL</b> (Conductivity input)	error alarm output) is selected in
	[EVT3 type]	
	Setting range: Measurement range low limit to Measurement range high limit (*1)	
	When set to 0.00, Conductivity input error alarm is disabled.	
E3ECT	EVT3 conductivity input error alarm time	0 sec.
0	when EVT□ output OFF	
	Sets time to assess EVT3 conductivity input error	•
	which is selected in [EVT3 conductivity input error	
	• Available only when <b>EEUL</b> (Conductivity input error alarm output) is selected in	
	[EVT3 type]	
	• Setting range: 0 to 10000 seconds or minutes	
	Time unit follows the selection in [Conductivity inp	<del>-</del>
10/710	When set to 0, Conductivity input error alarm is di	
MVZN3	EVT3 cycle variable range	50.0%
50.0	<ul> <li>Sets EVT3 cycle range to be changed.</li> <li>Available when EC_L (Conductivity input low</li> </ul>	limit action) <b>FC H</b> (Conductivity
	input high limit action), <b>TEMPL</b> (Temperature in	
	(Temperature input high limit action) is selected in	•
	Not available for ON/OFF control.	[=1.5.950].
	• Setting range: 1.0 to 100.0%	
CENT3	EVT3 cycle extended time	0 sec.
	• Sets time to extend EVT3 cycle.	
	• Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity	
	input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>	
	(Temperature input high limit action) is selected in [EVT3 type].	
	Not available for ON/OFF control.	
	Setting range: 0 to 300 seconds	
(+4) 84		

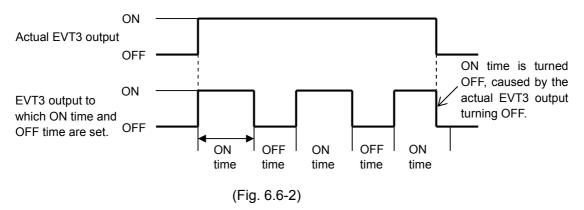
<sup>(\*1)</sup> Measurement unit and decimal point place follow the measurement range.

#### **EVT3 Action**

EVT3 Type	P Control Action	ON/OFF Control Action
Conductivity input low limit action, Temperature input low limit action	ON OFF  EVT3 proportional band  ON VALUE	If Medium Value is selected in [EVT3 hysteresis type]:  EVT3 ON sides  ON  OFF  EVT3 value  If Reference Value is selected in [EVT3 hysteresis type]:  EVT3 ON side  EVT3 OFF side  ON  OFF
Conductivity input high limit action, Temperature input high limit action	EVT3 proportional band ON OFF EVT3 value	If Medium Value is selected in [EVT3 hysteresis type]:  EVT3 ON sides  ON  OFF  EVT3 value  If Reference Value is selected in [EVT3 hysteresis type]:  EVT3 OFF side  EVT3 ON side  ON  OFF  EVT3 Value

(Fig. 6.6-1)

#### Timing chart of EVT3 output ON time and OFF time while in EVT3 output ON



#### 6.7 EVT4 Group

Available when EVT4 option is ordered.

To enter EVT4 Group, follow the procedure below.

- ① **G\_EC** Press the key in Conductivity/Temperature Display Mode.
- ② **G\_E04** Press the ☑ key 5 times in Conductivity Input Group.
- ③ **EVT4F** Press the <sup>SET</sup> key.

The unit will enter EVT4 Group, and 'EVT4 type' will appear.

Note: If EVT4 type is changed, EVT4 value will default to 0.00 or 0.0.  • If OFF (No temperature compensation) is selected in [Temperature compensation]		
method (p.23)], and if <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>		
(Temperature input high limit action) is selected here, EVT4 action differs depending on		
the selection in [Temperature Display when no temperature compensation (p.49)].		
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d ON.]		
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nit (*1)		
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<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.

<sup>(\*2)</sup> The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default
E4RST	EVT4 reset	Conductivity input: 0
0.00		Temperature input: 0.0°C
	<ul> <li>Sets the EVT4 reset value.</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT4 type].</li> <li>Not available for ON/OFF control.</li> <li>Setting range: Conductivity input: ±10% of Measurement span (*1) Temperature input: ±100.0°C (*2)</li> </ul>	
E4DIF	EVT4 hysteresis type	Reference Value
SDIF	<ul> <li>Selects EVT4 output hysteresis type (Medium or Reference Value). (Fig. 6.7-1)(p.44)</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT4 type].</li> <li>Not available for P control.</li> <li>CDIF : Medium Value  Sets the same value for both ON and OFF sides in relation to EVT4 value.  Only ON side needs to be set.</li> <li>SDIF : Reference Value  Sets individual values for ON and OFF sides in relation to EVT4 value.  Both ON and OFF sides need to be set individually.</li> </ul>	
E4DF0	EVT4 ON side	Conductivity input: 0.01
0.01	• Sets the span of EVT4 ON side. (Fig. 6.7-1)(p.44	Temperature input: 1.0°C
	If <b>CDIF</b> (Medium Value) is selected in [EVT4 hysteresis type], the span of ON/OFF side will be the same value.  • Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b> (Temperature input high limit action) is selected in [EVT4 type].  • Not available for P control.  • Setting range: Conductivity input: 0 to 20% of Measurement range high limit (*1) Temperature input: 0.0 to 10.0°C (*2)	
E4DFU	EVT4 OFF side	Conductivity input: 0.01 Temperature input: 1.0°C
0.01	<ul> <li>Sets the span of EVT4 OFF side. (Fig. 6.7-1)(p.44)</li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT4 type].</li> <li>Not available for P control.         Available when SD IF (Reference Value) is selected in [EVT4 hysteresis type].</li> <li>Setting range:         Conductivity input: 0 to 20% of Measurement range high limit (*1)         Temperature input: 0.0 to 10.0°C (*2)</li> </ul>	
E40NT	EVT4 ON delay time 0 sec.	
<b>0</b>	<ul> <li>Sets EVT4 ON delay time.         The EVT4 output does not turn ON (under the conditions of turning ON) until the time set in [EVT4 ON delay time] elapses.     </li> <li>Available when EC_L (Conductivity input low limit action), EC_H (Conductivity input high limit action), TEMPL (Temperature input low limit action) or TEMPH (Temperature input high limit action) is selected in [EVT4 type].</li> <li>Not available for P control.</li> <li>Setting range: 0 to 10000 seconds</li> </ul>	

<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.
(\*2) The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default
E40FT	EVT4 OFF delay time	0 sec.
	Sets EVT4 OFF delay time.	
	The EVT4 output does not turn OFF (under the conditions of turning OFF) until the time	
	set in [EVT4 OFF delay time] elapses.	
	• Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>	
	(Temperature input high limit action) is selected in	
	Not available for P control.	լ⊏v r4 typej.
	Setting range: 0 to 10000 seconds	
E4C	EVT4 proportional cycle	30 sec.
	• Sets proportional cycle for EVT4.	00 000.
30	Available when <b>EC_L</b> (Conductivity input low I)	imit action), <b>EC_H</b> (Conductivity
	input high limit action), TEMPL (Temperature inp	
	(Temperature input high limit action) is selected in	[EVT4 type].
	Not available for ON/OFF control.	
	Setting range: 1 to 300 seconds	
E40LH	EVT4 output high limit	100%
100	• Sets EVT4 output high limit value.	
ii	• Available when <b>EC_L</b> (Conductivity input low I	imit action), <b>LC-H</b> (Conductivity
	input high limit action), <b>TEMPL</b> (Temperature input	
	(Temperature input high limit action) is selected in	[EV14 type].
	Not available for ON/OFF control.  Setting range: EVT4 output low limit value to 100%.	
E40LL	• Setting range: EVT4 output low limit value to 100%	I
	EVT4 output low limit	0%
	<ul> <li>Sets EVT4 output low limit value.</li> <li>Available when EC_L (Conductivity input low l</li> </ul>	imit action) <b>FC U</b> (Conductivity
	input high limit action), <b>TEMPL</b> (Temperature input	
	(Temperature input high limit action) is selected in	,
	• Not available for ON/OFF control.	
	• Setting range: 0% to EVT4 output high limit value	
OONT4	Output ON time when EVT4 output ON	0 sec.
9	Sets Output ON time when EVT4 output is ON.	
issued bound formal bound from	If ON time and OFF time are set, EVT4 output can be turned ON/OFF in a configured	
	cycle when EVT4 output is ON. (Fig. 6.7-2)(p.44)	
	• Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b> (Conductivity	
	input high limit action), <b>TEMPL</b> (Temperature input low limit action) or <b>TEMPH</b>	
	(Temperature input high limit action) is selected in [EVT4 type].	
	Not available for P control.     Setting range: 0 to 10000 accords.	
00FT1	• Setting range: 0 to 10000 seconds	0 sec.
	Output OFF time when EVT4 output ON	0.500.
0	<ul> <li>Sets Output OFF time when EVT4 output is ON.</li> <li>If ON time and OFF time are set, EVT4 output can</li> </ul>	he turned ON/OFF in a configured
	cycle when EVT4 output is ON. (Fig. 6.7-2)(p.44)	be turned ON/OFF III a Corniguled
	• Available when <b>EC_L</b> (Conductivity input low I	imit action). <b>EC_H</b> (Conductivity
	input high limit action), <b>TEMPL</b> (Temperature input	
	(Temperature input high limit action) is selected in	
	Not available for P control.	
	Setting range: 0 to 10000 seconds	
E4CS	EVT4 conductivity input error alarm EVT□ type	
	Selects an EVT□ type (except EVT4 type) in ord	der to assess EVT4 conductivity input
	error alarm.	
	Available only when <b>EEUL</b> (Conductivity input erro	r alarm output) is selected in [EVT4 type]
	• EVT1 : EVT1 type	
	EVT2 : EVT2 type	
	<b>EVT3</b> : EVT3 type	
	: No action	

Character	Setting Item, Function, Setting Range	Factory Default
E4E0	EVT4 conductivity input error alarm span	Measurement range low limit
0.00	when EVT□ output ON	, s
L	• Sets span to assess EVT4 conductivity input error alarm when EVT□ output is ON −	
	which is selected in [EVT4 conductivity input error alarm EVT□ type].	
	• Available only when <b>EEUL</b> (Conductivity input error alarm output) is selected in	
	[EVT4 type]	
	Setting range: Measurement range low limit to Me	easurement range high limit (*1)
	When set to 0.00, Conductivity input error alarm is	• • • • • • • • • • • • • • • • • • • •
E4E0T	EVT4 conductivity input error alarm time	0 sec.
9	when EVT⊡ output ON	
	Sets time to assess EVT4 conductivity input error	alarm when EVT□ output is ON –
	which is selected in [EVT4 conductivity input error	
	Available only when <b>EEUL</b> (Conductivity input)	
	[EVT4 type]	• ,
	Setting range: 0 to 10000 seconds or minutes	
	Time unit follows the selection in [Conductivity inp	ut error alarm time unit].
	When set to 0, Conductivity input error alarm is di	sabled.
E4EC	EVT4 conductivity input error alarm span	Measurement range low limit
0.00	when EVT□ output OFF	_
	Sets span to assess EVT4 conductivity input error	alarm when EVT□ output is OFF−
	which is selected in [EVT4 conductivity input error	alarm EVT□ type].
	Available only when <b>EEUL</b> (Conductivity input)	error alarm output) is selected in
	[EVT4 type]	
	• Setting range: Measurement range low limit to Measurement range high limit (*1)	
	When set to 0.00, Conductivity input error alarm is disabled.	
E4ECT	EVT4 conductivity input error alarm time	0 sec.
2	when EVT□ output OFF	
	• Sets time to assess EVT4 conductivity input error alarm when EVT□ output is OFF−	
	which is selected in [EVT4 conductivity input error alarm EVT□ type].	
	Available only when <b>EEUL</b> (Conductivity input error alarm output) is selected in	
	[EVT4 type]	
	Setting range: 0 to 10000 seconds or minutes	
	(Time unit follows the selection in [Conductivity inp	<u>-</u> ,
	When set to 0, Conductivity input error alarm is di	
MVZN4	EVT4 cycle variable range	50.0%
50.0	• Sets EVT4 cycle range to be changed.	limit action) FP U (Conductivity)
	• Available when <b>EC_L</b> (Conductivity input low input high limit action), <b>TEMPL</b> (Temperature in	
	, , , , , , , , , , , , , , , , , , , ,	•
	<ul><li>(Temperature input high limit action) is selected in [EVT4 type].</li><li>Not available for ON/OFF control.</li></ul>	
CENT4	Setting range: 1.0 to 100.0%  EVT4 cycle extended time	0.500
	Sets time to extend EVT4 cycle.	0 sec.
0	• Available when <b>EC_L</b> (Conductivity input low	limit action) <b>FC_H</b> (Conductivity
	input high limit action), <b>TEMPL</b> (Temperature in	
	(Temperature input high limit action) is selected in	
	Not available for ON/OFF control.	
	Setting range: 0 to 300 seconds	
	Detailing range. o to 300 35001103	

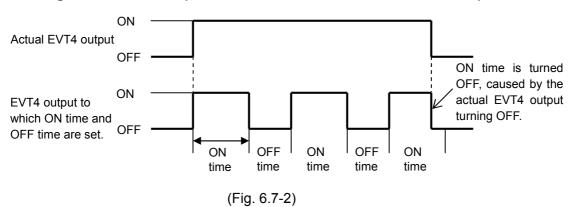
<sup>(\*1)</sup> Measurement unit and decimal point place follow the measurement range.

#### **EVT4 Action**

EVT4 Type	P Control Action	ON/OFF Control Action
Conductivity input low limit action,	ON OFF  EVT4 value	If Medium Value is selected in [EVT4 hysteresis type]:  EVT4 ON sides  OFF  EVT4 value
Temperature input low limit action		If Reference Value is selected in [EVT4 hysteresis type]:  EVT4 ON side EVT4 OFF side  ON  OFF  EVT4 value
Conductivity input high limit action, Temperature input high limit action	ON OFF EVT4 value	If Medium Value is selected in [EVT4 hysteresis type]:  EVT4 ON sides  ON  OFF  EVT4 value  If Reference Value is selected in [EVT4 hysteresis type]:  EVT4 OFF side EVT4 ON side  ON  OFF  EVT4 value

(Fig. 6.7-1)

## Timing chart of EVT4 output ON time and OFF time while in EVT4 output ON



## **6.8 Communication Group**

Available only when C5 option is ordered.

To enter the Communication Group, follow the procedure below.

- ① **G\_EC** Press the key in Conductivity/Temperature Display Mode.
- $\bigcirc$  **G\_COM** Press the  $\bigcirc$  key as many times as necessary until the left characters appear.
- ③ CMSL□ Press the set key.

The unit will enter the Communication Group, and the 'Communication protocol' will appear.

Character	Setting Item, Function, Setting Range	Factory Default
CMSL	Communication protocol	Shinko protocol
NOML	Selects communication protocol.	
	• NOML : Shinko protocol	
	MODA : Modbus ASCII mode	
CMNO	MODR : Modbus RTU mode Instrument number	0
	<ul> <li>Sets the instrument number. (The instrument nur multiple instruments are connected.)</li> </ul>	fibers should be set one by one when
	• Setting range: 0 to 95	
CMSP	Communication speed	9600 bps
9600	Selects a communication speed equal to that of the second se	the host computer.
	• <b>9600</b> : 9600 bps	•
	□ <b>19200</b> : 19200 bps	
	<b>38400</b> : 38400 bps	
CMFT	Data bit/Parity	7 bits/Even
7EVN	Selects data bit and parity.	
	BNON: : 8 bits/No parity	
	<b>7NON</b> : 7 bits/No parity	
	<b>8EVN</b> : : 8 bits/Even	
	<b>7EVN</b> : 7 bits/Even	
	<b>80DD</b> : 8 bits/Odd	
	<b>7000</b> : 7 bits/Odd	
CMST.	Stop bit	1 bit
1	Selects the stop bit.	
	• <b>1</b> : 1 bit	
	<b>2</b> : 2 bits	

#### **6.9 Transmission Output Group**

To enter the Transmission Output Group, follow the procedure below.

- ① **G\_EC** Press the key in Conductivity/Temperature Display Mode.
- ② **G\_TRA** Press the ☑ key as many times as necessary until the left characters appear.
- ③ TROS1 Press the <sup>SET</sup> key.

The unit will enter Transmission Output Group, and 'Transmission output 1 type' will appear.

Character	Setting Item, Function, Setting Range	Factory Default	
TROS1	Transmission output 1 type	Conductivity transmission	
EC	Selects the Transmission output 1 type.		
1	If <b>0FF</b> (No temperature compensation) is selected in [Temperature compensation		
	method (p.23)], and if <b>TEMP</b> (Temperature transmission) is selected here,		
	transmission output value differs depending on the selection in [Temperature Display		
	when no temperature compensation (p.49)].		
	If <b>0FF</b> (Unlit) or <b>STD</b> (Reference ter	nperature) is selected, the	
	transmission output value will become the valu	e set in [Reference temperature (p.23)].	
	If <b>PV</b> (Measurement value) is selected, the transmission output value will be		
	the Measurement value.		
	• <b>EC</b> : Conductivity transmission		
	<b>TEMP</b> :: Temperature transmission		
	MV1 : EVT1 MV transmission		
	MV2 : EVT2 MV transmission		
TRLH1	Transmission output 1 high limit	Conductivity transmission: 20.00	
20.00		Temperature transmission: 100.0℃	
	MV transmission: 100.0%  • Sets the Transmission output 1 high limit value. (This value correponds to 20 mA DC output.)		
	If Transmission output 1 high limit and low limit are set to the same value, Transmission		
	output 1 will be fixed at 4 mA DC.	Llow limit to Magaurament range high	
	Conductivity transmission: Transmission output 1 low limit to Measurement range high		
	limit (*1)  Temperature transmission: Transmission output 1 low limit to 100.0°C (*2)		
	MV transmission: Transmission output 1 low limit to 100.0 (2)		
TRLL1	Transmission output 1 low limit Conductivity transmission: 0.00		
0.00	Transmission output 1 low mint	Temperature transmission: 0.0°C	
0.00		MV transmission: 0.0%	
	Sets the Transmission output 1 low limit value. (Thi	is value correponds to 4 mA DC output.)	
	If Transmission output 1 high limit and low limit a	re set to the same value, Transmission	
	output 1 will be fixed at 4 mA DC.		
	Conductivity transmission: Measurement range leadings.	ow limit to Transmission output 1 high	
	limit (*1)		
	Temperature transmission: 0.0°C to Transmission		
	MV transmission: 0.0% to Transmission output 1 high limit		
TRCS1	Transmission output 1 status	Last value HOLD	
BEFH	when calibrating	ation.	
	• Sets the Transmission output 1 status when calibr	•	
	• <b>BEFH</b> : Last value HOLD (Retains and outputs the last value before conductivity		
	calibration.)		
	<b>SETH</b> : Set value HOLD (Outputs the value set in [Transmission output 1 Set value		
	HOLD].)		
	<b>PVH</b> : Measurement value (Outputs the measurement value when conductivity is		
	calibrated.)		

- (\*1) Measurement unit and decimal point place follow the Measurement range.
- (\*2) The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default
TRSE1	Transmission output 1 Set value HOLD	Conductivity transmission:
0.00	·	Measurement range low limit
		Temperature transmission: 0.0°C
	Coto the Transmission autout 4 Cot value LICLD	MV transmission: 0.0%
	• Sets the Transmission output 1 Set value HOLD.	
	Available only when <b>SETH</b> (Set value HOLD) is selected in [Transmission output 1	
	status when calibrating]  • Conductivity transmission: Measurement range low limit to Measurement range high	
	limit (*1)	ow little to Measurement range high
	Temperature transmission: 0.0 to 100.0°C (*2)	
	MV transmission: 0.0 to 100.0%	
TROS2	Transmission output 2 type	Conductivity transmission
EC	Selects the Transmission output 2 type.	Conductivity transmission
	If <b>OFF</b> (No temperature compensation) is se	elected in [Temperature compensation
	method (p.23)], and if <b>TEMP</b> (Temperature tra	
	transmission output value differs depending on the	
	when no temperature compensation (p.49)].	io concomon in [nomponataro zhopha)
	If <b>0FF</b> (Unlit) or <b>STD</b> (Reference ten	nperature) is selected, the unit
	operates based on the value set in [Reference	·
	If <b>PV</b> (Measurement value) is selected, t	the unit operates based on the
	Measurement value.	
	• <b>EC</b> : Conductivity transmission	
	<b>TEMP</b> :: Temperature transmission	
	MV1 : EVT1 MV transmission	
	MV2 : EVT2 MV transmission	
	MV3 : EVT3 MV transmission	
TRLH2	Transmission output 2 high limit	Conductivity transmission: 20.00
20.00		Temperature transmission: 100.0°C
	MV transmission: 100.0%  • Sets the Transmission output 2 high limit value. (This value correponds to 20 mA DC output.)	
	If Transmission output 2 high limit and low limit are set to the same value, Transmission	
	output 2 will be fixed at 4 mA DC.	To dot to the dame value, Transmission
	Conductivity transmission: Transmission output 2	2 low limit to Measurement range high
	limit (*1)	
	Temperature transmission: Transmission output 2	2 low limit to 100.0°C (*2)
	MV transmission: Transmission output 2 low limit	to 100.0%
TRLL2	Transmission output 2 low limit	Conductivity transmission: 0.00
0.00		Temperature transmission: 0.0°C
	s Sata the Transmission output 2 low limit value (Thi	MV transmission: 0.0%
	<ul> <li>Sets the Transmission output 2 low limit value. (Thi         If Transmission output 2 high limit and low limit at     </li> </ul>	• • • • • • • • • • • • • • • • • • • •
	output 2 will be fixed at 4 mA DC.	re set to the same value, Transmission
	Conductivity transmission: Measurement range le	ow limit to Transmission output 2 high
	limit (*1)	ow mile to Transmission Salpat 2 mgm
	Temperature transmission: 0.0°C to Transmission	n output 2 high limit (*2)
	MV transmission: 0.0% to Transmission output 2 high limit	
TRCS2	Transmission output 2 status	Last value HOLD
BEFH	when calibrating	
	Sets the Transmission output 2 status when calibrate	•
	• <b>BEFH</b> : Last value HOLD (Retains and output	ts the last value before conductivity
	calibration.)	
	<b>SETH</b> : : Set value HOLD (Outputs the value set in [Transmission output 2 Set value	
	HOLD].)	
	<b>PVH</b> :: Measurement value (Outputs the measurement value when conductivity is	
	calibrated.)	

<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.
(\*2) The placement of the decimal point does not follow the selection. It is fixed.

Character	Setting Item, Function, Setting Range	Factory Default
TRSE2	Transmission output 2 Set value HOLD	Conductivity transmission:
0.00		Measurement range low limit
		Temperature transmission: 0.0°C
		MV transmission: 0.0%
	Sets the Transmission output 2 Set value HOLD.	
	Available only when <b>SETH</b> (Set value HOLD) is selected in [Transmission output 2 status when calibrating]	
	Conductivity transmission: Measurement range low limit to Measurement range high	
	limit (*1)	
	Temperature transmission: 0.0 to 100.0℃ (*2)	
	MV transmission: 0.0 to 100.0%	

<sup>(\*1)</sup> Measurement unit and decimal point place follow the Measurement range.

<sup>(\*2)</sup> The placement of the decimal point does not follow the selection. It is fixed.

## **6.10 Special Function Group**

To enter the Special Function Group, follow the procedure below.

- ① **G\_EC** Press the key in Conductivity/Temperature Display Mode.
- ② **G\_OTH** Press the ☑ key as many times as necessary until the left characters appear.
- 3 LOCK Press the set key.

The unit will enter the Special Function Group, and the 'Set value lock' will appear.

Character	Setting Item, Function, Setting Range	Factory Default	
LOCK	Set value lock	Unlock	
	Locks the set values to prevent setting errors.		
	• (Unlock): All set values can be changed.		
	<b>LOCK1</b> (Lock 1): None of the set values can be		
	LOCK2 (Lock 2): Only EVT1, EVT2, EVT4, EV	<del>_</del>	
	LOCK3 (Lock 3): All set values – except Senso	e, Conductivity Zero adjustment value,	
	•	value, Temperature calibration value,	
		justment value, Transmission output 1	
	·	mission output 2 Zero adjustment	
		Span adjustment value – can be	
	temporarily changed.		
	However, they revert to their previous value after the power is turned off because they are not saved in the non-volatile IC memory.		
	off because they are not saved in the non-volatile IC memory.  Do not change setting items (FVT1_FVT2_FVT4_FVT4_types). If they		
	Do not change setting items (EVT1, EVT2, EVT4, EVT4 types). If they		
	are changed, they will affect other setting items.  Be sure to select Lock 3 when changing the set value frequently via		
	software communication. (If a value set via software communication		
	is the same as the value before the setting, the value will not be		
	written in non-volatile IC memory.)		
DISP	Display selection Input value (Conductivity, Temperature)		
DUAL	• Selects items to be indicated in the Conductivity Display and Temperature Display.		
	DUAL : Input value (Conductivity, Temperature)  EC : Conductivity		
	EC : Conductivity TEMP : Temperature		
INERR	EVT output when input errors occur	Disabled	
OFF	If input errors occur, such as conductivity sensor		
VI I LILL	EVT output can be Enabled or Disabled.	is allowing of their on called,	
	If "Enabled" is selected, EVT output will be maint	ained when input errors occur.	
	If "Disabled" is selected, EVT output will be turne	d OFF when input errors occur.	
	• ON : Enabled		
OFDD:	OFF : Disabled		
OFDP_	Temperature Display when no temperature	Unlit	
OFF	compensation	locted in ITemperature compensation	
	• If <b>OFF</b> (No temperature compensation) is selected in [Temperature compensation method (p.23)], selects an item to be indicated in the Temperature Display.		
	<ul> <li>Method (p.23)], selects an item to be indicated in the Temperature Display.</li> <li>Available when OFF (No temperature compensation) is selected in [Temperature]</li> </ul>		
	compensation method (p.23)].		
	• OFF : Unlit		
	STD: : Reference temperature		
	PV : Measurement value		
M_S	Conductivity input error alarm time unit	Second(s)	
SEC	Selects conductivity input error alarm time unit.		
	• SEC : Second(s)		
	MIN : Minute(s)		

## 7. Calibration

Conductivity Calibration Mode, Temperature Calibration Mode and Transmission Output Adjustment Mode are described below.

#### 7.1 Conductivity Calibration Mode

Deterioration of the 4-electrode/2-electrode conductivity sensor may cause the cell constant to change. To correct the changed cell constant, calibration is performed.

Perform Conductivity Zero adjustment first, followed by Span adjustment.

However, if **LOCK1** (Lock 1), **LOCK2** (Lock 2) or **LOCK3** (Lock 3) is selected in [Set value lock (p.49)], the instrument cannot move to Conductivity Calibration Mode.

The following outlines the procedure for conductivity calibration.

- ① When selecting **BEFH** (Last value HOLD) in [Transmission output 1 status when calibrating (p.46)] or in [Transmission output 2 status when calibrating (p.47)], select it while the 4-electrode/2-electrode conductivity sensor is being immersed in the solution currently calibrated.
- ② Do not immerse the 4-electrode/2-electrode conductivity sensor in the standard solution.
- ③ Press the key in Conductivity/Temperature Display Mode.
  The unit will enter Conductivity Zero adjustment in Conductivity Calibration Mode, and will indicate the following.

Display	Indication
Conductivity Display	ADJZ and conductivity are indicated alternately.
Temperature Display	Conductivity Zero adjustment value is indicated.

4 Set the Conductivity Zero adjustment value with the  $\triangle$  or  $\nabla$  key so that the conductivity becomes 0. If conductivity is 0 (zero), this adjustment is not necessary.

Setting range of the Conductivity Zero adjustment value differs depending on the measurement range. (See Table 7.1-1.)

However, it is effective within the measurement range regardless of the Conductivity Zero adjustment value.

## (Table 7.1-1)

## FEB-102-ECH:

Measurement Range		Conductivity Zero Adjustment Value Setting Range
	0.00 to 20.00 mS/cm	-2.00 to 2.00
	0.0 to 200.0 mS/cm	-20.0 to 20.0
	0.0 to 500.0 mS/cm	-50.0 to 50.0
	0 to 500 mS/cm	-50 to 50
	0.000 to 2.000 S/m	-0.200 to 0.200
Cell constant	0.00 to 20.00 S/m	-2.00 to 2.00
1.0/cm	0.00 to 50.00 S/m	-5.00 to 5.00
	0.0 to 50.0 S/m	-5.0 to 5.0
	0 to 2000 mS/m	-200 to 200
	0.0 to 20.0 g/L	-2.0 to 2.0
	0 to 200 g/L	-20 to 20
	0 to 500 g/L	-50 to 50

Measurement Range		Conductivity Zero Adjustment Value Setting Range
	0.0 to 200.0 mS/cm	-20.0 to 20.0
	0.0 to 500.0 mS/cm	-50.0 to 50.0
	0 to 2000 mS/cm	-200 to 200
Cell constant	0.00 to 20.00 S/m	-2.00 to 2.00
10.0/cm	0.00 to 50.00 S/m	-5.00 to 5.00
10.0/GIII	0.0 to 200.0 S/m	-20.0 to 20.0
	0 to 200 g/L	-20 to 20
	0 to 500 g/L	-50 to 50
	0 to 2000 g/L	-200 to 200
Seawater salinity 0.00 to 4.00%		-0.40 to 0.40
NaCl salinity 0.00 to 20.00%		-2.00 to 2.00

#### FEB-102-ECM:

Cell	Measurement	Conductivity Zero Adjustment Value
Constant	Range	Setting Range
0.01/cm	0.00 to 20.00 µS/cm	-2.00 to 2.00
0.1/cm	0.0 to 200.0	-20.0 to 20.0
1.0/cm	0 to 2000	-200 to 200
0.01/cm	0.000 to 2.000 mS/m	-0.200 to 0.200
0.1/cm	0.00 to 20.00 mS/m	-2.00 to 2.00
1.0/cm	0.0 to 200.0 mS/m	-20.0 to 20.0
0.01/cm	0.0 to 20.0 mg/L	-2.0 to 2.0
0.1/cm	0 to 200 mg/L	-20 to 20
1.0/cm	0 to 2000 mg/L	-200 to 200

## ⑤ Press the SET key.

Conductivity Zero adjustment value will be registered, and the unit moves to in Conductivity calibration Span adjustment mode.

The following is indicated in Conductivity calibration Span adjustment mode.

Display	Indication
Conductivity Display	ADJS  and conductivity are indicated alternately.
Temperature Display	Conductivity Span adjustment value is indicated.

- 6 Immerse the 4-electrode/2-electrode conductivity sensor in the standard solution.
- Set the Conductivity Span adjustment value with the 
   or 
   key, checking the conductivity. Conductivity Span adjustment value: 0.700 to 1.300
- 8 Press the key.
  Conductivity Span adjustment value will be registered, and the unit reverts to Conductivity/
  Temperature Display Mode.

#### 7.2 Temperature Calibration Mode

Temperature calibration is performed by setting the temperature calibration value.

If **OFF** (No temperature compensation) is selected in [Temperature compensation method (p.23)], Temperature Calibration Mode is not available.

The unit cannot enter Temperature Calibration Mode in the following cases:

• If **LOCK1** (Lock 1), **LOCK2** (Lock 2) or **LOCK3** (Lock 3) is selected in [Set value lock (p.49)].

When a sensor cannot be set at the exact location where measurement is desired, the resulting measured temperature may deviate from the temperature in the desired location. In this case, the desired temperature can be set for the desired location by setting a temperature calibration value. However, it is effective within the input rated range regardless of the temperature calibration value.

Temperature after calibration = Current temperature + (Temperature calibration value)

(e.g.) When current temperature is 23.5°C,

If temperature calibration value is set to  $1.5^{\circ}$ C:  $23.5 + (1.5) = 25.0^{\circ}$ C If temperature calibration value is set to  $-1.5^{\circ}$ C:  $23.5 + (-1.5) = 22.0^{\circ}$ C

#### Temperature calibration procedure is shown below.

1 Press the key and key (in that order) together in Conductivity/Temperature Display Mode. The unit proceeds to Temperature Calibration Mode, and indicates the following.

Display	Indication
Conductivity Display	<b>S0</b> and temperature are indicated alternately.
Temperature Display	Temperature calibration value

- ② Set a temperature calibration value with the  $\triangle$  or  $\nabla$  key while checking temperature. Setting range: -10.0 to 10.0°C (The placement of the decimal point does not follow the selection. It is fixed.)
- ③ Press the wo key.
  Temperature calibration is complete, and the unit reverts to Conductivity/Temperature Display Mode.

#### 7.3 Error Code during Temperature Calibration

For temperature sensor error or outside temperature compensation range during calibration, their corresponding error codes flash in the Temperature Display as shown below in (Table 7.3-1).

(Table 7.3-1)

<u>, , , , , , , , , , , , , , , , , , , </u>	-1		
Error Code	Error Type	Error Contents	Description
ERRØ1	Fail	Temperature Sensor Burnout	Temperature sensor lead wire is burnt out.
ERRØ2	Fail	Temperature Sensor Short-circuited	Temperature sensor lead wire is short-circuited.
ERRØ3	Error	Outside Temperature Compensation Range	Measured temperature has exceeded 110.0℃.
ERR04	Error	Outside Temperature Compensation Range	Measured temperature is less than 0.0℃.

7.4 Transmission Output 1 Adjustment Mod	7.4	Transmiss	ion Output	1 Adi	ustment	Mode
--	-----	-----------	------------	-------	---------	------

Fine adjustment of Transmission output 1 is performed.

This Conductivity Meter is adjusted at the factory, however, differences may occur between the indication value of the connected equipment (recorders, etc.) and output value of this instrument. In this case, perform Transmission output 1 Zero adjustment and Span adjustment.

The unit cannot enter Transmission Output 1 Adjustment Mode in the following cases:

- During Conductivity Calibration Mode or Temperature Calibration Mode
- When **L0CK1** (Lock 1), **L0CK2** (Lock 2) or **L0CK3** (Lock 3) is selected in [Set value lock (p.49)]

The following outlines the procedure for adjustment.

① Press and hold the key and key (in that order) together for 3 seconds in Conductivity/ Temperature Display Mode.

The unit will enter Transmission Output 1 Zero Adjustment Mode, and will indicate the following.

Display	Indication
Conductivity Display	AJZ1
Temperature Display	Transmission output 1 Zero adjustment value

② Set a Transmission output 1 Zero adjustment value with the  $\triangle$  or  $\nabla$  key, while viewing the value indicated on the connected equipment (recorders, etc.).

Setting range: ±5.00% of Transmission output span

3 Press the set key.

The unit will enter Transmission Output 1 Span Adjustment Mode, and will indicate the following.

Display	Indication
Conductivity Display	AJS1□
Temperature Display	Transmission output 1 Span adjustment value

④ Set a Transmission output 1 Span adjustment value with the △ or ▽ key, while viewing the value indicated on the connected equipment (recorders, etc.).

Setting range: ±5.00% of Transmission output span

<sup>5</sup> Press the key.

The unit reverts to Transmission Output 1 Zero Adjustment Mode.

Repeat steps ② to ⑤ if necessary.

6 To finish Transmission output 1 adjustment, press the set key in Transmission Output 1 Span Adjustment Mode.

The unit reverts to Conductivity/Temperature Display Mode.

#### 7.5 Transmission Output 2 Adjustment Mode

Fine adjustment of Transmission output 2 is performed.

This Conductivity Meter is adjusted at the factory, however, differences may occur between the indication value of the connected equipment (recorders, etc.) and output value of this instrument. In this case, perform Transmission output 2 Zero adjustment and Span adjustment.

The unit cannot enter Transmission Output 2 Adjustment Mode in the following cases:

- During Conductivity Calibration Mode or Temperature Calibration Mode
- When **LOCK1** (Lock 1), **LOCK2** (Lock 2) or **LOCK3** (Lock 3) is selected in [Set value lock (p.49)]

The following outlines the procedure for adjustment.

① Press and hold the  $\ ^{\bigcirc}$  key and  $\ ^{\bigcirc}$  key (in that order) together for 3 seconds in Conductivity/ Temperature Display Mode.

The unit will enter Transmission Output 2 Zero Adjustment Mode, and will indicate the following.

Display	Indication
Conductivity Display	AJZ2
Temperature Display	Transmission output 2 Zero adjustment value

② Set a Transmission output 2 Zero adjustment value with the  $\triangle$  or  $\nabla$  key, while viewing the value indicated on the connected equipment (recorders, etc.).

Setting range: ±5.00% of Transmission output span

③ Press the SET key.

The unit will enter Transmission Output 2 Span Adjustment Mode, and will indicate the following.

Display	Indication	
Conductivity Display	AJS2	
Temperature Display	Transmission output 2 Span adjustment value	

4 Set a Transmission output 2 Span adjustment value with the  $\triangle$  or  $\triangledown$  key, while viewing the value indicated on the connected equipment (recorders, etc.).

Setting range: ±5.00% of Transmission output span

⑤ Press the key.

The unit reverts to Transmission Output 2 Zero Adjustment Mode.

Repeat steps ② to ⑤ if necessary.

6 To finish Transmission Output 2 Adjustment, press the set key in Transmission Output 2 Span Adjustment Mode.

The unit reverts to Conductivity/Temperature Display Mode.

## 8. Measurement

#### 8.1 Starting Measurement

After mounting to the control panel, wiring, setup and calibration are complete, turn the power switch ON. For approx. 4 seconds after the power switch is turned ON, the input types are indicated in the Conductivity Display and Temperature Display.

Indication differs depending on the model as follows.

#### FEB-102-ECH:

Conductivity	Item Selected in	Temperature
Display	[Measurement Unit (p.20)]	Display
CONV	Conductivity (mS/cm)	PT100
SI	Conductivity (S/m, mS/m)	or
SEA	Seawater salinity (%)	PT1000
SALT	NaCl salinity (%)	
TDS	TDS conversion (g/L)	

#### **FEB-102-ECM:**

Conductivity Display	Item Selected in [Measurement Unit (p.20)]	Temperature Display
CONV	Conductivity (µS/cm)	PT100
SI	Conductivity (mS/m)	or
TDS	TDS conversion (mg/L)	PT1000

After that, measurement starts, indicating the item selected in [Display selection] or [Temperature Display when no temperature compensation (p.49)].

#### 8.2 Error Code during Measurement

For temperature sensor error or outside temperature compensation range during measurement, their corresponding error codes flash in the Temperature Display as shown below in (Table 8.2-1).

(Table 8.2-1)

(145.5 5.2 1)			
Error Code	Error Type	Error Contents	Description
ERRØ1	Fail	Temperature Sensor Burnout	Temperature sensor lead wire is burnt out.
ERR02	Fail	Temperature Sensor Short-circuited	Temperature sensor lead wire is short-circuited.
ERR03	Error	Outside Temperature Compensation Range	Measured temperature has exceeded 110.0℃.
ERR04	Error	Outside Temperature Compensation Range	Measured temperature is less than 0.0℃.

#### 8.3 Setting EVT1, EVT2, EVT3, EVT4 Values

EVT1 to EVT4 values are set in Simple Setting Mode.

These EVT1 to EVT4 values correspond to those in EVT1 to EVT4 Groups.

To enter Simple Setting Mode, follow the procedure below.

① ESV1	Press the set lkey in Conductivity/Temperature Display Mode.
	"EVT1 value" will be indicated.

② Set each setting item with the  $\triangle$  or  $\nabla$  key, and register the value with the  $\square$  key.

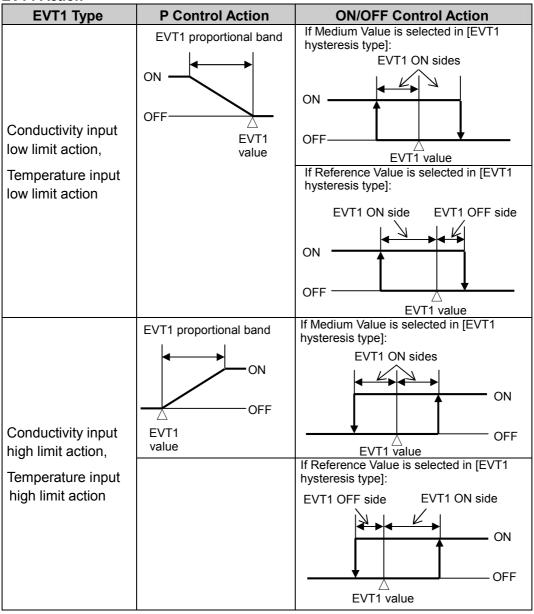
ESV1 Conductivity input low limit action), EC_H	out: Measurement range low limit out: 0.0°C			
• Sets EVT1 value.	•			
Sets EVT1 value.	out: 0.0℃			
I • Available when EL_L III (Conductivity input low limit action) EL_F	<b>1</b>			
· · · · · · · · · · · · · · · · · · ·	`			
input high limit action), <b>TEMPL</b> (Temperature input low limit action (Temperature input high limit action) is selected in [EVT1 type].				
• Setting range:				
Conductivity input: Measurement range low limit to Measurement range	nae hiah limit (*1)			
Temperature input: 0.0 to 100.0°C (*2)				
	out: Measurement			
0.00	range low limit			
Temperature inp	out: 0.0°C			
Sets EVT2 value.				
• Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_F</b>				
input high limit action), <b>TEMPL</b> (Temperature input low limit action	) or <b>iemph</b>			
	(Temperature input high limit action) is selected in [EVT1 type].			
	Setting range:     Conductivity input: Measurement range low limit to Measurement range high limit (*1)			
Temperature input: 0.0 to 100.0°C (*2)	rige riigir iiiriit ( 1)			
	out: Measurement			
0.00	range low limit			
Temperature inp	out: 0.0℃			
Sets EVT3 value.				
Available only when EVT3 or EVT4 is ordered.				
Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_F</b>	`			
input high limit action), <b>TEMPL</b> (Temperature input low limit action	) or ILMPH			
<ul><li>(Temperature input high limit action) is selected in [EVT1 type].</li><li>Setting range:</li></ul>				
Conductivity input: Measurement range low limit to Measurement range	nge high limit (*1)			
Temperature input: 0.0 to 100.0°C (*2)	ngo nigir illilit ( 1)			
	out: Measurement			
	range low limit			
Temperature inp	out: 0.0℃			
Sets EVT4 value.				
Available only when EVT4 is ordered.				
Available when <b>EC_L</b> (Conductivity input low limit action), <b>EC_H</b>				
· · · · · · · · · · · · · · · · · · ·				
input high limit action), TEMPL (Temperature input low limit action				
input high limit action), <b>TEMPL</b> (Temperature input low limit action (Temperature input high limit action) is selected in [EVT1 type].				
input high limit action), TEMPL (Temperature input low limit action	,			

- (\*1) Measurement unit and decimal point place follow the Measurement range.
- (\*2) The placement of the decimal point does not follow the selection. It is fixed.
- ③ Press the key. The unit reverts to Conductivity/Temperature Display Mode.

#### 8.4 EVT1, EVT2, EVT3, EVT4 Outputs

When **EC\_L** (Conductivity input low limit action), **EC\_H** (Conductivity input high limit action), **TEMPL** (Temperature input low limit action) or **TEMPH** (Temperature input high limit action) is selected in [EVT1 type (p.25)], EVT1 action will be activated as follows. The same applies to EVT2, EVT3 and EVT4 output.

#### EVT1 Action



(Fig. 8.4-1)

#### • P Control Action

Within the proportional band, the manipulated variable is output in proportion to the deviation between the EVT1 value and measurement value.

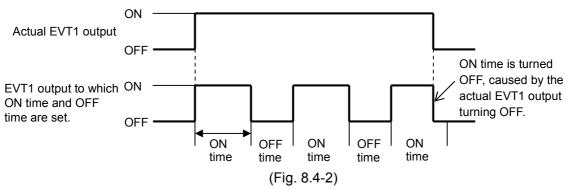
EVT1 Type	Description
Conductivity input	If measurement value is lower than [EVT1 value – EVT1 proportional
low limit action,	band], EVT1 output is turned ON.
,	If measurement value enters within the proportional band, EVT1 output is
Temperature input	turned ON/OFF in EVT1 proportional cycles.
low limit action	If measurement value exceeds EVT1 value, EVT1 output is turned OFF.
	If measurement value is higher than [EVT1 value + EVT1 proportional
Conductivity input	band], EVT1 output is turned ON.
high limit action,	If measurement value enters within the proportional band, EVT1 output is
Temperature input	turned ON/OFF in EVT1 proportional cycles.
high limit action	If measurement value drops below EVT1 value, EVT1 output is turned
	OFF.

#### ON/OFF Control Action

EVT1 Type	Description
Conductivity input	If measurement value is lower than EVT1 value, EVT1 output is turned
low limit action,	ON.
Temperature input low limit action	If measurement value exceeds the EVT1 value, EVT1 output is turned OFF.
Conductivity input	If measurement value is higher than EVT1 value, EVT1 output is turned
high limit action,	ON.
Temperature input high limit action	If measurement value drops below the EVT1 value, EVT1 output is turned OFF.

If ON and OFF time are set in [Output ON/OFF Time when EVT1 Output ON (p.27)], and when EVT1 output is turned ON, EVT1 output is turned ON/OFF in EVT1 proportional cycles.

#### Timing chart of Output ON time and OFF time while in EVT1 output ON



EVT output status, when input errors occur, differs depending on the selection in [EVT output when input errors occur (p.49)].

- If **ON** (Enabled) is selected, EVT output will be maintained when input errors occur.
- If **OFF** (Disabled) is selected, EVT output will be turned OFF when input errors occur.

#### 8.5 Error Output

If **EROUT** (Error output) is selected in [EVT1 type (p.25)], and if the error type is Error in (Table 8.5-1), EVT1 output will be turned ON.

The same applies to EVT2, EVT3 and EVT4.

(Table 8.5-1)

Error Code	Error Type	Error Contents	Description	
ERR01	Fail	Temperature Sensor Burnout	Temperature sensor lead wire is burnt out.	
ERRØ2	Fail	Temperature Sensor Short-circuited	Temperature sensor lead wire is short-circuited.	
ERR03	Error	Outside Temperature Compensation Range	Measured temperature has exceeded 110.0°C.	
ERR04	Error	Outside Temperature Compensation Range	Measured temperature is less than 0.0℃.	

#### 8.6 Fail Output

If **FAIL** (Fail output) is selected in [EVT1 type (p.25)], and if the error type is Fail in (Table 8.5-1), EVT1 output will be turned ON.

The same applies to EVT2, EVT3 and EVT4.

#### 8.7 Conductivity Input Error Alarm

Conductivity input error alarm is used for detecting actuator trouble.

Even if conductivity input error alarm time has elapsed, and if conductivity input does not become higher than conductivity input error alarm span, the unit assumes that actuator trouble has occurred, and writes Status flag 2.

In Serial communication, status can be read by reading Status flag 2 (EVT1, EVT2, EVT3, EVT4 output flags).

EVT1 output is turned ON when **EEUL** (Conductivity input error alarm output) is selected in [EVT1 type (p25)].

The same applies to EVT2, EVT3 and EVT4.

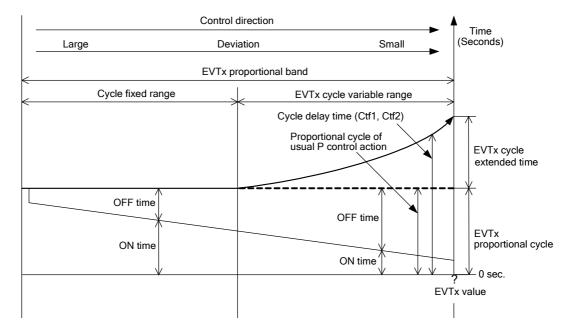
Conductivity input error alarm is disabled in the following cases.

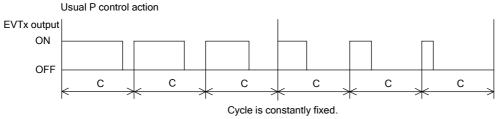
- During Conductivity Calibration Mode or Temperature Calibration Mode
- When Conductivity input error alarm time is set to 0 seconds (minutes), or Conductivity input error alarm span is set to 0.00.

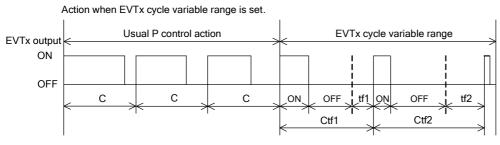
#### 8.8 Cycle Automatic Variable Function

If deviation between EVT $\square$  value and measured value enters EVT $\square$  cycle variable range, the proportional cycle will be automatically extended in accordance with the deviation. Proportional action OFF time will be extended, and ON / OFF ratio will be adjusted.

However, if EVT□ cycle extended time is set to 0 (zero) seconds, this function will be disabled.







C: EVTx proportional cycle tf1, tf2: Extended OFF time Ctf1, Ctf2: Cycle delay time

EVTx: EVT1, EVT2, EVT3, EVT4

#### **8.9 Transmission Output**

Converting conductivity, temperature or MV to analog signal every input sampling period, outputs in
current.
If <b>OFF</b> (No temperature compensation) is selected in [Temperature compensation method (p.23)]
and if <b>TEMP</b> (Temperature transmission) is selected in [Transmission output 1 type (p.46)],
Transmission output 1 value differs depending on the selection in [Temperature Display when no
temperature compensation (p.49)].
If <b>OFF</b> (Unlit) or <b>STD</b> (Reference temperature) is selected, the value set in [Reference
temperature (p.23)] will be output.
If <b>PV</b> (Measurement value) is selected, the Measurement value will be output.

If Transmission output 1 high limit and low limit are set to the same value, Transmission output 1 will be fixed at 4 mA DC.

The same applies to Transmission output 2.

Resolution	12000
Current	4 to 20 mA DC (Load resistance: Max 550 Ω)
Output accuracy	Within ±0.3% of Transmission output span

# 9. Specifications 9.1 Standard Specifications

Rating

Rating Rated Scale	FEB-102-ECH					
	Input			Scale Range	Resolution	
				0.00 to 20.00 mS/cm	0.01 mS/cm	
				0.0 to 200.0 mS/cm	0.1 mS/cm	
			Cell constant 1.0/cm	0.0 to 500.0 mS/cm	0.1 mS/cm	
				0 to 500 mS/cm	1 mS/cm	
				0.000 to 2.000 S/m	0.001 S/m	
				0.00 to 20.00 S/m	0.01 S/m	
				0.00 to 50.00 S/m	0.01 S/m	
				0.0 to 50.0 S/m	0.1 S/m	
				0 to 2000 mS/m	1 mS/m	
				0.0 to 20.0 g/L	0.1 g/L	
		Con-		0 to 200 g/L	1 g/L	
		ductivity		0 to 500 g/L	1 g/L	
				0.0 to 200.0 mS/cm	0.1 mS/cm	
				0.0 to 500.0 mS/cm	0.1 mS/cm	
				0 to 2000 mS/cm	1 mS/cm	
			Cell	0.00 to 20.00 S/m	0.01 S/m	
			constant	0.00 to 50.00 S/m	0.01 S/m	
			10.0/cm	0.0 to 200.0 S/m	0.1 S/m	
				0 to 200 g/L	1 g/L	
				0 to 500 g/L	1 g/L	
				0 to 2000 g/L	1 g/L	
		Seawater salinity		0.00 to 4.00 %	0.01 %	
		NaCl salinity		0.00 to 20.00 %	0.01 %	
	Temperature	rature Pt100				
	Compensation (*)			0.0 to 100.0 °C	0.1 ℃	
	(*) Temperature compensation: Decimal point place is selectable					
	FEB-102-ECM					
	Input Cell Constant		Scale Range	Resolution		
		Con-	0.01/cm	0.00 to 20.00 \( \mu \text{S/cm} \)	0.01 µS/cm	
			0.1/cm	0.0 to 200.0	0.1 <i>μ</i> S/cm	
			1.0/cm	0 to 2000	0.1 <i>μ</i> S/cm	
			0.01/cm	0.000 to 2.000 mS/m	0.001 mS/m	
			0.1/cm	0.00 to 20.00 mS/m	0.01 mS/m	
		ductivity	1.0/cm	0.0 to 200.0 mS/m	0.1 mS/m	
			0.01/cm	0.0 to 20.0 mg/L	0.1 mg/L	
			0.1/cm	0 to 200 mg/L	1 mg/L	
			1.0/cm	0 to 2000 mg/L	1 mg/L	
	Temperature	Pt100		0.0 to 100.0 %	0.1 °C	
	Compensation (*) Pt1000 0.0 to 100.0 °C 0.1 °C					
	(*) Temperature compensation: Decimal point place is selectable					
Input	FEB-102-ECI	EB-102-ECH				
	4-electrode conductivity sensor (Temperature element: Pt100 or Pt1000)					
	FEB-102-ECM					
	2-electrode conductivity sensor (Temperature element: Pt100 or Pt1000)					
Supply Voltage	100 to 240 V AC 50/60Hz					
	1			85 to 264 V AC		

## **General Structure**

External Dimensions	239.5 x 190 x 75 mm(W x H x D)			
Mounting	Wall mounted			
Case	Material: Poly	carbonat	e, Color: Metallic gray	
Panel	Membrane sh	eet		
Drip-proof/Dust-proof	IP65			
Indication Structure	LCD Display			
	Conductivity D	Display	Indicates conductivity.	
			Indicates the setting item or calibration item in	
			setting mode or calibration mode.	
	Temperature		Indicates temperature.	
	Display		Indicates the set value or calibration value in	
			setting mode or calibration mode.	
	Model display	i	Indicates the model.	
	Action	EV1	Indicated when EVT1 output (Contact output 1) is ON.	
	indicator	EV2	Indicated when EVT2 output (Contact output 2) is ON.	
		EV3	Indicated when EVT3 output (Contact output 3) is ON.	
			(When EVT3 or EVT4 option is ordered)	
		EV4	Indicated when EVT4 output (Contact output 4) is ON.	
	- · ·		(When EVT4 option is ordered)	
	T/R Indicated while in Serial communication TX out		Indicated while in Serial communication TX output	
	(transmitting) (When C5 option is ordered)			
Setting Structure	Setting method: Input system using membrane sheet key			

#### **Indication Performance**

indication Periormance		
Repeatability	FEB-102-ECH	
	Conductivity:	±0.5% of Measurement span
	Salinity:	±1% of Measurement span
	TDS conversion:	±1.5% of Measurement span
	FEB-102-ECM	
	Conductivity:	±0.5% of Measurement span
	TDS conversion:	±1.5% of Measurement span
Linearity	FEB-102-ECH	
	Conductivity:	±0.5% of Measurement span
	Salinity:	±1% of Measurement span
	TDS conversion:	±1.5% of Measurement span
	FEB-102-ECM	
	Conductivity:	±0.5% of Measurement span
	TDS conversion:	±1.5% of Measurement span
Temperature Indication	±1°C	
Accuracy		
Input Sampling Period	250 ms (2 inputs)	
Time Accuracy	Within ±1% of sett	ing time

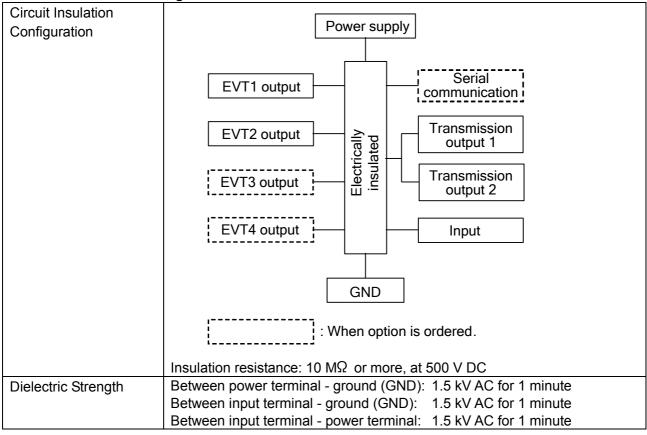
## **Standard Functions**

Standard Functions	
Conductivity Calibration	Perform Conductivity Zero adjustment first, followed by Span adjustment. If LOCK1 (Lock 1), LOCK2 (Lock 2) or LOCK3 (Lock 3) is selected in [Set value lock (p.49)], the unit cannot enter Conductivity Calibration Mode. In Conductivity Zero adjustment, adjustment is performed so that conductivity becomes 0, without immersing the 4-electrode/2-electrode conductivity sensor in the standard solution. In Conductivity Span adjustment, the 4-electrode/2-electrode conductivity sensor is immersed and adjustment is performed while checking conductivity. However, it is effective within the measurement range regardless of the adjustment value.
Temperature Calibration	When a sensor cannot be set at the exact location where measurement is desired, the resulting measured temperature may deviate from the temperature in the desired location. In this case, the desired temperature can be set for the desired location by setting a temperature calibration value. However, it is effective within the input rated range regardless of the temperature calibration value.
TDS Conversion	TDS stands for Total Dissolved Solids. Conductivity of a solution results from the amount of salt, minerals or dissolved gas. Conductivity is an index indicating total amount of substance in a solution, and TDS indicates only the amount of all dissolved solid substances. TDS can be used correctly to compare the two solutions in which one ingredient, such as NaCl, is included. However, for comparison between a solution in which one ingredient such as NaCl is included and the other solution in which more than one ingredient is included, TDS error will occur.
	TDS and conductivity are expressed with the following formula.  FEB-102-ECH:  For Conductivity of SI unit (S/m):  TDS (g/L) = L (S/m) × K × 10  TDS (g/L) = L (mS/m) × K/100  For Conductivity of older unit (mS/cm):  TDS (g/L) = L (mS/cm) × K  K: TDS conversion factor  L: Conductivity
	FEB-102-ECM: For Conductivity of SI unit (mS/m): TDS (mg/L) = L (mS/m) $\times$ K $\times$ 10 For Conductivity of older unit ( $\mu$ S/cm): TDS (mg/L) = L ( $\mu$ S/cm) $\times$ K K: TDS conversion factor L: Conductivity

E'	√T□ output				
	Setting accuracy	Same as Indication Accuracy			
	Output action	P control: When proportional band is set to any value, except 0 (zero).			
		ON/OFF control: When proportional band is set to 0 (zero).			
		EVT□ proportional band		Conductivity	0 to Measurement span (*1)
				input	
				Temperature	0.0 to 100.0°C (*2)
				input	
		EVT□ propor	tional cycle	1 to 300 seconds	
		EVT□ ON sid	le,	Conductivity	0 to 20% of Measurement
		EVT□ OFF s	ide	input	range high limit (*1)
				Temperature	0.0 to 10.0°C (*2)
				input	
		Output high lir	nit, low limit	0 to 100 %	
				point place follow	the Measurement range.
		(*2) The placem	ent of the decimal p	oint does not follo	w the selection. It is fixed.
	Туре		oe selected from	the following w	ith the keypad.
		No action			
			y input low limit a		
			y input high limit e input low limit a		
			e input low limit a		
		Error outpu	. •	action	
		Fail output			
		<ul> <li>Conductivit</li> </ul>	y input error alar	m output	
	Output	Relay contact	1a		
		Control	3A 250 V AC (R	esistive load)	
		capacity	1A 250 V AC (Ir	ductive load co	os <i>Ф</i> =0.4)
		Electrical life	100,000 cycles		
	EVT☐ ON delay time	0 to 10000 sed	conds		
	EVT□ OFF delay time	0 to 10000 sed			
	Output ON time/	•		•	output can be turned
	OFF time when	ON/OFF in a c	onfigured cycle	when EVT outp	ut is ON.
	EVT output ON	16 1	. 5.7		
	ycle Automatic ariable Function				red value enters EVT□ cycle
V	anable Function		ith the deviation.	iai cycle wiii t	be automatically extended in
				will he extende	d, and ON / OFF ratio will be
		•			led time is set to 0 (zero)
		_	function will be d		icu time is set to o (zero)
C	onductivity input error	Detects actua		ізаріса.	
	arm			r alarm time ha	is elapsed, and if conductivity
a.	um		• •		ity input error alarm span, the
		· -	_		
	unit assumes that actuator trouble has occurred, and writes Status flag In Serial communication, status can be read by reading Status fla				
(EVT1, EVT2, EVT3, EVT4 output flags).			ad by reading clates hag 2		
	` <u>i-</u>			(Conductivity input arran	
EVT1 output is turned ON when <b>EEUL</b> (Conductivity input en					
	alarm output) is selected in [EVT1 type (p. 25)].			)J-	
	The same applies to EVT2, EVT3 and EVT4.				
		_	•		e following cases.
		•	•		nperature Calibration Mode
		When Conductivity input error alarm time is set to 0 seconds (minutes),			
		or Conductiv	ity input error ala	rm span is set t	o 0.00.

Transmission Output	Converting conduc	ctivity, temperature or MV to analog signal every input			
1, 2	sampling period, and outputs the value in current.				
,, <u>~</u>	If <b>OFF</b> (No temperature compensation) is selected in [Temperature				
	compensation method (p.23)], and if <b>TEMP</b> (Temperature transmission)				
	is selected in [Transmission output 1 type (p.46)], transmission output 1				
	value differs depending on the selection in [Temperature Display when no				
	temperature compensation (p.49)].				
	If <b>OFF</b> (Unl	it) or <b>STD</b> (Reference temperature) is selected, the			
	1	sed on the value set in [Reference temperature (p.23)].			
		asurement value) is selected, the unit operates based			
	on the measurer	ment value.			
	If Transmission ou	tput 1 high limit and low limit are set to the same value,			
	Transmission output 1 will be fixed at 4 mA DC.				
	The same applies	to Transmission output 2.			
	Resolution 12000				
	Current 4 to 20 mA DC (Load resistance: Max 550 $\Omega$ )				
	Output accuracy	Within ±0.3% of Transmission output span			
Transmission output	For Transmission output 1 and 2, fine adjustment of Transmission output				
adjustment	can be performed via Transmission output Zero and Span adjustment.				
Transmission output	For Transmission output 1 and 2, Transmission output status when				
status when	calibrating conductivity can be selected.				
calibrating	Last value HOLD Retains and outputs the last value before conductivity				
	calibration.				
	Set value HOLD	Outputs the value set in [Transmission output 1, 2 Set			
		value HOLD].			
	Measurement	Outputs the measurement value when calibrating			
	value	conductivity.			

Insulation/Dielectric Strength



#### **Attached Functions**

Attached Functions						
Set Value Lock	Lock 1: None of the set values can be changed.  Lock 2: Only EVT1, EVT2, EVT3, EVT4 values can be changed.  Lock 3: All set values – except Sensor cell constant, Measurement unit,  Measurement range, RTD type, Conductivity Zero adjustment  value, Conductivity Span adjustment value, Temperature  calibration value, Transmission output 1 Zero adjustment value,  Transmission output 1 Span adjustment value, Transmission output  2 Zero adjustment value, Transmission output 2 Span adjustment  value – can be temporarily changed.  However, they revert to their previous value after the power is  turned off because they are not saved in the non-volatile IC memory.					
Conductivity Input		uctivity sensor may deviate from the				
Sensor Correction	conductivity in the measured location. be obtained by adding a sensor correct	In this case, desired conductivity can ction value.				
	However, it is effective within the m	easurement range regardless of the				
	sensor correction value.					
Outside Measurement	FEB-102-ECH					
Range	• When Conductivity measured value,	Salinity or TDS conversion factor				
	is outside the measurement range, ir					
	Conductivity Display	Temperature Display				
	Conductivity high limit, Salinity high	Temperature measured value				
	limit or TDS conversion high limit is	·				
	flashing.					
	When temperature measured value is outside the measurement range, indicates the following.					
	Conductivity Display	Temperature Display				
	Conductivity measured value	Exceeding 110.0°C: ERRØ3				
	Conductivity measured value	Less than 0.0℃: <b>ERRØ</b> 4				
	FEB-102-ECM • When Conductivity measured value or TDS conversion factor is outside the measurement range, indicates the following.					
	Conductivity Display	Temperature Display				
	Conductivity or TDS conversion high limit is flashing.	Temperature measured value				
	When temperature measured value is outside the measurement range					
		Conductivity Display Temperature Display				
	Conductivity Display Conductivity measured value	Exceeding 110.0℃: <b>ERR03</b>				
Power Failure Countermeasure	Conductivity measured value	Exceeding 110.0°C: <b>ERR03</b> Less than 0.0°C: <b>ERR04</b> on-volatile IC memory.				

Warm-up Indication	For approx. 4 seconds after the power switch is turned ON, the input types are indicated in the Conductivity Display and Temperature Display. FEB-102-ECH:		
	Conductivity Display	Item Selected in [Measurement Unit (p.20)]	Temperature Display
	CONV	Conductivity (mS/cm)	PT100
	SI	Conductivity (S/m, mS/m)	or
	SEA	Seawater salinity (%)	PT1000
	SALT	NaCl salinity (%)	
	TDS	TDS conversion factor (g/L)	
	FEB-102-ECM:		
	Conductivity Display	Item Selected in [Measurement Unit (p.20)]	Temperature Display
	CONV	Conductivity (µS/cm)	PT100
	SI	Conductivity (mS/m)	or
	TDS	TDS conversion factor (mg/L)	PT1000
Display Selection	Selects items to be indicated in the Conductivity Display and Temperature Display.  Input value (Conductivity, temperature)  Conductivity  Temperature		
Temperature Display	`	lo temperature compensation) is sele	
when No Temperature		pensation method (p.23)], selects an	item to be
Compensation	indicated in the Ter		
	Unlit: Temperatur     Deference temperatur	e Display is unlit. erature: Indicates the value set in [Re	forance tomperature
	• Reference tempe	(p.23)].	elerence temperature
	• Measurement value: Indicates the measurement value in the Temperature		
		Display.	·
Cable Length		e type) is selected in [Pt100 input wi	
Correction		o long, temperature measurement e	
		This can be corrected by setting	g the Cable length
	correction value ar	nd Cable cross-section area.	

## **Error Code**

Error Code	For temperature sensor error or outside temperature compensation range during measurement or calibration, their corresponding error codes flash in the Temperature Display.				
	Error Code	Error Error Description			
	ERRØ1	Fail	Temperature sensor lead wire is burnt out.		
	ERRØ2	Fail	Temperature sensor lead wire is short-circuited.		
	ERRØ3	Error	Outside Temperature Compensation Range	Measured temperature has exceeded 110.0℃.	
	ERRØ4	Error	Outside Temperature Compensation Range	Measured temperature is less than 0.0°C.	

## Other

Power Consumption	Approx. 10 VA		
Ambient Temperature	-20 to 50°C (Indication accuracy is applicable to 0 to 50°C range only.		
	Direct sunlight must be avoided.)		
Ambient Humidity	35 to 95 %RH (non-condensing)		
Weight	Approx. 950 g		
Environmental	RoHS directive compliant		
Specification			

## 9.2 Optional Specifications

## **Serial Communication (Option code: C5)**

Serial Communication (				<del></del>	
Serial Communication	The following operations can be carried out from an external computer.			external computer.	
	· ,	•	various set values		
	` '			y, salinity, temperature or its status	
	(3) Function change and adjustment				
	(4) Reading and setting of user save area				
Cable Langth	1.2 km (Max), Cable resistance value: Within 50 $\Omega$ (Terminators are not			(Terminators are not	
Cable Length	necessary, but if	used, use	120 $\Omega$ or more on one s	ide.)	
Communication	EIA DO 405				
Line	EIA RS-485				
Communication	Lief division comm				
Method	Half-duplex comr	nunication			
Communication	0600 10200 204	100 hna (C	alastable by kayrad		
Speed	9600, 19200, 364	ioo phs (Se	electable by keypad)		
Synchronization	Start aton aynahr	onization			
Method	Start-stop synchronization				
Code Form	ASCII, binary				
Communication	Chiples protocol Modbus ACOII Modbus DTI (Colootable bullioned)				
Protocol	Shinko protocol, Modbus ASCII, Modbus RTU (Selectable by keypad)				
Data Dit/Darity	8-bits/No parity, 7	'-bits/No pa	arity, 8-bits/Even, 7-bits/E	Even, 8-bits/Odd,	
Data Bit/Parity	7-bits/Odd (Selec	table by ke	eypad)		
Stop Bit	1 bit , 2 bits (Sele	ctable by k	(eypad)		
Error Correction	Command reques				
	Parity check, Che		<b>,</b>		
Error Detection	LRC (Modbus pro	•	• ,		
	CRC-16 (Modbus		•		
Data Format	Communication	Shinko	,		
	Protocol	Protocol	Modbus ASCII	Modbus RTU	
	Start bit	1 bit	1 bit	1 bit	
	Data bit	7 bits	7 bits	8 bits	
	7 510		Even (No parity, Odd)	No parity (Even, Odd)	
	Parity	Even	Selectable	Selectable	
			1 bit (2 bits)	1 bit (2 bits)	
	I Stop hit I 1 hit I	Selectable	Selectable		
			Selectable	Selectable	

## EVT3, EVT4 Outputs (Contact outputs 3, 4) (Option Code: EVT3 or EVT4)

	1
EVT3, EVT4 Outputs	Same as EVT□ output (p.64)
(Contact outputs 3, 4)	

# 10. Troubleshooting

If any malfunction occurs, refer to the following items after checking that power switch of the FEB-102-EC $\square$  is turned ON.

## 10.1 Indication

Problem	Possible Cause	Solution
Indication of the	Electrode sensor terminal	Tighten the screws securely.
Conductivity Display or	screws have become loose.	
Temperature Display is	Electrical insulation of electrode	Clean the terminals with alcohol,
unstable or irregular.	sensor terminals is deteriorating.	and dry completely.
	The electrode is not clean.	Rinse the electrode.
	Air bubbles are attached to the	Make sure there are no bubbles
	electrode.	in the measurement solution.
	The electrode has not been	Install the electrode in the
	placed in the measurement	measurement solution,
	solution.	maintaining a consistent volume.
	There may be equipment that	Keep FEB-102-EC□ clear of any
	interferes with or makes noise near the FEB-102-EC□.	potentially disruptive equipment.
	Conductivity calibration and	Perform conductivity calibration
	temperature calibration may not	and temperature calibration.
	have finished.	and temperature earlieren.
	RTD type might not be selected	Select a correct RTD type.
	correctly.	7.
	Temperature compensation	Select a correct temperature
	method may not be selected	compensation method.
	correctly.	
	Specification of conductivity	Replace the sensor with a
	sensor may not be suitable.	suitable specification.
Temperature Display is	<b>OFF</b> (unlit) is selected in	Select <b>STD</b> (Reference
unlit.	[Temperature Display when no	temperature) or <b>PV</b>
	temperature compensation (p.49)].	(Measurement value).
[ <b>ERR01</b> □] is flashing in	Temperature sensor lead wire is	Replace the conductivity sensor.
Temperature Display.	burnt out.	
[ <b>ERR02</b> ] is flashing in	Temperature sensor lead wire is	Replace the conductivity sensor.
Temperature Display.	short-circuited.	
[ <b>ERR03</b> ] is flashing in	Measured temperature has	Check the measurement location
Temperature Display.	exceeded 110.0℃.	environment.
[ <b>ERR04</b> □] is flashing in	Measured temperature is less	Check the measurement location
Temperature Display.	than 0.0℃.	environment.
[ERR1 ] is indicating in	Internal memory is defective.	Contact our agency or us.
Conductivity Display.		

10.2 Key Operation

Problem	Possible Cause	Solution
None of the set values can	<b>L0CK1</b> ☐ (Lock 1) is selected in	Select (Unlock).
be changed.	[Set value lock (p.49)].	
• The values do not change		
by the $\triangle$ , $\nabla$ keys.		
• Only EVT1, EVT2, EVT3,	<b>LOCK2</b> (Lock 2) is selected in	Select (Unlock).
EVT4 values can be set.	[Set value lock (p.49)].	
Other settings are not		
possible.		
• The values do not change		
by the $\triangle$ , $\nabla$ keys.		
Unable to enter	LOCK1 (Lock 1), LOCK2	Select (Unlock).
Conductivity Calibration	(Lock 2) or <b>LOCK3</b> (Lock 3) has	
Mode.	been selected in [Set value lock	
	(p.49)].	
Unable to enter	<b>0FF</b> (No temperature	Select any other item except
Temperature Calibration	compensation) is selected in	<b>0FF</b> (No temperature
Mode.	[Temperature compensation	compensation).
	method (p.23)].	
	LOCK1 (Lock 1), LOCK2	Select (Unlock).
	(Lock 2) or <b>LOCK3</b> (Lock 3) has	
	been selected in [Set value lock	
	(p.49)].	

# 11. Character Tables

The following shows our character tables. Use the data column for reference. Depending on the model and settings, different items are available.

11.1 Setting Groups

Character	Setting Group	
G_EC	Conductivity input group	
G_TMP	Temperature input group	
G_E01	EVT1 Group	
G_E02	EVT2 Group	
G_E03	EVT3 Group	
G_E04	EVT4 Group	
G_COM	Communication Group	
G_TRA	Transmission Output Group	
G_OTH	Special Function Group	

#### 11.2 Temperature Calibration Mode

Character	Setting Item, Setting Range	Factory Default	Data
<b>SO</b> (*)	Temperature calibration value	0.0℃	
0.0	-10.0 to 10.0℃		

<sup>(\*)</sup> **SO** and temperature are displayed alternately.

## 11.3 Conductivity Calibration Mode

Character	Setting Item, Setting Range	Factory Default	Data
ADJZ (*1)	Conductivity Zero adjustment	0.00	
0.00	value		
	Refer to (Tables 11.3-1, 11.3-2, 11.3-3).		
<b>ADJS</b> (*2)	Temperature Span adjustment	1.000	
1.000	value		
	0.700 to 1.300		

<sup>(\*1)</sup> **ADJZ** and conductivity are displayed alternately.

#### FEB-102-ECH:

## (Table 11.3-1)

Measurement Range		Conductivity Zero Adjustment Value Setting Range
	0.00 to 20.00 mS/cm	-2.00 to 2.00
	0.0 to 200.0 mS/cm	-20.0 to 20.0
	0.0 to 500.0 mS/cm	-50.0 to 50.0
	0 to 500 mS/cm	-50 to 50
	0.000 to 2.000 S/m	-0.200 to 0.200
Cell constant	0.00 to 20.00 S/m	-2.00 to 2.00
1.0/cm	0.00 to 50.00 S/m	-5.00 to 5.00
	0.0 to 50.0 S/m	-5.0 to 5.0
	0 to 2000 mS/m	-200 to 200
	0.0 to 20.0 g/L	-2.0 to 2.0
	0 to 200 g/L	-20 to 20
	0 to 500 g/L	-50 to 50

<sup>(\*2)</sup> **ADJS** and conductivity are displayed alternately.

(Table 11.3-2)

Measurement Range		Conductivity Zero Adjustment Value Setting Range
	0.0 to 200.0 mS/cm	-20.0 to 20.0
	0.0 to 500.0 mS/cm	-50.0 to 50.0
	0 to 2000 mS/cm	-200 to 200
Call assistant	0.00 to 20.00 S/m	-2.00 to 2.00
Cell constant 10.0/cm	0.00 to 50.00 S/m	-5.00 to 5.00
	0.0 to 200.0 S/m	-20.0 to 20.0
	0 to 200 g/L	-20 to 20
	0 to 500 g/L	-50 to 50
	0 to 2000 g/L	-200 to 200
Seawater salinity 0.00 to 4.00%		-0.40 to 0.40
NaCl salinity 0.00 to 20.00%		-2.00 to 2.00

## FEB-102-ECM:

## (Table 11.3-3)

Cell Constant	Measurement Range	Conductivity Zero Adjustment Value Setting Range
0.01/cm	0.00 to 20.00 µS/cm	-2.00 to 2.00
0.1/cm	0.0 to 200.0	-20.0 to 20.0
1.0/cm	0 to 2000	-200 to 200
0.01/cm	0.000 to 2.000 mS/m	-0.200 to 0.200
0.1/cm	0.00 to 20.00 mS/m	-2.00 to 2.00
1.0/cm	0.0 to 200.0 mS/m	-20.0 to 20.0
0.01/cm	0.0 to 20.0 mg/L	-2.0 to 2.0
0.1/cm	0 to 200 mg/L	-20 to 20
1.0/cm	0 to 2000 mg/L	-200 to 200

## 11.4 Transmission Output 1 Adjustment Mode

Character	Setting Item, Setting Range	Factory Default	Data
AJZ1	Transmission output 1	0.00%	
0.00	Zero adjustment value		
	±5.00% of Transmission output span		
AJS1	Transmission output 1	0.00%	
0.00	Span adjustment value		
	±5.00% of Transmission output span		

## 11.5 Transmission Output 2 Adjustment Mode

Character	Setting Item, Setting Range	Factory Default	Data
AJZ2	Transmission output 2	0.00%	
0.00	Zero adjustment value		
	±5.00% of Transmission output span		
AJS2	Transmission output 2	0.00%	
0.00	Span adjustment value		
	±5.00% of Transmission output span		

# 11.6 Simple Setting Mode

Character	Setting Item, Setting Range	Factory Default	Data
ESV1	EVT1 value	Conductivity input: Measurement	
0.00		range low limit	
		Temperature input: 0.0°C	
	Conductivity input: Measurement	•	
	range high limi	t	
	Temperature input: 0.0 to 100.0℃		
ESV2	EVT2 value	Conductivity input: Measurement	
0.00		range low limit	
		Temperature input: 0.0℃	
	Conductivity input: Measurement	range low limit to Measurement	
	range high limi	t	
	Temperature input: 0.0 to 100.0℃		
ESV3	EVT3 value	Conductivity input: Measurement	
0.00		range low limit	
		Temperature input: 0.0°C	
	Conductivity input: Measurement	range low limit to Measurement	
	range high limi	t	
	Temperature input: 0.0 to 100.0℃		
ESV4	EVT4 value	Conductivity input: Measurement	
0.00		range low limit	
		Temperature input: 0.0°C	
	Conductivity input: Measurement		
	range high limi	t	
	Temperature input: 0.0 to 100.0℃		

11.7 Conductivity Input Group

Character	Setting Item, Setting Range	Factory Default	Data
CELL	Sensor cell constant	FEB-102-ECH: 1.0/cm	
1.0		FEB-102-ECM: 0.01/cm	
	FEB-102-ECH:		
	<b>1.0</b> : 1.0/cm		
	<b>10.0</b> : 10.0/cm		
	FEB-102-ECM:		
	<b>0.01</b> : 0.01/cm		
	<b>3.1</b> : 0.1/cm		
COFF	<b>1.0</b> : 1.0/cm	1,000	
COEF	Cell constant correction value	1.000	
1.000	0.001 to 5.000		
UNIT	Measurement unit	FEB-102-ECH : Conductivity (mS/cm)	
CONV	FED 400 FOLL	FEB-102-ECM: Conductivity ( $\mu$ S/cm)	
	FEB-102-ECH:		
	CONV : Conductivity (mS		
	SI : Conductivity (S/n	•	
	<b>SEA</b> □□□ : Seawater salinity <b>SALT</b> □□ : NaCl salinity (%)	·	
	TDS : TDS conversion		
	FEB-102-ECM:		
	<b>CONV</b> □□ : Conductivity (µS		
	<b>SI</b> : Conductivity (mS		
	TDS : TDS conversion	(mg/L)	

Character	Setting Item, Settin	g Range	Factory Default	Data
MRNG	Measurement range	FEB-102-E0	CH : 0.00 to 20.00 mS/cm	

FEB-102-ECM : 0.00 to 20.00  $\mu$ S/cm (Fixed)

20.00

#### FEB-102-ECH:

Selection items differ depending on the Sensor cell constant and Measurement unit.

#### When Sensor cell constant 1.0/cm is selected:

Measurement Unit	Selection Item	Measurement Range
	20.00	0.00 to 20.00 mS/cm
Conductivity (mS/cm)	200.0	0.0 to 200.0 mS/cm
Conductivity (mo/cm)	500.0	0.0 to 500.0 mS/cm
	500	0 to 500 mS/cm
	2.000	0.000 to 2.000 S/m
	20.00	0.00 to 20.00 S/m
Conductivity (S/m)	50.00	0.00 to 50.00 S/m
	50.0	0.0 to 50.0 S/m
	2000	0 to 2000 mS/m
	20.0	0.0 to 20.0 g/L
TDS conversion (g/L)	200	0 to 200 g/L
	500	0 to 500 g/L
Seawater salinity (%)	4.00	0.00 to 4.00 %
NaCl salinity (%)	20.00	0.00 to 20.00 %

#### When Sensor cell constant 10.0/cm is selected:

Measurement Unit	Selection Item	Measurement Range
	200.0	0.0 to 200.0 mS/cm
Conductivity (mS/cm)	500.0	0.0 to 500.0 mS/cm
	2000	0 to 2000 mS/cm
	20.00	0.00 to 20.00 S/m
Conductivity (S/m)	50.00	0.00 to 50.00 S/m
	200.0	0.0 to 200.0 S/m
	200	0 to 200 g/L
TDS conversion (g/L)	500	0 to 500 g/L
	2000	0 to 2000 g/L
Seawater salinity (%)	4.00	0.00 to 4.00 %
NaCl salinity (%)	20.00	0.00 to 20.00 %

#### FEB-102-ECM:

Measurement range will be fixed by selecting the Sensor cell constant and Measurement unit.

Measurement Unit	Sensor cell constant	Item	Measurement Range
Conductivity	0.01/cm	20.00	0.00 to 20.00 µS/cm
Conductivity (µS/cm)	0.1/cm	200.0	0.0 to 200.0 <i>µ</i> S/cm
(M3/CIII)	1.0/cm	2000	0 to 2000 \( \mu \text{S/cm} \)
Conductivity	0.01/cm	2.000	0.000 to 2.000 mS/m
(mS/m)	0.1/cm	20.00	0.00 to 20.00 mS/m
(1113/111)	1.0/cm	200.0	0.0 to 200.0 mS/m
TDS	0.01/cm	20.0	0.0 to 20.0 mg/L
conversion	0.1/cm	200	0 to 200 mg/L
(mg/L)	1.0/cm	2000	0 to 2000 mg/L

Character	Setting Item, Setting Range	Factory Default	Data
TDSK	TDS conversion factor	0.50	
0.50	0.30 to 1.00		
FIT1	Conductivity input filter time constant	0.0 sec.	
0.0	0.0 to 10.0 seconds		
ESO.	Conductivity input sensor correction	0.00	
0.00	±10% or Measurement span		

11.8 Temperature Input Group

_	Input Group		
Character	Setting Item, Setting Range	Factory Default	Data
SENS	RTD type	Pt100	
PT100	<b>PT100</b> □ : Pt100		
	<b>PT1000</b> : Pt1000		
TCM	Temperature compensation	FEB-102-ECH: NaCl	
NACL	method	FEB-102-ECM: NaCl	
	FEB-102-ECH:		
		ation is conducted using temperature	
	characteristics of NaC		
		ingredient of salt included in a	
	sample is NaCl. <b>TC0E</b> : Temperature compens	ation is conducted using	
	·	ation is conducted using nt (%/℃) and randomly selected	
	reference temperature	` '	
	<b>OFF</b> : No temperature compe		
	FEB-102-ECM:		
		ation is conducted using temperature	
	characteristics of NaC		
	sample is NaCl.	ingredient of salt included in a	
	· ·	ation is conducted using	
	·	ation is conducted using nt (%/℃) and randomly selected	
	reference temperature		
	PURE : Temperature compens		
	temperature characte		
	<b>OFF</b> : No temperature compe		
KC0E	Temperature coefficient	2.00 %/°C	
2.00	-5.00 to 5.00 %/℃		
STND	Reference temperature	25.0℃	
25.0	5.0 to 95.0℃		
DP2	Decimal point place	1 digit after decimal point	
0.0	□□□□ <b>□</b> : No decimal point	J : : : : : : : : : : : : : : : : : : :	
	<b>B.9</b> : 1 digit after decimal po	oint	
CNECT	Pt100 input wire type	3-wire type	
3WIRE	<b>2WIRE</b> : 2-wire type	2 762	
	<b>3⊌IRE</b> □ : 3-wire type		
CABLE	Cable length correction	0.0 m	
0.0	0.0 to 100.0 m	5.5	
CSEC	Cable cross-section area	0.30 mm <sup>2</sup>	
0.30	0.10 to 2.00 mm <sup>2</sup>	0.00 111111	
	Temperature input filter time		
FIT2	constant	0.0 sec.	
0.0	0.0 to 10.0 seconds		
	3.0 to 10.0 00001100		

# 11.9 EVT1 Group

Character	Setting Item, Sett	ing Pange	Factory Default	Data
EVT1F	EVT1 type	ing Kange	No action	Dala
	: No action	n .	NO action	
		tivity input low	limit action	
	EC_H : Conduc			
	TEMPL : Temper	, , ,		
	· ·	ature input higl		
	EROUT : Error ou	ıtput		
	FAIL : Fail out	out		
	<b>EEUL</b> : Conduc	tivity input erro	or alarm output	
ESV1	EVT1 value	Conductivity	input: Measurement range low limit	
0.00		Temperature	input: 0.0℃	
	Conductivity input:		-	
			range high limit	
	Temperature input:			
EP1	EVT1 proportional		input: Measurement range low limit	
0.00	band	Temperature	•	
	Conductivity input:		nent span	
FIDOT	Temperature input:	<u>ປ.0 to 100.0℃</u>		
EIRST	EVT1 reset		Conductivity input: 0	
0.00		1.400/ 5.84	Temperature input: 0.0℃	
	Conductivity input:		surement span	
EIDIE	Temperature input:		Deference value	
EIDIF	EVT1 hysteresis typ		Reference value	
SDIF	CDIF : Medium			
E1DF0	EVT1 ON side	ce value	Conductivity input: 0.01	
0.10	LVII ON SIDE		Temperature input: 1.0°C	
	Conductivity input:	0 to 20% of Me	easurement range high limit	
	Temperature input:		sasarement range mgm mm	
E1DFU	EVT1 OFF side		Conductivity input: 0.01	
0.10			Temperature input: 1.0℃	
	Conductivity input:	0 to 20% of Me	easurement range high limit	
	Temperature input:			
E10NT	EVT1 ON delay time		0 sec.	
	0 to 10000 seconds	3		
E10FT	EVT1 OFF delay time	9	0 sec.	
2	0 to 10000 seconds			
E1C.	EVT1 proportional c	ycle	30 sec.	
30	1 to 300 seconds			
E10LH	EVT1 output high lin	nit	100%	
100	EVT1 output low lin	nit to 100%		
E10LL	EVT1 output low lim	it	0%	
	0% to EVT1 output	high limit		
OONT1	Output ON time whe	n EVT1	0.500	
OONTI	output ON 0 sec.			
	0 to 10000 seconds	3		
00FT1	Output OFF time wh	en EVT1	0 sec.	
00111	output ON		0 300.	
	0 to 10000 seconds	3		

Character	Setting Item, Setting Range	Factory Default	Data
E1CS	EVT1 conductivity input error alarm	No action	
	EVT□ type		
	: No action		
	<b>EVT2</b> : EVT2 type		
	<b>EVT3</b> : EVT3 type		
	EVT4 : EVT4 type		
E1E0	EVT1 conductivity input error alarm	Measurement range low limit	
0.00	span when EVT□ output ON		
	Measurement range low limit to Meas	urement range high limit	
E1E0T	EVT1 conductivity input error alarm	0 sec.	
2	time when EVT□ output ON		
	0 to 10000 seconds or minutes		
E1EC	EVT1 conductivity input error alarm	Measurement range low limit	
0.00	span when EVT⊡ output OFF		
	Measurement range low limit to Meas	urement range high limit	
E1ECT	EVT1 conductivity input error alarm	0 sec.	
2	time when EVT□ output OFF		
	0 to 10000 seconds or minutes		
MVZN1	EVT1 cycle variable range	50.0%	
50.0	1.0 to 100.0%		
CENT1	EVT1 cycle extended time	0 sec.	
	0 to 300 seconds		

## **11.10 EVT2 Group**

Character	Setting Item, Se	tting Range	Factory Default	Data
EVT2F	EVT2 type	tung runge	No action	Duta
	: No action			
		tivity input low limit	action	
		tivity input high lim		
	TEMPL : Tempera			
	<u> </u>	ature input high lim		
	EROUT : Error ou			
	FAIL : Fail out	out		
	<b>EEUL</b> : Conduc	tivity input error ala	arm output	
ESV2	EVT2 value	Conductivity inpu	t: Measurement range low limit	
0.00		Temperature inpu	ıt: 0.0℃	
	Conductivity input:	Measurement rang	e low limit to	
		Measurement rang	je high limit	
	Temperature input:	0.0 to 100.0°C		
EP2	EVT2 proportional	Conductivity inpu	t: Measurement range low limit	
0.00	band	Temperature inpu	ıt: 0.0℃	
	Conductivity input:	0 to Measurement	span	
	Temperature input:	0.0 to 100.0°C		
E2RST	EVT2 reset		Conductivity input: 0	
0.00			Temperature input: 0.0℃	
	Conductivity input: ±10% of Measurement span			
	Temperature input: ±100.0℃			
E2DIF	EVT2 hysteresis type Reference value			
SD IF	CD IF : Medium	value		
	SDIF : Referen	ce value		

Character	Setting Item, Setting Range	Factory Default	Data
E2DF0	EVT2 ON side	Conductivity input: 0.01	
0.10		Temperature input: 1.0°C	
	Conductivity input: 0 to 20% of Measu	rement range high limit	
	Temperature input: 0.0 to 10.0℃	,	
E2DFU	EVT2 OFF side	Conductivity input: 0.01	
0.10		Temperature input: 1.0℃	
	Conductivity input: 0 to 20% of Measu	rement range high limit	
FOOLIT	Temperature input: 0.0 to 10.0°C	I a	
E20NT	EVT2 ON delay time	0 sec.	
	0 to 10000 seconds	T a	
E20FT_	EVT2 OFF delay time	0 sec.	
	0 to 10000 seconds	Las	
E2C	EVT2 proportional cycle	30 sec.	
30	1 to 300 seconds		
E20LH	EVT2 output high limit	100%	
100	EVT2 output low limit to 100%	,	
E20LL	EVT2 output low limit	0%	
	0% to EVT2 output high limit	,	
00NT2	Output ON time when EVT2	0 sec.	
	output ON		
i i i i i i i i i i i i i i i i i i i	0 to 10000 seconds	T .	
00FT2	Output OFF time when EVT2	0 sec.	
	output ON		
FOOC	0 to 10000 seconds	I	
E2CS	EVT type	No action	
	EVT□ type EVT1□□ : EVT1 type		
	: No action		
	EVT3 : EVT3 type		
	<b>EVT4</b> : EVT4 type		
E2E0	EVT2 conductivity input error alarm	Measurement range low limit	
0.00	span when EVT□ output ON		
	Measurement range low limit to Meas	urement range high limit	
E2E0T	EVT2 conductivity input error alarm	0 sec.	
2	time when EVT⊡ output ON		
	0 to 10000 seconds or minutes		
E2EC	EVT2 conductivity input error alarm	Measurement range low limit	
0.00	span when EVT□ output OFF		
	Measurement range low limit to Meas	urement range high limit	
E2ECT	EVT2 conductivity input error alarm	0 sec.	
	time when EVT□ output OFF		
	0 to 10000 seconds or minutes	,	
MVZN2	EVT2 cycle variable range	50.0%	
50.0	1.0 to 100.0%		
CENT2	EVT2 cycle extended time	0 sec.	
	0 to 300 seconds		

# 11.11 EVT3 Group

Character	Setting Item, Se	etting Range	Factory Default	Data
EVT3F	EVT3 type		No action	
	: No action			
	EC_L : Conductivity input low limit action			
	<b>EC_H</b> : Conductivity input high limit action			
	<b>TEMPL</b> ☐: Temperature input low limit action <b>TEMPH</b> ☐: Temperature input high limit action			
			nit action	
	<b>EROUT</b> ☐: Error output <b>FAIL</b> ☐: Fail output			
	·	tivity input error ala	arm outout	
ESV3	EVT3 value		it: Measurement range low limit	
0.00		Temperature inpu	_	
	Conductivity input:	·		
	• •	Measurement rang		
	Temperature input:	0.0 to 100.0℃	· · · ·	
EP3	EVT3 proportional	Conductivity inpu	it: Measurement range low limit	
0.00	band	Temperature inpu	ut: 0.0℃	
	Conductivity input:		span	
	Temperature input:	0.0 to 100.0°C		
E3RST	EVT3 reset		Conductivity input: 0	
0.00			Temperature input: 0.0°C	
	Conductivity input:		ement span	
	Temperature input: ±100.0°C			
E3DIF	EVT3 hysteresis type  Reference value			
SDIF	CDIF : Medium value SDIF : Reference value			
E3DF0	EVT3 ON side	ice value	Conductivity input: 0.01	
0.10	LV10 ON Side		Temperature input: 1.0°C	
	Conductivity input: 0 to 20% of Measurement range high limit			
	Temperature input:			
E3DFU	EVT3 OFF side		Conductivity input: 0.01	
0.10			Temperature input: 1.0°C	
	Conductivity input: 0 to 20% of Measurement range high limit			
	Temperature input:			
E30NT_	EVT3 ON delay time		0 sec.	
	0 to 10000 seconds		T	
E30FT_	EVT3 OFF delay time		0 sec.	
	0 to 10000 seconds		T	
E3C	EVT3 proportional c	ycle	30 sec.	
30	1 to 300 seconds		Lucas	
E30LH	EVT3 output high lir		100%	
100	EVT3 output low lin		Lan	
E30LL	EVT3 output low lim		0%	
	0% to EVT3 output		T	
00NT3	Output ON time whe	en EVT3	0 sec.	
2	output ON			
	0 to 10000 seconds		T	
00FT3	Output OFF time wh output ON	en EVI3	0 sec.	
2	0 to 10000 seconds	•		
	U to rooto seconds	2		

Character	Setting Item, Setting Range	Factory Default	Data
E3CS	EVT3 conductivity input error alarm	No action	
	EVT⊡ type		
	<b>EVT1</b> : EVT1 type		
	<b>EVT2</b> : EVT2 type		
	: No action		
	EVT4 : EVT4 type		
E3E0	EVT3 conductivity input error alarm	Measurement range low limit	
0.00	span when EVT⊡ output ON		
	Measurement range low limit to Meas	urement range high limit	
E3E0T	EVT3 conductivity input error alarm	0 sec.	
	time when EVT⊡ output ON		
	0 to 10000 seconds or minutes		
E3EC	EVT3 conductivity input error alarm	Measurement range low limit	
0.00	span when EVT□ output OFF		
	Measurement range low limit to Measurement range high limit		
E3ECT	EVT3 conductivity input error alarm	0 sec.	
	time when EVT□ output OFF		
	0 to 10000 seconds or minutes		
MVZN3	EVT3 cycle variable range	50.0%	
50.0	1.0 to 100.0%		
CENT3	EVT3 cycle extended time	0 sec.	
	0 to 300 seconds		

## 11.12 EVT4 Group

EVT4F: No action  EC_L : Conductivity input low limit action  EC_H : Conductivity input low limit action  TEMPL : Temperature input low limit action  TEMPH : Temperature input high limit action  EROUT : Error output  FAIL : Fail output  EEUL : Conductivity input error alarm output  EVT4 value  Conductivity input: Measurement range low limit  Temperature input: 0.0℃  Conductivity input: Measurement range low limit to
EC_L : Conductivity input low limit action EC_H : Conductivity input high limit action TEMPL : Temperature input low limit action TEMPH : Temperature input high limit action EROUT : Error output FAIL : Fail output EEUL : Conductivity input error alarm output  EVT4 value   Conductivity input: Measurement range low limit Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
EC_H : Conductivity input low limit action EC_H : Conductivity input high limit action TEMPL : Temperature input low limit action TEMPH : Temperature input high limit action EROUT : Error output FAIL : Fail output EEUL : Conductivity input error alarm output  EVT4 value   Conductivity input: Measurement range low limit Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
EC_H : Conductivity input high limit action  TEMPL : Temperature input low limit action  TEMPH : Temperature input high limit action  EROUT : Error output  FAIL : Fail output  EEUL : Conductivity input error alarm output  ESV4   EVT4 value   Conductivity input: Measurement range low limit  Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
TEMPL☐: Temperature input low limit action TEMPH☐: Temperature input high limit action EROUT☐: Error output FAIL☐: Fail output EEUL☐: Conductivity input error alarm output  EVT4 value  Conductivity input: Measurement range low limit Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
TEMPH: Temperature input high limit action  EROUT: Error output  FAIL: Fail output  EEUL: Conductivity input error alarm output  ESV4  EVT4 value  Conductivity input: Measurement range low limit  Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
EROUT: Error output FAIL: Fail output EEUL: Conductivity input error alarm output  ESV4  EVT4 value Conductivity input: Measurement range low limit Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
FAIL : Fail output  EEUL : Conductivity input error alarm output  ESV4   Conductivity input: Measurement range low limit  Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
ESV4 : Conductivity input error alarm output  ESV4   EVT4 value   Conductivity input: Measurement range low limit   Temperature input: 0.0°C   Conductivity input: Measurement range low limit to
ESV4 Conductivity input: Measurement range low limit Temperature input: 0.0°C Conductivity input: Measurement range low limit to
Temperature input: 0.0°C  Conductivity input: Measurement range low limit to
Conductivity input: Measurement range low limit to
Mossurement range high limit
Measurement range high limit
Temperature input: 0.0 to 100.0°C
EP4
Temperature input: 0.0℃
Conductivity input: 0 to Measurement span
Temperature input: 0.0 to 100.0°C
E4RST EVT4 reset Conductivity input: 0
Temperature input: 0.0℃
Conductivity input: ±10% of Measurement span
Temperature input: ±100.0℃
E4DIF EVT4 hysteresis type Reference value
SDIF : Medium value
SDIF : Reference value

Character	Setting Item, Setting Range	Factory Default	Data
E4DF0	EVT4 ON side	Conductivity input: 0.01	
0.10		Temperature input: 1.0°C	
	Conductivity input: 0 to 20% of Measu	ırement range high limit	
	Temperature input: 0.0 to 10.0℃		
E4DFU	EVT4 OFF side	Conductivity input: 0.01	
0.10		Temperature input: 1.0°C	
	Conductivity input: 0 to 20% of Measurement range high limit		
	Temperature input: 0.0 to 10.0℃	1 .	
E40NT_	EVT4 ON delay time	0 sec.	
	0 to 10000 seconds		
E40FT	EVT4 OFF delay time	0 sec.	
	0 to 10000 seconds		
E4C	EVT4 proportional cycle	30 sec.	
30	1 to 300 seconds		
E40LH	EVT4 output high limit	100%	
100	EVT4 output low limit to 100%		
E40LL	EVT4 output low limit	0%	
9	0% to EVT4 output high limit		
00NT4	Output ON time when EVT4	0	
	output ON	0 sec.	
	0 to 10000 seconds		
00FT4	Output OFF time when EVT4	0.000	
	output ON	0 sec.	
	0 to 10000 seconds		
E4CS	EVT4 conductivity input error alarm	No action	
	EVT type		
	EVT1 : EVT1 type		
	EVT2 : EVT2 type		
	<b>EVT3</b> : EVT3 type		
E4E0	: No action	Magazramant ranga law limit	
	EVT4 conductivity input error alarm span when EVT□ output ON	Measurement range low limit	
0.00	· ·	uromont rango high limit	
E4E0T	Measurement range low limit to Meas  EVT4 conductivity input error alarm	0 sec.	
	time when EVT□ output ON	U Sec.	
	0 to 10000 seconds or minutes		
E4EC	EVT4 conductivity input error alarm	Measurement range low limit	
0.00	span when EVT output OFF	Wicasurement range low liftlit	
0.00	Measurement range low limit to Meas	urement range high limit	
E4ECT	EVT4 conductivity input error alarm	0 sec.	
	time when EVT□ output OFF	0 300.	
	0 to 10000 seconds or minutes		
MVZN4	EVT4 cycle variable range	50.0%	
MVZIV4 50.0	1.0 to 100.0%	JU.0 /0	
CENT4		0 sec.	
	EVT4 cycle extended time	U 566.	
8	0 to 300 seconds		

# 11.13 Communication Group

Character	Setting Item, Setting Range	Factory Default	Data
CMSL	Communication protocol	Shinko protocol	
NOML	NOML : Shinko protocol		
	MODA : Modbus ASCII mode		
	MODR:: Modbus RTU mode		
	Instrument number	0	
2	0 to 95		
CMSP	Communication speed	9600 bps	
9600	□ <b>.9600</b> : 9600 bps		
	□ <b>19200</b> : 19200 bps		
	<b>38400</b> : 38400 bps		
CMFT.	Data bit/Parity	7 bits/Even	
7EVN	<b>8N0N</b> : 8 bits/No parity		
	<b>7N0N</b> : 7 bits/No parity		
	<b>8EVN</b> : 8 bits/Even		
	<b>7EVN</b> : 7 bits/Even		
	<b>80DD</b> : 8 bits/Odd		
	<b>70DD</b> : 7 bits/Odd		
CMST	Stop bit	1 bit	
1	<b>1</b> : 1 bit		
	<b>2</b> : 2 bits		

11.14 Transmission Output Group

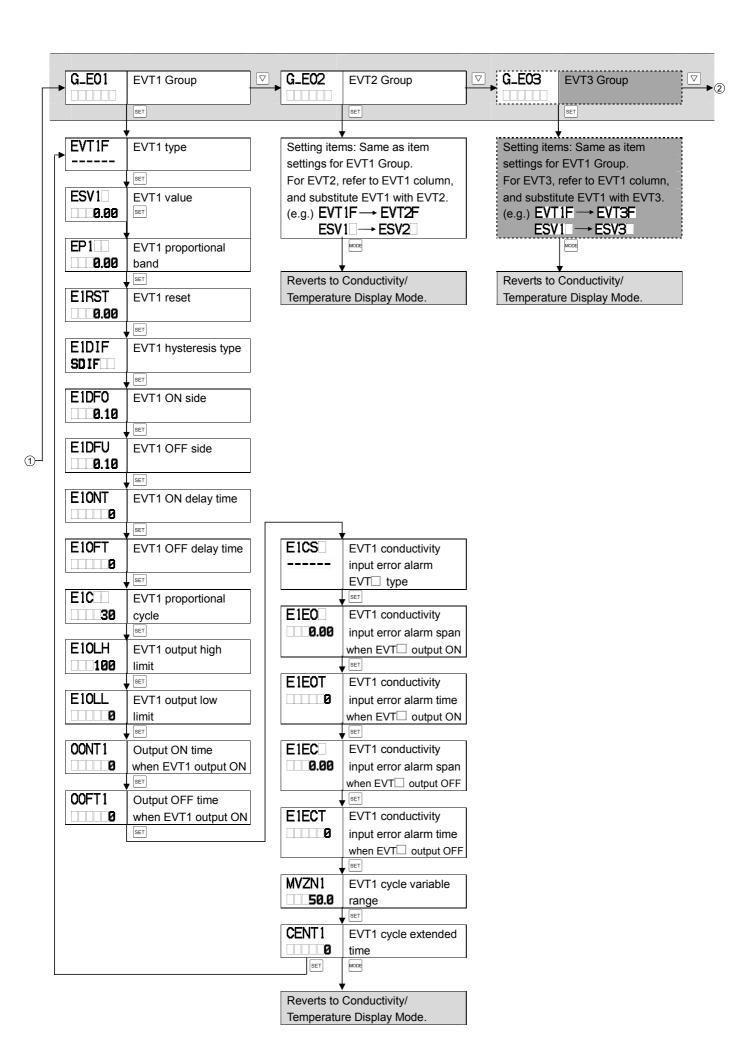
Character	Setting Item, Setting Range	Factory Default	Data
TROS1	Transmission output 1 type	Conductivity transmission	
EC	EC : Conductivity transmission		
- I considerate la co	<b>TEMP</b> : Temperature transmiss	sion	
	MV1 : EVT1 MV transmission		
	MV2 : EVT2 MV transmission		
TRLH1	Transmission output 1 high limit		
20.00		Temperature transmission: 100.0°C	
		MV transmission: 100.0%	
	Conductivity transmission: Transm		
		rement range high limit	
		nission output 1 low limit to 100.0°C	
TDL L 1	MV transmission: Transmission ou Transmission output 1 low limit	Conductivity transmission: 0.00	
TRLL1	Transmission output 1 low limit	Temperature transmission: 0.0°C	
0.00		MV transmission: 0.0%	
	Conductivity transmission: Measurement range low limit to		
	Transmission output 1 high limit		
	Temperature transmission: 0.0℃ to Transmission output 1 high limit		
	MV transmission: 0.0% to Transm	, ,	
TRCS1	Transmission output 1 status	Last value HOLD	
BEFH	when calibrating		
	BEFH: Last value HOLD		
	SETH : Set value HOLD		
TDCE 1	PVH :: Measurement value  Transmission output 1	Conductivity transmission:	
TRSE1	Set value HOLD	Measurement range low limit	
0.00	Get value HGEB	Temperature transmission: 0.0°C	
		MV transmission: 0.0%	
	Conductivity transmission: Measurement range low limit to		
	Measurement range high limit		
	Temperature transmission: 0.0 to 100.0°C		
	MV transmission: 0.0 to 100.0%		

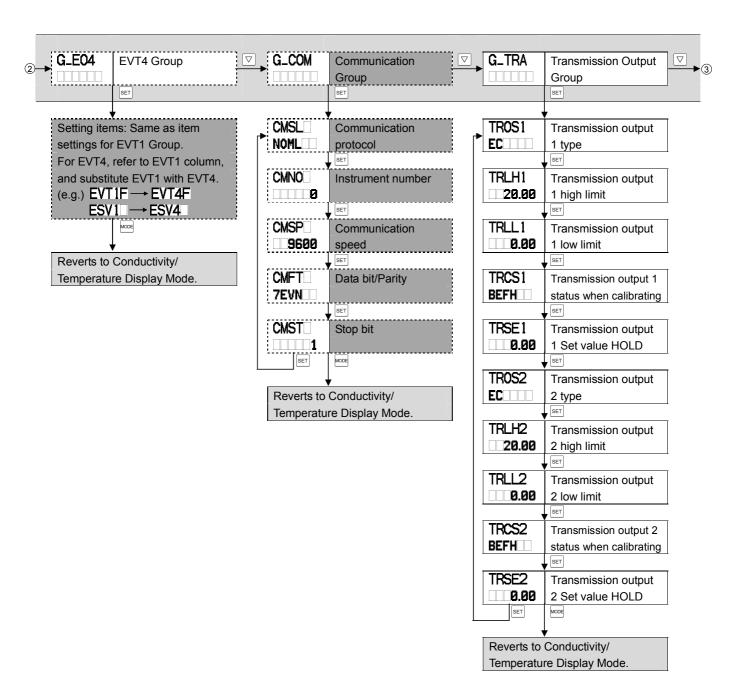
Character	Setting Item, Setting Range	Factory Default	Data
TROS2	Transmission output 2 type	Conductivity transmission	
EC	EC : Conductivity transmission		
<b>—</b> — iii	<b>TEMP</b> : Temperature transmis		
	MV1 : EVT1 MV transmission		
	MV2 : EVT2 MV transmission		
	MV3 : EVT3 MV transmission		
TRLH2	Transmission output 2 high limit		
20.00		Temperature transmission: 100.0℃	
town lower		MV transmission: 100.0%	
	Conductivity transmission: Transm		
		rement range high limit	
		nission output 2 low limit to 100.0°C	
TDLLO	MV transmission: Transmission or	. '	
TRLL2	Transmission output 2 low limit	Conductivity transmission: 0.00	
0.00		Temperature transmission: 0.0°C	
	MV transmission: 0.0%		
	Conductivity transmission: Measurement range low limit to Transmission output 2 high limit		
	Transmission output 2 high limit  Temperature transmission: 0.0° to Transmission output 2 high limit		
	MV transmission: 0.0% to Transm		
TRCS2	Transmission output 2 status	Last value HOLD	
	when calibrating	Edot Valdo FroEB	
BEFH	<b>BEFH</b> : Last value HOLD		
	SETH : Set value HOLD		
	PVH : Measurement value		
TRSE2	Transmission output 2 Set value	Conductivity transmission:	
0.00	HOLD	Measurement range low limit	
0.00		Temperature transmission: 0.0℃	
		MV transmission: 0.0%	
	Conductivity transmission: Measurement range low limit to		
	Measurement range high limit		
	Temperature transmission: 0.0 to 100.0°C		
	MV transmission: 0.0 to 100.0%		

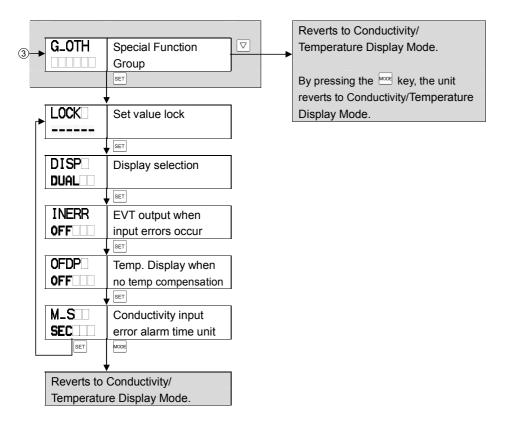
# 11.15 Special Function Group

Character	Setting Item, Setting Range	Factory Default	Data
LOCK	Set value lock	Unlock	
	: Unlock		
	<b>L0CK1</b> □ : Lock 1		
	<b>L0CK2</b> : Lock 2		
	<b>L0CK3</b> : Lock 3		
DISP	Display selection Inpu	t value (Conductivity, Temperature)	
DUAL	<b>DUAL</b> : Input value (Conductive	vity, Temperature)	
	EC : Conductivity		
	TEMP : Temperature		
INERR	EVT output when input	Disabled	
OFF	errors occur		
	ON : Enabled		
	<b>OFF</b> : Disabled		
OFDP_	Temperature Display when	Unlit	
OFF	no temperature compensation		
	OFF : Unlit		
	<b>STD</b> : Reference temperatur	e	
	PV : Measurement value		
M_S	Conductivity input error alarm time	e unit Second(s)	
SEC	SEC : Second(s)		
	MIN : Minute(s)		

#### 12. Key Operation Flowchart Abbreviations: Con.: Conductivity Temp.: Temperature Trans: Transmission Power Switch ON Con./Temp. Display Mode (\*1) Conductivity Calibration Mode CAL MODE 1.00 ADJZ SET ADJS\_ Conductivity/ Conductivity Conductivity 25.0 0.00 1.000 Span adjustment Temperature Zero Adjustment Display Mode △+ CAL (\*2) S0 📖 MODE Temperature Calibration Mode Transmission Output 1 Adjustment Mode MODE △+<sup>SET</sup> (3 sec) AJS1 AJZ1 Trans. output 1 Trans. output 1 0.00 Zero adjustment 0.00 Span adjustment (\*3) Transmission Output 2 Adjustment Mode AJZ2 Trans. output 2 AJS2 Trans. output 2 MODE 0.00 Zero adjustment 0.00 Span adjustment (\*4) SET MODE Simple Setting Mode **Group Selection Mode** □ G\_TMP ESV1 G\_EC Conductivity Input Temperature Input EVT1 value 0.00 Group Group SET ESV2 EVT2 value CELL Sensor cell constant SENS 0.00 RTD type 1.0 PT100 ESV3 EVT3 value 0.00 COEF Cell constant TCM Temperature com-NACL 1.000 correction value pensation method EVT4 value ESV4 UNIT KC0E Measurement unit 0.00 Temperature CONV coefficient 2.00 SET MRNG MODE STND Measurement Reference 20.00 25.0 Reverts to Conductivity/ range temperature Temperature Display Mode. TDSK DP2 TDS conversion Decimal point place 0.50 factor 0.0 **CNECT** FIT1 Conductivity input Pt100 input wire type 0.0 filter time constant 3WIRE CABLE ESO\_\_ Conductivity input Cable length 9.00 sensor correction 0.0 correction MODE CSEC Cable cross-section Reverts to Conductivity/ 0.30 area Temperature Display Mode. FIT2 Temperature input 0.0 filter time constant SET Reverts to Conductivity/ Temperature Display Mode.







#### [Each Mode and Setting Item]

ESV1	EVT1 value
0.00	

- Upper left: Conductivity Display: Indicates the setting item characters.
- Lower left: Temperature Display: Indicates the factory default.
- Right side: Indicates the setting item.
- (\*1) Indicates the item selected in [Display selection (p.49)] or in [Temperature Display when no temperature compensation (p.49)] in Conductivity/Temperature Display Mode.
- (\*2) If **0FF** (No temperature compensation) is selected in [Temperature compensation method (p.23)], the unit will not enter Temperature Calibration Mode.
- (\*3) If C5, EVT3 or EVT4 option is ordered, the unit will not enter Transmission Output 1 Adjustment Mode.
- $(^{\star}4)$  If C5 or EVT4 is ordered, the unit will not enter Transmission Output 2 Adjustment Mode.

: Available only when the corresponding option is ordered.

#### [Key Operation]

- 🗘 + 🕮 : Press and hold 🛆 and 🖭 (in that order) together. The unit will enter Temperature Calibration Mode.
- $\triangle$ + $\blacksquare$ F (3 sec) : Press and hold the  $\triangle$  and  $\blacksquare$ F keys (in that order) together for 3 seconds.

The unit will proceed to Transmission Output 1 Adjustment Mode.

• 💟 + 🖅 (3 sec): Press and hold the 💟 and 🖼 keys (in that order) together for 3 seconds.

sec). These and find the Ending Reys (in that order) together for a second

The unit will proceed to Transmission Output 2 Adjustment Mode.

• If the key is pressed at each setting item, the unit will revert to Conductivity/Temperature Display Mode.

\*\*\*\*\* Inquiries \*\*\*\*\*

For any inquiries about this unit, please contact our agency or the vendor where you purchased the unit after checking the following.

	[Example]
• Model	FEB-102-ECH
Serial number	No. 142F05000

In addition to the above, please let us know the details of the malfunction, or discrepancy, and the operating conditions.

# SHINKO TECHNOS CO., LTD. OVERSEAS DIVISION

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