263A Power Booster

Hardware User's Manual

PerkinElmer™
instruments.

Princeton Applied Research

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A. Contact the Customer Service Department (865-482-4411) or your local representative to discuss the problem. In many cases it will be possible to expedite servicing by localizing the problem to a particular plug-in circuit board.

B. If it is necessary to send any equipment back for service, we need the following information.

1. Model number and serial number.
2. Your name (instrument user).
3. Your address.
4. Address to which the instrument should be returned.
5. Your telephone number and extension.
6. Symptoms (in detail, including control settings).
7. Your purchase order number for repair charges (does not apply to repairs in warranty).
8. Shipping instructions (if you wish to authorize shipment by any method other than normal surface transportation.)

C. U.S. CUSTOMERS — Ship the equipment being returned to:

PerkinElmer Instruments
801 S. Illinois Avenue
Oak Ridge, TN 37831
ATTN: Customer Service

PHONE: 865-482-4411
FAX: 865-483-0396

D. CUSTOMERS OUTSIDE OF U.S.A. — To avoid delay in customs clearance of equipment being returned, please contact the factory or the nearest factory distributor for complete shipping information.

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EG&G INSTRUMENTS
Potentiostat/Galvanostat Model 263A
KEPCO

1. GENERAL

The Model 263A Power Booster is designed for special electrochemical applications such as battery research, etching, plating, electrosynthesis, and corrosion studies. Three models are available:

- The 263A/10A provides ±10 amps (nominal[1]) at ±20 volts (nominal) compliance
- The 263A/20A provides ±20 amps (nominal) at ±20 volts (nominal) compliance
- The 263A/8A provides ±8 amps (nominal) at ±50 volts (nominal) compliance

This add-on system consists of the 263A/94 2A option; a specially configured 20-10A, 20-20A, or 50-8A bipolar power supply from KEPCO®, Inc.; an internal PerkinElmer Instruments Power Booster Interface (see the block diagram in Fig. 1); and cabling.

The Power Booster interfaces the 263A and the external cell, acts as the cell switch, and provides the drive signal for the KEPCO power supply. Experiments can be controlled manually from the front panel of the 263A or from a PC using the appropriate PerkinElmer Instruments software.

The Power Booster Interface also provides cell current (scaled) required by the 263A I/E converter. With the 263A current range set to 10 µA, 1 µA reading on 263A = 1 A actual cell current; and 10 µA reading on 263A = 10 A actual cell current.

The system frequency response has been modified to provide stability for the complete closed-loop response for electrochemical cells with a very high capacitance and very low resistance.

The Power Booster Interface operates in power-boosted or normal mode — a simple cable connection and flip of a switch convert between modes. This manual discusses boosted mode only. For normal operation, see the potentiostat's user manual.

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[1]Determined by the KEPCO.

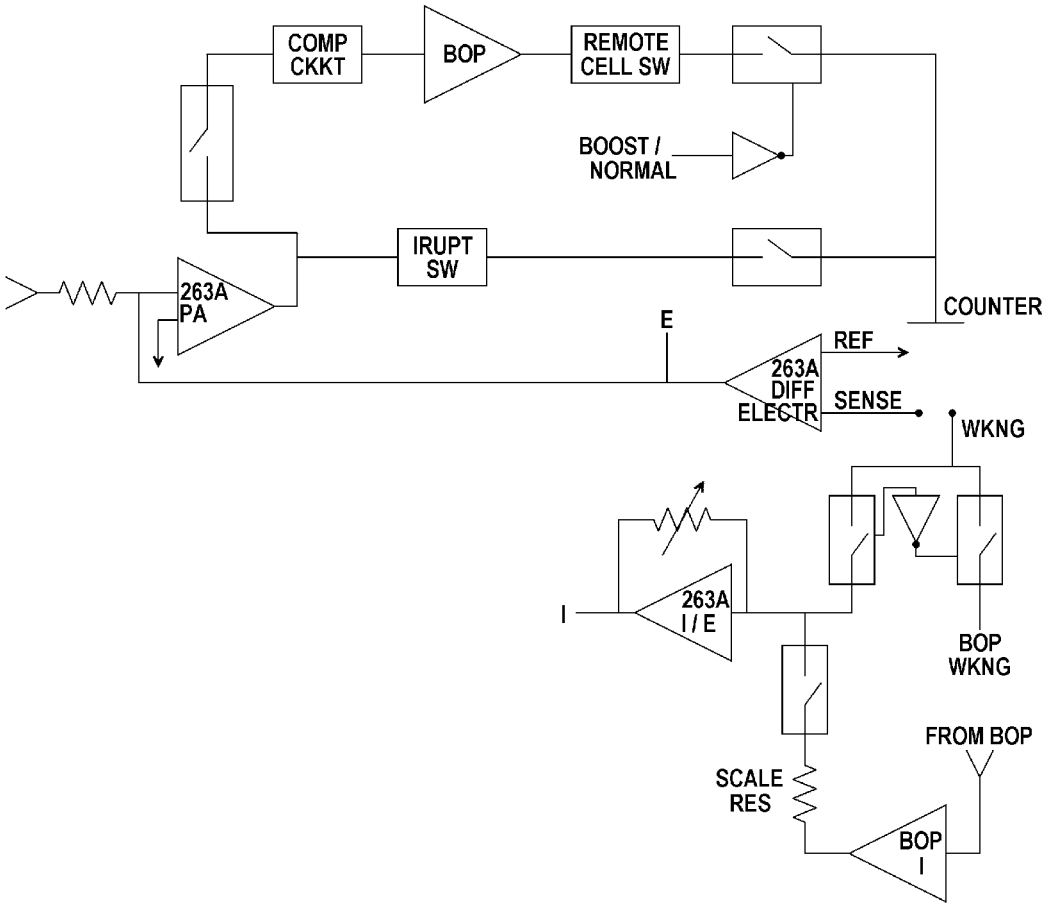

Fig. 1 Block Diagram for the 263A Power Booster System.

Connections and settings are identical among the three Power Booster Interface options. However, for simplicity, we discuss and illustrate only the 10-A unit in this manual.

CAUTION ***Do not use auto-ranging current in Power Booster mode!*** The 263A should be set to the 10-µA current range on the front panel or via PC/software control.

2. SYSTEM SPECIFICATIONS

Bandwidth 5 KHz at –3 db with 1 V applied at counter with 1-Ω cell (1-W load)

Voltage Rise Time <70 µs (10–90%, measured at Counter, ± 10 V/10-Hz square wave into a 1-W load, high-speed mode).

Potential Noise <500 µV rms at E Monitor Out.

Applied Potential Accuracy ±0.5% of reading, ±2 mV (nominal; determined by the KEPCO).

Current Measurement Rise Time <75µs (10–90%, measured at I Monitor Out, ±10 A/10-Hz square wave).

Current Measurement Accuracy ±1% of reading, ± 20 mA.

Rated Output Current 20 A (nominal) for the 263A/20A system; 10 A for the 263A/10A system; and 8 A (nominal) for the 263A/8A system.

Rated Output Voltage 20 V at 20 A (nominal) for the 263A/20A and 263A/10A; 50 V at 8 A (nominal) for the 263A/8A.

Overload Shutdown ±20 V or ± 20 A (nominal) for the 263A/20A; ±20 V or ±10 A (nominal) for the 263A/10A; and ±50 V or ±8 A (nominal) for the 263A/8A.[2]

[2]The KEPCO power supply allows you to limit the overload shutdown (that is, to create shutdown set points at lower than the maximum value. Refer to the KEPCO manual for more information.)

3. INTERCONNECTIONS

3.1. Connecting the Potentiostat to the Power Booster

The 263A and KEPCO are connected by 2 marked cables provided with the interface unit (see also the diagram in Fig. 2).

CAUTION	Make all connections, as well as changes between Normal and Boost modes, with the power ***off***.

NOTE	*Do not* use the **C0345** cable (the label is on a white tab) in power-boosted mode. C0345 is for normal operation only (for instructions on using it, see the 263A *User's Guide).*

NOTE	In 4-terminal connections where the sense lead is used, the 263A must be in high-speed mode.

Boost Mode

On the 263A rear panel, flip the **BOOST/NORMAL** toggle switch to **BOOST**.

S-COM Connection

Connect the S-COM brown wire to **S COM** (or **COM**; they are shorted together) on the KEPCO rear panel. Connect the opposite end of the wire to screw-clamp connector **3** on the rear panel of the Power Booster Interface.

S-OUT Connection

Connect the S-OUT red wire to **S OUT** on the KEPCO rear panel. Connect the opposite end of the wire to screw-clamp connector **4** on the rear panel of the Power Booster Interface.

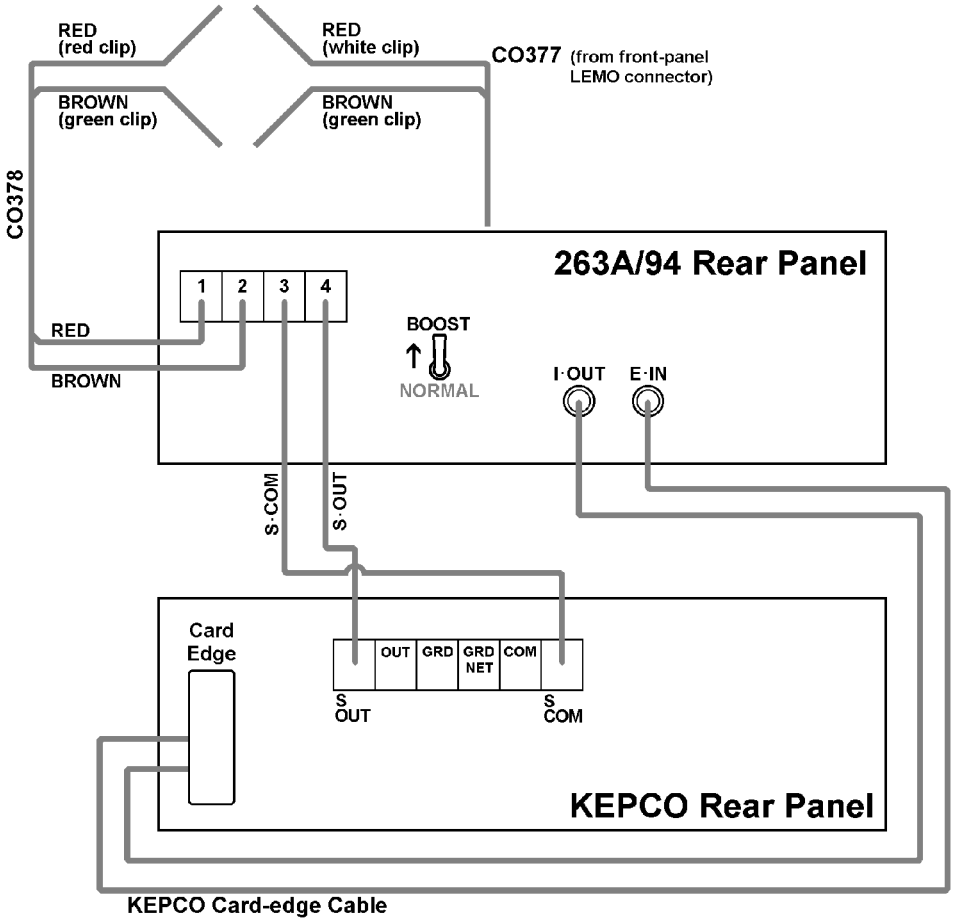

Fig. 2 Connecting the 263A, KEPCO Power Supply, and Power Booster Interface.

KEPCO Cardedge/Double BNC Cable

Connect the cardedge (female) connector to the **card edge (male)** projecting from the KEPCO rear panel (both connectors are keyed to ensure correct orientation).

On the double-BNC end of the cable, connect the **E/IN** connector to the rear panel of the 263A at the BNC connector marked **E IN**. Connect the **I/OUT** BNC portion of the cable to the rear panel of the potentiostat at the BNC connector marked **I OUT**.

3.2. 263A Cell Cable Connections

CO378 Screw Clamp/Spring Clamp Cable

Connect the red and brown leads to the 263A rear panel at screw clamps **1** and **2**, respectively (see Fig. 2). The opposite end of this cable terminates in 2 spring-clamp connectors for the working (brown wire/green spring clamp) and counter (red wire/red spring clamp) leads.

CO377 LEMO/Spring Clamp Cable (replaces CO345 during boost mode)

Connect this cable to the 263A front panel at the female LEMO connector. The opposite end of this cable terminates in white and green spring-clamp connectors for the reference and sense leads, respectively.

3.3. KEPCO Front-Panel Setup

- The **MODE** switch on the front panel of the KEPCO should be set to Voltage mode (left position).
- The **Voltage CONTROL** switch (red toggle on left side) should be in the OFF (down) position.
- The **Current CONTROL** switch (red toggle on right side) should be in the OFF (down) position.
- The **SENSE/COMMON** (black banana jacks at bottom-center) should be connected with a shorting bracket.
- The **OUTPUT/SENSE** (red banana jacks at bottom-center) should be connected with a shorting bracket.

3.4. External Cell Connection and Initial Check

Use the provided cell cables (Section 3.2) to connect the electrochemical cell being tested (see Fig. 3).

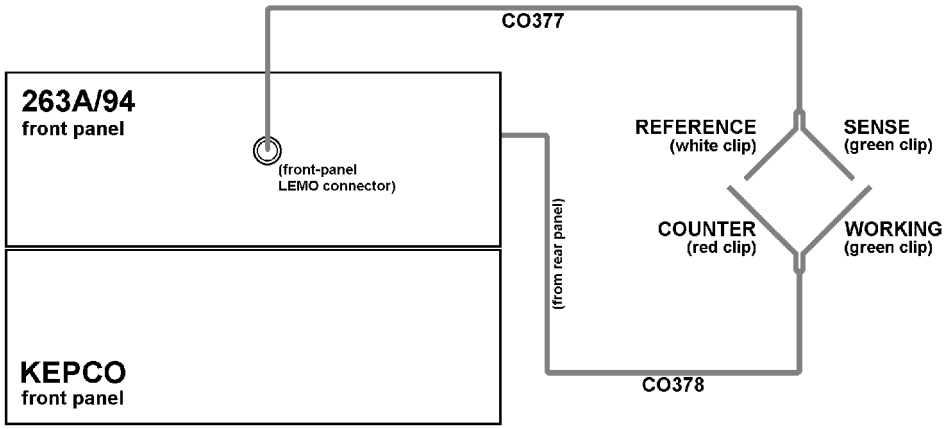

Fig. 3 Connecting the Power Booster Interface to the 263A Differential Electrometer.

DANGER	**Dangerous and possibly lethal voltages may be present on the electrometer's red lead.** Never touch the red lead while mains power is supplied to the electrometer. For more information, see the electrometer manual.

Once the interconnections are complete, perform the following check to ensure the system is functioning properly:

1. Connect a 1-Ω dummy cell resistor as shown in Fig. 4.

WARNING	The dummy cell resistor must have a power rating of at least 9 W. Three 3-Ω/3-W resistors linked in parallel are acceptable.

2. Connect the **Reference** and **Counter** to one side of the resistor (Reference connection closest to cell), and **Sense** and **Working** to the other side (Sense connection closest to the cell).

3. Turn on the 263A power.

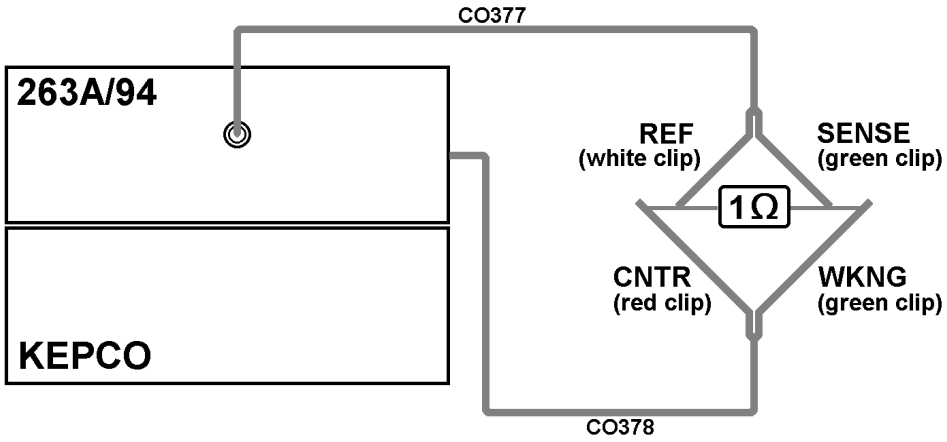

Fig. 4 Dummy Cell Connections.

4. Turn on the KEPCO power supply.

5. From the front panel of the 263A, select the 10-µA current range.

6. Set the 263A to high-speed mode.

7. Apply a ±3-V potential via the front panel (see the 263A *User's Guide*) and turn the cell on.

8. The current reading on the front-panel display should be ±3 µA (+3 µA if −3 V are applied), and the E reading should be ±3 V.

9. Turn the cell off.

10. Turn the 263A and KEPCO power off.

11. Disconnect the cell.

Part No. 223119 **4352 1199**
Manual Revision A
Printed in USA