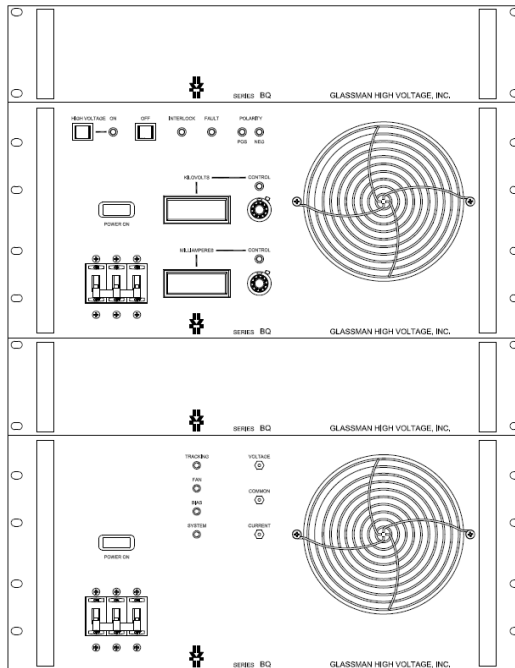


# INSTRUCTION MANUAL

## BQ SERIES



**XP** **GLASSMAN**  
HIGH VOLTAGE

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## LIMITED WARRANTY

XP Power LLC (“XP Power”) provides a limited warranty in lieu of all other warranties. Buyer’s exclusive remedies in the event of a defect are limited to repair, replacement, or at XP Power’s discretion, refund of the purchase price. The terms of the limited warranty and the Buyer’s remedies are described below.

XP Power warrants its standard power supplies to be free from defect in material and workmanship, and XP Power agrees to repair or replace any power supply which fails to perform in accordance with XP Power’s written specification within three years after date of shipment from XP Power.

This limited warranty shall not apply to any power supply which has been:

- (1) Repaired, worked on, or altered by persons unauthorized by XP Power, which in XP Power’s sole judgement, adversely affects the performance, stability, or reliability of the power supply.
- (2) Subject to misuse, negligence, or accident; or
- (3) Connected, installed, adjusted, or used otherwise than in accordance with instructions furnished by XP Power.

XP Power reserves the right to make any changes in design or construction of its power supply at any time, without incurring any obligation to make any change whatsoever in units previously delivered.

**LIMITATION ON REMEDIES.** Buyer’s exclusive remedy in the event of a defect in a power supply is limited to the repair or replacement of any defective power supply or to refund of the purchase price at XP Power’s sole discretion. Buyer must return the power supply to the XP Power factory, transportation prepaid by the Buyer, within the warranty period for the warranty claim to be effective. **XP Power is not liable to Buyer or to any third party for consequential or incidental damages** under any circumstances, whether due to defect in the power supply, due to delay or failure of delivery, due to a failure of the power supply to perform as specified, or for any other reason or cause. Buyer and XP Power agree that Buyer’s sole remedy and XP Power’s sole liability to Buyer is limited to repair, replacement, or refund of the purchase price of the power supply as described herein, whether Buyer’s claim arises out of contract or tort.

**DISCLAIMER OF IMPLIED WARRANTIES.** This limited warranty excludes all other warranties and is offered and accepted in lieu of any and all other warranties, whether express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose.

The entire contract concerning warranty rights and obligations and concerning Buyer’s remedies is embodied in this writing. This writing constitutes the final expression of the parties’ agreement, and it is a complete and exclusive statement of the terms of that agreement. No statements or understanding, purporting to modify or vary the terms hereof, shall be binding and cannot be relied upon by Buyer.

## SECTION II – GENERAL INFORMATION

### UNPACKING AND INSPECTION

First inspect package exterior for evidence of rough handling in transit. If none, proceed to unpack ... carefully. After removing the supply from its shipping container, inspect it thoroughly for damage.

**CAUTION.** This power supply is equipped with six handles, two front & two rear on the driver chassis and two front on the high voltage chassis. Due to the weight of the unit, always lift or carry using a minimum of two handles.

**IMPORTANT!** In cases of damage due to rough handling in transit, notify the carrier immediately if damage is evident from appearance of package. Do not destroy or remove any of the packing material used in a damaged shipment. Carrier companies will usually not accept claims for damaged material unless they can inspect the damaged item and its associated packing material. Claims must be made promptly - certainly within five days of receipt of shipment.

### CORRESPONDENCE

Each XP Glassman power supply has an identification label on the chassis that bears its model and serial number. When requesting engineering or applications information, reference should be made to this model and serial number. If specific components or circuit sections are involved in the inquiry, also indicate the component symbol number(s) shown on the applicable schematic diagram.

#### XP GLASSMAN HIGH VOLTAGE

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[www.xppower.com](http://www.xppower.com)

## ACCESSORIES (provided)

QTY	ITEM
1	HV Output cable, (W1)
2	HVAC Interconnect Cables, (W2 & W3)
1	Driver Assembly to High Voltage Assembly, Ground Cable, (W4)
1	Driver Assembly to High Voltage Assembly, Signal Cable, (W5)
1	Master to Slave Interconnect Cable 1 (W6, One per slave, Master/Slave Systems only).
1	Master to Slave Interconnect Cable 2 (W7, One per slave, Master/Slave Systems only).
1	Master to Slave Ground Cable (One per slave, Master/Slave Systems only).
1	Subminiature "D" mating connector kit, 25 pin female.

## SAFETY



This symbol, wherever it appears on the supply, alerts you to the presence of uninsulated dangerous voltages - voltages that may be sufficient to constitute a risk of electrical shock.



This symbol, wherever it appears on the supply, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.

### TERMS IN THIS MANUAL

**CAUTION!** statements identify conditions or practices that could result in damage to the equipment or other property.

**WARNING!** statements identify conditions or practices that could result in injury or loss of life.

### WARNING!

If this equipment is used in a manner not specified herein, the protection provided by the equipment may be impaired.

To avoid the risk of shock or fire do not attempt to service the supply beyond that described in these instructions.

To avoid the risk of shock and personal injury, do not remove the product covers while the unit is operating or connected to the AC mains. Wait at least 5 minutes after disconnecting the AC mains power before removing any covers, panels, or the HV cable.

Upon loss of protective ground connection(s), all accessible conductive parts can render an electric shock.

Use only a NRTL listed power cord with a separable mains plug of the proper voltage, rated greater than the input current rating of the unit. For CE compliant supplies used in Europe the protective conductor/ground wire on the cord must be green/yellow. Use only a cord in good condition.”

To avoid fire hazard, use only fuses of the correct type, voltage rating, and current rating as specified.

To avoid explosion, do not operate this product in an explosive atmosphere.

If liquid is spilled on the supply, shut it off immediately and disconnect it from the AC mains.

Always maintain adequate supply ventilation. All ventilation openings must remain free from obstruction.

## Equipment Maintenance

There is no regular maintenance required to be performed on this equipment.

## User Serviceable Components

**There are no user-serviceable components. Return supply to factory for replacement of components by qualified technicians.**

*(For instructions on changing the polarity in reverse polarity models see REVERSE POLARITY Section elsewhere in this manual).*

## CONNECTIONS AND CONTROLS

*(Refer to Schematic, Interface and O&I Drawings)*

The power supply consists of two chassis assemblies, the driver chassis and the high voltage chassis. All input and interface connections are made to the driver assembly. The High Voltage output is provided on the high voltage assembly.

**CAUTION:** *All interconnections between the driver and high voltage chassis must be installed with the cables provided before AC line power is applied.*

## REAR PANEL ELEMENTS

*(Refer to the Outline & Interface Diagram and Remote Control Interface in Section III).*

### Master Driver Assembly

**WARNING! Do not make or remove connections to any REAR PANEL connector or any other connector until power is off and the output has discharged.**

#### **TB1 REMOTE INTERFACE TERMINAL STRIP**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged**

This connector provides REMOTE/LOCAL selection and interlock functions. For a description of these connections see REMOTE CONTROL INTERFACE Figures 1-8 and the REMOTE CONTROL INTERFACE section of this manual.

#### **TB2 AC POWER INPUT**

BQ units operate off 208 VAC +/-10%, 3 phase, 45 Amps (Delta or Wye connectable), 48-63Hz. (Unless ordered with 200V, 380V, 415V, or 480V options. See option spec control provided).

**WARNING! The ground (TB2-5) terminal of this input should always be connected to the AC mains ground.**

TB2 is an NRTL approved terminal block rated for 600V, 50 A & 105 Deg. C. The power cord provided by the user should be an NRTL approved, 4 or 5/C, 6AWG, 600VAC, 45 A, 90 Deg. C. **minimum rating.**

For 380VAC thru 480VAC options the power cord provided by the user should be an NRTL approved, 4 or 5/C, 10AWG, 600VAC, 25 A, 90 Deg. C. **minimum rating.** The line cord wires should be connected as follows:

- TB2-1 Line 1 (Brown)
- TB2-2 Line 2 (Black)
- TB2-3 Line 3 (Grey)
- TB2-4 Neutral (Blue)
- TB2-5 Ground (Green/Yellow)

Colors indicated are for European CE compliant supplies.

Note: Master/Slave supplies have one additional set of AC input terminals per slave chassis. A separate NRTL approved line cord must be provided for each module.

It is recommended that an NRTL approved separable plug be installed on each power cord to connect & disconnect from the mains. This plug should also be rated for the required Input VAC & Current of the supply.



**CAUTION**

Check to see that your input line voltage and frequency matches the rating of the supply before applying power.

**MAINS SERVICE MUST BE PROTECTED WITH FUSES OR CIRCUIT BREAKERS WITH A MAXIMUM RATING OF 125 A FOR 208 VAC MODELS AND 100 A FOR 380 THRU 480 VAC MODELS AND A MINIMUM INTERRUPTING CAPACITY OF 5000 A**

**For CE compliant supplies used in Europe:**

Multi-phase equipment is required to have a Safety Disconnect switch or circuit-breaker from the supply source. This should be installed in the MAINS SERVICE connected to the unit and meet the following requirements.

- The switch or circuit breaker must meet the relevant requirements of IEC60947-1 & IEC60947-3
- The switch or circuit breaker should be rated for the load requirements of the supply or supplies connected to it.
- The Disconnect must be in close proximity to the supply and within easy reach of the operator.
- It must be marked as the disconnecting device for the supply or supplies.

**Please refer to the Declaration of Conformity located elsewhere in this manual for installation environment conditions required to conform to 2014/35/EU (Low Voltage Directive).**

**POWER ON INDICATOR**

**WARNING! When this lamp is illuminated, AC power is present. Do not apply or remove any connections to this unit until AC power is removed and the DC output has discharged.**

**E1 GROUND STUD**

**WARNING! Do not operate unit without good external earth ground connected to this point.**

This is the main grounding terminal for the supply and **must** be connected to a good external earth GROUND!

**E2 GROUND STUD**

This ground terminal **must** be connected to E3 of the High Voltage chassis (via W4).

**E4    GROUND STUD**

**WARNING! Do not use E4 connection for main earth ground or load return! E1 and E3 ground studs on the rear panel are provided for this purpose.**

Chassis ground connection to be used for TB1 cable shield return.

**J1    REMOTE INTERFACE CONNECTOR**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

This connector provides inputs and outputs for the remote control functions. For a description of each of these signals and their applications see REMOTE CONTROL INTERFACE Figures 1-8 and the REMOTE CONTROL INTERFACE section of this manual.

**J2    MASTER/SLAVE CONNECTOR (OPTION)**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

This connector provides the interface signals needed for parallel operation to J1 of the nearest downstream slave chassis. For a description of each of these signals and their application see the MASTER/SLAVE SYSTEM SCHEMATIC and the MASTER/SLAVE O & I.

**J3    HIGH VOLTAGE INTERFACE CONNECTOR**

This connector receives the high voltage interface signals from J6 (via W5) of the High Voltage chassis. *(See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings).*

**JHV1,  
JHV2    HIGH VOLTAGE AC CONNECTORS****CAUTION**

**All HVAC interconnect cable plugs must be properly fully seated in JHV1 thru JHV4 before applying power to the system. Faulty installation may damage the supply.**

These connectors provide the multiplier drive signals to the corresponding connectors on the High Voltage chassis (via W2 & W3) *(See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings).*

JF1,JF2 **MASTER/SLAVE FIBER OPTIC CONNECTOR (OPTION)**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

This connection provides the fiber optic interface needed for parallel operation to JF3 and JF4 of the nearest downstream slave chassis. For a description of this connection and its application see the MASTER/SLAVE SYSTEM SCHEMATIC and the MASTER/SLAVE O & I.

**S3** **CURRENT LIMIT/TRIP SWITCH**

This switch allows selection of two modes of operation as follows:

1. **CURRENT TRIP (CT):** When the switch is set to the CT position the HV output will trip and latch off when the load current exceeds the programmed level. Reset by toggling the HV ON/OFF buttons, HV ENABLE signal or by cycling the AC power.
2. **CURRENT LIMIT (CL):** When the switch is set to the CL position, the load current is regulated at the programmed level when the unit is operating in current mode.

## Master High Voltage Assembly

**WARNING! Do not make or remove connections to any REAR PANEL connector or any other connector until power is off and the output has discharged.**

### **JHV5 HIGH VOLTAGE OUTPUT**

**WARNING! Do not insert or remove the output cable from this connector until AC power is off and the DC output has discharged.**

This is the high voltage output of the supply. Engage the connector as follows: Insert the end of the high voltage cable provided into the receptacle. Screw the threaded barrel onto the receptacle.

### **E3 GROUND STUD**

E3 on the High Voltage chassis must be connected to E2 on the Driver chassis (via W4). Unless otherwise indicated, this terminal should also be used for the HV load return (*See SYSTEM SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings*).

### **J6 HIGH VOLTAGE INTERFACE CONNECTOR**

This connector provides the high voltage interface signals to J3 of the Driver chassis (via W5) (*See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings*).

### **JHV3, JHV4 HIGH VOLTAGE AC CONNECTORS**

#### **CAUTION**

**All HVAC interconnect cable plugs must be properly fully seated in JHV1 thru JHV4 before applying power to the system. Faulty installation may damage the supply.**

These connectors receive the multiplier drive signals from the corresponding connectors on the Driver chassis (via W2 & W3) (*See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings*).

## **Slave Driver Assembly (Master/Slave supplies only):**

### **TB1 NOT USED**

TB1 is not used on the Slave Driver chassis.

### **TB2 AC POWER INPUT**

Refer to TB2 of Master Driver chassis above.

### **POWER ON INDICATOR**

**WARNING! When this lamp is illuminated, AC power is present. Do not apply or remove any connections to this unit until AC power is removed and the DC output has discharged.**

### **E1 GROUND STUD**

**WARNING! Do not operate unit without good external earth ground connected to this point.**

This is the main grounding terminal for the slave module and **MUST** be connected back to E1 of the master module, either directly or via the E1 ground terminal of the next upstream slave module. See the MASTER/SLAVE SYSTEM SCHEMATIC and the MASTER/SLAVE O & I.

### **E2 GROUND STUD**

This ground terminal **must** be connected to E3 of the High Voltage chassis (via W4).

### **J1 MASTER/SLAVE CONNECTOR (OPTION)**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

This connector provides the interface signals needed for parallel operation from J2 of the master chassis or J2 of the nearest upstream slave chassis. For a description of each of these signals and their application see the MASTER/SLAVE SYSTEM SCHEMATIC and the MASTER/SLAVE O & I.

**J2 SLAVE/SLAVE CONNECTOR (OPTION)**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

This connector provides the interface signals needed for parallel operation to J1 of the nearest downstream slave chassis. In the case of the last slave chassis, a terminator plug is installed on J2. For a description of each of these signals and their application see the MASTER/SLAVE SYSTEM SCHEMATIC and the MASTER/SLAVE O & I.

**J3 HIGH VOLTAGE INTERFACE CONNECTOR**

This connector receives the high voltage interface signals from J6 (via W5) of the High Voltage chassis. *(See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings).*

**JHV1,  
JHV2 HIGH VOLTAGE AC CONNECTORS****CAUTION**

**All HVAC interconnect cable plugs must be properly fully seated in JHV1 thru JHV4 before applying power to the system. Faulty installation may damage the supply.**

These connectors provide the multiplier drive signals to the corresponding connectors on the High Voltage chassis (via W2 & W3) *(See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings).*

**JF1,**  
**JF2** **SLAVE/SLAVE FIBER OPTIC CONNECTOR (OPTION)**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

This connection provides the fiber optic interface needed for parallel operation to JF3 and JF4 of the nearest downstream slave chassis. In the case of the last slave chassis, JF1 and JF2 will be capped with the cover provided. For a description of this connection and its application see the MASTER/SLAVE SYSTEM SCHEMATIC and the MASTER/SLAVE O & I.

**JF3,**  
**JF4** **MASTER/SLAVE FIBER OPTIC CONNECTOR (OPTION)**

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

This connection provides the fiber optic interface needed for parallel operation from JF1 and JF2 of the nearest upstream master or slave chassis. For a description of this connection and its application see the MASTER/SLAVE SYSTEM SCHEMATIC and the MASTER/SLAVE O & I.

## Slave High Voltage Assembly

**WARNING! Do not make or remove connections to any REAR PANEL connector or any other connector until power is off and the output has discharged.**

### **JHV5 HIGH VOLTAGE OUTPUT**

**WARNING! Do not insert or remove the output cable from this connector until AC power is off and the DC output has discharged.**

This is the high voltage output of the supply. Engage the connector as follows: Insert the end of the high voltage cable provided into the receptacle. Screw the threaded barrel onto the receptacle.

### **E3 GROUND STUD**

E3 on the High Voltage chassis must be connected to E2 on the Driver chassis (via W4). Unless otherwise indicated, this terminal should also be used for the HV load return (*See SYSTEM SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings*).

### **J6 HIGH VOLTAGE INTERFACE CONNECTOR**

This connector provides the high voltage interface signals to J3 of the Driver chassis (via W5) (*See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings*).

### **JHV3, JHV4 HIGH VOLTAGE AC CONNECTORS**

#### **CAUTION**

**All HVAC interconnect cable plugs must be properly fully seated in JHV1 thru JHV4 before applying power to the system. Faulty installation may damage the supply.**

These connectors provide the multiplier drive signals to the corresponding connectors on the High Voltage chassis (via W2 & W3) (*See the SCHEMATICS, OUTLINE & INSTALLATION and SYSTEM INSTALLATION drawings*).

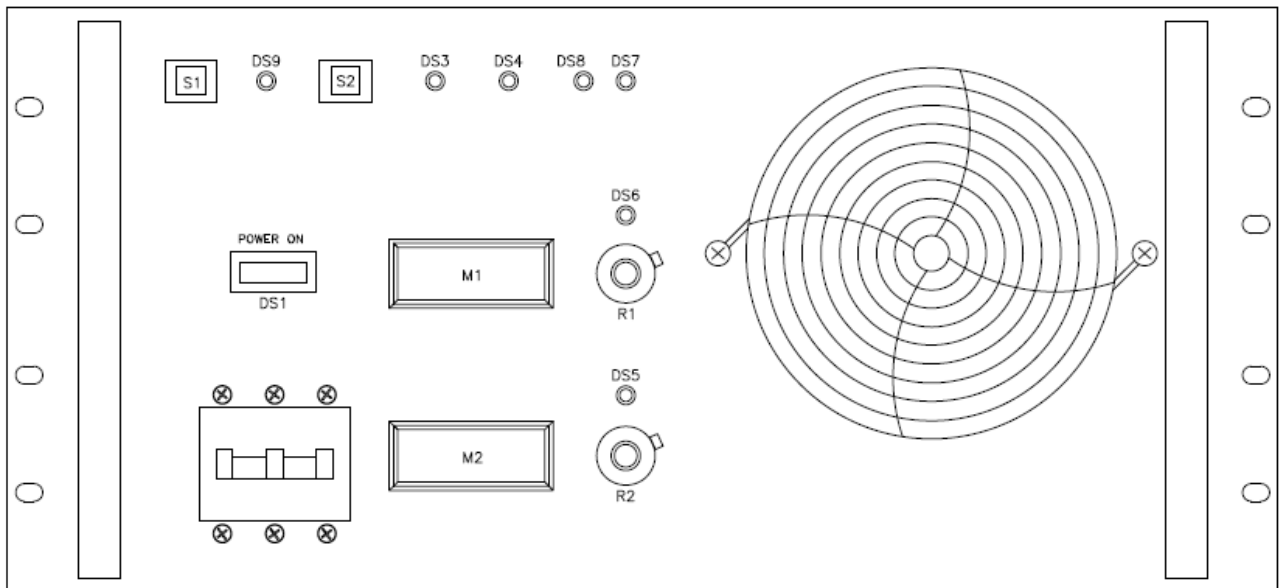


## FRONT PANEL ELEMENTS

### POWER SWITCH/CIRCUIT BREAKER

**WARNING! Do not apply or remove any connections to this unit when power is on.**

This switch applies AC power to the unit when in the on ("1") position (as long as power is present at TB2). It also provides protective interrupting functions.



**BQ Driver Front Panel, Figure 1**

### POWER ON INDICATOR (DS1)

The AC POWER ON indicator lamp will illuminate when power is present and POWER BREAKER is in the ON / 1 position.

**WARNING! Do not apply or remove any connections to this unit until AC power is removed and the DC output has discharged.**

*"NC" OPTION USERS: The front panel elements that follow are not present on "NC" option supplies.*

### **HIGH VOLTAGE ON PUSHBUTTON (S1)**

**WARNING! When depressed, activates the high voltage enable circuit** (as indicated by the HIGH VOLTAGE ON indicator) if the INTERLOCK signal is closed. The supply will not generate high voltage unless/until a valid "on" signal is present at the HV ENABLE input (see "REMOTE CONTROL INTERFACE" section for details), or if the fault indicator is illuminated.

### **HIGH VOLTAGE ON INDICATOR (DS9)**

Illuminates after the HV ENABLE pushbutton is depressed (if the INTERLOCK signal is closed).

**WARNING! If this indicator is on and the HV ENABLE signal is present, the supply will generate high voltage.** If the INTERLOCK signal is opened, and there are no faults, even temporarily, the high voltage will be disabled and the HIGH VOLTAGE ON indicator will extinguish. Once the INTERLOCK is closed, the HIGH VOLTAGE ON pushbutton must again be depressed to restart the supply.

### **HIGH VOLTAGE OFF PUSHBUTTON (S2)**

When depressed, disables the high voltage enable circuit (HIGH VOLTAGE ON indicator will extinguish). This control also resets the CURRENT TRIP (if enabled by rear panel switch) and ARC TRIP (if ARC TRIP option is factory installed) latching faults.

### **LOCAL KILOVOLTS (R1) & MILLIAMPERES (R2) CONTROL**

10-turn controls provide a 0 to 10 V signal for local MILLIAMPERE and KILOVOLT programming. Clockwise rotation increases output. A 10-turn dial with brake is provided to secure the settings, if desired.

### **KILOVOLT (DS6) & MILLIAMPERE (DS5) CONTROL INDICATORS**

These indicators are located above their respective controls. If the KILOVOLTS CONTROL indicator is illuminated, the supply is operating as a constant voltage source with an output voltage determined by the local KILOVOLTS CONTROL or remote V-PROGRAM signal. If the MILLIAMPERES CONTROL lamp is illuminated, the supply is operating as a constant current source with the output current determined by the local MILLIAMPERES CONTROL or remote I-PROGRAM signal.

### **KILOVOLT (M1) & MILLIAMPERE (M2) OUTPUT METERS**

Digital panel meters display output voltage and current (Note: Meters are operational only when power is applied to the unit. See WARNING! statement below.)

**WARNING!** When system is powered down under light or no load conditions, the output may retain a charge even after power is removed. This charge will not show on the kilovolt meter. Discharge the output to ground or use an external meter to determine if output has discharged or wait at least 5 minutes before making or removing any connections to the supply.

### **POSITIVE (DS8) & NEGATIVE (DS7) POLARITY INDICATORS**

Indicates the output polarity of the supply with respect to ground.

### **INTERLOCK (DS3) INDICATOR**

Indicates that an open is/was present in the external interlock circuit. HV output is disabled and cannot be enabled until the interlock is closed and the power supply re-enabled.

### **FAULT (DS4) INDICATOR**

Illuminates when one or more of the following conditions are present.

- One or more cooling fans is inoperative.
- Insufficient AC line voltage is supplied.
- The power supply temperature is too high.
- An internal BIAS voltage is low or missing.
- There is a fault in a slave module or open Master/Slave interconnect cable (Master/Slave systems only).

## Slave Modules (Master/Slave supplies only):

### POWER INDICATOR

Will illuminate when the AC power circuit breaker on the slave module is in the on ("1") position and AC power is supplied to the module.

**WARNING! Do not apply or remove any connections to this unit until AC power is removed and the DC output has discharged.**

### TP-CURRENT TESTPOINT

A 0 to 10 V service testpoint for measuring the relative output current of the slave module.

### TP-VOLTAGE TESTPOINT

A 0 to 10 V service testpoint for measuring the relative output voltage of the slave module.

### TP-COMMON TESTPOINT

The COMMON return point for the instruments measuring the TP-VOLTAGE and TP-CURRENT testpoints.

## FAULT INDICATORS

### BIAS INDICATOR

Will illuminate if any of the following conditions are present:

- An internal BIAS voltage is missing.
- The AC input line voltage is insufficient.
- An over temperature condition has occurred.

### FAN INDICATOR

Will illuminate when one or more cooling fans are slow or inoperative.

---

**TRACKING INDICATOR**

Will illuminate if the slave module is not tracking the master. The tracking circuit will latch and shut down the supply if the condition persists for more than approximately 3 seconds. Tracking shutdown can be reset by toggling the REMOTE HIGH VOLTAGE ENABLE or through AC power down either by the master module power breaker or by disconnecting the supply from the AC mains. It is normal for this indicator to momentarily illuminate during load or programming transients.

**SYSTEM INDICATOR**

This indicator will illuminate if the master & slave polarities do not match. (This applies only to reversible supplies).

## INSTALLATION AND OPERATION

This unit is a component type of power supply, and as such, is designed for permanent mounting within an equipment rack that will provide adequate fire and shock protection. As is the case with most rack mounted equipment, this supply might in some cases be used for “Bench Top” operation.

### **WARNING!**

**When used as a “Bench-Top” supply all user controls & monitoring are accessed via the front panel controls. Safety precautions should be taken during the installation to prevent the connections on the rear panel from becoming “Operator Accessible” when power is applied.**

Refer to the OUTLINE AND INSTALLATION drawing located in Section III for mechanical mounting specifications and dimensions.

### **CAUTION!**

This power supply is equipped with six handles, two front & two rear on the driver and two front on the high voltage assembly. Due to the weight of the unit, always lift or carry using a minimum of two handles.

**ALWAYS MAINTAIN ADEQUATE SUPPLY COOLING! Care should be taken when mounting this supply not to block or otherwise impede airflow at inlet and exhaust areas.**

### **WARNING!**

**NEVER ATTEMPT TO OPERATE THIS UNIT WITHOUT A GOOD EARTH GROUND CONNECTED TO THE GROUND STUD E1 (E1 OF THE MASTER CHASSIS ON MASTER/SLAVE SUPPLIES).**

**THE GROUND WIRE OF THE AC LINE CORD OR CORDS SHALL BE GROUNDED FROM THE MAINS AC GROUND TO TB2-5 GROUND (AND ON ALL TB2-5 GROUNDS FOR MASTER/SLAVE SUPPLIES).**

**PER EN61010-1 THE DISCONNECTING DEVICE MUST BE READILY IDENTIFIABLE AND EASILY REACHED BY THE USER. THE EXTERNAL SAFETY DISCONNECT (CIRCUIT BREAKER OR SWITCH) INSTALLED BY THE USER, IS THE POWER SUPPLY DISCONNECTING DEVICE. TO DISCONNECT THE POWER SUPPLY FROM THE MAINS, THE CIRCUIT BREAKER OR SWITCH MUST BE TURNED OFF.**

**MAKE SURE THAT ALL INTERCONNECT CABLES AND GROUNDS ARE PROPERLY INSTALLED BETWEEN THE HV ASSEMBLY AND DRIVER CHASSIS. IF A MASTER/SLAVE SYSTEM, ALSO MAKE SURE ALL THE INTERCONNECTS AND GROUNDS ARE PROPERLY INSTALLED BETWEEN THE MASTER AND SLAVE SUPPLIES.**

**READ AND FULLY UNDERSTAND THE OPERATING INSTRUCTIONS BEFORE APPLYING POWER TO THIS UNIT.**

**THIS EQUIPMENT EMPLOYS VOLTAGES THAT ARE DANGEROUS. EXTREME CAUTION MUST BE EXERCISED WHEN WORKING WITH THIS EQUIPMENT.**

**DO NOT HANDLE THE LOAD OR EXPOSED HIGH VOLTAGE TERMINATIONS OR ATTEMPT TO MAKE OR REMOVE ANY CONNECTIONS TO THE SUPPLY UNTIL THE LOAD AND/OR SUPPLY HAS BEEN DISCHARGED (GROUNDED). AN UNLOADED SUPPLY MAY TAKE UP TO 5 MINUTES TO FULLY DISCHARGE.**

**THE LOAD RETURN SHALL BE CONNECTED TO E3 OF THE HV ASSEMBLY. FOR MASTER/SLAVE SUPPLIES, THE LOAD RETURN SHALL BE CONNECTED TO E3 (GROUND STUD) ON THE MASTER HV ASSEMBLY.**

## INITIAL TURN ON

**WARNING!** This procedure should only be attempted by qualified personnel who are knowledgeable in methods of safely testing and operating high voltage power supplies and related high voltage equipment. The following steps to connect and operate this equipment should be carried out only after the unit has been placed or mounted in position.

1. **CAUTION:** Check the input voltage rating on the rear or side panel nameplate of the power supply and make certain that this is the rating of the available power source.
2. Check to see that the POWER breaker is in the off ("0") position.
3. Check to see that all inter-chassis wires and cables have been installed in accordance with the schematic/interface drawings supplied.
4. Check to see that the proper grounding straps and/or buss bars have been installed between chassis as shown in the installation drawing.
5. Check to see that the jumpers are present on TB1 and are connected for local operation.

*USERS WITH "NC" OPTION SUPPLIES: Connect external pot or control signal to V-PROGRAM. (See REMOTE CONTROL INTERFACE Figure 3).*

6. Connect the high voltage output cable to your HV apparatus and ground the return lead of the load to E3 GROUND STUD. Connect the high voltage output cable to the receptacle on the rear panel.  
**WARNING!** Make sure to isolate your HV apparatus/load from any possible contact with other objects and personnel.

*"NC" OPTION USERS: Connect an external kilovolt meter to the high voltage output or monitor the V-MONITOR terminal on J1 with a DVM (0 - 10VDC = 0 - rated kV output). Monitor the I-MONITOR terminal on J1 with a DVM (0 - 10VDC = 0 - rated mA output). See REMOTE CONTROL INTERFACE Figures 5 & 6.*

7. Connect the AC input cable provided by the user to TB2 and to the MAINS power source.
8. Make sure that a good earth ground is connected to the main ground stud, E1, as described in the warning.



9. **CAUTION:** Rotate KILOVOLTS CONTROL to the fully counterclockwise position (set external pot or control signal on "NC" option units for zero volts programming). This is optional, but desirable to prevent damage to external equipment caused by inadvertent overvoltage setting. Not required if correct setting has already been established.
10. Rotate the MILLIAMPERES CONTROL clockwise (set external pot or control signal on "NC" option units) to a level that is greater than the amount that the connected load will require (any setting above zero if no load is connected).
11. Apply input power to the supply by setting POWER breaker to the on ("1") position.

**WARNING! "NC" OPTION USERS:**

**The supply is shipped to operate so that the HV ENABLE function is provided upon turn on of the AC POWER SWITCH/CIRCUIT BREAKER!**

12. Depress HIGH VOLTAGE ON pushbutton. The HIGH VOLTAGE ON indicator should illuminate.
13. Rotate KILOVOLT CONTROL (or increase external V-PROGRAM signal) until kilovolt meter indicates desired output voltage.
14. Depress HIGH VOLTAGE OFF pushbutton to disable high voltage output.

**USERS WITH "NC" OPTION SUPPLIES: Refer to REMOTE CONTROL INTERFACE figure 8 for configuring EXTERNAL HIGH VOLTAGE ON/OFF functions.**

15. To shut down supply, set POWER breaker to the off ("0") position.

**WARNING!**

**DO NOT HANDLE THE LOAD OR EXPOSED HIGH VOLTAGE TERMINATIONS OR ATTEMPT TO MAKE OR REMOVE ANY CONNECTIONS TO THE SUPPLY UNTIL THE LOAD AND/OR SUPPLY HAS BEEN DISCHARGED (GROUNDED). AN UNLOADED SUPPLY MAY TAKE UP TO 5 MINUTES TO FULLY DISCHARGE.**

## REVERSE POLARITY

### Reversible Polarity Supplies:

**WARNING!**

**TO AVOID THE RISK OF SHOCK AND PERSONAL INJURY, WAIT AT LEAST 30 SECONDS AFTER DISCONNECTING THE AC MAINS POWER BEFORE DISCONNECTING ANY CABLES.**

Two High Voltage chassis of opposite polarity are provided with each supply (and slave where applicable). To verify the polarity of the High Voltage assembly, refer to the label on the side of the High Voltage chassis.

It is required that the two High Voltage chassis be exchanged to reverse the output polarity. This may be done in the following manner

1. **If the supply has been running, the output must be discharged or allowed to bleed down for a minimum of 5 minutes**
2. Disconnect the AC power from the supply.
3. Disconnect all cables from the High Voltage chassis.

**BE SURE AC POWER IS DISCONNECTED AND HV IS DISCHARGED!**

4. Remove the High Voltage chassis from rack or installed location.
5. Insert the opposite polarity High Voltage chassis in the same location.
6. Reconnect all E3 connections to Driver chassis, load return, and slave chassis if applicable.
7. Reconnect J6, JHV3, JHV4, and output cable (JHV5).

***CAUTION:** All High Voltage chassis in master/slave systems must be installed for the same polarity. The supplies will not operate if this is not the case.*

**WARNING!**

**DO NOT HANDLE EXPOSED HIGH VOLTAGE TERMINATIONS OR ATTEMPT TO MAKE OR REMOVE ANY CONNECTIONS TO THE SUPPLY UNTIL THE LOAD AND/OR SUPPLY HAS BEEN DISCHARGED (GROUNDED). AN UNLOADED SUPPLY MAY TAKE UP TO 5 MINUTES TO FULLY DISCHARGE.**

## REMOTE CONTROL INTERFACE

*NOTE: It is recommended that shielded cables be used for these connections with the shield connected to ground.*

*NOTE: All "Figures" mentioned hereafter can be found on the REMOTE CONTROL INTERFACE located in SECTION III of this manual.*

***For CE compliant supplies used in Europe:***  
*Please refer to the EMC addendum located elsewhere in this manual for shielding, terminating filtering conditions required to conform to 2014/30/EU.*

### TB1 Connections

**WARNING! Do not make or remove connections to this connector or any other connector until power is off and the output has discharged.**

#### **TB1-1      INTERLOCK**

This terminal provides a connection to complete the INTERLOCK circuit. It is internally connected to +24 VDC through a 390 ohm, 2 W resistance.

**CAUTION:** This terminal must not be connected to GROUND or COMMON.

#### **TB1-2      INTERLOCK RETURN**

This terminal must be connected to TB1-1 to enable the supply. As shipped from the factory, the INTERLOCK terminal is tied to the adjacent TB1-1 terminal by means of a jumper. If desired, this jumper may be removed and replaced by an external switch. This switch must be closed for the supply to operate. If the external switch is opened, the supply output will drop to zero. When the switch is again closed, the front panel HIGH VOLTAGE ON pushbutton must be depressed to re-enable the supply (see Figure 1).

***WARNING! "NC" option supplies will re-enable immediately.***

<u>TB1-3</u>	<u>REMOTE HV ON</u>
<u>TB1-4</u>	<u>REMOTE HV ON</u>
<u>TB1-5</u>	<u>REMOTE HV OFF</u>
<u>TB1-6</u>	<u>REMOTE HV OFF</u>

These terminals provide for remote control of the HV ON and HV OFF functions. They duplicate the front panel HV ON and HV OFF switch functions (except for "NC" Option supplies).

These are momentary switch contacts as follows:

**HV ON** - Momentary closure enables the HV. These are wired in parallel with the HV ON front panel switch.

**HV OFF** - Momentary opening turns the HV off. These are wired in series with the HV OFF front panel switch.

The supplied jumper link must be removed when using the remote HV OFF function.

The front panel HV ON switch remains functional as long as momentary contacts are used. The front panel HV OFF switch always remains functional in the interest of safety. (See Figure 8)

**WARNING! Installing a permanent connection across the remote HV ON terminals will cause the supply to generate HV immediately upon the application of AC power (assuming there are no faults). In addition, if the interlock is opened disabling the HV, closure of the interlock will cause the HV to turn on immediately.**

<u>TB1-7</u>	<u>HV ENABLE</u>
<u>TB1-8</u>	<u>HV ENABLE</u>

These pins allow selection of remote or local operation of the HV enable as follows:

TB1-7 jumpered to TB1-8 – **WARNING! The HV is always enabled** and J1-6 is not used.

TB1-7 not connected to TB1-8 - The HV is enabled by applying a TTL level signal to J1-6. (See Figure 2).

**TB1-9**      **CURRENT LOCAL/REMOTE**  
**TB1-10**     **CURRENT LOCAL/REMOTE**

These pins allow selection of remote or local Current programming as follows:

TB1-9 jumpered to TB1-10 - The front panel Current control potentiometer is connected to the Current program (except for "NC" Option supplies where it is connected to +10 V REF). J1-2 is not used.

TB1-9 not connected to TB1-10 - Current program is via J1-2. (See Figure 4).

**TB1-11**      **VOLTAGE LOCAL/REMOTE**  
**TB1-12**     **VOLTAGE LOCAL/REMOTE**

These pins allow selection of remote or local Voltage programming as follows:

TB1-11 jumpered to TB1-12 - The front panel Voltage control potentiometer is connected to the Voltage program. J1-1 is not used.

TB1-11 not connected to TB1-12 - Voltage program is via J1-1. (See Figure 3).

## SIGNAL INTERFACE

### J1 Connections

**J1-1**      **V-PROGRAM**

This input is available for use when the jumper from TB1-11 to TB1-12 is removed.

A positive 0 to 10 V signal (with respect to SIGNAL COMMON) at J1-1 will program the output voltage proportionally from zero to rated output. This input can be programmed in several ways (see Figure 3):

- \* A user supplied 0 to +10 V signal.
- \* A user supplied potentiometer (10-50 k ohms, 10 k nominal) can be connected between the 10 V REFERENCE and SIGNAL COMMON, with the wiper connected to the V-PROGRAM terminal.
- \* The V-PROGRAM input may be jumpered to the REFERENCE voltage terminal for a fixed output at the maximum voltage.

**J1-2**      **I-PROGRAM**

This input is available for use when the jumper from TB1-9 and TB1-10 is removed.

A 0 to 10 V positive signal (with respect to SIGNAL COMMON) at J1-2 will program the output current proportionally from zero to full output. This input can be programmed in several ways (see Figure 4):

- \* A user supplied 0 to +10 V signal.
- \* A user supplied potentiometer (10-50 k ohms, 10 k nominal) can be connected between the 10 V REFERENCE and SIGNAL COMMON, with the wiper connected to the I-PROGRAM terminal.
- \* The I-PROGRAM input may be jumpered to the REFERENCE voltage terminal for a fixed current limit at the maximum rated current.

**J1-3**      **SIGNAL COMMON**

Return COMMON provided for the program and monitor signals. ALL program and monitor returns should be connected to this terminal not the COMMON terminals J1-8, J1-9 or INTERLOCK RETURN TB1-2.

**J1-4**      **V-MONITOR**

A 0 to 10 V positive signal (with respect to SIGNAL COMMON), in direct proportion to the output voltage, is available at this terminal. An internal 10 k ohm, 1%, limiting resistance protects the circuitry. Therefore, it is recommended that a digital voltmeter is used to monitor this output. It is also acceptable to use a 1 mA DC full scale instrument (e.g., analog meter) for monitor purposes (see Figure 5).

**J1-5**      **I-MONITOR**

A 0 to 10 V signal, positive with respect to SIGNAL COMMON, and in direct proportion to the output current, is available at this terminal. An internal 10 k ohm, 1%, limiting resistance protects the circuitry. Therefore, it is recommended that a digital voltmeter is used to monitor this output. It is also acceptable to use a 1 mA DC full scale instrument (e.g., analog meter) for monitor purposes (see Figure 6).

**J1-6**      **HV ENABLE**

This input is available for use when the jumper from TB1-7 to TB1-8 is removed.

This terminal must be connected to a positive 2.5 to 15 V source, with respect to COMMON (J1-8 or J1-9), to enable the supply. A 0 to 1.5 V signal at this input will disable the supply (see Figure 2).

**J1-7**      **+10 V REF**

The output of this terminal is an ultra-stable, positive, 10 V reference voltage (with respect to SIGNAL COMMON (J1-3)) that is supplied for user programming applications. Maximum current drain from this point should be limited to 4 mA. (See Figures 3 & 4).

*("NC" Option Supplies: TB1-10 is also +10V REF)*

**J1-8**      **COMMON**  
**J1-9**      **COMMON**

These SIGNAL COMMONS are provided as a return for the HV ENABLE (see Figure 2) and if desired a connection point to reference any of the following signals:

- HV STATUS COMMON
- FAULT STATUS COMMON
- MODE STATUS COMMON

## STATUS MONITOR SIGNALS

Three status monitor signals are provided for logic or computer interface. These signals are supplied by means of "Form C" (SPDT) relay contacts. The contact ratings are 24 V @ 1 A max. and are isolated from ground by 60 VDC maximum. The three sets of status monitor relay connections are as follows: (See Figure 7)

**J1-10**      **HV STATUS (NO)**  
**J1-11**      **HV STATUS (NC)**  
**J1-12**      **HV STATUS (COM)**

When the supply begins generating HV, the HV STATUS relay energizes and the HV STATUS (COM) contact transfers from HV STATUS (NC) to HV STATUS (NO).

**J1-13**  
**J1-14**  
**J1-15**

**FAULT STATUS (NO)**  
**FAULT STATUS (NC)**  
**FAULT STATUS (COM)**

When an internal fault occurs, the FAULT STATUS relay energizes and the FAULT STATUS (COM) contact transfers from FAULT STATUS (NC) to FAULT STATUS (NO).

As an illustration of how FAULT STATUS and HV STATUS signals differ, consider the following scenario:

1. Initially, there is no AC power applied and all status relays are de-energized.
2. AC power is applied with a "HIGH" on the HV ENABLE (with HV ENABLE jumper removed). There is no change to the status relays (assuming there are no faults).
3. The HIGH VOLTAGE ON pushbutton is pressed causing the generation of HV and the HV STATUS relay to energize.
4. Sometime later, a fan fails inside the unit causing a fault and shutting off the high voltage. The FAULT STATUS relay energizes to indicate the presence of a fault and the HV STATUS relay de-energizes indicating the absence of HV at the output.
5. An attempt is made to restart the HV by depressing the HV on switch and toggling the HV ENABLE signal, but the fault prevents the HV from being enabled and there is no effect on the HV STATUS relay.
6. The supply is powered down and the defective fan is replaced.
7. AC power is applied with a "LOW" HV ENABLE signal. The FAULT STATUS relay is de-energized because there is no longer a fan fault.
8. The HIGH VOLTAGE ON button is pressed causing the HIGH VOLTAGE ON lamp to illuminate. However, the HV STATUS relay does not energize and no HV is generated because the HV ENABLE is still low.
9. Upon bringing the HV ENABLE signal "HIGH", HV is generated and the HV status relay energizes.

**J1-16**  
**J1-17**  
**J1-18**

**I MODE STATUS (NO)**  
**V MODE STATUS (NC)**  
**MODE STATUS (COM)**

When the supply goes into current regulation or CURRENT TRIP mode (as determined by the rear panel MODE switch), the MODE STATUS relay energizes and the MODE STATUS (COM) contact transfers from V MODE (NC) to I MODE (NO).



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<u>J1-19</u>	<u>RESERVED</u>
<u>J1-20</u>	<u>RESERVED</u>
<u>J1-21</u>	<u>RESERVED</u>
<u>J1-22</u>	<u>RESERVED</u>
<u>J1-23</u>	<u>RESERVED</u>
<u>J1-24</u>	<u>RESERVED</u>

These terminals are reserved for special options or expansion of features.

J1-25      GROUND

**WARNING! Do not use J1 connections for main earth ground or load return!  
E1 and E3 ground studs on the rear panel are provided for this purpose.**

Chassis ground connection to be used for cable shield return.