

Operation Manual for X-51 Simulator

Carefully read this manual before using the X-51 Simulator.

X-51 Simulator gives theoretical equivalent input of electrodes for pH, mV, ion, and DO measuring instruments and checks linearity and temperature compensation functions of the instrument.

The simulator makes equivalent voltage output for pH, mV, and ion, equivalent current output for DO (dissolved oxygen), and thermistor equivalent temperature resistance output for temperature.

■ HORIBA's Warranty and Responsibility

X-51 Simulator is covered by HORIBA's warranty for a period of one (1) year, under normal use. Although unlikely, if any trouble attributable to HORIBA should occur during this period, necessary exchange or repairs shall be conducted by HORIBA, free of charge. The warranty does not cover the following:

- Any trouble or damage attributable to actions or conditions specifically mentioned to be avoided in the operation manuals
- Any trouble or damage attributable to use of the Simulator in ways or for purposes other than those described in the operation manuals
- Replacement of consumables and accessories, or use of parts not specified by HORIBA
- Any alteration to the external appearance of this Simulator attributable to scratches, dirt, etc. occurring through normal use
- Any trouble or damage attributable to repair or modification by any party not authorized by HORIBA

HORIBA also shall not be liable for any damages resulting from any malfunctions of this product, any erasure of data, or any other uses of this product.

■ CE Marking

This equipment is in conformity with the following directives and standards:



Directives: The EMC Directives 2004/108/EC
The Low Voltage Directive 2006/95/EC
Standards: EN61326-1: 2006
(EMISSION: Class B, IMMUNITY Category: Basic Requirement)

EN61010-1: 2001

Installation Environment

This product is designed for the following environment.

Pollution degree 2

Measurement categorie I

WARNING: Do Not use the equipment for measurements within measurement categories II, III and IV.

■ Information on Disposal of Electrical and Electronic Equipment and Disposal of Batteries and Accumulators

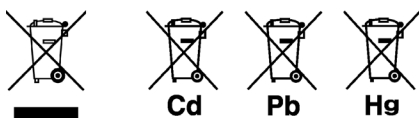
The crossed out wheeled bin symbol with underbar shown on the product or accompanying documents indicates the product requires appropriate treatment, collection and recycle for waste electrical and electronic equipment (WEEE) under the Directive 2002/96/EC, and/or waste batteries and accumulators under the Directive 2006/66/EC in the European Union.

The symbol might be put with one of the chemical symbols below. In this case, it satisfies the requirements of the Directive 2006/66/EC for the object chemical.

This product should not be disposed of as unsorted household waste.

Your correct disposal of WEEE, waste batteries and accumulators will contribute to reducing wasteful consumption of natural resources, and protecting human health and the environment from potential negative effects caused by hazardous substance in products.

Contact your supplier for information on applicable disposal methods.



■ FCC Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

■ Safety precautions for use

- Do not give physical shock to the Simulator like dropping or hitting.
- Do not immerse the Simulator into alcohol, organic solvent, strong acid, strong alkaline, and other similar solutions. The simulator contains ABS resin, acrylic resin and various rubber products in its body.
- Do not use a hair-dryer for drying the Simulator. When the Simulator is wet, wipe it using soft cloth.
- Perform the key operation by the fingers, not by the hard object like metal stick or rod.
- To disconnect the cable, pull them out with holding the connector part. Do not pull the cable part; it may cause a breakage.
- Do not remove the battery gasket or twist it.
- When opening the battery case, make sure that no foreign matter is attached to the battery gasket.
- Do not use any unspecified batteries; it may cause a breakage.
- Be sure to use packaged cable. The accuracy is guaranteed by the combination of Simulator and cable.

Auto power OFF function

This Simulator automatically turns off, if it is left without any key operation. To turn the power OFF manually, press ON/OFF key for one second or more.

Termination of output	After one minute without key operation
Power OFF	After five minutes without key operation

Storage and operating environment

- Storage temperature: 0°C to 45°C
- Place the Simulator where the relative humidity is kept below 80% and no dew is condensed.
- Avoid operating the Simulator in the following kind of locations.
 - Dusty locations
 - Location with severe vibration
 - Location with direct sunlight
 - Location exposed to corrosive gas
 - Location near to an air-conditioner or heater
 - Location exposed to direct wind

Transportation of the X-51

When you transport the Simulator, be sure to use the box in which the Simulator has been packaged. Transporting it otherwise may cause malfunction of the Simulator.

Disposition

When you dispose the Simulator, be sure to dispose it as an industrial waste.

5 Check

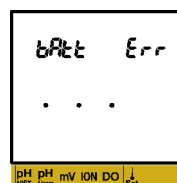
- Simulator (X-51) 1 pc
- Cable (1 m) 1 pc
- Dry-cell battery (AA alkaline) 2 pcs
- Strap 1 pc
- Soft case 1 pc
- Operation manual 1 sheet

Turn on the power of Simulator with ON/OFF key.

- When certifying the instrument, keep the room temperature in the range of $\pm 5^{\circ}\text{C}$ of the temperature in X-51 delivery inspection.
- *: Temperature in delivery inspection of X-51 is described in the inspection report.
- It is necessary to keep the Simulator placed in environment of 15°C to 25°C .
- Follow the "Operational Qualification Confirmation Report", when performing OQ (Operational Qualification).

Note

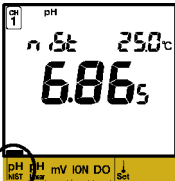
When the battery is running down, "Err" is displayed, and the Simulator does not start.



Caution for the operation during outputting simulation value

- If OUTPUT key is pressed or mode is changed with MODE key, outputting simulation input value stops.
- Even if simulation input value is toggled, outputting simulation input value continues unless output mode is changed.

5.1 pH check

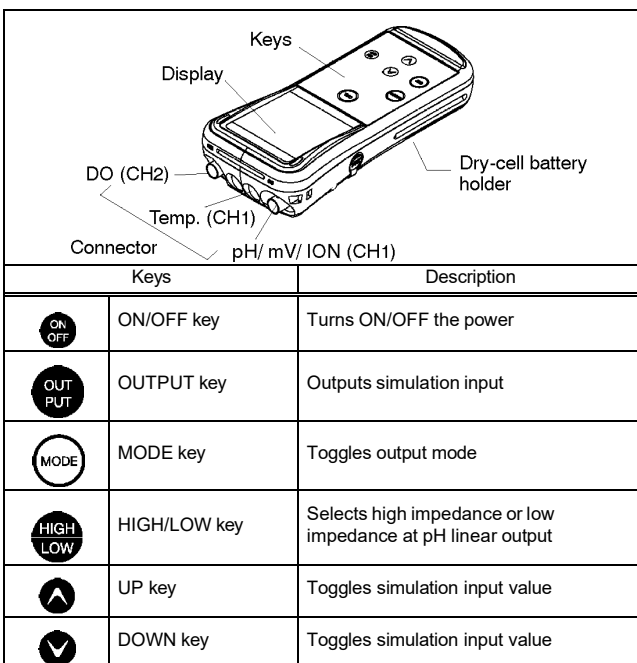
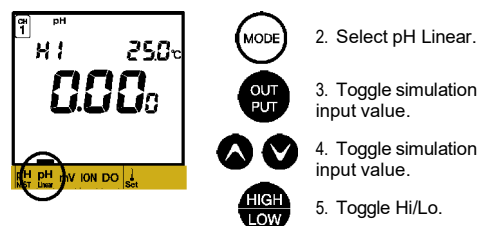
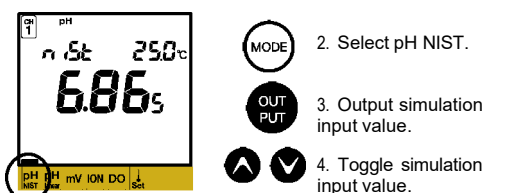
1. Set pH calibration mode of the measuring instrument to NIST.
 2. Select pH NIST with MODE key on the Simulator.
 3. Start outputting simulation input value with OUTPUT key.
 4. Input the simulation value in the order of pH 6.865 and pH 4.008 to the Simulator, then calibrate the instrument with the input value. Check that calibration can be performed on the instrument.
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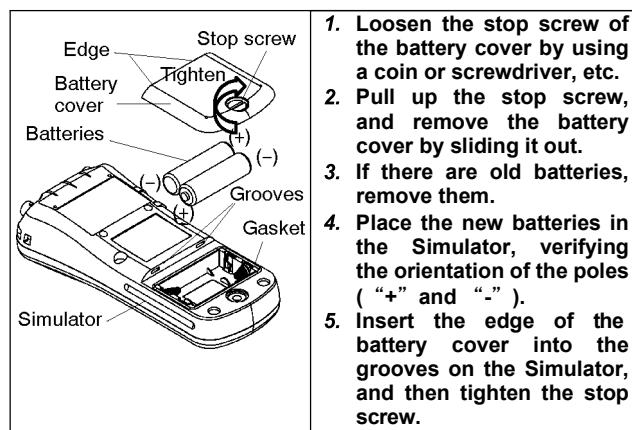




2. Select pH NIST.
 3. Output simulation input value.
 4. Toggle simulation input value.
5. Select pH Linear with MODE key on the Simulator.
 6. Start outputting simulation input value with OUTPUT key.
 7. Input the simulation value in the order of pH 0.000, 4.000, 7.000, 10.000, and 14.000 to the Simulator, then check the value on the instrument.
 8. Toggle impedance Hi/Lo with HIGH/LOW key in each simulation input, then check the difference between above mentioned value and displayed value of the measuring instrument.

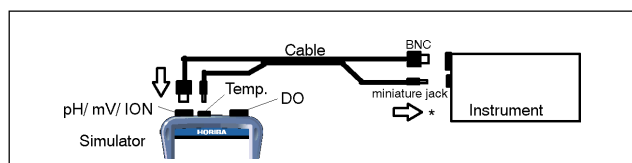


3 Procedures for replacing battery



4 Connection

- For inspection of pH, mV, ION, DO: Connect the BNC connector.
- For inspection of temperature: Connect the miniature jack connector.

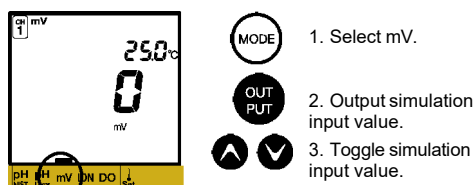


Note

DS-10 series and D-20 series, do not connect the BNC connector and miniature jack connector at the same time.

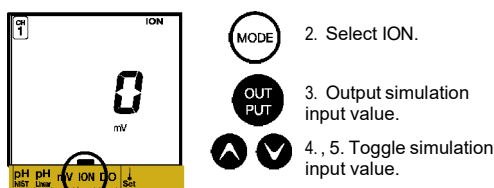
5.2 mV check

1. Select mV with MODE key on the Simulator.
2. Start outputting simulation input value with OUTPUT key.
3. Input the simulation value in the order of 0, ± 1000 , ± 1500 and ± 1900 mV to the Simulator, then check the value on the instrument.



5.3 ION check

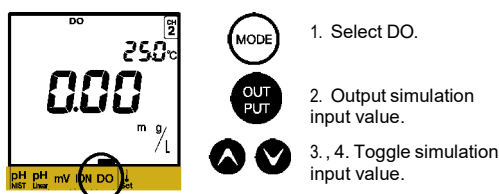
1. Set the unit to mol/L and ion type to +1 with ION measurement mode of the measuring instrument.
2. Select ION with MODE key on the Simulator.
3. Start outputting simulation input value with OUTPUT key.
4. Input the simulation value in the order of 0 mV (1 mmol/L) and 120 mV (10.0 mmol/L), then calibrate the instrument with the input value. Check that calibration can be performed on the instrument.
5. Input the simulation value in the order of 240 mV, 120 mV, 0 mV, and -120 mV to the Simulator, then check the value on the instrument.



Simulation input	Equivalent concentration	Simulation input	Equivalent concentration
240 mV	100 μ mol/L	0 mV	1.00 mol/L
120 mV	10.0 mmol/L	-120 mV	100 mol/L

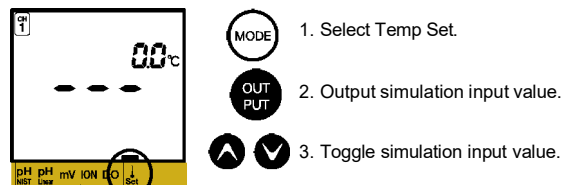
5.4 DO check

1. Select DO with MODE key on the Simulator.
2. Start outputting simulation input value with OUTPUT key.
3. Input the simulation value in the order of 0.00 mg/L and 8.11 mg/L to the Simulator, then calibrate the instrument with the input value. Check that calibration can be performed on the instrument.
4. Input the simulation value in the order of 10.00 mg/L and 4.05 mg/L to the Simulator, then check the value on the instrument.



5.5 Temperature display check

1. Select Temp Set with MODE key on the Simulator.
2. Start outputting simulation input value with OUTPUT key.
3. Input temperature simulation value in the order of 0.0°C, 25°C, 30.0°C, 60°C and 100°C to the Simulator, then check the value on the instrument.



6 Specifications

	parameter	Output value	Accuracy (Varies depending on temperature used.)	
			15°C to 25°C	5°C to 40°C
Output	pH NIST	pH 4.008/ 6.865	± 0.004 pH	± 0.01 pH
	pH Linear	pH 0.000/ 4.000/ 7.000/ 10.000/ 14.000	± 0.004 pH	± 0.01 pH
	mV	0, ± 1000 , ± 1500 , ± 1900 mV	± 0.5 mV	± 1.0 mV
	ION	0, ± 60 , ± 120 , ± 180 , ± 240 mV	± 0.2 mV	± 0.6 mV
	DO	0.00/ 4.05/ 8.11/ 19.00 mg/L	± 0.04 mg/L	± 0.2 mg/L
	Temperature	0.0/ 25.0/ 30.0/ 60.0/ 100.0°C	± 0.1 °C	± 0.2 °C
Ambient temp.	5°C to 40°C (–15°C to 25°C for certification of measuring instrument)			
Ambient humidity	0% to 80% (No dew condensation)			
Power	Two AA alkaline dry-cell batteries (Approx. 40 hours with continuous operation)			
Dimensions	170(H) $\times$ 89(W) $\times$ 40(D) mm			

Note

This Simulator supplies simulation input specific to HORIBA pH meter, ION meter, and DO meter. Therefore, the simulator output cannot be measured by general-purpose digital multi-meter.