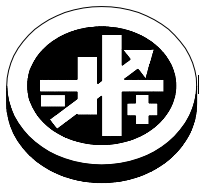


# QUICK START GUIDE



**KEPCO** An ISO 9001 Company.

**BOP**  
**2X-DE SERIES**

## BIPOLAR 2X-DE SERIES DUAL CHANNEL OPERATIONAL POWER SUPPLY

### I — INTRODUCTION

1.1. SCOPE OF MANUAL. This Quick Start Guide covers simple installation and local operation of the Kepco BOP 2X-DE Series Dual Channel Bipolar Operational Power Supply, hereafter referred to as BOP 2X-DE. Complete specifications, features and instructions are found in the full BOP 2X-DE Series Operator Manual that can be downloaded free from the Kepco web site at:

[www.kepcopower.com/support/opman1s.htm#bop-op](http://www.kepcopower.com/support/opman1s.htm#bop-op)

### 1.2. DESCRIPTION.

Kepco's Series BOP 2X-DE dual-channel BOP models are 200W and 400W power supplies. Each channel is a separate power supply, completely isolated, independent and functionally identical. The 200W units have two 100W channels and the 400W units have two 200W channels. The channels are completely isolated, but share two digital front panel meters (without affecting isolation) which display d-c output voltage and current for the channel selected by the front panel Channel select switch. A single power cord powers both channels; separate on-off circuit breakers turn each channel on/off separately.

Each BOP 2X-DE channel is a linear stabilizer with two bipolar control loops (voltage or current mode), selectable and individually controllable by remote signals applied to the PC 15 programming connector at the rear panel. These two principal control loops are each protected by bipolar limit circuits. The positive and negative current or voltage limit points can be remotely programmed simultaneously or Individually. Automatic crossover between each principal control loop and the limit loops is provided. Only one principle loop (voltage or current) can control the output at any one time.

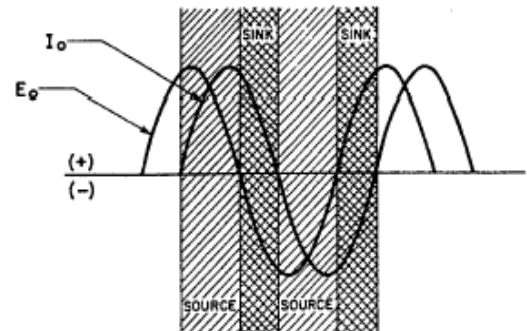
Each channel can operate automatically in all four voltage-current quadrants; it can act as either a source (output voltage is the same polarity as output current) or a sink (output voltage is opposite the polarity of output current). An example is shown in Figure 1 where the BOP channel is programmed to deliver a sine wave output and the load produces a phase shift between the output voltage and current. See BOP 2X-DE Series Operator Manual (PAR. 1.1) for limits on long-term operation in sink mode.

**Remote On-Off Feature.** A remote on-off feature provides Isolated remote on-off control of the output; an associated

flag signal is configured at the PC 15 programming connector.

Units are shipped for 115V a-c operation (105V to 125V a-c), 57 to 63Hz. For operation at 104V a-c, 208V a-c or 230V a-c refer to the full Operator Manual (PAR 1.1).

**LAN OPERATION.** Each channel of the BOP 2X-DE includes a LAN interface that accepts digital data bus information from a computer and converts it to an analog signal which, in turn, controls the channel output.



**FIGURE 1. SINK OPERATION PRODUCED BY LOAD PHASE SHIFT**

1.3. OPTIONS. Models optimized to operate in current mode with large inductive loads are identified by suffix L. Models optimized to operate in voltage mode with large capacitive loads are identified by suffix C.

### 1.4. EQUIPMENT SUPPLIED.

- Two PC 15 programming connectors. One PC 15 programming connectors **MUST** be installed at the rear panel of each channel to enable operation.
- 115V a-c Line Cord NEMA 5-15P-C13

### 1.5. ACCESSORIES (NOT SUPPLIED)

- Slides

## II — SAFETY.

Exercise care in making all connections to and from the BOP terminals.



### WARNINGS

1. Remove a-c power from the BOP 2X-DE before making any connections.
2. Wires and/or cables, connected from the BOP terminals to external components or programming devices must be properly insulated and securely terminated on both sides to make accidental touch impossible.
3. The BOP 2X-DE chassis and cover must be safety-grounded to a reliable a-c source ground. A safety-ground may be established by using a grounded a-c power outlet or, if the latter is not available, by means of a separate wire, from the provided GND terminal of the rear panel terminal block to a reliable a-c source ground point.
4. THE COM OUTPUT TERMINALS OF THE BOP 2X-DE channel MAY EITHER FLOAT OR BE GROUNDED. Leave the output terminal floating when an externally grounded device is used at either the programming input or the output, or for a grounded load. For noise reduction ground a single return terminal on either the programming device, the BOP or the load configuration. See "D-C Signal Ground." on page 3 for the maximum allowable floating voltage for the output terminals.

## III — INSTALLATION

3.1. UNPACKING. The power supply has been thoroughly inspected and tested prior to packing and is ready for operation. After careful unpacking, inspect for shipping damage before attempting to operate. Perform the Preliminary Checkout (PAR. 3.2). If any indication of damage is found, file an immediate claim with the responsible transport service

3.2. PRELIMINARY CHECKOUT. A simple operating check after unpacking and before permanent installation, is advisable to ascertain whether the BOP 2X-DE has suffered damage in shipment.

1. Install PC 15 programming connectors (supplied) for each channel under test at the rear panel. This is required for proper operation of each channel.
2. Set the CHANNEL 1 - CHANNEL 2 selector switch to CHANNEL 1.

3. Refer to Safety instructions (see Section II) and connect channel to 115V a-c source; see Operator Manual (PAR 1.1) for different source voltage.
4. Connect the channel to a computer as specified in "CONNECT BOP2X-DE CHANNEL TO NETWORK." on page 4.
5. Set the a-c POWER switch for channel under test to ON. **CAUTION: DO NOT repeatedly toggle the POWER on/off switch as this may cause unit to fault.** If actuator does not lock when released, wait a few seconds before trying again. The circuit breaker is "trip-free;" if overload exists, contacts cannot be held closed by actuator.
6. Using a thin tool (e.g., the end of a paper clip), press then release the LAN Reset pushbutton switch of the channel under test (see Figure 8). The LAN indicator will blink briefly, then remain on.
7. Locate the BOP/BIT using the PS Find utility as specified in "FINDING KEPCO POWER SUPPLIES ON THE LAN." on page 4
8. From the PS Find screen (Figure 5) click **Launch Webpage** to view the Instrument Home page (Figure 2). Verify the model is correct, matching the voltage and current of the BOP channel in use. The serial no. of channel 1 ends in A, channel 2 ends in B. To verify the correct unit/channel has been selected, click ID INSTRUMENT at the left of the Instrument Home page. This causes the associated LAN indicator (see Figure 8) on the BOP 2X-DE rear panel to blink.



FIGURE 2. INSTRUMENT HOME PAGE

9. Click on the **OPERATE INSTRUMENT** tab of the home page. Leave password blank and click **Submit** to access the Operate Instrument page (see Figure 3).

10. If necessary, click on the **MODE** button at the upper right side of the Operate Instrument page until the indicator above the **MODE** button reads **VOLTAGE**.
11. Set the unit to output +8.1V by entering +8.1 in the **VOLTAGE** field, then click **SET**. Verify the output of the BOP changes and the voltage indication is +8.1V on both the web page and the BOP front panel.



**FIGURE 3. OPERATE INSTRUMENT PAGE**

12. Repeat steps 1 through 11 for channel 2. At step 2 set selector switch to CHANNEL 2
13. Set the a-c POWER switch for channels 1 and 2 to OFF.

**3.3. INSTALLING THE POWER SUPPLY.** These models are shipped with fixed angle brackets and chassis slide support bars installed and are ready for mounting in a 19-inch rack.

**3.4. CONNECTIONS.** Connections to the load are made using the rear panel terminations.

**LOAD CONNECTIONS.** Connect the load between OUT (output) and COM (common) terminals at the rear panel. **Sense connections are required; otherwise the unit will not operate properly.**

**LOCAL SENSE CONNECTIONS.** For local sensing the OUT and COM terminals are connected to the adjacent S (sense) terminals. The unit is shipped with local sensing links in place at the rear panel.

**REMOTE SENSE CONNECTIONS.** Remote sensing (connecting the corresponding S terminals to the OUT and COM terminations at the load instead of at the BOP) can compensate for load wire losses up to 0.5V per wire (0.25V per wire on models with rated output less than 20V). Remote sensing is recommended for minimum load effect in voltage mode for a remote load. Use twisted pairs: #22 AWG for output sense lines and wires rated for the nominal

output current of the power supply for power leads. See full Operator Manual (see PAR. 1.1) for remote sensing requirements.

**GROUNDING NETWORK.** The unit is shipped with a link installed between GND NET and GND terminals at the rear panel to enable the Grounding Network. This network reduces noise/ripple that may be present at the output when the output is not grounded.

**INPUT A-C CONNECTIONS.** Install the line cord (supplied) at the rear panel and connect to 115V a-c, 60Hz (105V to 125V a-c, 47 to 63Hz) mains. Refer to the full Operator Manual (see PAR. 1.1). For operation at 104V a-c, 208V a-c or 230V a-c refer to the full Operator Manual (see PAR 1.1).

**A-C GROUND.** The 3-wire line cord with 3-prong safety plug (supplied), in combination with a properly grounded a-c power outlet, automatically grounds the BOP 2X-DE case. If an adapter for a non-grounded outlet is used, the case must be grounded separately using the GND terminal at the rear panel terminal block. The ground wire must be rated for at least the BOP input current (as noted on nameplate at rear of unit).

**D-C SIGNAL GROUND.** Specified ripple and noise figures for BOP power supplies are valid only with the COM side of the output load circuit returned to a ground point. The BOP circuits, including output and programming terminals, have no d-c connection to the chassis.

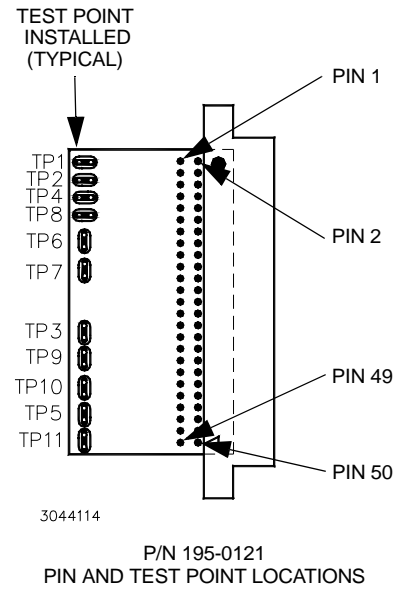
Each output terminal of each BOP channel can be “floated” up to 250 volts (d-c or peak) off chassis ground. The common mode current (leakage from output to ground) is less than 50  $\mu$ A (rms) or 5 mA (p-p) at 115V a-c, 60 Hz power input. To avoid common mode current from affecting the BOP output, the system (including the programming device, if used, load, and BOP) can have a single connection to ground (earth ground). The d-c ground wire must be rated for the nominal output current of the BOP (e.g., for BOP 20-10D, use rating of 10A).

Multiple signal grounds in the system may cause “ground-loop” and instability problems, since noise signals develop across the impedances between the multiple ground points. The exact physical location of the “best” single ground point must be carefully selected for minimum ripple/noise output and to avoid the possibility of output current flowing through the return path of an external programming signal.

**REAR PROGRAMMING CONNECTOR, PC 15.** Control of each channel is via the associated rear panel programming connector. (See Figures 4, 6, and 8). Table 1 lists the functions of each terminal. For more details, refer to the BOP 2X-DE Operator Manual (see PAR. 1.1).

**TABLE 1. REAR PROGRAMMING CONNECTOR  
TERMINAL FUNCTIONS**

TERMINAL (Figure 6)	FUNCTION
1	Current Limit Reference
3	Voltage Limit Reference
15 13 2 4	<p>Preamp "B"</p>
11 9 5 7	<p>Preamp "A"</p>
6	+E <sub>O</sub> Limit Input
8	+I <sub>O</sub> Limit Input
32	-E <sub>O</sub> Limit Input
34	-I <sub>O</sub> Limit Input
10	Current Monitoring
20	Voltage Monitoring
12, 14	Voltage Mode Compensating Terminals
16, 18	Current Mode Compensating Terminals
17	Voltage Comparison Amp Input
19	Current Comparison Amp Input
21	On-off Controlling Logic
22	-10V Reference Voltage 4mA Max
28	+10V Reference Voltage 4mA Max
23, 25, 27, 29, 31, 33	Sensing Common
24	Circuit Breaker Control
26, 36	Turn-off Signal Output
30	Voltage Mode/Current Mode control
35	Local/Remote control
37	+5V
38	I <sub>O</sub> Limit Flag
39	E <sub>O</sub> Limit Flag
40	E <sub>O</sub> Mode Flag
42	I <sub>O</sub> Mode Flag
41	Non-isolated Turn-off Signal Input
43, 44, 45	Not Used.
46	/ON-OFF_FLAG
47, 49	Optically Isolated Turn-off Signal Input
48	ISO_GND
50	ON-OFF_CTRL



**FIGURE 4. REAR PROGRAMMING CONNECTOR, PIN AND TEST POINT LOCATIONS**

**3.5. CONNECT BOP2X-DE CHANNEL TO NETWORK.**

1. Connect a BOP 2X-DE channel to a network via the LAN Port (see Figure 8). Use either a standard ethernet cable if using a HUB, or a crossover LAN cable if connecting the channel directly to a computer. The LAN interface is not Auto-MDI-X enabled and requires the crossover cable.
2. Apply power to BOP 2X-DE channel. The BOP 2X-DE will beep for less than 1 second, then will be ready for use.

**3.6. FINDING KEPKO POWER SUPPLIES ON THE LAN.**

The PSfind utility can be downloaded from the Kepco web site at:

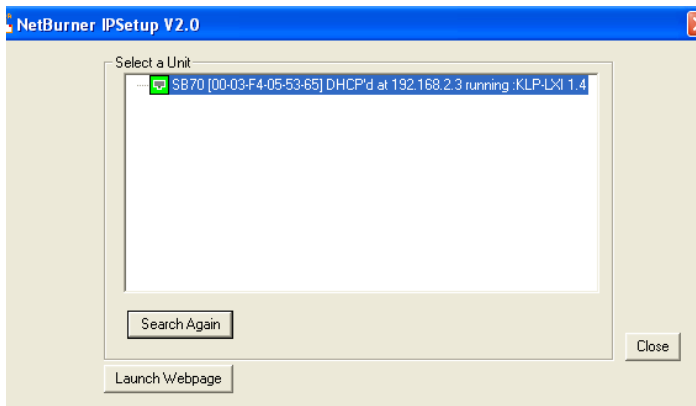
[www.kepcopower.com/drivers/  
drivers-dl3.htm#bit802e](http://www.kepcopower.com/drivers/drivers-dl3.htm#bit802e).

This utility finds all operational Kepco power supplies connected to the LAN and then shows the MAC and IP addresses of the models found.

To run the utility from your PC download the psfind.zip file to your computer. Extract psfind.exe from the zip file to a location of your choice, then double-click psfind.exe to run the application. A separate window opens as shown in Figure 5. Once the search is completed, all found units are displayed in the Select a Unit window (the MAC address appears in parentheses). If you do not see your device in the Select a Unit window or if the icon to the left of the selected instrument is red (not green), make



sure it is turned on and connected to the network, then click the Search Again button.



**FIGURE 5. PS FIND SCREEN**

3.7. COOLING. The components in the BOP 2X-DE power supply rely on forced air cooling. FRONT AND REAR PANEL OPENINGS AND THE TOP OF THE CASE **MUST BE KEPT CLEAR FROM ALL OBSTRUCTIONS TO ENSURE AIR CIRCULATION.** Periodic cleaning of the interior of the power supply is recommended. If the BOP 2X-DE is rack-mounted or installed into confined spaces, care must be taken that the ambient temperature (the temperature immediately surrounding the power supply) does not rise above 55°C (~131°F).

#### IV — OPERATION

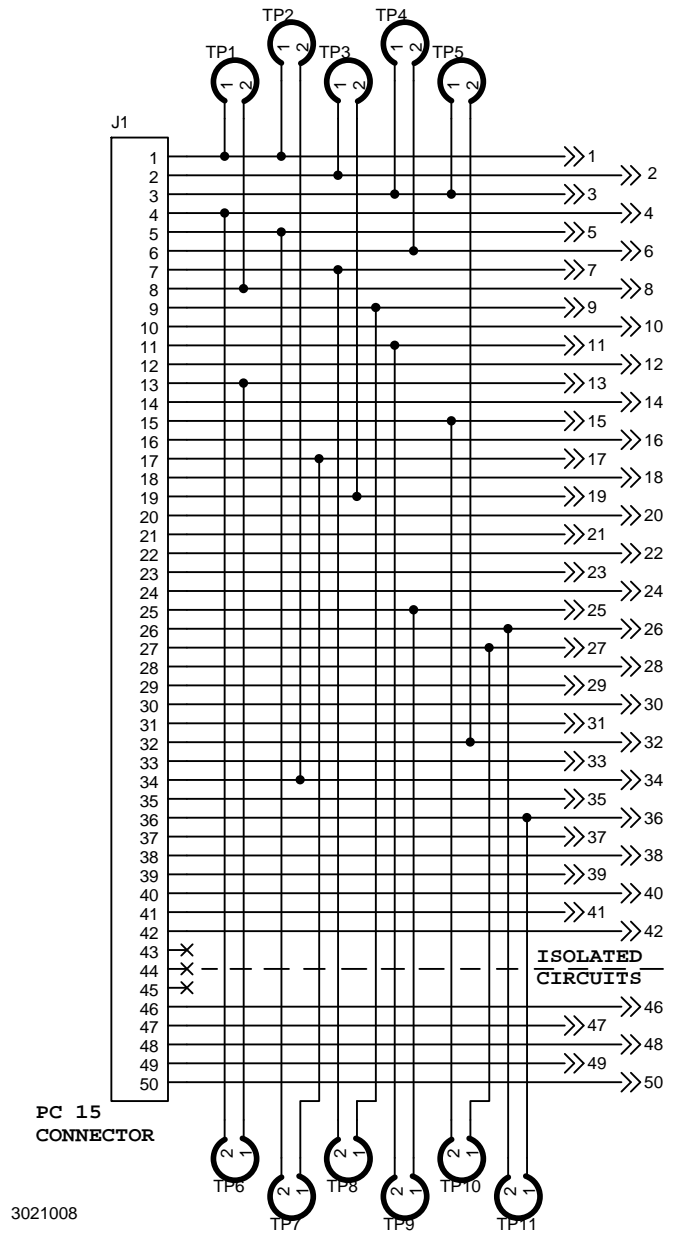
Each BOP channel is controlled by commands issued through web pages accessed through a web browser.

The following paragraphs provide simple procedures to control a BOP channel output voltage (PAR. 1) or output current (PAR. 4.2). Refer to the Operator’s Manual (see PAR. 1.1) for alternative ways of controlling the BOP output.

Voltage and current limits are set by default to a fixed value approximately 10% above the nominal output voltage and current of the unit. Refer to the Operator’s Manual (see PAR. 1.1) to use external reference signals in the 0 to +10V range to remotely program/control limits between 0.2% and 110% of nominal output,

4.1. VOLTAGE MODE OPERATION WITH CURRENT LIMITING. The BOP channel may be used as a stabilized (d-c) source of positive or negative voltage with output current limiting (for either polarity) when adapted for the application at hand.

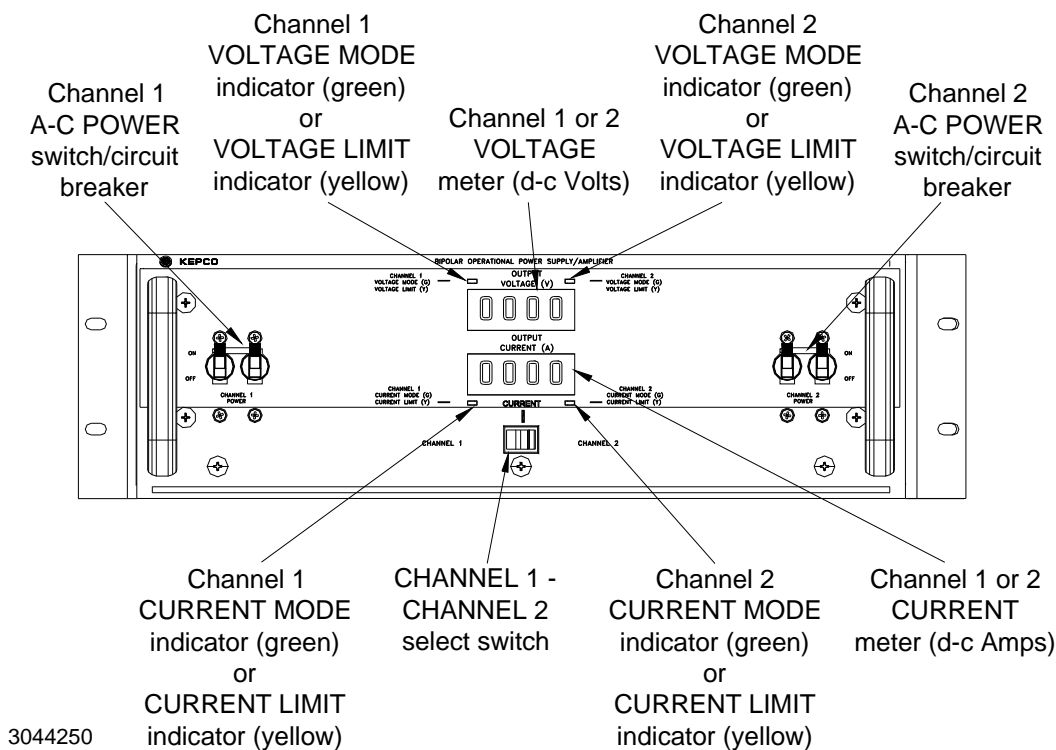
Always monitor the front panel meters while adjusting output voltage/current.



**FIGURE 6. REAR PROGRAMMING CONNECTOR, WIRING DIAGRAM**

1. Refer to PAR. 3.4 and connect the load to the DC OUTPUT Terminal Block for the channel in use.
2. Perform steps 1 through 10 of the Preliminary Checkout (see PAR. 3.2).
3. From the Operate Instrument page, click the Output **ON/OFF** button at the upper right of the web page and

- verify the OFF indicator above the button changes to ON (green) indicating the output is on.
- Program the channel by entering desired output voltage in the **VOLTAGE** field, and current limit in the **CURRENT** field, then click **SET**. Settings that exceed the channel's rated voltage/current will not be accepted.
  - From the Operate Instrument page, click the Output **ON/OFF** button at the upper right of the web page and verify the OFF indicator above the button changes to ON (green) indicating the output is on.
  - Verify the output of the BOP changes and the voltage indication is the same on both web page and the BOP front panel.



**FIGURE 7. BOP 2X-DE SERIES, FRONT PANEL CONTROLS AND INDICATORS**

4.2. CURRENT MODE OPERATION WITH VOLTAGE LIMITING. The BOP channel may be used as a stabilized d-c source of positive or negative current, with output voltage limiting (for either polarity), pre-selected for the application at hand. Always monitor the front panel meters while adjusting output voltage/current.

- Refer to PAR. 3.4 and connect the load to the DC OUTPUT Terminal Block for the channel in use.
- Perform steps 1 through 9 of the Preliminary Checkout (see PAR. 3.2).
- Click on the **MODE** button at the upper right side of the Operate Instrument page until the indicator above the **MODE** button reads **CURRENT**.

- Program the channel by entering desired output current in the **CURRENT** field and voltage limit in the **VOLTAGE** field, then click **SET**. Settings that exceed the channel's rated voltage/current will not be accepted.
- From the Operate Instrument page, click the Output **ON/OFF** button at the upper right of the web page and verify the OFF indicator above the button changes to ON (green) indicating the output is on.
- Verify the output of the BOP changes and the current indication is as programmed on both the web page and the BOP front panel.

4.3. ADDITIONAL FEATURES. The following features of the BOP 2X-DE power supply are covered in the full BOP 2X-DE Operator Manual (see PAR. 1.1).

- BOP Channel Operation with Remote Control of the Voltage Control Channel
- BOP Channel Operation with Remote Control of the Current Control Channel
- Using a BOP Channel as an Amplifier
- Remote Control of a BOP Channel Current Limit
- Remote Control of a BOP Channel Voltage Limit
- Series and Parallel Connection of BOP Channels
- Remote On-Off Control.

The following additional features are covered in the BIT 802E Operator Manual (see PAR. 1.1).

- Programming an Output channel via the LAN interface.
- Calibration of an Output channel via the LAN interface.

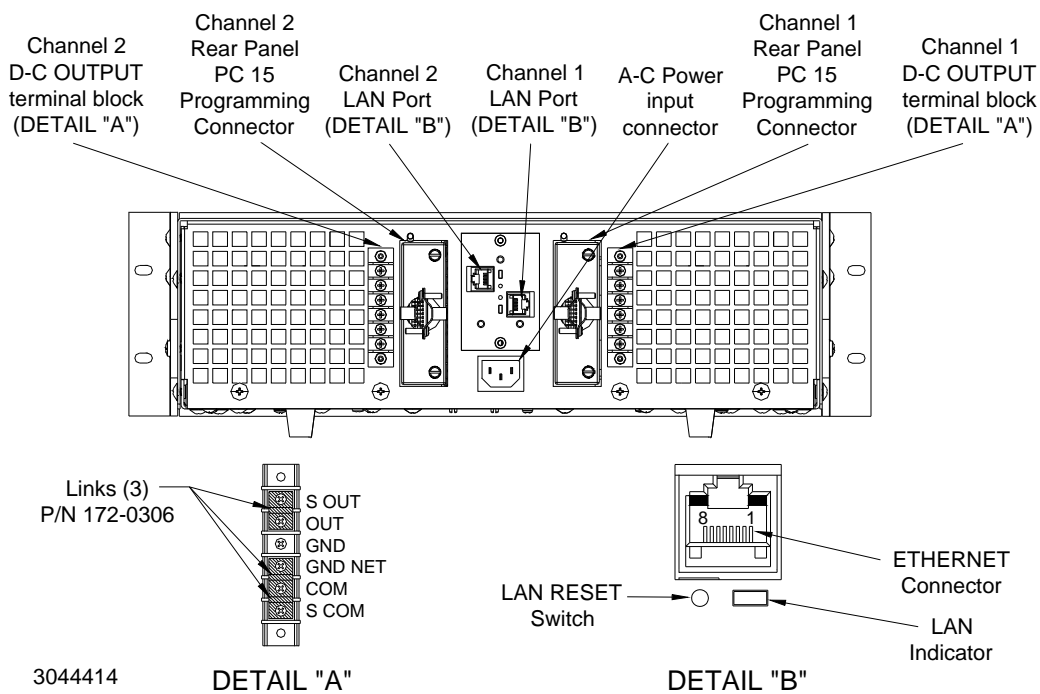


FIGURE 8. BOP 2X-DE SERIES REAR PANEL TERMINATIONS

