PRA
Leading edge

Electrostatic Voltage Source
MODEL PHV-0303CT-SP2
3kv (+/-1.5kv) 3.3mA
1KV Bias with Center Tap

User Manual

28 /Oct / 2020

REV	Date	DESCRIPTION OF CHANGE	Issue	Check	Approve
01	22/June/2020	ORIGINAL ISSUE – June 22, 2020	K.S	K.S	K.S
02	23/June/2020	Page 7 USER PORT DEFINITION Explanation for Pin9	K.S	K.S	K.S
03	16/July/2020	Page 6 Change Output stability from 0.1% to 0.3%. Change Output Voltage Linearity from 0.2% to 0.5% Page13,14 Local manual operation procedure.	K.S	K.S	K.S

Table of Contents

1. General Description

This user's guide and manual includes installation guidelines, operation procedures and voltage requirements. Also included are safety procedures and cautions during installation, which should be adhered to in order to protect against injury or warranty violations.

- The PHV-0303CT-SP1 is designed to run in bipolar output configurations. The center tap point connected to an electrical bias within the range of 0V to -1000V. For bipolar applications it is important to make sure the load impedance from each HV terminal to the center tap reasonably match. This assures proper output voltage balance and regulation.

- The PHV-0303CT-SP1 is a compact, lightweight system, and is equipped with low stored energy and built-in current limitations, which safeguard your process from surges and arcs.

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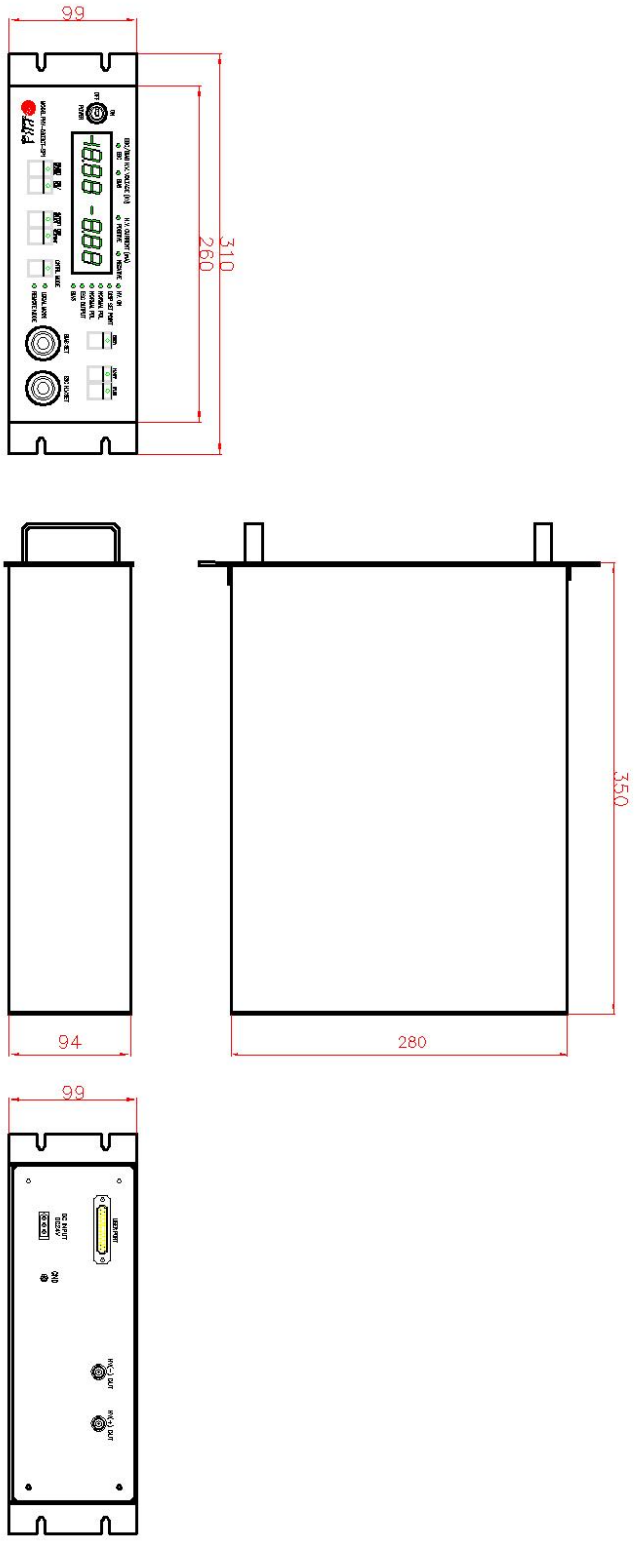
2. Physical Specifications

Dimensions (cm)	Approx. 260mm wide x 99mm high x 350mm deep
Mounting	Interlocking side rail extrusions
Connectors	
DC Input	
Analog I/O	25-Pin D-sub, female
H.V. Output	HV-BNC

ICD Drawing



3. Electrical Specifications

A. Output Capability

1. ESC H.V. Output voltage: +/- 1500 Vdc max. @ 10watts max. (3.3ma maximum limit)

2. Bias offset voltage: - 1000 Vdc max. @ 10watts max. (10ma maximum limit)

3. Output current: +/- 3.3 mA max @ 10 watts max.

4. Output stability: 0.3% or better of output from 0 to full load.

5. Output ripple: Less than 0.3%.

6. Output Voltage Linearity: Better than 0.5% full scale.

7. H.V. Voltage set: Local 10 turn potentiometer on the front panel/
   Remote 0 to 10V DC = 0 to 3KV.
   Positive output: 0 to 1.5KV
   Negative output: 0 to -1.5KV

8. Output Polarity Reversal on command.

9. Output Discharge Remote mode: Command at USER PORT
   Local mode: After turn off HV, Output will be discharge automatically
   Discharge via 300K Ohms resistor.

10. Output Voltage balance better than 0.5% for matched loads.

11. Protections Over voltage limit: 110% of set point
    Current Limit: 3.5mA

B. Input Requirements

Single 24 Volt dc, 1 A dc (2 amp surge capability for 2 seconds at start up).
(1A Poly switch (Resettable fuse) inside of PHV unit)

C. Controls and Features

1. All control features are available local (front panel) and remote (25 pin d-type connector).
2. All analog set-point and monitor signals are 0-10v full scale and are fully differential Inputs are 470k ohm min. Outputs are capable of driving 1k ohm at 10v max.
3. All command lines and status indicators are uncommitted optically isolated digital signals. (All signals are active true).
4. Continuously variable output voltage set point.
5. Hi-voltage enable command.
6. Hi-voltage enabled indicator.
7. Output polarity reversal command.
8. Output discharge command.
9. Output Voltage (differential) monitor.

10. Bias Voltage monitor
11. Positive terminal output current monitor.
12. Negative terminal output current monitor.
13. Output protection: Over voltage limit and current limits.

D. System Connections

1. DC power input: 3 pin Molex type, non-reversible quick disconnect. Molex P/N
2. DC Output: MHV connectors for HV+ and HV-.
3. Remote Interface: 25 pin d-type female (DB-25 Female #4-40 Screw).
4. Fusing Requirements (customer supplied): 1amp.
   (1 amp poly-switch (resettable fuse) inside of this unit.)

4. Environmental Specifications

1 Operating Temperature: 0-45° C.
2 Storage temperature: 0-70° C.
3 Humidity: 10-90 % non-condensing

5. Interface Specifications

A. USER PORT PIN DEFINITION

DB-25f Pin #	Signal
1	Voltage set-point input, analog return.
14	Voltage set-point input, analog +. (0-10V)
2	Bias voltage set-point input, analog return.
15	Bias voltage set-point input, analog +. (0-10V)
3	Voltage output monitor, analog +. (0-10V)
16	Bias voltage monitor, analog +. (0-10V)
4	Positive terminal current monitor, analog +. (0-10V)
17	Negative terminal current monitor, analog +. (0-10V)
5	Analog gnd. (Monitor circuits, analog return.)
18	HV enable input +. (24V = HV enable)
6	HV enable input-.
19	Polarity change command input +. (24V = Polarity reverse)
7	Polarity change input -.
20	Discharge command input+. (24V = Discharge)
8	Discharge command input -.
21	Digital common (Control circuit common gnd).
9	Not used
22	Digital common (Control circuit common gnd).
10	Power on output (open collector).
23	Digital common (Control circuit common gnd).
11	HV on output (open collector).
24	Digital common (Control circuit common gnd).

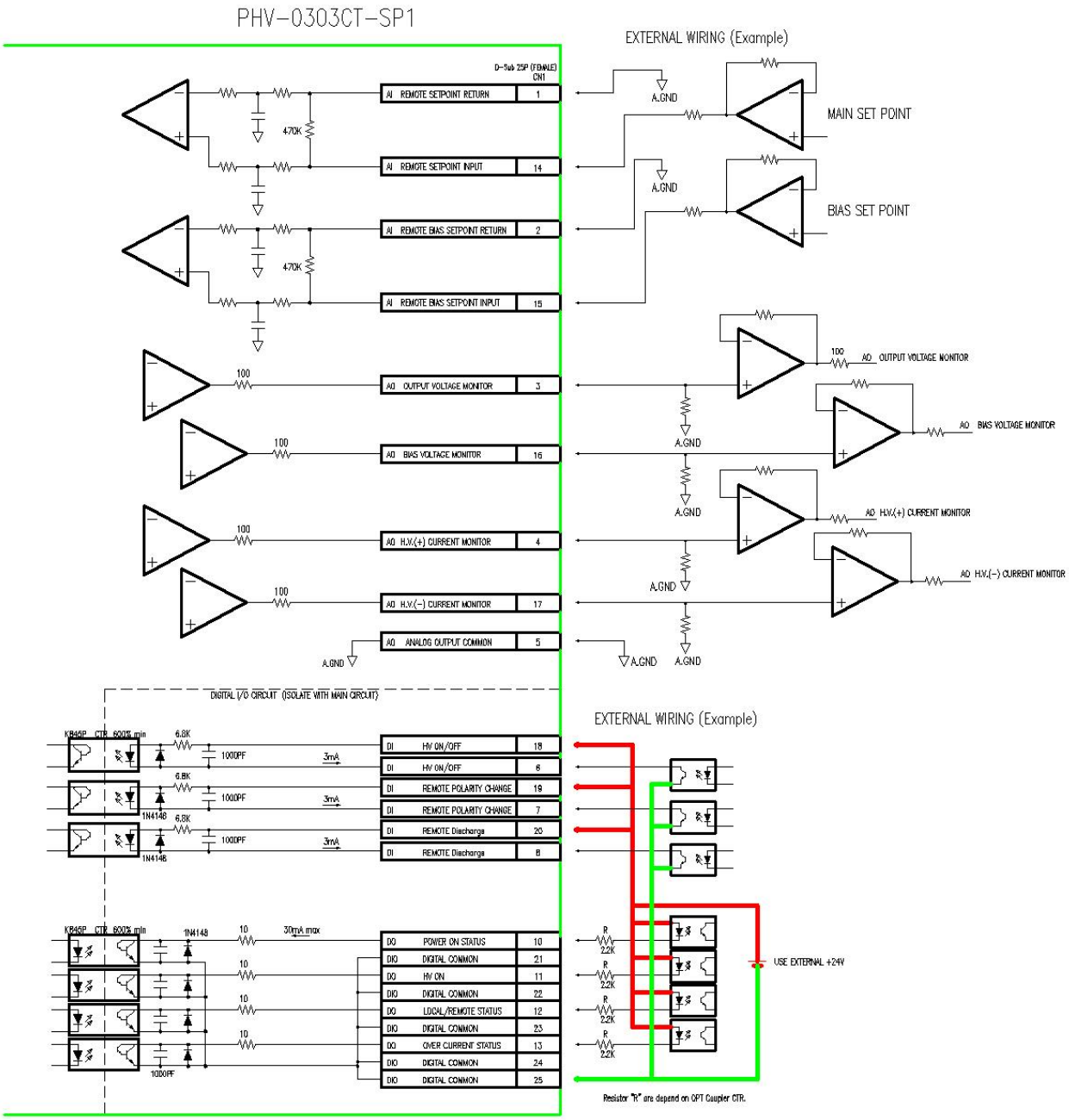
12 Local/Remote Status
25 Digital common (Control circuit common gnd).
13 Over current Status

B. USER PORT PIN DIFINITION TABLE

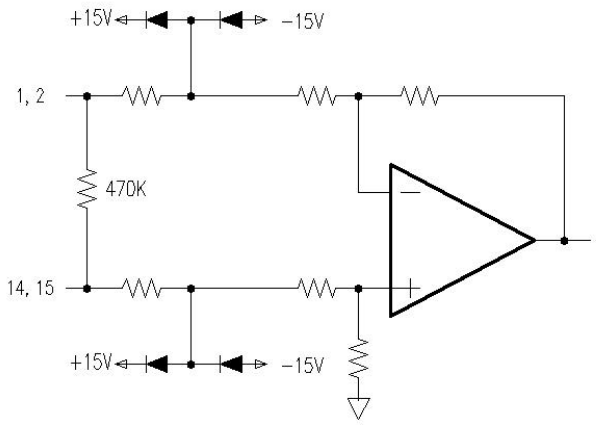
The following table provides the connector pinouts for the user port connector on the PHV-0303CT-SP1
Unless otherwise specified, all analog signals are 0 to 10 V while all digital signals are opto-coupled (digital inputs require 24 volts for a logic high while digital outputs are open-collector signals with return lines referenced to digital ground (pin21～25))

Signal Pin	Return Pin	Name	Signal Type	Signal Description
14	1	Remote Set Point	Analog Input	Remote Setpoint Input: 0 to +10VDC = 0V to 3KV linear.
15	2	Remote Bias Set Point	Analog Input	Remote Bias Setpoint Input: 0 to +10VDC = 0V to -1000V linear.
3	5	Output Voltage Monitor	Analog Output	This -10 to 10V signal represent the output voltage as measured at the H.V. output. Voltage monitor, analog 0 to +10VDC = 0KV to 3KV linear.
16	5	BIAS Voltage Monitor	Analog Output	This 0 to 10V signal represent the Bias voltage as measured at the CT . Voltage monitor, analog 0 to +10VDC = 0V to -1000V linear.
4	5	Positive output Current Monitor	Analog Output	This signal represent the output current as measured at the H.V. (+) output. Current monitor, analog 0 to +10VDC = -1.66mA to +1.66mA linear.
17	5	Negative output Current Monitor	Analog Output	This 0 to 10V signal represent the output current as measured at the H.V. (-)output. Current monitor, analog 0 to +10VDC = -1.66mA to +1.66mA linear.
18	6	Remote H.V. ON	Digital Input	Apply 24Vdc voltage between pin 18 pin- pin 6 to enable H.V. output.
19	7	Remote Polarity Change	Digital Input	Apply 24Vdc voltage between pin 19pin- pin 7 to Polarity change.
20	8	Discharge enable	Digital Input	Apply 24Vdc voltage between Pins 9 - pin 8 to enable the HV discharge relay
10	21～25	Power ON	Digital Output	A low impedance path between these two pins indicates that AC power ON.
11	21～25	H.V.ON	Digital Output	A low impedance path between these two pins indicates that H.V. ON.
12	21～25	Local/Remote Status	Digital Output	A low impedance path between these two pins indicates that the control mode is Remote, and high impedance path between these two pins indicates that control mode is local.
13	21～25	Over Current	Digital Output	A low impedance path between these two pins indicates that over current status.
21,22,23, 24,25		Digital input Common	Digital Reference	These pins are Digital I/O return for pins 6,7,8,*,10,11,12,13
5		Analog monitor common	Ground Reference	This pins is Analog return for pins 3, 4 ,16,18 Voltage and current monitor.

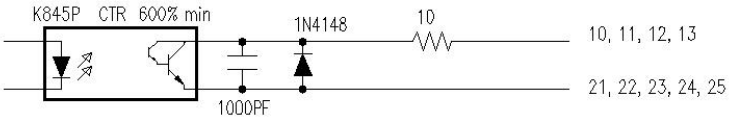
C. Interface Schematics



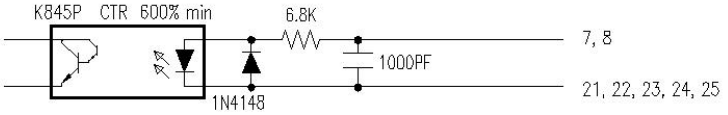
D. USER PORT CIRCUIT DIAGRAM



TYPICAL ANALOG INPUT (H.V. SET POINT, BIAS SET POINT)



TYPICAL DIGITAL OUTPUT (POWER ON, HV. ON, LOCAL/REMOTE STATUS, OVER CURRENT)



TYPICAL DIGITAL INPUT (HV ON, POLARITY Change, Discharge)

6. Safety Information

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- WARNING: Due to the presence of high voltages in and around the unit, extreme caution should be exercised when using and handling this supply.
- Do not operate the unit with the cover or end panels removed.
- Never operate the PHV-0303CT-SP1 with the output cables removed or disconnected.
- There are no user serviceable parts in this unit. Refer all service to a qualified technician.

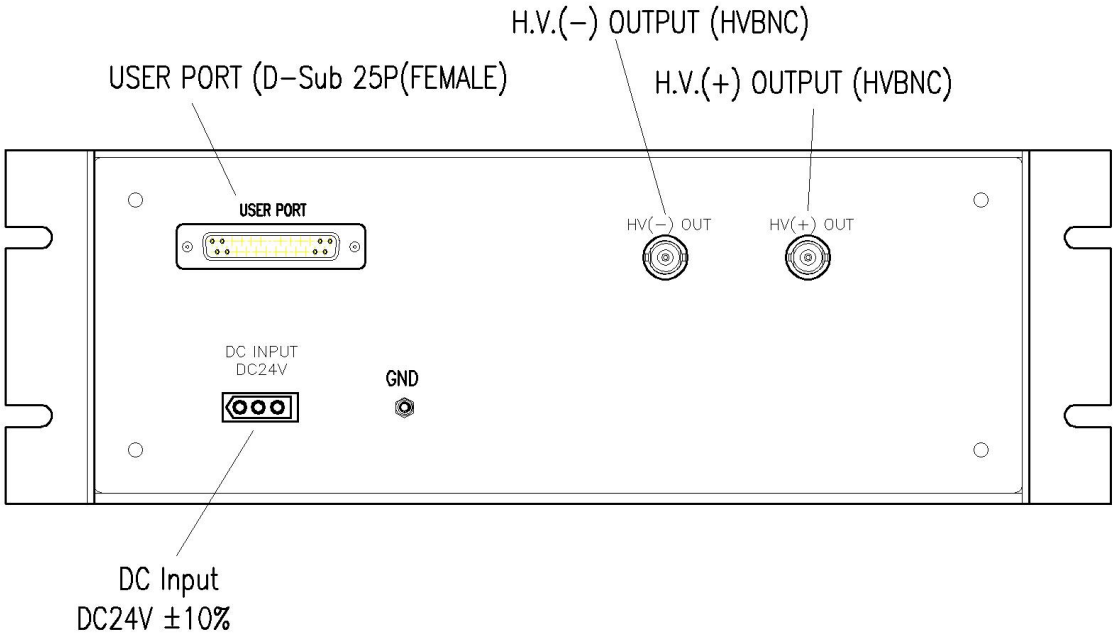
7. Installation

The PHV-0303CT-SP1 may be located in any convenient location and in any orientation. There are no special requirements for cooling, shielding or grounding, as none are necessary. The system requires a single 24Vdc source capable of delivering 1A minimum to operate. A 3 pin Molex Connector/cable assembly is supplied with each unit. The power connection is reverse polarity projected, which is protected internally to the ESC-3, therefore, connection orientation does not affect the operation or present a possible fault condition.

High voltage output connections (+ and -) are via MHV jacks located at the rear of the unit.
Shielded cable is recommended for all applications.

CAUTION: Breaking the seal or removing the warranty decal from this unit will void the warranty. If internal damage
is suspected, contact factory for assistance.

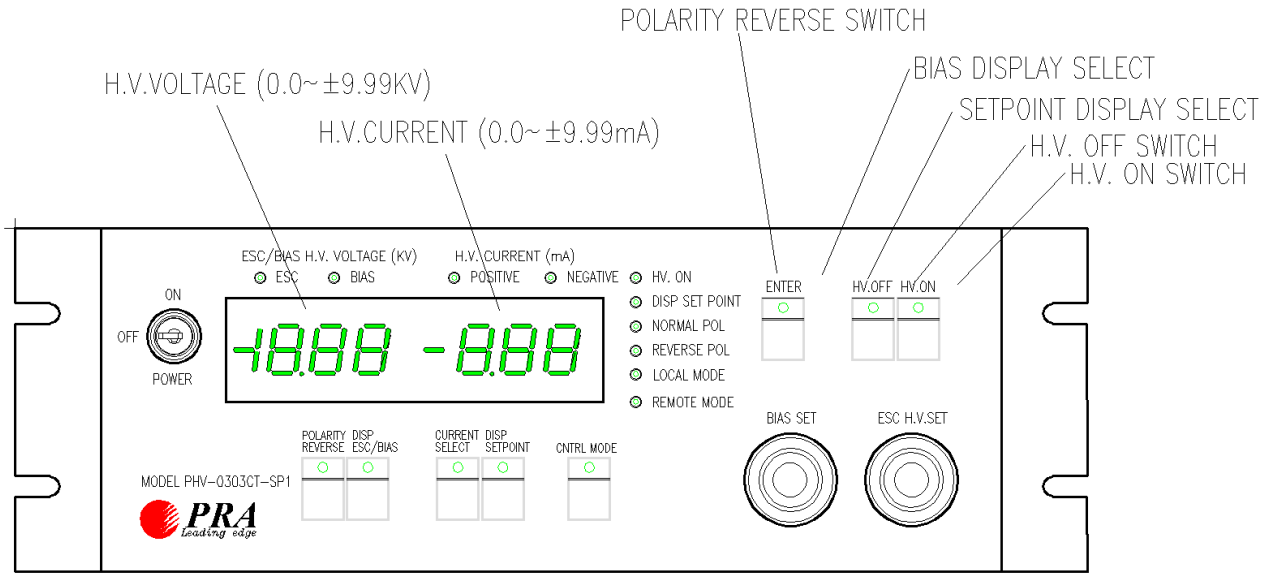
REAR PANEL



8. Monitors and Indicators

The PHV-0303CT-SP1 makes analog outputs available representing output differential voltage (the voltage present from the + to - output terminals), + terminal output current, - terminal output current and center tap Bias voltage. Outputs are scaled as 0-10Vdc representing 0 - full output for the differential voltage and + and - current monitors. The center tap Bias voltage monitor is scaled as 0 to 10Vdc =0 to -1000 Volts.

FRONT PANEL



9. Cabling

Output cables must be high quality RG-58/A type cable with a polyethylene or polypropylene dielectric. Foam type dielectric must not be used. The mating high voltage output connectors is MHV (HV-BNC) types. Output cables should be kept as short as possible to minimize energy storage associated with cable capacitance and to minimize the possibility of high voltage breakdown.

Interface signals are brought to the PHV-0303CT-SP1 at the rear panel, through a DB25S connector for manual (analog) remote operation.

10. Operating Instructions

The PHV-0303CT-SP1 is designed as a fully functional stand-alone voltage source. Operation may be in one of the following modes: **A) Local Manual** operation via the front panel controls, **B) Remote Manual** operation via the rear panel analog interface connector. Most of the operational functions are similar for each mode, the following guidelines apply to all two modes of operation:

- After power up, the PHV-0303CT-SP1 defaults to a disabled state. This assures a safe starting point with no high voltage output present.

- It is important to note that in manual remote mode, the discharge signal is also used as a high voltage lock out. This forces the high voltage to a disabled state when the discharge relay is activated. The remote discharge input must be inactive to allow the unit to be enabled. The discharge signal should NOT be used as a high voltage enable signal.

- Set points are included for both output voltage and output current in all modes. A value greater than "0" must be set for each to obtain output. Remote setpoints is scaled 0 to 10Vdc = 0 to 3KV output. And Bias setpoint is scaled 0 to 10Vdc = 0 to -1000V bias offset voltage.

- In actual system operation, the setpoints can be applied at any time before or after the application of the high voltage enable signal. It is important to remember that remote manual mode does not have a ramp-up or ramp-down function. If the voltage set point is present when high voltage is enabled, the output will immediately jump to the level set. If a ramp is needed, the setpoint should be ramped via an external source from 0 to its final value, after turn ON H.V.

A. Local Manual Operation

Local manual operation is performed using the front panel control functions on the unit. Upon supplying a live 24Vdc source to the rear panel power connector, the unit will automatically initialize and default to the Remote Manual mode. For instruction on Remote Manual mode, see Section VI. B.

1. Enter LOCAL manual mode by press "REMOTE/LOCAL" switch on the front panel.
   "LOCAL" LED lamp will lite and it mean unit is "Local Manual" mode.

2. "H.V. voltage" 3 digit digital display shows the set point, you can set the output voltage with the front panel knob. By turning the knob clockwise, the voltage setting increases. The minimum setting is 0.03KV, the maximum, 3.00KV.

3. When the HV output is OFF, the display will show the set value. When the HV on , the display will show actual output voltage automatically.

4. High Voltage turn ON by both "HV ON" and "ENTER" switch on the front panel. Push both two switch same time. "HV ON" switch and "HV ON" LED will lite. It means H.V. Voltage turn on.

5. "H.V. Voltage" 3 digit digital display shows the actual output voltage, and "H.V. Current" 3digit display show the actual output current.

6. During HV on, Push “DISP SETPOINT” switch, Left 3digit display shows the set point about 5 seconds, and after 5 seconds the display will shows the actual output voltage.

7. Push the ”Polarity change” switch, output polarity will change from normal to reverse. Push this switch again, polarity will change from reverse to normal polarity.

8. High Voltage turn OFF by "HV OFF" switch button on the front panel. This switch lit mean H.V. voltage turn off.

9. During “LOCAL MANUAL operation “, discharge relay will turn on after H.V. off automatically.

B. Remote Manual Operation

The ESC-3 may be run entirely by the remote operation functions by connecting your controller interface to the rear panel Analog USER PORT connector (DB25S). This requires a minimum of the following signals:

- Voltage set point (0-10Vdc analog)
- Bias set point (0-10Vdc analog)
- HV enable (digital 24Vdc signal where enable + 24V present)

Typical remote operation is as follows:

1. Upon applying 24Vdc power, the unit will initialize to the default remote manual mode.

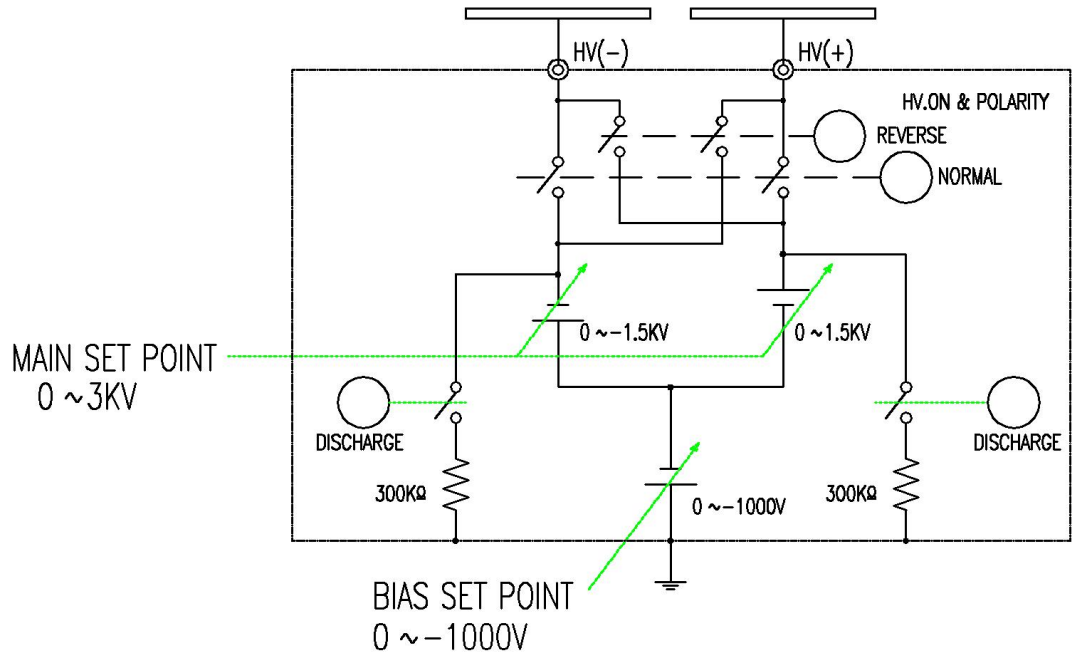
2. Apply an analog voltage between Interface Pins 14 and 1 of 0-10Vdc. This will request 0-3000Vdc output.

3. Apply an analog voltage between Interface Pins 15 and 2 of 0-10Vdc. This will request 0to -1000V Bias voltage.

4. Apply a 24Vdc signal between Interface Pins 18 and 6 to enable the HV output. Removing this signal will disable HV.

5. After disabling HV, the output should be discharged by Apply the 24Vdc signal between Interface Pins 20 and 8. Discharge is via 2 @ 300KOhms.

6. At any time, a 24Vdc signal may be applied between Interface Pins 19 and 7 to reverse the output polarity.


HV(−)
HV(+)
HV.ON & POLARITY
REVERSE
NORMAL
MAIN SET POINT
0 ~3KV
0 ~−1.5KV
0 ~1.5KV
DISCHARGE
DISCHARGE
300KΩ
300KΩ
0 ~−1000V
BIAS SET POINT
0 ~−1000V

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