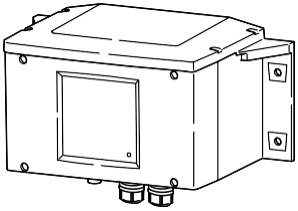
GI Instruments
Québec Inc.

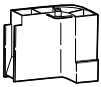
SC7440 Low Range Turbidity

User Manual

The Contents of Packaging



Sensor



Deaerator

Cleaning paper

Instruction Manual

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

Table of Contents

1 For safe use

Be sure to read this instruction manual in order to use the Turbidity Checker TR6 properly.

- Please thoroughly read the “For safe use” before using the SC7440 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.

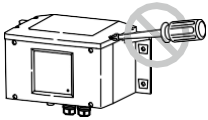
In order to use the SC7440 properly, observe the following precautions.

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.

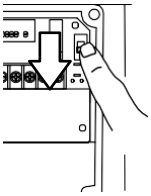
- Do not wipe the product with solvent. It may cause failure.
- To clean the product, first wipe away lightly with a clean soft cloth damped by diluted mild detergent solution and then wipe off moisture with a dry clean soft cloth.

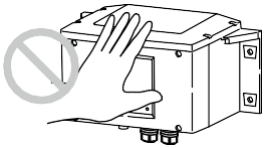
DC24V

- Be sure to use the power supply of DC24V. Otherwise it may cause fire or electric shock.

Keep the Power off during installation and wiring operations.

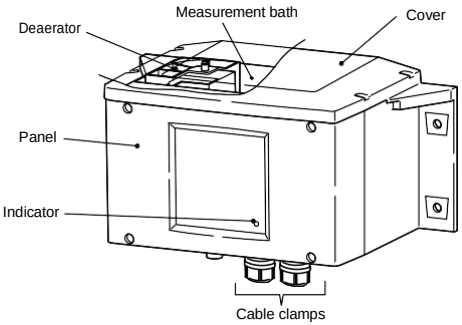
- During installation and wiring, turn OFF the power switch and disconnect the power cable from the outlet. Otherwise, it could result in fire, electric shock, and damage.

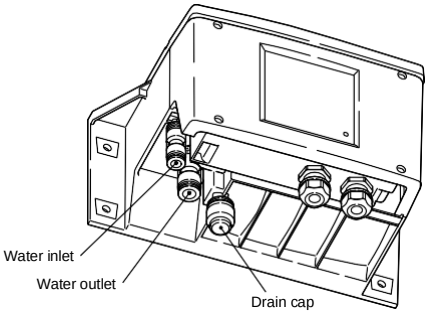


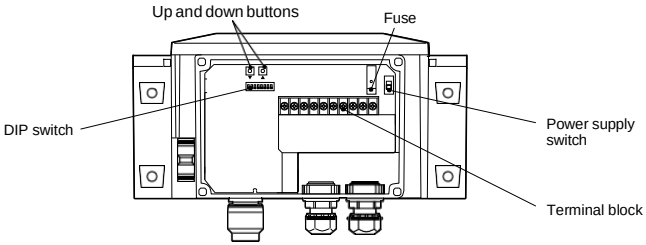


- Do not apply strong impact or excessive force to the SC7440 unit.

2 Names of the parts

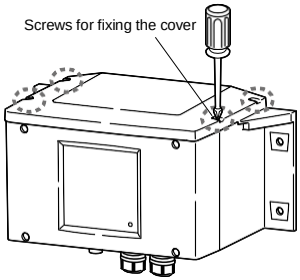






How to open / close the Cover

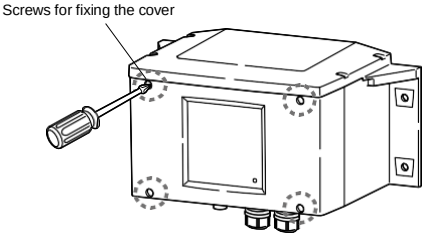
Open/close the cover by loosening/fastening the four cover fixing screws.



Caution
Fasten the cover fastening screws surely. If these screws are loose, turbidity might not be measured correctly due to the light entered in the measurement bath or dust mixed in the measurement water.

How to open / close the Panel

Open/close the panel by loosening/fastening the four cover fixing screws.

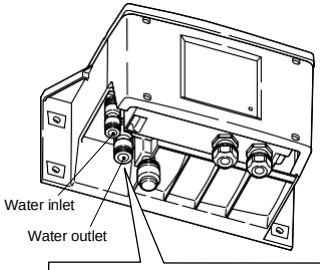


Caution
Screws must be tightened securely. Otherwise, sufficient protection cannot be obtained.

How to connect / disconnect the tube

Caution

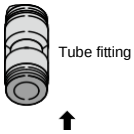
- Do not apply strong impact or excessive force to the joint. Otherwise, it may damage the joint, as well as may cause crush, rupture, or disconnection of the tube.
- Water temperature must be between 0 and 40 ºC.
- The unit must be isolated not to damage other machines or equipment in case of water leakage.
- Use insert rings if necessary. To determine whether to insert rings or not, check the specification of the tube. Selection of insert rings unmatched to the specification of the tube may cause tube coming-off and water leakage.
- Follow the precautions below when attaching the tube.
  - The cutting section must be right angle.
  - Outer circumference must have no damage.
  - The tube must not be shaped like an ellipse.
  - The tube must be fully inserted to the end.
  - Ensure that the tube is securely inserted and cannot come off after attached.



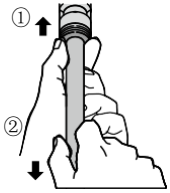
Applicable tube diameter for water inlet:
Nylon tube: 8 +/- 0.1 mm dia.
Urethane tube: 8 +/- 0.15 mm dia.

Applicable tube diameter for water outlet:
Nylon tube: 10 +/- 0.1 mm dia.
Urethane tube: 10 +/- 0.15 mm dia.

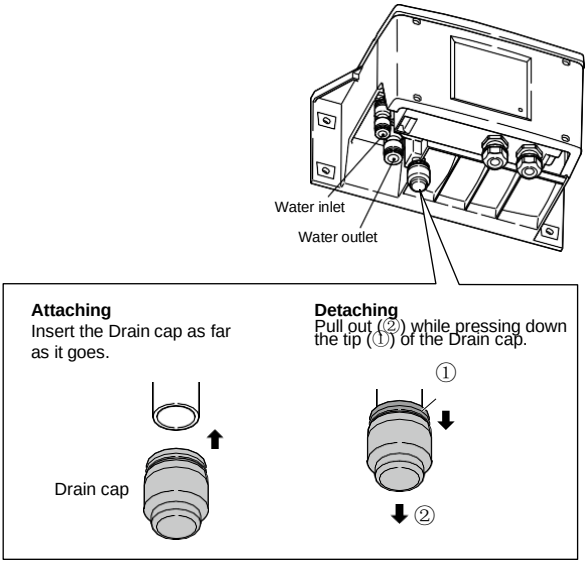
Connecting
Insert the tube to the tube fitting.



Disconnecting
Pull out the tube while push the lip of the tube fitting.

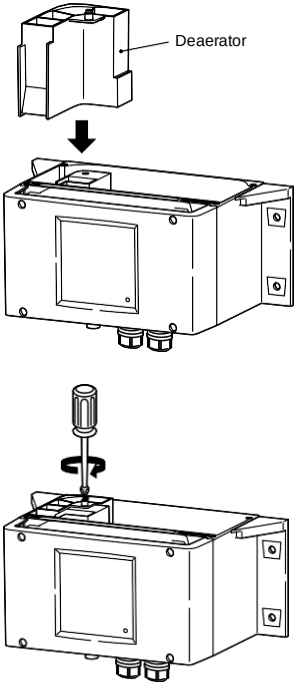


How to attach / detach the Drain cap



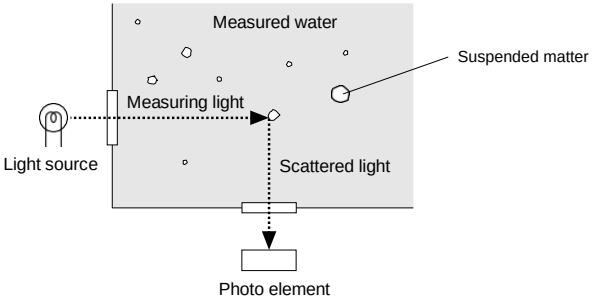
How to attach / detach the Deaerator

Attach the Deaerator and fix it by using the fixing screws.



3 Measuring principle

Turbidity Checker SC7440 uses a method of 90 degree scattered light. In this method, a light source illuminates the surfaces of matter suspended in the water, and the light is scattered by these surfaces is detected by a photo element installed at an angle of 90 degrees from the light axis of the measured light. The turbidity is determined by the amount of the scattered light.

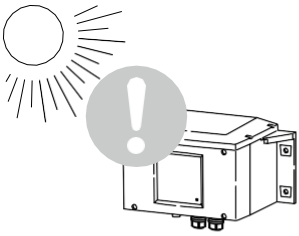


4 Installation

1 InstallingTR6 unit

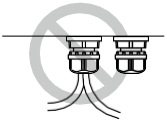
Before installation, remove the cable from the power supply, and after completion, wire the power supply cable.

denotes "Prohibited action" denotes "Required action"



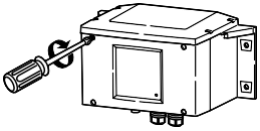
- The SC7440 unit must be installed at the place which is well-ventilated, and is not exposed to direct sunlight.

- For wiring the unit, use the bundled cable clamps.

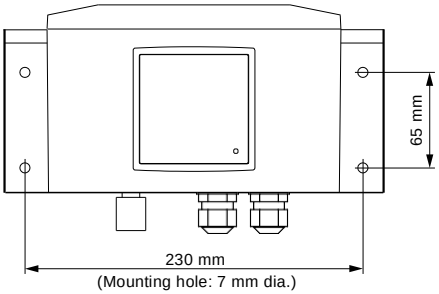


- The signal output cable and the power cable must not be bound together or put in the same cable clamps.

- Securely tighten the panel fixing screws. When the screws are loose, sufficient protection cannot be obtained.

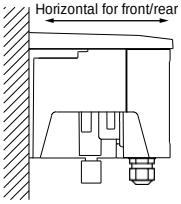


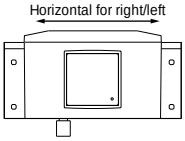
Install the SC7440 unit on the wall. For the mounting pitch, see the figure below.



Caution

Install the SC7440 unit horizontally for all directions (front/rear, right/left).



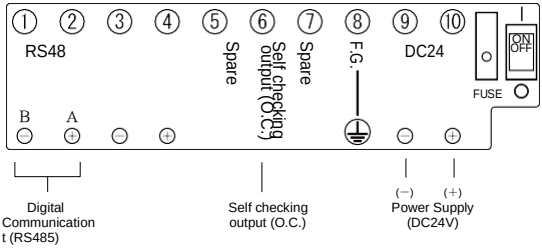


2 Wiring

Caution

- Be sure to use the power supply of DC24V. Otherwise it may cause fire or electric shock.
- Before installation, turn off the power supply switch, and then wire the power supply cable. Otherwise it may cause fire or electric shock.

Terminal block

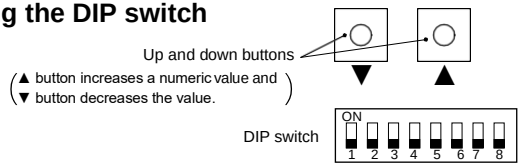


- Compatible cable diameter with the Cable Clamps is 6 to 8 mm

Reference

For the digital communications, refer to page 21, "10 Digital Communications".

3 Setting the DIP switch

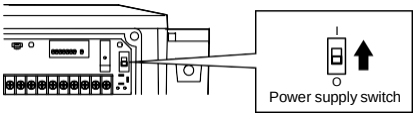


SW	Description
1-4	Do not use.
5	The standard substance of the calibration curve can be selected. To select formazine, turn OFF SW5. To select polystyrene, turn ON SW5
6	Do not use
7-8	The measurement range can be selected SW7 / SW8 / measurement range ON / ON / 0-2 ON / OFF / 0-5 OFF / ON / 0-20 OFF / OFF / 0-100
	Caution To change the measurement range via digital communication, turn OFF SW7 and SW8.

5 Operation start

1 Turn on the power

Turn on the power, the indicator illuminates.



2 Attaching the panel

Caution
Screws must be tightened securely. Otherwise, sufficient protection cannot be obtained.

Attach the panel with screws (see page 5, "How to open/close the panel").

3 Passing water

Caution
•Make sure that the panel is attached securely. High water pressure may cause water leakage, which could result in malfunction. •Adjust the water flow rate to 100 - 200 mL/min.

Start passing water through the SC7440 unit.

•If leaking from the inlet passage, the outlet and the drain, check the connection of the tubes, joints and drains.

•If the tube vibrate, fix the tube.

4 Checking water level

Pass water until the water level becomes a certain.

If the water is overflowing from the measuring tank, check the measured water flow rate and the clogging of the outlet.

5 Attaching the cover

Attach the cover by using screws (see page 5, "How to open/close the cover").

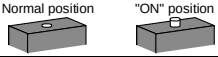
Caution
Fasten the cover fastening screws surely. If these screws are loose, turbidity might not be measured correctly due to the light entered in the measurement bath or dust mixed in the measurement water.

6 Checking the measurement value

Check the displayed measurement value to see if the measurement water is in stable condition.

Caution
When passing the water for the first time, it may take time until the measurement value becomes stable. Clean the measurement tank and the Deaerator as needed.

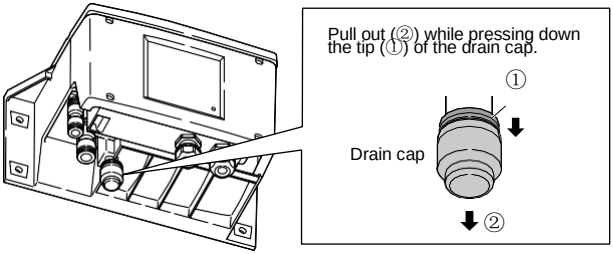
6 Troubleshooting

Problem	Cause		Inspection and corrective action
The indicator blinks. Self-checking relay is output.	Internal signal error	The cover is not mounted correctly.	Mount the cover correctly.
		The equipment is out of order.	SC7440 needs repair. Contact your dealer.
The indicator blinks.	Out of the ambient temperature		Use the equipment in the measured water temperature (0 to 40°C) and the ambient temperature (-20°C to 50°C).
The indicator does not turn on.	A power cable is not wired.		Wire the power cable correctly.
	The power supply voltage is out of specification.		Use the product within the power supply voltage (DC24V±10%).
	The fuse is in the "ON" position.		Get rid of a possible cause why the fuse has been in "ON" position, and switch it to the normal (OFF) position. 
	The power switch is not ON.		Turn ON the power switch.
	SC7440 is out of order.		SC7440 needs repair. Contact your dealer.
Water leaks out of the inflow port or drain port.	The tube is damaged.		If the tube have length to spare, cut off the tip. Replace the tube.
	The joint is damaged.		The joint must be replaced. Contact your dealer.
	The inflow port or drain port is damaged.		SC7440 needs repair. Contact your dealer.
Water leaks out of the drain.	The drain cap is damaged.		The drain cap must be replaced. Contact your dealer.
	The drain is damaged.		SC7440 needs repair. Contact your dealer.
Water leaks out of the measurement bath.	Dirt has been collected in the measurement bath.		Clean the measurement bath.
	The measurement water's flow rate is much.		Use the product with a measurement water's flow rate of 100-200 ml/min.

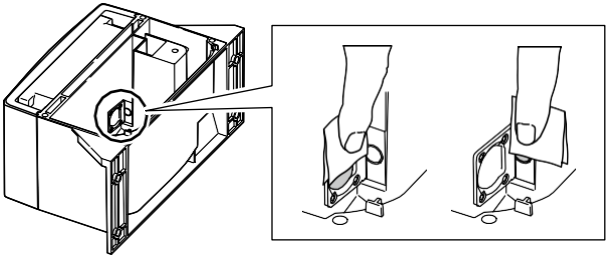
7 Maintenance

Maintenance

- Cleaning is required in proper interval (the interval depends on the water quality). Clean the following locations:
  - Clean the measurement tank and Deaerator using a clean soft cloth.
    If dirt accumulates at the bottom of the measurement tank, detach the drain cap and drain off the water before cleaning it.



  - Clean the measurement windows (2 places) using a clean soft cloth.



  - If the cover or panel is contaminated, first wipe away lightly with a clean soft cloth immersed in a diluted mild detergent solution and then wipe off the moisture by using a dry clean soft cloth.

Caution

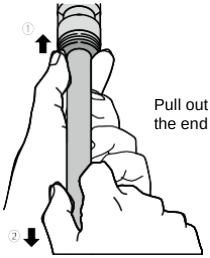
- Do not use organic solvent such as benzene for cleaning this product.
  Do not wipe SC7440 with organic solvent such as benzine.
- Wiping the light source window with a hard cloth may cause scratches, which disables the correct measurement. Use a clean soft cloth or a cotton swab to remove dirt.

Periodic inspection

- Inspect the following items every month:
  - •Scratches on the cable or cable deterioration
  - •Water leakage from the water inlet, water outlet, or drain
  - •Check if the unit outputs a correct value when the measurement water with known concentration is used.
  - •If the cover or display area is contaminated, clean it by using a clean soft cloth.
- Inspect the following items every 3 months:
  - •Ensure that SC7440 is fixed securely.
  - •Ensure that SC7440 is not damaged.
  - •Make sure that the screws of the Terminal Block are not rusted.

Storage for a long time

- When the Turbidity Checker SC7440 is not used over a prolonged period, keep it as follows:
  - •Drain off the water from the measurement tank and keep the water. Follow the procedure below.
    (1) Stop feeding water to this product.
    (2) Detach the drain cap and let the water come out of the tank, and protect the water outlet.
    (3) Wash the drain cap and keep it in a clean place.
    (4) Disconnect the tube at the water inlet (In order to protect the inflow port, keep the joint attached.).



Pull out the tube as pushing the end of the joint in.

(5) The tube does not have to be disconnected from the water outlet.
(6) Open the panel and shut down the power supply switch.
(7) Disconnect the power cable from the power source and attach the panel.

- •Keep SC7440 at a place not being exposed to direct sunshine.

Caution

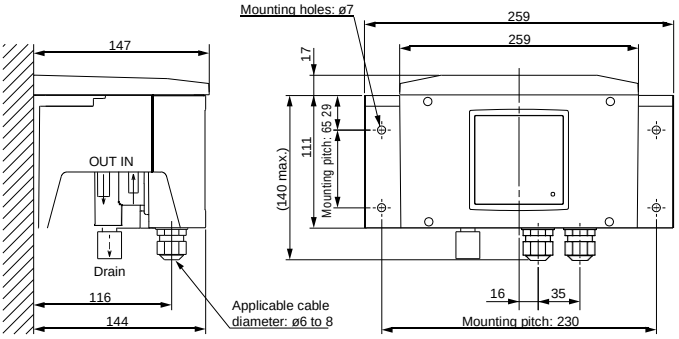
- •Leaving the drain cap in place allows rain to come into the measurement tank. The drain cap must be detach and kept.
- •Be careful not to damage the water inlet and outlet. Damage causes water leakage and could result in malfunction, which requires replacement of the unit.

8 Specifications

Name	Turbidity Checker
Model No.	SC7440
Measurement principle	Turbidimetric light-scattering method
Light source	LED
Measuring range	Select from 0-2, 0-5, 0-20 and 0-100 (NTU/FNU: Formazine standard solution)
	Select from 0-2, 0-5, and 0-20 (Polystyrene standard solution)
Power supply voltage	24VDC±10%
Current consumption	Normal: 100mA or less, During activation: 600mA max.
Digital communication	MODBUS protocol (RS485) TC-Mi protocol (RS485)
Measured water flow	100 to 200 mL/min
Measuring water temperature	0 to +40ºC (unfrozen)
Ambient temperature	-20 to +50C, humidity 95%Rh or less
Main material	PPO, AES, SUS316L
Dimensions	W x H x D 259 x 157 x 147 mm Protruding portions are included
Weight	approx. 2 kg
Degree of protection	IP65
Option	Flowmeter

Specifications are subject to change without prior notice.

9 Dimensions



(Unit: mm)

10 Digital communications

◆ Communication Method

Item	Specification
Compliant Standard	Based on EIA RS-485
Transmission Method	2-wire, semi-duplicate
Protocol	MODBUS RTU (default) MODBUS ASCII SC7440 protocol
Baud rate	9600 (default) / 14400 / 19200 / 38400 bps
Data bits	8bit
Start bits	1bit
Stop bits	1bit
Parity bit	None
Slave address MODBUS only	1 (default) to 247

1 MODBUS protocol

◆ Frame Configuration

Mode	Start	Slave address	Function code	Data	Error check	End
RTU		1 byte	1 byte	n byte	2 byte	
ASCII	:	2 chars	2 chars	n chars	2 chars	CR, LF

Item	Mode	Description
Start	RTU	3.5 chare silence
	ASCII	":" character
End	RTU	3.5 chare silence
	ASCII	"CR","LF"character
Slave address	Common	1 byte field with a value ranging from 1 to 247. Broadcast address is 0.
Function code	Common	4, 6
Data	RTU	0-N bytes with response data from the device.
	ASCII	0-N bytes with response data from the device in hex characters.
Error check	RTU	CRC
	ASCII	LRC

Function Codes	Description
4	Read input registers
6	Write single resisters

◆ Error Codes

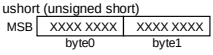
・The returned value is the sum of the function code of the request message and 0x80 (one is set on the MSB).
Ex.) This is 0x04 if the error is caused by read-out operation 0x84.
This is 0x06 if the error is caused by write-in operation 0x86.

・Exception codes (codes indicating the error details)

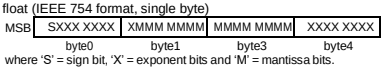
Exception codes	Name	Description
1	Illegal function	The function code received in the query is not an allowable action for the slave. If a Poll Program Complete command was issued, this code indicates that no program function preceded it.
2	Illegal data address	The data address received in the query is not an allowable address for the slave.
3	Illegal data value	A value contained in the query data field is not an allowable value for the slave.
4	Slave device failure	An unrecoverable error occurred while the slave was attempting to perform the requested action.
5	Acknowledge	The slave has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occurring in the master. The master can next issue a Poll Program Complete message to determine if processing is completed.
6	Slave device busy	The slave is engaged in processing a long−duration program command. The master should retransmit the message later when the slave is free.

◆ Data Type

・ushort (unsigned short)

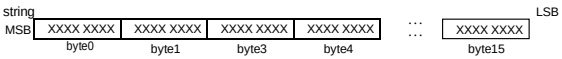


・float (IEEE 754 format, single byte)



where 'S' = sign bit, 'X' = exponent bits and 'M' = mantissa bits.

・string



◆ Register Map

Register(Dec)	Size (registers)	R(Read)/W(Write)		Data type	Description
0002	1	R	W	ushort	Read: Confirm measurement state (Not in measurement = 0x0000, In measurement = 0xFFFF) Write: Start measurement (write in 0xFFFF)
0003	1	-	W	ushort	Stop measurement (write in 0xFFFF)
0047-0054	8	R	-	string	Store serial number
0070	1	R	-	ushort	Store error number
0084	1	R	W	ushort	Store communication protocol
0085	1	R	W	ushort	Store transmission speed
0087	1	R	W	ushort	Store slave address (default = 1)
0100-0101	2	R	-	float	Store measured value
0110	1	R	W	ushort	Store unit indication
0111-0112	2	R	W	float	Store offset adjustment value
0115-0116	2	R	W	float	Store span adjustment value
0123	1	R	W	ushort	Store signal output response time
0124-0126	2	R	W	float	Store measurement range
0196	1	R	W	ushort	Store the noise reduction setting

Caution

Reset the power supply after changing protocol, baud rate or slave address.
The settings do not change until power reset.

・Communications protocol selection

Value	Transmission mode
0xAA00	MODBUS RTU (default)
0xAAFF	MODBUS ASCII
0xAA0F	SC7440 protocol

(Ex.) When changing from "MODBUS RTU" to "SC7440 protocol". (When slave address=1)

	Start	Slave address	Funciton code	Data	Error check	End
Request command		01	06	0054AA0F	F6BE	

	Start	Slave address	Funciton code	Data	Error block	End
Normal response		01	06	0054AA0F	F6BE	

Return the value written directly after receiving the request command normally.
(When it can't normally be received, an error code is returned.)

・Transmission speed: Bit assignment

Bit	Description
0-3	2=9600 (default) 3=14400 4=19200 5=38400
4-7	0x00 (fixed)
8-15	0xAA (fixed)

・Error number: Bit assignment

Bit	Description
0-1	N/A
2	Err3 Internal signal error
3	Err4 Out of the ambient temperature
4	N/A
5	Err6 Internal data error
6-15	N/A

・Turbidity unit selection

Value	Description
0	Unit indication N/A
1	NTU (default)
2	FNU
3	Degree

・Adjust the span
Adjust the span scaling factor.

Initial value	Setting range
0	0.30 to 3.00

・Noise reduction setting

Value	Description
0	Normal (default)
1	Enhanced