

POTENTIOSTAT / GALVANOSTAT

N600-HA151B



Manual of Operations

IMPORTANT!

Read the following before using this equipment:

Carefully follow all instructions and observe all precautions given in this manual



LOOK US UP ONLINE



CAUTION!

- Never disassemble or attempt to repair the unit by yourself, such an attempt may damage the unit or cause you injury.
- Avoid installation of the unit where too much dust or corrosive gas exists.
- Do not install the unit on carpet to avoid interference of static electricity.
- Avoid installation of the unit where excessive vibration or electromagnetic fields exist.
- Do not place the unit in direct sunshine, and keep away from fog or rain.
- Do not install the unit in such a manner that blocks the rear panel or the bottom chassis because such installation may cause overheating and damage to the unit.
- Avoid installation of the unit where a heavy substance may drop on it.
- We recommend to ground the unit as to reduce noise and stabilize measurement. To ground the unit, connect the grounding terminal on the rear of the unit to a ground. (structural steel of building or power supply grounding conductor) through the wire supplied with the unit.
- Do not connect the TO-CELL-OUT cable (the output of this unit) to any other power source, to avoid damage the unit.

BEFORE YOU BEGIN

- Before connecting or disconnecting the power cable, be sure the power switch is off.
- Before turning on the unit, make sure that the FUNCTION switch is set to ZERO ADJ to avoid unstable initial conditions.

Connect the TO-CELL-OUT cable clips as follows:

Red (GE)	: Counter electrode
Green (RE)	: Reference electrode
Black (WF2)	: Working electrode
Black (WE1)	: Working electrode

- The WE2 electrode grounds the RE terminal which detects electric potential. In order to minimize the error from voltage drop due to the lead wire and large current, place the WE2 electrode as close as possible to working electrode.
- Do not extend the TO-CELL-OUT cable clip using a PVC wire or a similar conductor because such extension of the cable may cause oscillation or noise due to excessive floating capacity.

REPAIR

Do not force the unit to operate when any fault is found. Whenever a problem is encountered, switch off the power supply, pull out the plug, and contact NADA Scientific for a service and repair quote at support@nadascientific.com, or call us at 1-800-799-6232.

TABLE OF CONTENTS

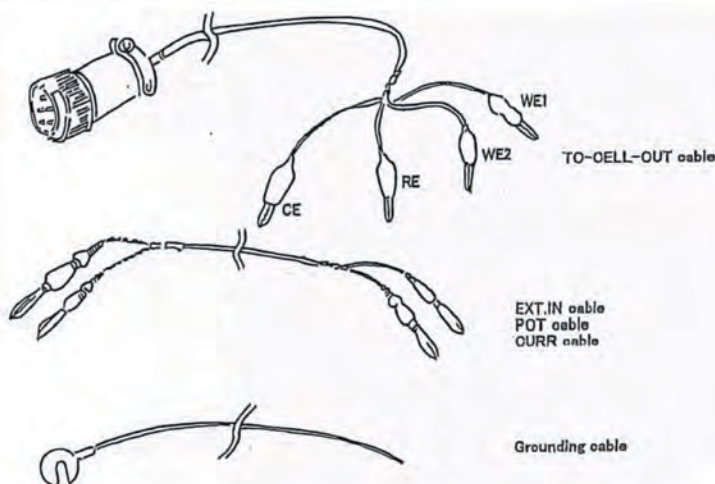
	PAGE
1. BEFORE USE	
Unpackaging check	1
Power supply	1
Installation	2
Precaution before use	2
Repair	3
2. GENERAL INFORMATION	
Function	3
Configuration	3
Specifications	3-4
3. ACCESSORIES	
Output cable	5
External signal cable	5
Recorder output cable	5
Grounding cable	5
4. PANEL OVERVIEWS	
Front panel	6-7
Rear panel	7-8
5. OPERATION	
General precautions before operation	9
Zero adjustment	9
Function check	10
Connection of the load (how to shield)	10-11
Use of HA-151B as the electrometer	12
Use of HA-151B as the potentiostat	12
Use of HA-151B as the galvanostat	12
6. OVERLOAD DISPLAY	
Excess current	13
Excess voltage	13
Uncontrollableness	13
7. CONNECTING TO PERIPHERAL EQUIPMENT	
Connection with logarithmic transformer	13-14
Recommendation of data waveform monitoring	14-15

1. BEFORE USE

Content Checklist

Upon receipt of the HA-151B, please confirm that the panels and the enclosure have not been scarred or damaged. Confirm that the following components are contained in the package and, if any damage or shortage is discovered contact the agent from whom you purchased the HA-151B or one of Hokuto offices.

- HA-151B unit..... 1 set
- TO-CELL OUT cable (1.2m) 1 pc.
- EXT.IN external signal input cable (1.2m) 1 pc.
- POT voltage recorder output cable (1.2m) 1 pc.
- CURR current recorder output cable (1.2m) 1 pc.
- Grounding cable (3m) 1 pc.
- Operation Manual 1 set



Power Supply

Be sure to use power supply of 115 VAC ($\pm 10\%$), 50Hz or 60Hz.

CAUTION: Supply voltage lower than 104V AC may cause error in control, measurement or operation. Supply voltage exceeding 126V AC may damage the unit.

CAUTION: When disconnecting the power cable from the power source; be sure to turn off the power switch of the unit at first and, holding the plug with your hand, pull out the cable. Do not pull out the cable, holding the cable itself, because this may decrease or break the electric continuity of the cable.

Power supply must be sufficient for the following power consumption of this HA-151B

- 20 VA at standby
- 100 VA under the maximum load (output short-circuited, in the G-STAT mode).

Installation

Install the unit where the weight of the unit can be safely supported. (The unit and the accessories: 7.7kg)

- CAUTION:**
- Avoid installation of the unit where too much dust or corrosive gas exists.
 - Do not install the unit on carpet to avoid interference of static electricity.
 - Avoid installation of the unit where excessive vibration or electromagnetic field exists.
 - Do not install the unit in direct sunshine, fog or rain.
 - Do not install the unit in such a manner that blocks up the rear panel and the bottom chassis because such installation may disturb heat radiation, which may damage the unit.
 - Avoid installation of the unit where a heavy substance may drop.

We recommend to ground the unit so as to reduce noise and stabilize measurement. For grounding the unit, connect the grounding terminal on the rear of the unit to ground (structural steel of building or power supply grounding conductor) through the grounding wire supplied together with the unit.

Precautions

Following the precaution mentioned below:

- Before connecting or disconnecting the power cable, be sure to turn off the power switch of the unit.
- Before turning on the power switch of the unit make sure, to avoid unstable initial conditions, that the FUNCTION switch is set to ZERO ADJ.

CAUTION: Do not connect the TO-CELL-OUT cable (the output of this unit) with any other power source. Connecting this cable with other power source may damage the unit.

- Connect the TO-CELL-OUT cable clips as follows:

Red (CE)	:	counter electrode
Green (RE)	:	reference electrode
Black (WE2)	:	working electrode
Black (WE1)	:	working electrode

The WE2 electrode grounds the RE terminal which detects electric potential. In order to minimize the error from voltage drop due to the lead wire and large current, place the WE2 electrode as close as possible to the working electrode.

- Do not extend the TO-CELL-OUT cable clip using a PVC wire or a similar conductor because such extension of the cable may cause oscillation or noise due to excessive stray capacity.

Repair

Do not force the unit to operate when any fault is found. Whenever a trouble is encountered, switch off the power supply, pull out the plug, and contact the agent from whom you purchased the unit or an office of Hokuto Denko.

CAUTION: Never disassemble or attempt to repair the unit by yourself. Such attempt may damage the unit or electrically shock you.

2. GENERAL INFORMATION

Functions

The HA-151B is a compact standing-alone electrolyzing unit, integrating a potentiostat and a galvanostat which are indispensable for electrochemical measurement. This unit, easy to handle and reasonable in price, suits field use and training of operators.

The potentiostat/galvanostat part, provided with a capacity of 15V 1A and a current detecting range covering a minimum of 10 μ A, has sufficient functions for normal electrolytic testing and corrosion testing. This part is equipped with three major functions:

high-input-impedance electrometer, potentiostat (constant-voltage control) and galvanostat (constant-current control). The potentiostat/galvanostat part is provided also with alarm functions for uncontrollableness, excess voltage and excess current as well as additional convenient functions, including external control input and current-monitor noise rejection filter.

The waveform generating part employs an analog circuit system that assures smooth output. This part can generate lamp waves and triangular waves having a wide-range sweeping speed from 50V/sec to 10mV/min, with set peak voltage of -5V to +5V. Stop, hold and reverse can be performed easily during sweep.

Configuration

This unit consists of the electrometer, the potentiostat and the galvanostat.

Specifications

1) Potentiostat

- | | |
|-----------------------------|--|
| a) Maximum output | $\pm 15V, \pm 1A$ |
| b) Current detection ranges | 6 ranges of $\pm 1A, \pm 100mA,$
$\pm 10mA, \pm 1mA, \pm 100\mu A,$ and $\pm 10\mu A$ |
| c) Maximum control voltage | $\pm 10V$ |
| d) Control tolerance | $\pm 3mV$ |
| e) Response speed | 50 μ sec and less |
| f) Input resistance | $10^{10} \Omega$ and more |

2) Galvanostat

- a) Maximum output $\pm 1A, \pm 15V$
- b) Set current ranges 6 ranges of $\pm 1A, \pm 100mA, \pm 10mA, \pm 1mA, \pm 100\mu A$, and $\pm 10\mu A$
- c) Current set-up accuracy Not more than $\pm 1\%$ of the set current range full scale
- d) Response speed $50\mu sec$ and less

3) Electrometer

- a) Input resistance $10^{10} \Omega$ and more
- b) Bias current $10^{-10} \Omega$ and more
- c) Response speed $10\mu sec$ and less
- d) Conversion error Not more than 0.1% of the input voltage
- e) Voltage display ranges 2 ranges of $\pm 10V$ and $\pm 2V$ (digital display)

4) Recording portion

- a) Voltage record output 1:1
- b) Current record output Full scale of each current range is converted into 1V

5) Current consumption

20VA at standby
100VA under maximum load

6) External dimensions

215 (w) \times 200 (d) \times 100 (h) mm

7) Weight

7.7 kg

• Other requirements

Temperature and humidity range	Dew formation is not allowable in operation at $0-40^{\circ}C$, 10-90% relative humidity, and in custody at $-10^{\circ}C$ to $+50^{\circ}C$, 10-80% relative humidity.
--------------------------------	---

3. ACCESSORIES

Output Cable

This 1.2 meter cable connects the HA-151B unit with the electrodes in the load electrolytic cells. The five-pin metal connector is located on the rear panel of the HA-151B. Insert the connector pins into the TO-CELL-OUT terminal, referring to the notch on the terminal, then lock the connector. Connect the terminal clips with the electrodes as follows:

- Red (CE) → with counter electrode
- Green (RE) → with reference electrode
- Black (WE2) → with working electrode
- Black (WE1) → with working electrode

Since the unit has been tuned with the supplied output cable, do not replace the cable with other cable or extend the cable. If a longer cable is needed, please contact Hokuto.

External Signal Cable

This 1.2 meter shielded cable is provided with banana plugs at both ends. Use this cable for inputting control signals from an external source into the EXT.IN on the rear panel.

Recorder Output Cable

These 1.2 meter shielded cables also have banana plugs at both ends. Connect the cable with the CURR terminal for current record output. Connect the cable with the POT terminal for voltage record output.

NOTE: The external signal cable and the recorder output cable use common cables and parts. Therefore these cables may be interchanged.

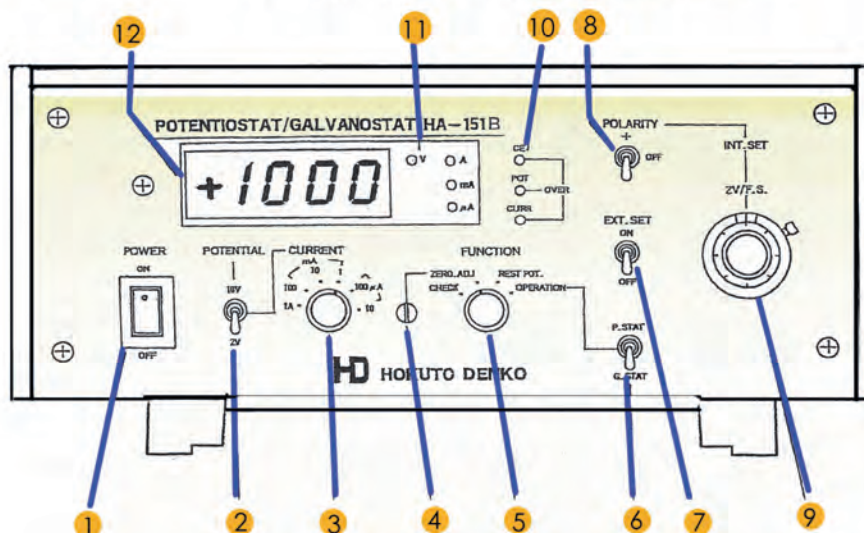
Grounding Cable

This 3 meter PVC solid wire is designed to withstand large current. Connect this wire with the grounding terminal on the rear panel and with a grounding conductor of the laboratory where this unit is installed.

4. PANEL OVERVIEWS

Front Panel

- 1 Power switch
 - 2 Display switch
 - 3 CURR range switch
 - 4 Zero adjusting potentiometer
 - 5 FUNCTION selecting switch
 - 6 P-STAT/G-STAT selecting switch
 - 7 EXT.SET ON/OFF
 - 8 Internal potential set-up polarity selecting switch
- This switch changes over the digital meter ⑫ to voltage or current. For voltage, the sensitivity of the digital meter ⑫ can be either 10V F.S. or 2V F.S. For current, the sensitivity of the digital meter ⑫ depends on the CURR RANGE selector switch ③.
- This switch determines the range of current flowing in the electrolytic cell in the P-STAT mode, and sets up the range of set current in the G-STAT mode.
- Potentiometer for zero adjustment
- CHECK: The output of the unit (RE and CE) is separated from the electrolytic cell and connected with a built-in 2k Ω resistance.
- ZERO ADJ: Zero adjustment position. Turn the zero adjustment potentiometer ④ with a minus driver so that the digital meter ⑫ shows zero.
- REST POT: Set to this position for measurement of rest potential (in the electrometer mode).
- OPERATION: Set to this position for changing over to potentiostat or to galvanostat. Select a mode using the P-STAT/G-STAT selecting switch ⑥.
- With this switch select either potentiostat or galvanostat when the FUNCTION switch ⑤ is set to OPERATION.
- External signal switch
Turning this switch on the signal inputted into the EXT.IN terminal is added to the control system.
- This switch selects the polarity of the set voltage in the P-STAT mode, and selects the polarity of the set current in the G-STAT mode.



9 Internal potential set-up vernier dial

This dial sets up set potential in P-STAT mode, and sets up set current in the G-STAT mode. Ten turns of the dial give the full scale, which equals 2V in the P-STAT mode and equals the current range in the G-STAT mode.

10 CE, POT and CURR OVER display

If the bath voltage (output voltage) exceeds 15V, CE OVER is lit. If the control or detecting voltage exceeds 10V, POT OVER is lit. If the current range is exceeded, CURR OVER is lit.

11 Digital meter unit display

When the digital meter is used as a voltmeter, "V" is employed as the measurement unit. When the digital meter is used as an ammeter, either "A", "mA" or "μA" is employed as the unit.

12 Digital meter

Digital meter displays both voltage and amperage, interlocked with the range switch ②. The meter displays polarity +3 1/2 digits, and units of V, A, mA and μA are automatically selected.

Rear Panel

13 FILTER HIGH/LOW – filter switch

This switch decreases hum noise (50Hz or 60Hz) or other AC noise included in the output from the current record terminal ⑩. Attenuation and response speed are as follows irrespective of the current range:

Range	Current detection response speed	Attenuation at 50Hz	Attenuation at 60Hz
LOW	40msec	-16dB (0.15)	-17.5dB (0.13)
HIGH	20msec	-22dB (0.079)	-23.5dB (0.066)

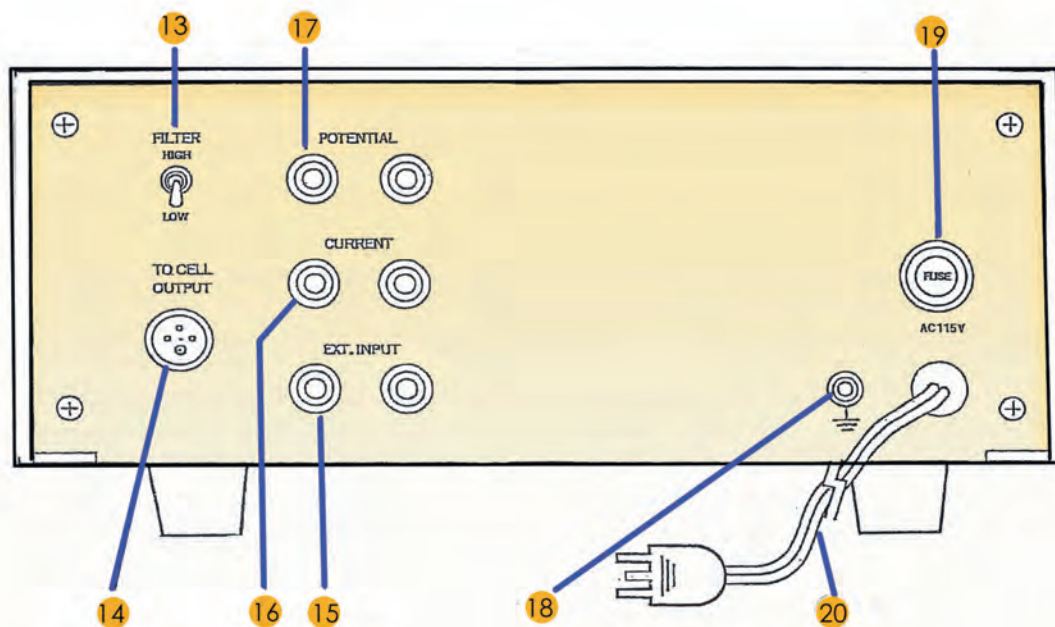
14 TO CELL OUTPUT – load cell connecting terminal

Five-pin metal connector for connecting the TO-CELL-OUT output cable, which is connected with the electrolytic cell. Pay attention to the orientation of the pins:

- Pin 1 : counter electrode (CE) red wire
- Pin 2 : RE shield
- Pin 3 : reference electrode (RE) green wire
- Pin 4 : working electrode sensor (WE2) white wire
- Pin 5 : working electrode common (WE1) black wire



- 15 EXT.IN – external signal input terminal
Constant-voltage control in the potentiostat mode and constant-current control in the galvanostat mode may depend on an external signal source. In such a case, external signals are inputted to this terminal
- 16 CURR – current record terminal
Current record output terminal.
Output impedance : 50 and less
- 17 POT – voltage record terminal
Voltage record output terminal.
Output impedance : 50 and less
- 18 GND – grounding plug
Connected with the enclosure. We recommend grounding be made for preventing electric shock and decreasing noise.
- 19 Fuse holder
An 1A fuse in a glass tube is contained. Replace, if necessary, with a fuse of the same standard capacity.
- 20 AC cable
The cable can be connected with an 115V AC (50/60Hz) receptacle. Current capacity of the power source must be 1A and more.



5. OPERATION

General Precautions Before Use

Connection of power supply:

Before turning on the power switch make sure that the FUNCTION switch is set to ZERO ADJ.

CAUTION: If the power supply is connected with the FUNCTION switch set to OPERATION, the specimen may receive excess voltage and so may be damaged.

Salt bridge:

In order to measure the potential of the working electrode accurately, the Luggin probe must be as close as possible to the working electrode. The salt bridge connecting the Luggin probe and the reference electrode may be affected by noise because this bridge is of high impedance. Therefore we recommend to shield the whole electrolytic cell or, if it is difficult, shield only the salt bridged reference electrode.

Reference electrode circuit:

Make sure that the reference electrode is not leaking and the salt bridge contains salt.

CAUTION: If the P-STAT mode is selected with the reference electrode disconnected, the unit becomes out of control. This may damage the specimen or heat the electrolytic cell although this unit is protected with a built-in protective circuit against such phenomenon.

Connection with the electrolytic cell:

When the electrolytic cell is connected, the FUNCTION switch must be set to ZERO ADJ. position.

CAUTION: If the electrolytic cell is connected with the FUNCTION switch set to OPERATION mode, the cell may be exposed to high voltage. This may electrically shock you or may generate a spark from poor electrical continuity.

Zero Adjustment

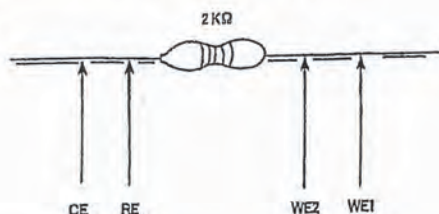
Normally zero adjustment is unnecessary. Check zero adjustment when the room temperature fluctuates remarkably or the unit will be used for a long time.

- Set the FUNCTION switch ⑤ to ZERO ADJ.
- Turn on the POWER switch ①
- Warm up the unit for 10-20 minutes.
- Set display switch ② to the highest sensitivity of 2V.
- Using a minus driver, adjust the ZERO ADJ. hole ④ so that the digital meter ⑩ indicates ± 0001 and less.

Now you have completed zero adjustment.

Function Check

Make sure that the unit is in normal conditions before operation or after any trouble occurred during operation. Particularly when any trouble occurred (such as CURR OVER, POT OVER, OUT OF CONTROL) with the electrolytic cell connected, it is necessary to clarify whether the unit is abnormal or the cell connection is abnormal. For checking the abnormality, set the FUNCTION selecting switch ⑤ to CHECK. When the switch is set to CHECK, a built-in 2kΩ resistance, as an electrolytic-cell simulating load, is connected with the output as follows:



When the FUNCTION switch is set to CHECK position, the unit operates in the potentiostat mode. Operation of ③ and ④ makes a current value in accordance with the Ohm's law indicated. Make sure the normal conditions of the unit referring to the indication.

$$\text{Current value} = \frac{\text{Internal set value (V)}}{2000\Omega}$$

Example: In case of the initial potential +1V, 500μA should be indicated.

If a current value in accordance with the Ohm's law is indicated when the waveform generator is started up, the unit is normal.

Connection of the Load (how to shield)

Connect the load cell with the special cable (TO-CELL-OUT cable) supplied with the unit. Connect clips WE1 and WE2 with the working electrode, RE with the reference electrode, and CE with the counter electrode.

WE1 (black clip and black wire) working electrode

WE2 (black clip and white wire) working electrode (as close as possible to the specimen)

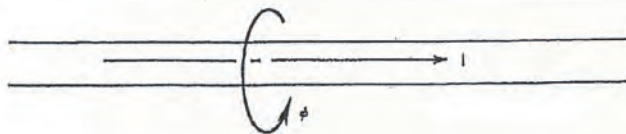
RE (green clip and green wire) reference electrode

CE (red clip and red wire) counter electrode

In connecting the WE1 and the WE2 with the working electrode, pay attention to the following. Very little current flows in the WE2, which detects the potential of the working electrode. Current flows in the WE1, which receives electrolytic current from the counter electrode. Therefore, in order to avoid voltage drop from resistance of the specimen and the conductor or contact resistance of the WE1, install the WE2 clip as close as possible to the specimen. Do not allow the clips of WE1 and WE2 to contact each other.

Shielding of the Electrolytic Cell

Current flow in a wire causes a magnetic field in accordance with Fleming's rule. The more the current changes (in frequency), the stronger the magnetic field.



It is supposed that various magnetic inducing noise having commercial frequency (50Hz or 60Hz) from indoor and outdoor electric cables exists inside non-shielded buildings.

For electrolytic experiment using the potentiostat, the following two types of noise should be reduced:

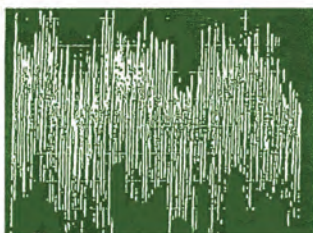
- (1) Magnetic inducing noise having 50/60Hz frequency
- (2) Electrostatic noise produced by electric capacitance that exists in all substances.

Electrostatic noise can be reduced by any of the following means:

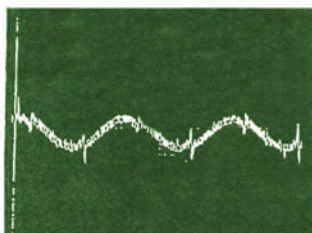
- (A) Cover the electrolytic cell with a steel sheet for electrostatic shielding. Connect the shield case with the grounding terminal 18 of the enclosure.
- (B) Cover the reference electrode with a shield and connect the electrode to the enclosure grounding terminal 18
- (C) Wrap the salt bridge of the reference electrode with metal, such as aluminum foil, and connect the bridge to the shielding cover.

Magnetic inducing noise can also be reduced in the same manner as mentioned above. It is effective for reducing magnetic inducing noise to use magnetic-absorbing material (steel or permalloy is better than aluminum) for shielding.

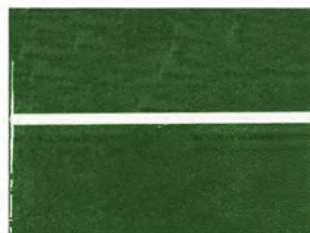
(Hokuto Denko manufactures shield cases of general and tailored specifications. Nada Scientific welcomes your inquiry.)



Experiment with a non-shielded electrolytic cell.



Shielded with aluminum sheet.



Shielded with steel sheet.

Use of the HA-151B as an Electrometer

Set the FUNCTION selecting switch ⑤ to REST POT. Set the range selecting switch ② to a suitable sensitivity –10V, 2V or any other. Then the digital meter ⑫ will indicate the rest potential. Also the potential record terminal ⑮ on the rear panel will output impedance-converted potential at 1:1 ratio. At this time, if the range selecting switch ② is changed over, the digital meter ⑫ display changes its digit but the output of the potential record terminal ⑮ remains unchanged.

Use of the HA-151B as a Potentiostat

For using the HA-151B as the potentiostat, take the steps as follows:

(a) Preparation

- Set the FUNCTION switch ③ to OPERATION.
- Set the P-STAT/G-STAT selecting switch ⑥ to P-STAT.
- Adjust the POLARITY switch ⑧ and INT.SET dial ⑨ to rest or other desired initial potential.
- For reading voltage, set the display change-over switch ② to a suitable range, such as 10V and 2V.
- For reading current, set the display change-over switch ② to neutral. Adjust the CURR range switch ③ to a suitable range between 1A and 10 μ A.

(b) For drawing polarization curve

- Connect the potential record terminal ⑮ to the X-axis of the X-Y recorder.
- Connect the current record terminal ⑭ to the Y-axis of the X-Y recorder.
(For setting the current range and reading current values, see below (e).)

(c) For introducing external signals

Connect an external signal source to the EXT.IN terminal ⑬ on the rear panel. Since the potential setup which is internally set and the external input are overlapped, turn the POLARITY switch ⑧ off in order to use the external signals only.

- (d) Set the current range to a little larger current value than expected. The circuit is not opened by current range switching operation during electrolysis.

- (e) The current value can be read directly from the digital meter ⑫, and the range selecting switch ③. Anode polarization is denoted by (+) while cathode polarization is denoted by (-). The voltage appearing at the CURR record terminal ⑭ can be converted into a current value proportionally to the ratio of the current range set by the CURR range switch ③ versus 1V.

Example: When 0.2V (200mV) appears at the record terminal ⑭,

$$\text{In 1A range : current value} = 1\text{A} \times \frac{0.2\text{V}}{1\text{V}} = 0.2\text{V}$$

$$\text{In 10mA range : current value} = 10\text{mA} \times \frac{0.2\text{V}}{1\text{V}} = 2\text{mA}$$

Use of the HA-151B as a Galvanostat

For using the HA-151B as the galvanostat, take the following steps.

(a) Preparation

- Set the FUNCTION switch ⑤ to OPERATION.
- Set the P/G STAT switch ⑥ to G-STAT.
- Adjust the POLARITY ⑧ and INT.SET ⑨ to zero or any other desired Initial current value.

NOTE: When the total voltage of the waveform generator set voltage and the external Input voltage equals 2V, the full scale current set at the range selector switch ③ flows.

Example: Setting 500mA

Range switch ③ : 1A
INT.SET ⑨ : +500

Setting -5.12mA

Range switch ③ : 10mA
INT.SET ⑨ : -512

(b) For drawing polarization curve

Connect the potential record terminal ⑪ to the X-axis of the X-Y recorder.

Connect the current record terminal ⑫ to the Y-axis of the X-Y recorder.

- (c) For current setting with external input, connect the external signal source to the EXT IN Input terminal ⑬. Since external signals and the internal set voltage are overlapped, make sure that:

EXT.IN voltage+Internal generator set voltage does not exceed 2V.

- (d) Potential appears at the POT record output terminal ⑭ also at the constant-current mode.

6. OVERLOAD DISPLAY

Excess Current (curr over)

If a current larger than the detecting current range set with the range switch ③ (current 1.1 times the range full scale) flows when the unit is in the potentiostat mode, the CURR OVER lamp at the overload display ⑩ is turned on.

NOTE: The unit is protected against overload, and the protective current-limiting circuit recovers the constant-current mode.

If the total set voltage (waveform voltage + external voltage) exceeds 2V when the unit is in the galvanostat mode, the CURR OVER lamp at the overload display ⑩ is turned on.

NOTE: The unit is protected against overload, and the protective circuit recovers the constant-voltage mode.

Excess Voltage (pot over)

The control voltage of this unit is maximum $\pm 10V$. The POT OVER lamp at the overload display ⑩ is turned on when:

- the total of external signal voltage and waveform voltage exceeds 10V in the potentiostat mode, or
- the detected potential difference between the reference electrode and the working electrode exceeds 10V.

NOTE: The unit is protected with the protective circuit against overload.

System Overload (ce over)

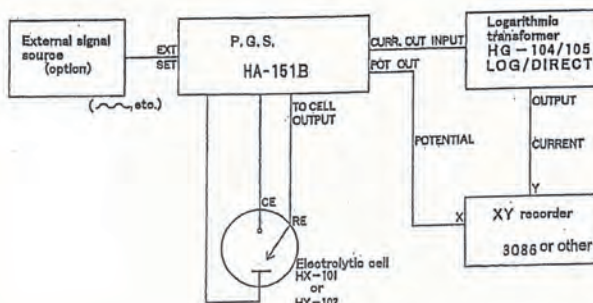
The maximum output voltage (CE-WE bath voltage) of this unit equals $\pm 15V$. If the bath voltage exceeds 15V in potentiostat or galvanostat mode due to solution resistance, the CE OVER lamp at the overload display ⑩ is turned on.

NOTE: The protective circuit protects the unit against overload.

7. CONNECTING TO PERIPHERAL EQUIPMENT

Current values increase exponentially in general electrochemical measurement. Also current values are treated logarithmically in Tafel plotting for studying electrode reaction process. For these reasons, Hokuto Denko offers two models of logarithmic transformers: HG-104 and HG-105.

The following diagram shows a general circuit connecting a logarithmic transformer and a X/Y recorder.



Connection with Logarithmic Transformer

For Tafel plotting to study the electrode reaction process, current values during potentiostat sweep must be logarithmically transformed. For logarithmic transformation, it is recommended to connect the current record output ⑩ to the X-Y recorder through a logarithmic transformer, such as HG-104 and HG-105.

In this case, connect the input cable banana plug attached to the logarithmic transformer to the record output terminal ⑩, and connect the logarithmic transformer output to the X-Y recorder.

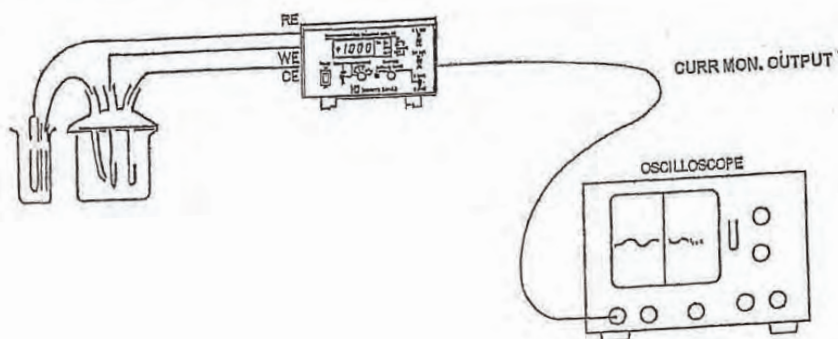
Reading of current:

The current record terminal outputs the set-up current range full-scale converted into 1V. Consequently, in order to calculate the real current value from the logarithmic transformer output, it is necessary to reverse the logarithmic transformation referring to the formula mentioned in the logarithmic transformer manual, and further to convert the logarithmic transformer input voltage into current at 1V full scale.

Example: In case of current range of 10mA and logarithmic transformer HG-104 output of 600mV, HG-104 Input (HA-151B output current) equals 100mV and the true current equals 1mA.

Recommendation of Data Waveform Monitoring

In case very small current is detected, the signal/noise ratio may be extremely poor due to a high amplification ratio. X-Y recorder cannot detect 50/60Hz noise because of slow response. In order to clarify the reliability of measured data, we recommend waveform monitoring using an oscilloscope connected to the CURRENT record terminal ⑩.



NADA
SCIENTIFIC

P.O. Box 1336, CHAMPLAIN, NY 12919
TOLL FREE: 1-800-799-NADA
TEL: 518-297-3208
FAX: 518-297-3524
support@nadascientific.com