



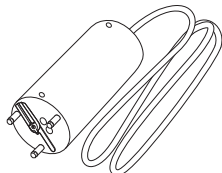
# TSC-10 (E) Instruction Manual

Thank you very much for purchasing OPTeX Turbidity Checker TSC-10(E). All of this instruction manual must be read before operation of the Turbidity Checker TSC-10(E) for safe and proper operation.

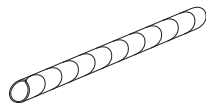
This instruction manual should be kept for future reference such as maintenance.

## The Contents of Packaging

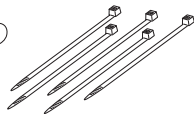
### TSC-10S Detector



Detector



Cable Protective Cover



5 Cable Tying Band

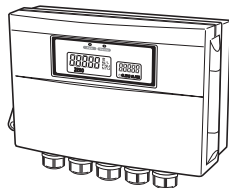


Cleaning Brush

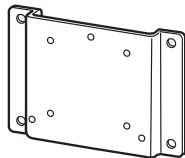


Cleaning Paper

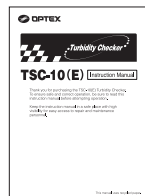
### TSC-10S Transmitter



Transmitter



Mounting Bracket



Instruction Manual



2 Transmitter Fixing Screw



20 Y-Terminal

In the unlikely event that there are any missing components or defects, please contact your dealer.

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# 1 For safe use

**Be sure to read this instruction manual in order to use the Turbidity Checker TSC-10(E) properly.**

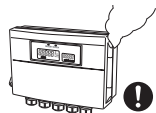
- Please thoroughly read the "For safe use" before using the TSC-10(E) properly.
- Because these precautions are related to failure or malfunction, observe the precautions for use without fail.

**⚠ Use the Turbidity Checker only for measurement of water quality.**

**In order to use the TSC-10(E) properly, observe the following precautions.**

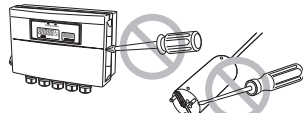
## Precautions which are the cause of failure:

"⊘" denotes "Prohibited action", and "⚠" denotes "Required action".



⚠ Power supply OFF

- Turn off the Power immediately in the unlikely event that there occur any abnormalities such as smoke or abnormal noise. Otherwise it may cause fire or an electric shock.



- Do not disassemble or modify the product.

- Do not wipe the product with solvent. It may cause failure.
- To clean the product, first wipe away lightly with a clean soft cloth dampened by diluted mild detergent solution and then wipe off moisture with a dry clean soft cloth.

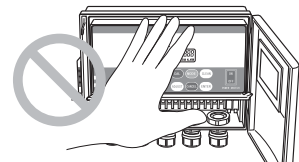
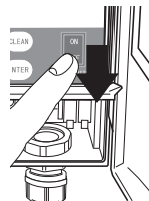


**100 to 240 VAC**

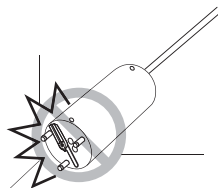
- Be sure to use the power supply of 100 to 240 VAC. Otherwise it may cause fire or electric shock.

Keep the Power off during installation and wiring operations.

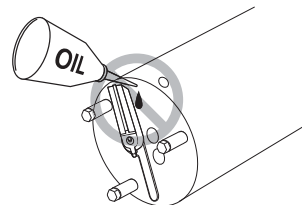
- There are high voltage parts inside the Transmitter. Failure to observe this precaution may cause fire or an electric shock.



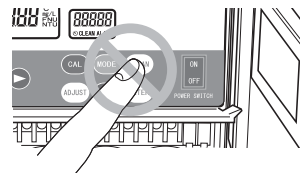
- Do not give a strong shock to the Transmitter.



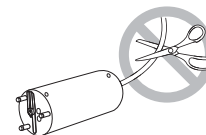
- Avoid strong physical shock to the detector or do not drop it.



- Do not apply grease or other oils to the wiper.



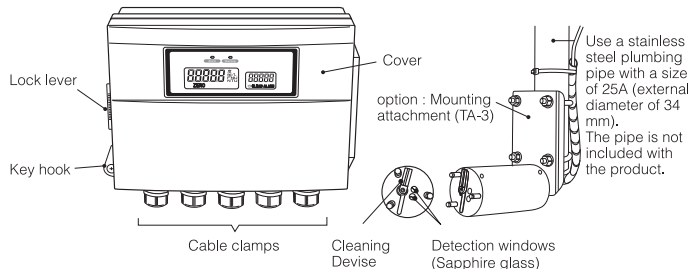
- Do not press the CLEAN button while the Detector is in the air.



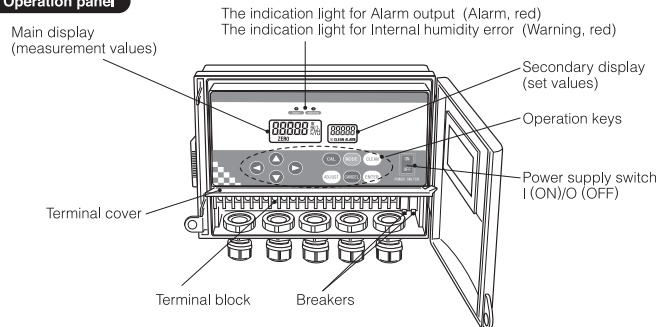
- Handle with care not to damage.

## 2 External Features

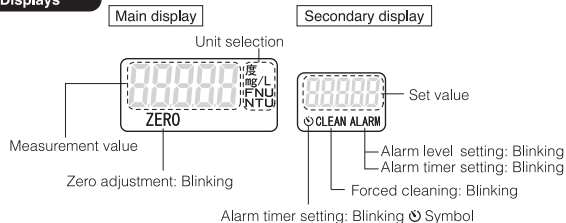
### Transmitter



### Operation panel

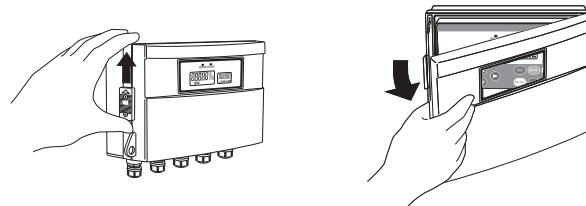


### Displays



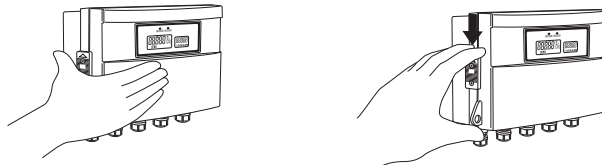
## Cover Opening & Closing Procedure

### How to open the Cover



1. Slide up the Lock lever.
2. Pull the Cover.

### How to close the Cover



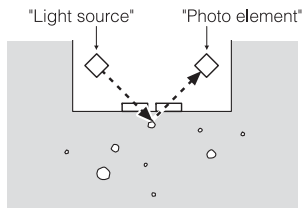
1. Close the Cover securely.
2. Slide down the Lock Lever until it stops.

### Caution

- Make sure that the Cover is locked without fail. Otherwise, protective structure may not function adequately.

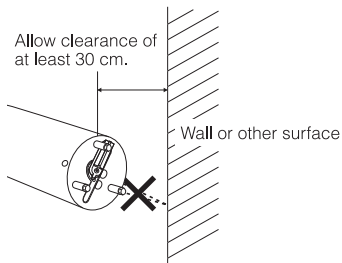
### 3 Measuring Principle

Turbidity Checker TSC-10(E) uses a method of 90 degrees scattered light. In the method, a light source of a Detector illuminates the surfaces of suspended matter floating in the water, and the light is scattered by these surfaces is detected by a photo element installed at an angle of 90° from the light source. The turbidity is determined by the amount of scattered light.



#### Caution

The Turbidity Checker uses a method of scattered light to measure amount of reflected light. Therefore, the measurement values may be affected by the measurement light reflected from equipment surfaces or accumulated materials if the Detector is installed nearby. Install the Detector with a clearance of at least 30 cm from the Detector Surface to equipment or other surfaces.



Do not install the Detector with the detection windows mounted toward the equipment surface. Measurement light will strike the wall or other surface, and the reflected light will affect the measurement values.

### 4 Installation

#### 1 Detector Installation



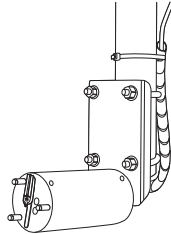
**Before installation, remove the cable from the power supply, and after completion, wire the power supply cable.**



denotes "Prohibited action" denotes "Required action"

<p>• Please install the sensor at the proper angle against the water flow according to the figure on the right side. Or the contaminations in the water could attach to the surface of the detection windows and it could prevent the accurate measurement.</p>	<p>• Do not install the Detector with the Detector Surface facing down.</p>
<p>• Do not install the Detector near a wall or other surface. Measuring light will strike the surface and the reflected light will affect the measurement values.</p>	<p>• Install the detector avoiding the situation that the Detector Surface receive strong light such as sunlight directly.</p>
<p>• With fluctuation of water level taken into account, dispose the Detector so as to be immersed up to the order of 30 cm below the expected lowest water level.</p>	<p>• Dispose the detector in water without air bubbles.</p>

A separately sold Mounting Attachment (TA-3) is available to securely attach the Detector to the pipe to prevent it from rotating due to striking water flow. For details, contact your dealer or refer to the following Optex website: <http://www.optex.jp/env/eng>  
 Note: Use a stainless plumbing pipe with a size of 25A (external diameter of 34 mm). The pipe is not included with the product.

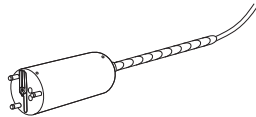


**!** Be sure to attach the protective cable enclosure.

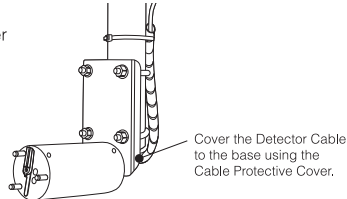
**Caution**

- Read and thoroughly understand the precautions given in the instruction manual before attempting to operate the product.
- Be sure to Wrap a Cable Protective Cover. Failure to do so may result in water penetration at maintenance if the cable is damaged.
- Do not hang the Detector by the Detector cable.

**1** Wrap the Cable Protective Cover on the Detector side of the Detector Cable.



**2** Secure the end of the Cable Protective Cover to the pipe or other surface using a cable tie.

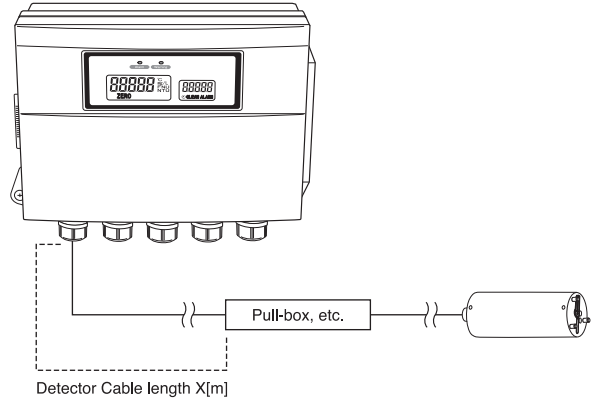


**Caution**

The measurement values may be affected by the measurement light reflected from the equipment surfaces or accumulated materials if the Detector is installed nearby. Install the Detector with a clearance of at least 30 cm from the surfaces of any equipments to the Detector Surface.

**2 Extension of Detector Cable**

The Detector Cable is 9m. The Detector Cable shall be extended by referring to the Table below. Use a device such as a Pull-box if necessary.

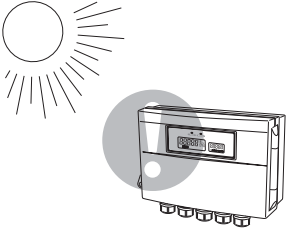
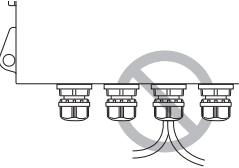
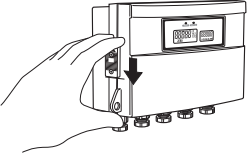


Nominal sectional area	Max. cable length X[m]
0.3 [mm <sup>2</sup> ]	20 [m]
0.5 [mm <sup>2</sup> ]	40 [m]
0.75 [mm <sup>2</sup> ]	70 [m]
1.0 [mm <sup>2</sup> ]	100 [m]

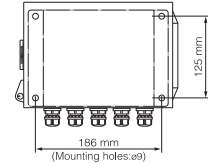
### 3 Transmitter Installation

**!** Before installation, remove the cable from the power supply, and after completion, wire the power supply cable.

"⊘" denotes "Prohibited action", and "!" denotes "Required action".

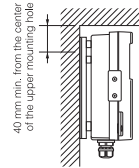
 <p>• Install the Transmitter at a place ventilating well and avoiding direct sunlight.</p>	<p>• Use Cable Clamps attached to the Transmitter for wiring. When the piping are directly connected with the Transmitter, take a corrective action such as caulking against intrusion of gas because corrosive gas is in danger of intruding through the piping, etc., into the Transmitter.</p>
 <p>• Do not bind the signal output cable with the power cable or do not put them in the one Cable Clamp.</p>	 <p>• Make sure that the Cover is locked without fail. Otherwise, protective structure may not function adequately.</p>

1 Install the Mounting Bracket on the wall and so forth. For mounting pitch, refer to the Fig. to the right.

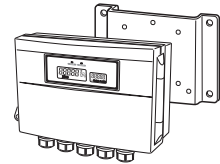


#### Caution

• If there is a projection on the mounting surface, separate 40 mm or more from the upper Mounting Holes of the Mounting Bracket (See Fig. to the right).



2 Fit the Mounting Bracket attached to the Transmitter with the Fitting Screws.



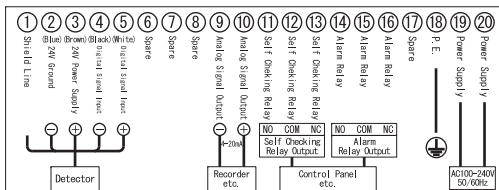
## 4 Wiring

### Caution

- The unit is designed to function as soon as power is supplied.
- Cover shall be closed during operation.
- Keep the Power off during wiring operations. Otherwise it may cause fire or an electric shock.
- Wire the Power Cable, at the end of wiring operation.

- Make sure that the Circuit Breaker is normal (OFF) position (Refer to 9 Troubleshooting).

### Transmitter Terminal Block



- ① to ②① • Compatible cable diameter with the Cable Clamps is 6 to 8 mm
- ① to ⑤ • Use a shielded cable with nominal sectional area of 0.2 to 1.25 mm<sup>2</sup> for the Detector Cable.
  - For extension of the Detector Cable, refer to [2] Extension of Detector Cable on page 9. Use a device such as a Pull-box if necessary.
- ⑨ to ⑩ • Use a shielded cable with nominal sectional area of 0.75 to 1.25 mm<sup>2</sup> for a Signal Output Cable.
  - For connection to the Signal Output terminal, load resistance should be 300 Ω Max (including wiring resistance).
- ⑪ to ⑯ • For connection to the Self-Checking Relay Output terminal and Alarm Relay Output terminal, load resistance should be 240 VAC and 1A Max. Although a protective circuit is built in to prevent from overcurrent due to thunderbolt, it is recommended to use fuses with rated current of 2A Max for the purpose of improvement of safety.
  - ⑱ • Carry out grounding work.
- ⑲ to ⑳ • Use a cross-linked polyethylene insulating vinyl sheath cable with nominal sectional area of 0.75 to 1.25 mm<sup>2</sup> for the power cable.
  - Use a circuit breaker with rated current of 2A or more for the power source of the TSC-10(E).

### Reference

When the Detector is in the air, due to the characteristics of the device, the display does not show 0.00 NTU. This is not an error.

## 5 Operation Panel







- ◀ ▶ Move the digit to be entered using the right and left arrow buttons ▶ ◀ (0.1 digit ⇔ 1 digit ⇔ 10 digit ⇔ 100 digit ⇔ 1000 digit). At this time, the selected digit blinks.
- ▲ ▼ Enter a numerical value (0, 1, 2, ..., 9) into the selected digit using the upper and lower arrow buttons ▲ ▼. ▲ button increases a numeric value and ▼ button decreases the value.
- CAL The CAL button CAL carries out calibration. Press CAL for 2 seconds or more to carry out calibration.
- MODE The MODE button MODE makes sure of each setting. To change the setting value, select an item and then keep pressing MODE for 2 seconds or more.
- CLEAN The CLEAN button CLEAN wipes the Detector Windows. To wipe the Detector Windows, press CLEAN for 2 seconds or more.
- ADJUST The ADJUST button ADJUST corrects the indicated value to the official method or the value you need.
- CANCEL The CANCEL button CANCEL cancels the setting change operation and return to the condition prior to change.
- ENTER The ENTER button ENTER saves the NUMERICAL values entered and terminate the setting change operation.
- ◀ + ▶ Press the right and left arrow buttons ▶ ◀ simultaneously to carry out Fine Adjustment of Signal Output Low Limit (4mA).
- ▲ + ▼ Press the upper and lower arrow buttons ▼ ▲ simultaneously to carry out Fine Adjustment of Signal Output High Limit (20mA).





## 6 Indicators

The Turbidity Checker provides notification using indicators on the operation panel in cases such as if alarm output is set or if the humidity in the Detector exceeds the reference value. The indicators have the following meanings.

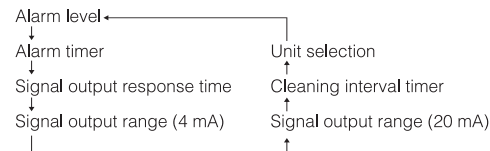
	<p>Alarm indicator lights in red when the set alarm level has been exceeded.</p>
	<p>Alarm Indicator blinks in red when the alarm level has been exceeded longer than the alarm timer.</p>
	<p>Warning Indicator lights in red when the humidity inside the Detector exceeds the specified values. Replacement of maintained components is recommended with overhaul every three years because packing and other components subject to wear and requiring periodic replacement will deteriorate even if there is no increase in the internal humidity.</p>
	<p>Warning Indicator flashes red when the in the humidity in the Detector has reached the limit. Discontinue use, contact the dealer to perform overhauling of the Detector.</p>

## 7 Operation

### 1 Each Setting

Every time the MODE button  is pressed, the Display is changed into each setting. To change the setting value, select the item and then press  for 2 seconds or more.

Every time the MODE button  is pressed, the display is changed as follows:



Press the Cancel Key  to making settings.

■ The following table gives default settings and setting ranges.

	Default	Setting range
Alarm level	OFF	OFF (no alarm output) or 0.5 to 500 NTU
Alarm timer	OFF	OFF (immediate alarm output) or 1 to 120 min
Signal output response time	10 s	5 to 120 s
Signal output range	Lower limit: 0.00 NTU Upper limit: 500.0 NTU	Depends on the following condition with the measurement range: Upper limit – Lower limit $\geq$ 2 NTU
Cleaning interval timer	30 min	OFF (no cleaning) or 10 to 240 min in increments of 10 min
Unit selection	NTU	NTU, FNU, mg/L, 度, none

### Alarm level




ALARM will be displayed on the secondary display along with the set alarm level.

Example: Alarm level: 20.0 NTU

### Alarm timer




The timer mark  and ALARM will be displayed on the secondary display along with the alarm timer.

Example: Alarm timer: 60 min

### Signal output response time



The timer mark  will be displayed on the secondary display along with the set signal output response time.

Example: Signal output response time: 10 s

### Signal output range



The "Lo" will be displayed on the secondary display along with the lower limit of the signal output (4mA).

Example: Signal output lower limit: 50.0 NTU



The "Hi" will be displayed on the secondary display along with the upper limit of the signal output (20mA).


Example: Signal output upper limit: 300.0 NTU

### Caution

The measurement accuracy will not change if the signal output range is changed.

### Cleaning interval timer



The timer mark  and CLEAN will be displayed on the secondary display along with the set cleaning interval time.

Example: Cleaning interval time: 30 min

### Unit selection



The units used by the Turbidity Checker can be changed according to specific standards or usage conditions.





Example: Unit: mg/L

### Caution

- This device creates a calibration curve using formazin standard liquid.
- The measurement accuracy will not change if the unit is switched.

## 2 Calibration

Be sure to carry out the calibration according to the following procedures before using the product.

- Clean the Detector and Detector window.
- Immerse the Detector in distilled water.
- After acclustoming the Detector to water temperature for 5 minutes or so, make sure that air bubbles are not attached on the Detector Window. And then, press  .  
Note: Air bubbles can be eliminated by moving the wiper. (Refer to Section [9](#) on page 31 for information on Manual Cleaning .)
- ZERO indicates on the main display. 
- Press  . Then Calibration will start and 0.00 and ZERO will blink for about 20 seconds.
- Once calibration has been completed, ZERO display will turn off. 

### Caution

- Before carrying out the calibration, be sure to thoroughly clean the Detector and the detection windows. After that, immerse the Detector into distilled water.
- Carry out the calibration with a clearance of at least 30 cm between the Detector Surface and the bottom of and the sidewall of the container. Failure to do so may result in incorrect calibration due to light reflected on the bottom and the sidewall of the container.
- When the calibration is carried out, the adjustment value will return to the default value of 0.00. Enter the adjustment value again if necessary.

### 3 Alarm Level, Alarm Timer, Signal Output Response Time, Signal Output Range

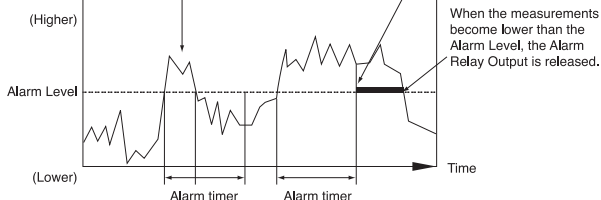
#### 1 Alarm Relay Output Setting

##### Alarm Relay Output

When the measurements get higher than the Alarm Level continuously beyond the time set by the Alarm Timer, the Alarm Relay Output will be produced.

Although the measurements get higher than the Alarm Level, since higher period is shorter than that of the Alarm Timer, Alarm Relay Output will not be produced.

The Alarm Relay Output will be produced. While the measurements values are higher than the Alarm Level, the Alarm Relay Output will continue to be produced.



The Alarm Level Indicator appears when the measurements get higher than the Alarm Level. Both the Alarm Timer indicator and Alarm Level Indicator blink when the measurements get longer and higher than the setting value of the Alarm Timer and Alarm Level. And in this case, Alarm Relay Output will be produced.



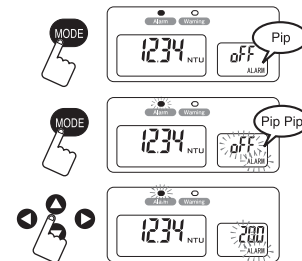
Example: At the time of Alarm Relay Output

#### Setting the Alarm Level

- You can set the alarm level to 0.5 to 500 NTU or to OFF (no alarm output).
  - The possible setting values for each measuring range are follows.
    - Range: 0.5 to 20.0 NTU = 0.5 NTU step
    - Range: 21 to 500 NTU = 1NTU step
  - The default alarm level is OFF.

Example: To set the Alarm Level for 20.0 NTU.

- Press **MODE** and select the Alarm Level. ALARM and setting value will be displayed on the secondary display.
- Press **MODE** for 2 seconds or more, the Alarm Level Indicator blinks.
- Enter "20.0" on the Display.



- Move the digit to be entered using **◀▶** (0.1 digit ⇔ 1 digit ⇔ 10 digit ⇔ 100 digit). At this time, the selected digit blinks.
- Enter a numerical value (0, 1, 2, ..., 9) into the selected digit using **▲▼**.
- ▲** button increases a numeric value and **▼** button decreases the value.
- While pressing **▲▼** buttons, the values displayed are continuously changed.
- To cancel the Alarm Level Setting, press **CANCEL**.
- To change the Display for the Measurements Indication mode, press **CANCEL** again.

#### Reference

- To cut off the Alarm Relay Output, enter "0". Then "OFF" appears on the Display. Next, press **ENTER**.

- Press **ENTER** to terminate the Alarm Level Setting.
- Press **MODE** to continue making settings and press **CANCEL** to end making settings.


#### Caution

When the value is out the setting range, the transmitter sounds "Pip Pip Pip". In that case, input the possible setting value to complete the setting.

## Alarm Timer Setting

- Alarm Timer can be set for 1 to 120 minutes or OFF.
- Setting unit is 1 minute.
- The Alarm Timer is set for OFF as a factory setting.

Example: To set the Alarm Timer for 60 minutes.

1 Press **MODE** and select the Alarm Timer. Timer mark , ALARM and setting value will be displayed on the secondary display.











2 Press **MODE** for 2 seconds or more, the Alarm Timer Indicator blinks.



3 Enter "60" on the Display.



- Move the digit to be entered using   (1 digit  $\leftrightarrow$  10 digit  $\leftrightarrow$  100 digit). At this time, the selected digit blinks.
- Enter a numerical value (0, 1, 2, ..., 9) into the selected digit using  .
-  button increases a numeric value and  button decreases the value.
- While pressing   buttons, the values displayed are continuously changed.
- To cancel the Alarm Timer Setting, press **CANCEL**.
- To change the Display for the measurement mode, press **CANCEL** again.

### Reference

- To cut off the Alarm Timer, enter "0". Then "OFF" appears on the Display. Next, press .

4 Press  to terminate the Alarm Timer Setting.



5 Press **MODE** to continue making settings and press **CANCEL** to return to the measurement mode.


### Caution

When the value is out the setting range, the transmitter sounds " Pip Pip Pip". In that case, input the possible setting value to complete the setting.

## 2 Signal Output Response Time Setting

- Signal Output Response Time can be set for 5 to 120 seconds or OFF.
- Setting unit is 1 second
- The Signal Output Response Time is set for 10 seconds as a factory setting.

Example: To set the Signal Output Response Time for 30 seconds.

1 Press **MODE** and select the Signal Output Response Time. Timer mark , and setting value will be displayed on the secondary display.











2 Press **MODE** for 2 seconds or more, the Signal Output Response Time Indicator blinks.



3 Enter "30" on the Display.



- Move the digit to be entered using   (1 digit  $\leftrightarrow$  10 digit  $\leftrightarrow$  100 digit). At this time, the selected digit blinks.
- Enter a numerical value (0, 1, 2, ..., 9) into the selected digit using  .
-  button increases a numeric value and  button decreases the value.
- While pressing   buttons, the values displayed are continuously changed.
- To cancel the Signal Output Response Time Setting, press **CANCEL**.
- To change the Display for the measurement mode, press **CANCEL** again.

### Reference

- To cut off the Signal Output Response Time, enter "0". Then "OFF" appears on the Display. Next, press .

4 Press  to terminate the Signal Output Response Time Setting.



5 Press **MODE** to continue making settings. Or press **CANCEL** to return to the measurement mode.

### Caution

When the value is out the setting range, the transmitter sounds " Pip Pip Pip". In that case, input the possible setting value to complete the setting.

### 3 Signal Output Range Setting

● Signal Output Range can be set as follows.

- "High Limit" - "Low Limit"  $\geq 2$ NTU
- The Signal Output Range is default at 4mA for the 0-Adjustment value and 20mA for the Span-Adjustment value.

Example: To set the Signal Output Range for 50.0 to 300.0 NTU.

#### (1) Signal Output Low Limit Setting

- 1 Press **MODE** and select the The Signal Output Low Limit.



※ "Lo-" and "the setting value" comes on alternatively.

- 2 Press **MODE** for 2 seconds or more, the Signal Output Low Limit value is displayed.



- 3 Enter "50.0" on the Display.



- Move the digit to be entered using **◀▶** (1 digit  $\leftrightarrow$  10 digit  $\leftrightarrow$  100 digit  $\leftrightarrow$  1000 digit). At this time, the selected digit blinks.
- Enter a numerical value (0, 1, 2, ..., 9) into the selected digit using **▲▼**.
- **▲** button increases a numeric value and **▼** button decreases the value.
- While pressing **▲▼** buttons, the values displayed are continuously changed.
- To cancel the Signal Output Low Limit Setting, press **CANCEL**.
- To change the Display for the measurement mode, press **CANCEL** again.

- 4 Press **ENTER** to terminate the Signal Output Range Low Limit Setting.



- 5 Press **MODE** to continue making settings press **CANCEL** to return to the measurement mode.

#### Caution

When the value is out the setting range, the transmitter sounds " Pip Pip Pip". In that case, input the possible setting value to complete the setting.

#### (2) Signal Output High Limit Setting

- 1 Press **MODE** and select the Signal Output High Limit.



※ "-Hi-" and "the setting value" comes on alternatively.

- 2 Press **MODE** for 2 seconds or more, the Signal Output High Limit value is displayed.



- 3 Enter "300.0" on the Display.



- Move the digit to be entered using **◀▶** (1 digit  $\leftrightarrow$  10 digit  $\leftrightarrow$  100 digit  $\leftrightarrow$  1000 digit). At this time, the selected digit blinks.
- Enter a numerical value (0, 1, 2, ..., 9) into the selected digit using **▲▼**.
- **▲** button increases a numeric value and **▼** button decreases the value.
- While pressing **▲▼** buttons, the values displayed are continuously changed.
- To cancel the Signal Output High Limit Setting, press **CANCEL**.
- To change the Display for the measurement mode, press **CANCEL** again.

- 4 Press **ENTER** to terminate the Signal Output High Limit Setting.



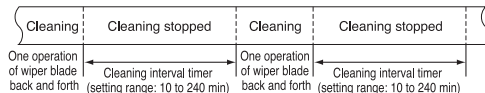
- 5 Press **MODE** to continue making settings. Or press **CANCEL** to return to the measurement mode.

#### Caution

When the value is out the setting range, the transmitter sounds " Pip Pip Pip". In that case, input the possible setting value to complete the setting.

## 4 Cleaning Interval Timer

The Cleaning Interval Timer can be set for 10 to 240 minutes. One cleaning is set as one operation of the wiper back and forth.




### Cleaning Interval Timer Setting

- The Cleaning Interval Timer can be set for 10 to 240 minutes.

- The setting unit is 10 minutes.

Example: Set the cleaning interval timer to 120 min.

1 Press **MODE** and select the Cleaning Interval Timer. Timer mark , CLEAN and setting value will be displayed on the secondary display.



2 Press **MODE** for 2 seconds or more, the value of the cleaning interval timer will blink on the secondary display.



3 Enter "120" on the Display.

- Use **←** and **→** to change the place value of the number to enter.

(0.1s ⇔ 1s ⇔ 10s ⇔ 100s)

The selected place value will flash.

- Use **▲** and **▼** to enter a number (0, 1, 2, . . . 9) at the selected place value.

Use **▲** to increase the number and **▼** to decrease.



- Press **CANCEL** to return to the value of 0.00 when starting to change settings.

Press **CANCEL** again to return to the measurement mode.

The Adjustment value will return to the value before changing the setting.

4 Press **ENTER** to terminate the Cleaning Interval Timer setting.



5 Press **MODE** to continue making settings.

Or press **CANCEL** to return to the measurement mode.

### Caution

When the value is out the setting range, the transmitter sounds "Pip Pip Pip". In that case, input the possible setting value to complete the setting.

## 5 Setting Unit

The turbidity unit used by the Turbidity Checker can be changed according to specific standards or usage conditions.

The default unit setting is NTU.

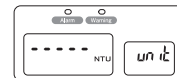
### Caution

- This device creates a calibration curve using formazin standard liquid.
- If 度 is selected, the calibration curve created using polystyrene standard liquid calculated from formazin standard liquid is shown.
- The measurement accuracy will not change if the unit is changed.

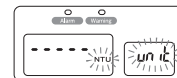
Unit	Description
NTU	EPA-compliant unit.
FNU	Unit compliant with ISO7027.
mg/L	Unit selected for use as a simplified measure found by the correlation between the measurement value (e.g., floating suspended matter (SS) in the official method) and the value displayed on the Turbidity Checker. (Refer to [7] on pages 27 to 30.)
度	Unit is used only in Japan.
—	Use as required.

Example: Set the unit to mg/L.

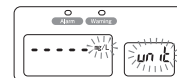
1 Press **MODE** to select the unit.



2 Press **MODE** for at least 2 s. You will hear a beep, and the unit will flash.



3 Use **▲** and **▼** to change the unit.



4 Press **ENTER** to end unit selection.

5 Press **MODE** to continue making settings. Or press **CANCEL** to return to the measurement mode.

## 6 Fine Adjustment of Signal Output

■ Fine Adjustment of Lower Limit 4mA and Upper Limit 20mA of Analog Signal Output can be made.

### Caution

· Make the Fine Adjustment of Lower Limit 4mA firstly. And then make the Fine Adjustment of Upper Limit 20mA. Otherwise the value of the Upper Limit 20mA cannot be adjusted accurately.

### 1 Fine Adjustment of Lower Limit 4mA

1 Simultaneously press both . At this time **-4-** is indicated on the secondary display.



2 While making sure of the values displayed by the connecting equipment such as recorder, make the Fine Adjustment of Lower Limit 4mA with .



3 Press to terminate the Fine Adjustment of Lower Limit 4mA.



- When both are pressed simultaneously, the signal output of 4mA will be produced irrespectively of the measurement value.
- To cancel the Fine Adjustment of the Lower Limit 4mA, press the cancel key before pressing .

### 2 Fine Adjustment of Upper Limit 20mA

1 Simultaneously press both . At this time **-20-** is indicated on the secondary display.



2 While making sure of the values displayed by the connecting equipment such as recorder, make the Fine Adjustment of Upper Limit 20mA with .



3 Press to terminate the Fine Adjustment of Upper Limit 20mA.

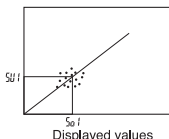


- When both up and down arrow buttons are pressed simultaneously, the signal output of 20mA will be produced irrespectively of the measurement value.
- To cancel the Fine Adjustment of the Upper Limit 20mA, press before pressing .

## 7 Adjustment

### Single-point Adjustment

Measurement values in official method



If the measured data concentrate into a small area as shown in the data to the left, carry out the Single-point Adjustment using a point of the correlated line.

### Caution

· When the calibration is carried out, the adjustment value will return to the default value of 0.00. Enter the adjustment value again if necessary.

Example: Carry out the Single-point adjustment when a display value of 9.00 NTU is on the operation panel and the measurement value is 11.00 NTU in the official method.

1 Press . The Adjustment value until now (e.g., 15.00 NTU) will be shown on the main display along with **50!** on the secondary display.



2 Press for 2 seconds or more, the hundredth place will blink on the main display.



3 Enter "9.00" on the Display.



■ Use to change the place value of the number to enter. (0.1s ⇔ 1s ⇔ 10s ⇔ 100s)

The selected place value will flash.

■ Use to enter a number (0, 1, 2...9) at the selected place value. Use to increase the number and to decrease.

• Press to return to the value of 0.00 when starting to change settings. Press again to return to the measurement mode. The Adjustment value will return to the value before changing the setting.

4 Press . The hundredth place on the main display will blink, and **50!** will be shown on the secondary display.



5 Enter "11.00" on the display.



- Press **CANCEL** to return to the value of 0.00 when starting to change settings. Press **CANCEL** again to return to the measurement mode. The Adjustment value will return to the value before changing the setting.

6 Press **ENTER**. The hundredths' place will blink on the main display, and **50.2** will be shown on the secondary display.

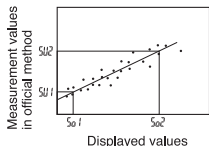


7 Press **CANCEL** to terminate the Single-point Adjustment. Once the Adjustment has been completed, check the Adjustment value. (Refer to Checking the Adjustment Values on page 30.)

**50.1** Displayed value 9.00 NTU  
**50.1** Measurement value in official method 11.00 NTU

**50.2** 0.00 NTU  
**50.2** 0.00 NTU

## Multi-point Adjustment (2-point)



If the measured data are scattered as shown in the data to the left, carry out the Multi-point Adjustment using two (2) points of high and low concentration on the correlated line.

### Caution

- When the Multi-point Adjustment is carried out, the slope of the calibration curve will change, and so the value may not be 0.00 NTU even if it measures pure water.
- When the calibration is carried out, the adjustment value will return to the default value of 0.00. Enter the adjustment value again if necessary.

**Example:** Adjust the display value of 7.00 NTU for the first point to a measurement value of 8.00 NTU in the official method for the first point. Adjust the display value of 48.0 NTU on the operation panel to a measurement value of 43.0 NTU in the official method for the second point.

1 Press **ADJUST**. The Adjustment value until now (e.g., 10.0 NTU) will be shown on the main display along with **50.1** on the secondary display.



2 Press **ADJUST** for 2 seconds or more, the hundredth place will blink on the main display.



3 Enter "7.00" on the Display.



- Use **▶▶** to change the place value of the number to enter. (0.1s ↔ 1s ↔ 10s ↔ 100s)  
The selected place value will flash.
- Use **▲▼** to enter a number (0, 1, 2, ... 9) at the selected place value. Use **▲** to increase the number and **▼** to decrease.

• Press **CANCEL** to return to the value of 0.00 when starting to change settings. Press **CANCEL** again to return to the measurement mode. The Adjustment value will return to the value before changing the setting.

4 Press **ENTER**. The hundredths' place on the main display will blink, and **50.1** will be shown on the secondary display.



5 Press **▶▶▲▶▶** to enter a measurement value of 8.00 on the official method for the first point on the secondary display.



• Press **CANCEL** to return to the value of 0.00 when starting to change settings. Press **CANCEL** again to end making settings. The correction value will return to the value before changing the setting.

6 Press **ENTER**. The hundredths' place on the main display will blink, and **50.2** will be shown on the secondary display.



7 Enter "48.00" on the Display.



• Press **CANCEL** to return to the value of 0.00 when starting to change settings.

### Caution

At this stage, the Adjustment setting cannot be canceled by pressing **CANCEL** again. (The entered new values for **50.1** and **50.1** will not return to the previous values.)

8 Press **ENTER**. The hundredths' place on the main display will blink, and **50.2** will be shown on the secondary display.





9 Enter "43.00" on the Display.



- Press **CANCEL** to return to the value of 0.00 when starting to change settings.
- Press **CANCEL** again to return to the measurement mode.  
The Adjustment value will return to the value before changing the setting.

10 Press **ENTER** to terminate the Multi-point Adjustment.

- Once correction has been completed, check the Adjustment value.

$S_{01}$  Displayed value for point 1 .....7.00 NTU  
 $S_{U1}$  Measurement value in official method for point 1 .....8.00 NTU  
 $S_{02}$  Displayed value for point 2 .....48.0 NTU  
 $S_{U2}$  Measurement value in official method for point 2 .....43.0 NTU

## 8 Checking the Adjustment Values

Press **ADJUST**. The Adjustment value for  $S_{01}$  will blink on the main display, and  $S_{01}$  will be shown on the secondary display.



The setting items will indicate as follows each time

**ADJUST** is pressed:  $S_{01} \rightarrow S_{U1} \rightarrow S_{02} \rightarrow S_{U2}$ .

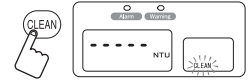
Press **CANCEL** to return to the measurement mode.

The displays have the following meanings.

Display	Single-point Adjustment	Multi-point Adjustment (2-point)
$S_{01}$	Displayed value	Display value for point 1
$S_{U1}$	Measurement value in official method	Measurement value in official method for point 1
$S_{02}$	Not displayed	Display value for point 2
$S_{U2}$	Not displayed	Measurement value in official method for point 2

## 9 Manual cleaning

Press **CLEAN** for 2 seconds or more to operate the cleaning device.



## 8 Error Indication

- The Turbidity Checker TSC-10(E) has an Error function to indicate improper operation and occurrence of problem. There are four kinds of error indications (Err1 to Err4), the meaning of which is as follows.



"Err 1" is indicated when the Detector is out of order, and so forth.



"Err 2" is indicated when calibration is not carried out properly.



"Err 3" is indicated when the light source of the Detector is not lighted.



"Err 4" is indicated when the measuring water temperature is out of the specified range.

- In the case of "Err 1" or "Err 3" is indicated, the Self-checking Relay Output will be produced.

- Press **CANCEL** to escape "Err 2" indication.

## 9 Troubleshooting

Problem	Cause	Inspection and corrective action
"Error 1" is indicated on the Display.	The Detector is out of order, and so forth.	Check this according to the "Troubleshooting" in the instruction manual for the Detector.
	A Detector Cable is not wired properly.	Turn off the power and check the wiring. After that, wire it properly.
"Error 2" is indicated on the Display.	Calibration turns out a failure.	Carry out calibration once again. If "Err 2" persists in indicating even when carrying out calibration repeatedly, it is necessary to make repairs. Contact your dealer.
	The Detector is out of order.	The Detector needs repair. Contact your dealer.
"Error 3" is indicated on the Display.	A Detector cable is not wired properly.	After checking the Detector Cable for wiring, wire it properly.
	The Detector is out of order.	The Detector needs repair. Contact your dealer.
"Error 4" is indicated on the Display.	The Detector is out of order.	The Detector needs repair. Contact your dealer.
	The measuring water temperature is not appropriate.	Use the Detector in water temperature of 0 to 40°C.
Warning indication light is blinking red.	The inside humidity of the detector has reached the limit.	The Detector needs overhaul or repair. Contact your dealer.
The display is not turn on.	The transmitter is out of order.	The Transmitter needs repair. Contact your dealer.
	A power cable is not wired.	After checking the internal wiring, wire the power cable properly.
	A Circuit Breaker is at the "Breaker On" position.	Get rid of possible cause of the circuit breaker being at the projected position before depressing the Circuit Breaker.



## 10 Maintenance

### Maintenance

- Maintenance (rough standard: once a month)
  - Clean and wash the detecting windows and the wiper blade with tap water.
  - Check whether or not the detecting windows are scratched or deteriorated.
  - Check whether or not the wiper blade is worn or deformed.
  - Make sure that the wiper blade is fixed securely.
  - Check whether or not the detector cable is scratched or deteriorated.
  - Check the lifting lug for corrosion.
  - Immerse the detector in the measured water (formazin, etc.) of known concentration and make sure of analog (4-20mA) signal output.

### Caution

- To clean the detector, first wipe away lightly with a clean soft cloth, and so forth immersed by diluted mild detergent solution and then wipe off moisture with a dry clean soft cloth, and so forth.
- Do not wipe the detector with organic solvent such as benzene.
- Do not put oil such as grease on a wiper blade.

### Periodic inspection

- Inspect the following items every 3 months:
  - Make sure that the Transmitter is fixed securely.
  - Make sure that the Transmitter is not damaged.
  - Make sure that the screws of the Terminal Block are not rusted.

### Replacement of consumables

- Replace the wiper blade once a year as rough standard. Besides, replace it when adequate wiping effect cannot be produced.
- In reference to the wiper blade, purchase a maintenance kit (TSC-MK).

### Calibration

- The Turbidity Checker TSC-10(E) is designed so as to make measurements stably for a long time. In order to maintain the reliability of measurement, however, carry our calibration at least once a year (Refer to page 17 (2) Calibration).

### Storage for a long time

- When the Turbidity Checker TSC-10(E) is not used over a prolonged period, keep it as follows:
  - Disconnect the power supply from the power source.
  - Pull up the detector from water and clean it.
  - Keep the detector at a place not being exposed to direct sunshine.

### Overhaul

- The seals and desiccant agent must be replaced every 3 years by OPTEX CO., LTD. as overhaul works. Please contact your dealer for more information.

## 11 Specifications

Name	Turbidity Checker
Model No.	TSC-10(E)
Measuring range	0.00 - 500.0 (NTU/FNU)
Power supply voltage	AC100 - 240V±10% 50/60Hz
Power consumption	Normal: 15VA or less, During cleaning: 22VA max.
Display resolution	0.01(0.00 - 19.99), 0.1(20.0 - 500.0) NTU/FNU
Repeatability	2% of reading or 0.05 NTU/FNU, whichever is greater (Formazin standard / 20°C)
Output	Signal Output (analog 4 - 20 mA, resistance load of 300 Ω max.)
	Self-checking Relay Output (non-voltage C-contact capacity 240VAC, 1A resistance load)
	Alarm Relay Output (non-voltage C-contact capacity 240 VAC, 1A resistance load)
Alarm timer	1 to 120 minutes (adjustable)
Calibration	Distilled water
Cleaning system	Automatic wiper cleaning system
Time interval for cleaning	10 to 240 min (selectable)
Measuring water temperature	0 to 40°C (unfrozen)
Ambient temperature	Transmitter: -20 to +50°C, humidity 95%Rh or less (Avoid direct sunlight)
Operating altitude	Altitude up to 2000 m
Main material	Detector: SUS316L, sapphire glass, fluorocarbon rubber, EPDM, Polyolefin (cable)
	Transmitter: Polycarbonate
Dimensions	Detector: approx. ø48 x 133 mm
	Transmitter: approx. W x H x D 240 x 162 x 75 mm
Weight	Detector: approx. 1.0 kg
	Transmitter: approx. 1.6 kg
Degree of protection	Detector: IP 68, maximum depth of 2 m (underwater type)
	Transmitter: IP65 (jetproof type) Pollution degree 2
Detector cable length	9 m
Option	TSC-MK: maintenance kit, TA-3: mounting attachment,

Specifications are subject to change without prior notice.

