
NEU-4, -6, -8 AND -10 E-BEAM GUN SWITCHING POWER SUPPLY

INSTRUCTION MANUAL

Version 3.00



NILES ELECTRONICS

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1

OVERVIEW

SYSTEM COMPONENTS

The **Electron Beam (E-Beam) Gun Switching Power Supply** is a direct current, regulated constant high voltage power supply. It is produced only as a one-gun version. Intended for use with E-Beam guns, it is compatible with E-Beam guns using electromagnetic deflection or combinations of electromagnetic deflection and permanent magnet focusing.

The **E-Beam Gun Power Supply** consists of the following components:

- Power Module with two power cords attached
- High Voltage Module with a 15 ft HV coaxial cable attached
- Control Module
- Rack Assembly for Power and High Voltage Modules

A system of safety interlock functions protects both the operator and the equipment.

LIST OF ACCESSORIES

The following accessories will be included with the shipment of the **Power Supply**:

- One filament transformer
- One B+ connection cable
- One 22" 7-pin cable
- One 66" 7-pin cable
- One 66" ribbon cable **
- One Instruction Manual (the one you are reading)

**Do not replace the ribbon cable with round computer cable nor with a longer cable. Doing so will cause interference amongst conductors of the cable.

2

SPECIFICATIONS

OVERALL SPECIFICATIONS

Input Voltage for Control:

230 Volts, single phase, 50/60 Hz, 3 Amps

Input Voltage for Power:

400 Volts, 3-phase, 50/60 Hz

10 Amps for NEU-4, 15 Amps for NEU-6, 20 Amps for NEU-8

25 Amps for NEU-10

Maximum output power:

4 KW for the NEU-4 model

6 KW for the NEU-6 model

8 KW for the NEU-8 model

10 KW for the NEU-10 model

High voltage range:

from -3 kV to -10 kV (adjustable)

Maximum emission current:

0.4 Amps for NEU-4

0.6 Amps for NEU-6

0.8 Amps for NEU-8

1.0 Amps for NEU-10

Ripple:

less than 150 Volts p-p

OUTPUT FOR FILAMENT TRANSFORMER PRIMARY COIL

- Voltage: 0-230 Volts, single-phase, 50Hz or 60 Hz
- Primary Control: SCR pulse width control

- Maximum Current: 2.0 Amps
- Insulation rating for Filament Transformer (Secondary to Primary and Core): 20 KV DC minimum

DIMENSIONS AND WEIGHT

For NEU-4, NEU-6 and NEU-8

Control Module	Power Module	High Voltage Module
19" wide (full rack)	half-rack wide	half-rack wide
3.5" high (2U)	10.5" high (6U)	10.5" high (6U)
12.2" case depth	18.5" case depth	18.5" case depth
15" deep including connectors and knobs	21" deep including parts mounting on the case	21" deep including parts mounting on the case
10 lbs	40 lbs for NEU-4 41 lbs for NEU-6 40 lbs for NEU-8	39 lbs for NEU-4 40 lbs for NEU-6 42 lbs for NEU-8

For NEU-10

Control Module	Power Module	High Voltage Module
19" wide (full rack)	half-rack wide	half-rack wide
3.5" high (2U)	10.5" high (6U)	10.5" high (6U)
12.2" case depth	20.5" case depth	20.5" case depth
15" deep including connectors and knobs	23" deep including parts mounting on the case	23" deep including parts mounting on the case
10 lbs	42 lbs	45 lbs

The weights of the cables that connect between modules are not included.

3

INSTALLATION

SAFETY PRECAUTIONS

DANGER – HIGH VOLTAGE

High, potentially lethal, voltage is present within this equipment and at end of the high voltage cable. Great care must always be exercised when working with this equipment. Only qualified and properly trained personnel may test or work with this equipment.

All connections must be made with the power cords unplugged from their sources, or with the power turned OFF at the source (not just on the equipment). Work should not be carried out in cramped and/or cluttered areas.

INTRODUCTION

The E-Beam Gun Power Supply is designed to be mounted in a standard 19-inch rack cabinet. The complete installation comprises the following aspects:

- Rack Assembly
- Cable Connections Between Modules
- Filament Transformer Connection
- High Voltage Cable Connection
- System Grounding
- Interlock Connections
- Remote Control Connections

Both the Power and the High Voltage Modules are half-rack wide and are to be mounted in the rack assembly, which can be placed in a 19-inch rack. There should be ample clearance on both the front and rear panels of these two modules to allow for proper airflow. If desired, it is

allowable to place these two modules in the lower part of the 19" rack in order to preserve easier-to-reach space for other modules. The cables connecting the Control Module and the High Voltage Module are 66" long to allow for such usage. However, separating these two Modules by distances longer than 66" will impair the Power Supply's function. Only use the ribbon cable supplied by Niles Electronics Inc. This cable carries both analogue and digital signals. Using different type of cable may cause "crosstalk" among the conductors. The signal crosstalk can impair or even permanently damage the power supply.

RACK ASSEMBLY

NOTE: All NE, NEU and NEDG series are using the same rack. Even though the pictures may not show exactly the model you purchased, the assembly procedures are the same.

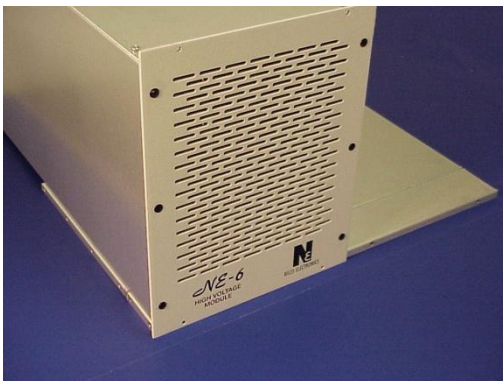
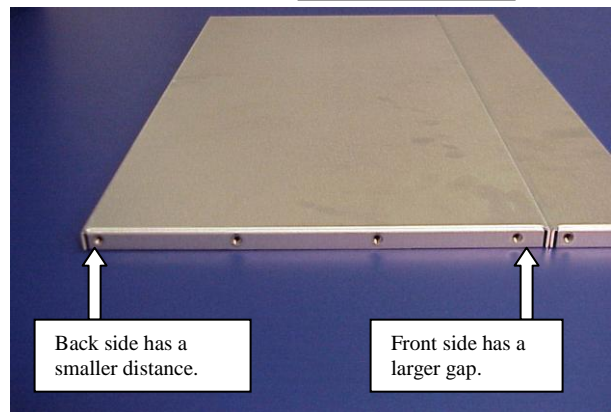
NOTE: Leaving the bolts slightly loose until all of the bolts are in position will make minor adjustments easier to make. Drive all of the bolts tight with a 10 lb-in torque at the end.

1. Place BRKT-P2 open side downwards with FEX nuts facing forward. NOTE: This piece looks very similar to BRKT-P1. It is important not to confuse the two. BRKT-P1 has notches in the front and the back while BRKT-P2 doesn't.



Steps 1&2

2. Place BRKT-P3 open side downwards directly behind BRKT-P2 so that the FEX nuts are on the sides. NOTE: Orientation of this piece is important. The front side should be labeled. If there is no label, the front is distinguished from the rear by the following: On the sides, the distance between the ends and the first FEX nut is unequal in the front and the back. The front side has a longer distance between the edge and the FEX nut than the back side.



3. Looking at the assembly from the front, line up the High Voltage Module on top of BRKT-P2 and BRKT-P3 in the FRONT, LEFT corner. The front panel of the HV Module should hang over the two bottom pieces.

4. Line up the two bottom holes in the front panel to the holes in BRKT-P2. Screw in two ½" bolts with nylon washers, attaching these two pieces together.

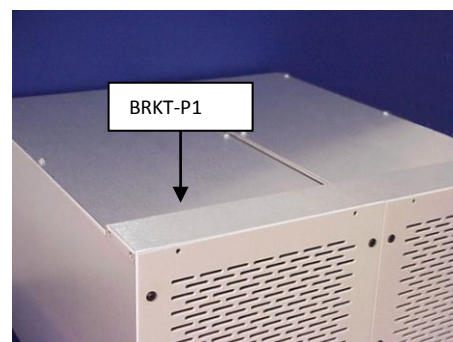


5. Place the Power Module to the right of the HV Module so that it is lined up in the FRONT, RIGHT corner of the two bottom pieces.

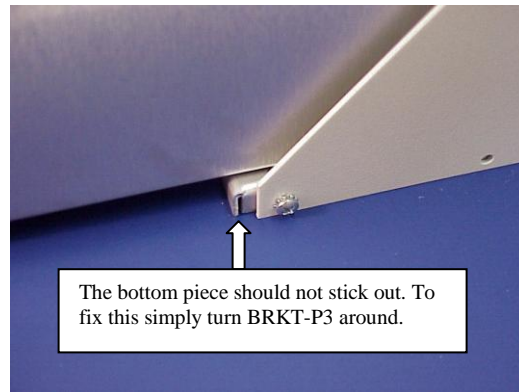
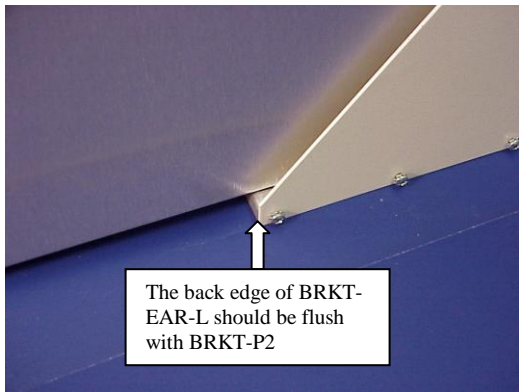
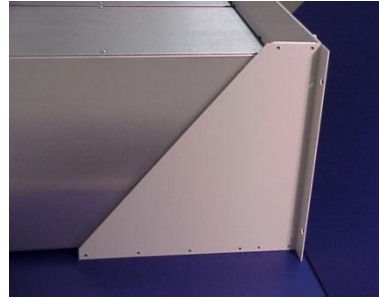


6. Line up the two bottom holes in the front panel of the Power Module to the holes in BRKT-P2. Screw in two ½" bolts with nylon washers, attaching these two pieces together.

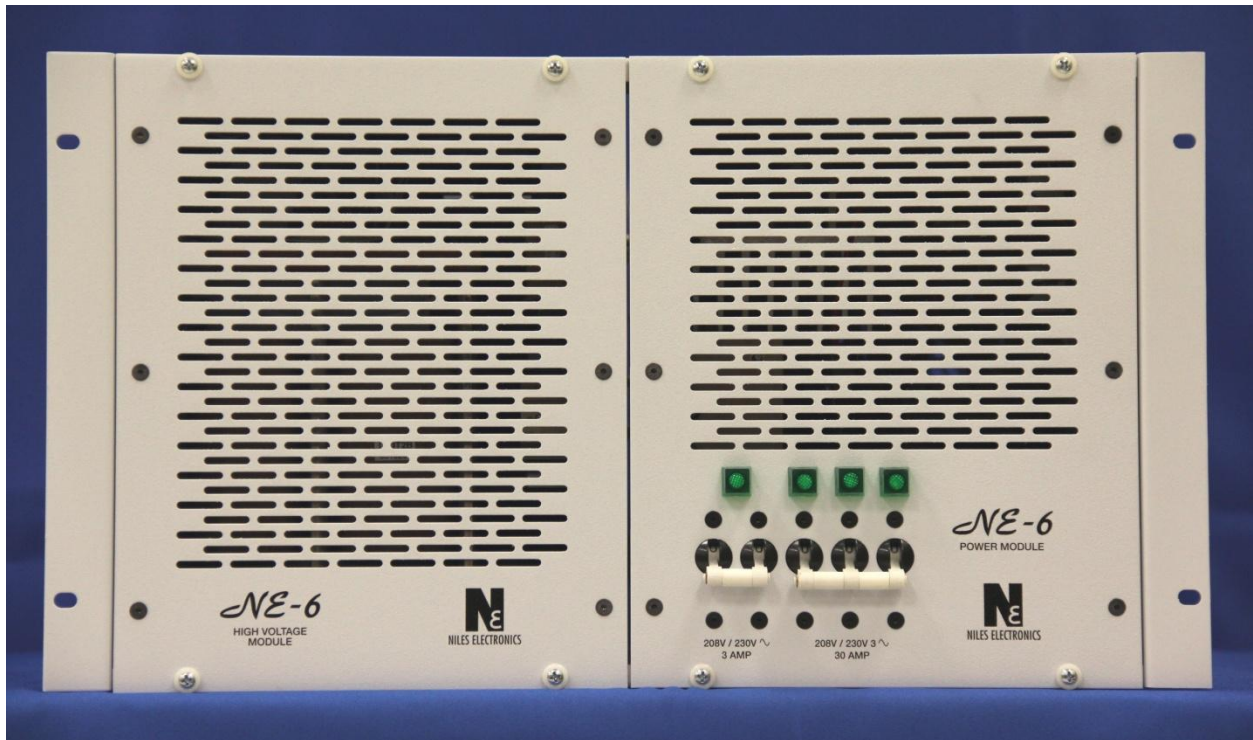
7. Place BRKT-P1 on top of the two Modules directly behind the front panels with the FEX nuts facing forward and the open side facing downwards. The notches in this piece enable the Modules to slide right out of the Rack Assembly from the front without disassembling the Rack. Line up the four holes in the front panels with the four holes in BRKT-P1 and screw in four ½" bolts with nylon washers.



8. Place BRKT-EAR-L to the left of the HV module with the six FEX nuts lined up with the holes in BRKT-P2 and BRKT-P3. The slanted edge should be going downwards towards the back, and the front flap should bend to the left away from the modules. The back edge of BRKT-EAR-L should be flush with the back of BRKT-P2. If it is not, there is a gap between the two bottom pieces that bolts will catch on when sliding out Modules from the Rack Assembly in the future.



9. Screw in six 3/8" bolts with spring lock washers, affixing BRKT-EAR-L to BRKT-P2 and BRKT-P3 (the two bottom pieces.)
10. Screw in two 3/8" bolts with spring lock washers, affixing BRKT-EAR-L to BRKT-P1 (the top piece.)
11. Place BRKT-EAR-R to the right of the power module. This should look symmetrical to the left side, with the front flap bending to the right away from the modules.
12. Screw in six 3/8" bolts with spring lock washers, affixing BRKT-EAR-R to BRKT-P2 and BRKT-P3 (the two bottom pieces.)
13. Screw in two 3/8" bolts with spring lock washers, affixing BRKT-EAR-R to BRKT-P1 (the top piece.)



The Completed Rack - 1



The Completed Rack - 2

Once assembled, the Rack Assembly will fit easily into a standard 19" rack. It is designed with the ease of Module removal in mind. To remove a Module, simply remove the four front bolts

and slide the Module out from the front of the Rack Assembly. Scratching along the bottom pieces is part of normal wear.

We strongly suggest that a supporting bar or plate to be set up to support both the rear ends of Power Module and HV Module.

CABLE CONNECTIONS BETWEEN MODULES



The connections are also labeled on the back panels of the Modules.

FILAMENT TRANSFORMER CONNECTION

Niles Electronics Inc. accommodates a filament transformer, since April 2005, with each power supply. The filament resistance, at room temperature, should not be less than 5 mOhms (5 thousandth Ohms). Too low filament resistance will trigger the “fast-response surge current sensor” circuitry. If the mentioned sensor is triggered, the fuse indicator LED goes off while the fuse is intact. The user can reset the indicator LED by pushing the “emission off” button. However, the problem cannot be solved until the filament

resistance is corrected or the short-circuit of filament block is resolved. Should any customer have questions regarding this issue, please do not hesitate to contact Niles Electronics Inc.

The core of the Filament Transformer must be connected to the Tank ground. It is advisable to remove the paint/varnish from a small area around the mounting holes of the Transformer and the frame. The mounting bolts themselves will establish a proper ground connection. As a result, the Transformer Core and the Ground Shield will have the same potential as the Ground during normal operation. The Filament Transformer Primary must be connected to the Output at the rear panel of the Control Module. A 2.5 Amp Fuse is used for over current protection. Use of AWG16 Wire is recommended for the Filament Transformer Primary Coil connections.

HIGH VOLTAGE CABLE CONNECTION

The High Voltage connection is made with RG 213/U Cable. Shipment of the **E-Beam Gun Power Supply** will include a High Voltage Coaxial Cable in our standard length of approximately 15 feet. The center conductor of this Coaxial Cable is the High Voltage Output and should be connected to the Secondary Winding of the Filament Transformer. The Copper Braided Shield should be connected to the Ground of the Vacuum Tank, as described in *Filament Transformer Connections* (see the section above and photo below).

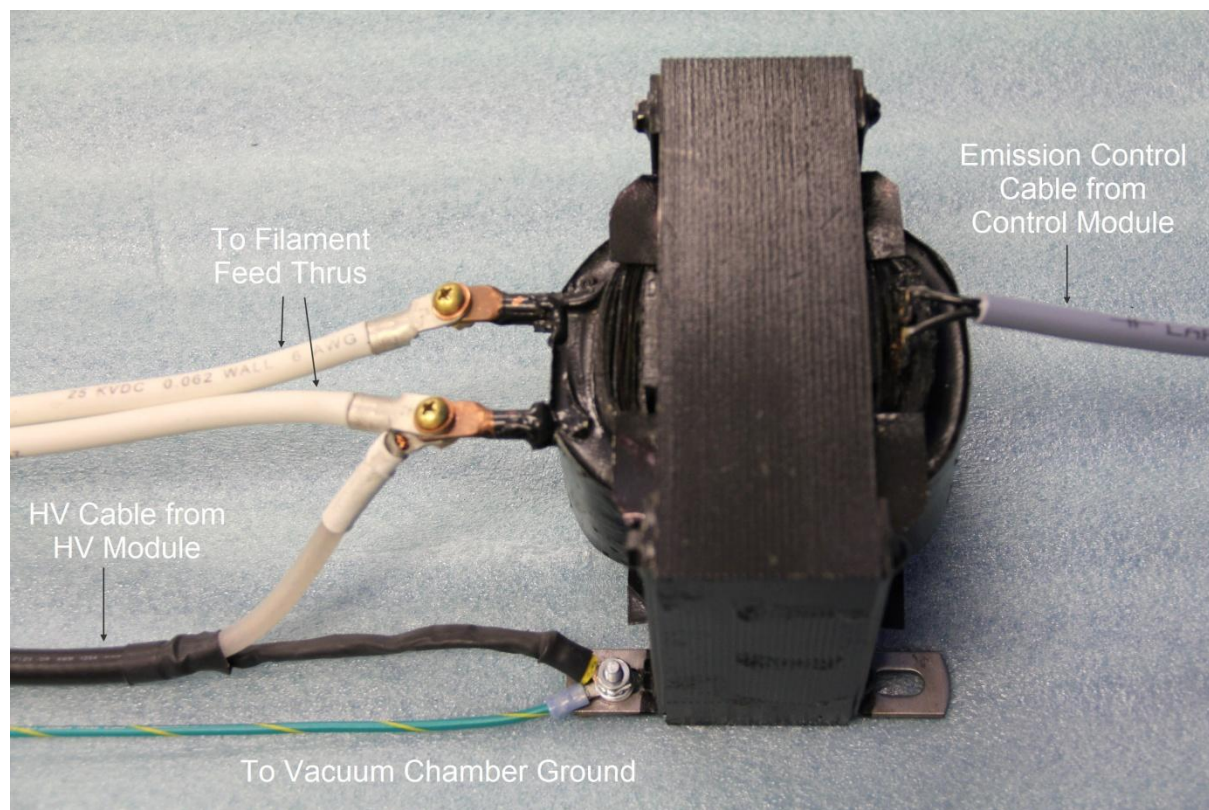
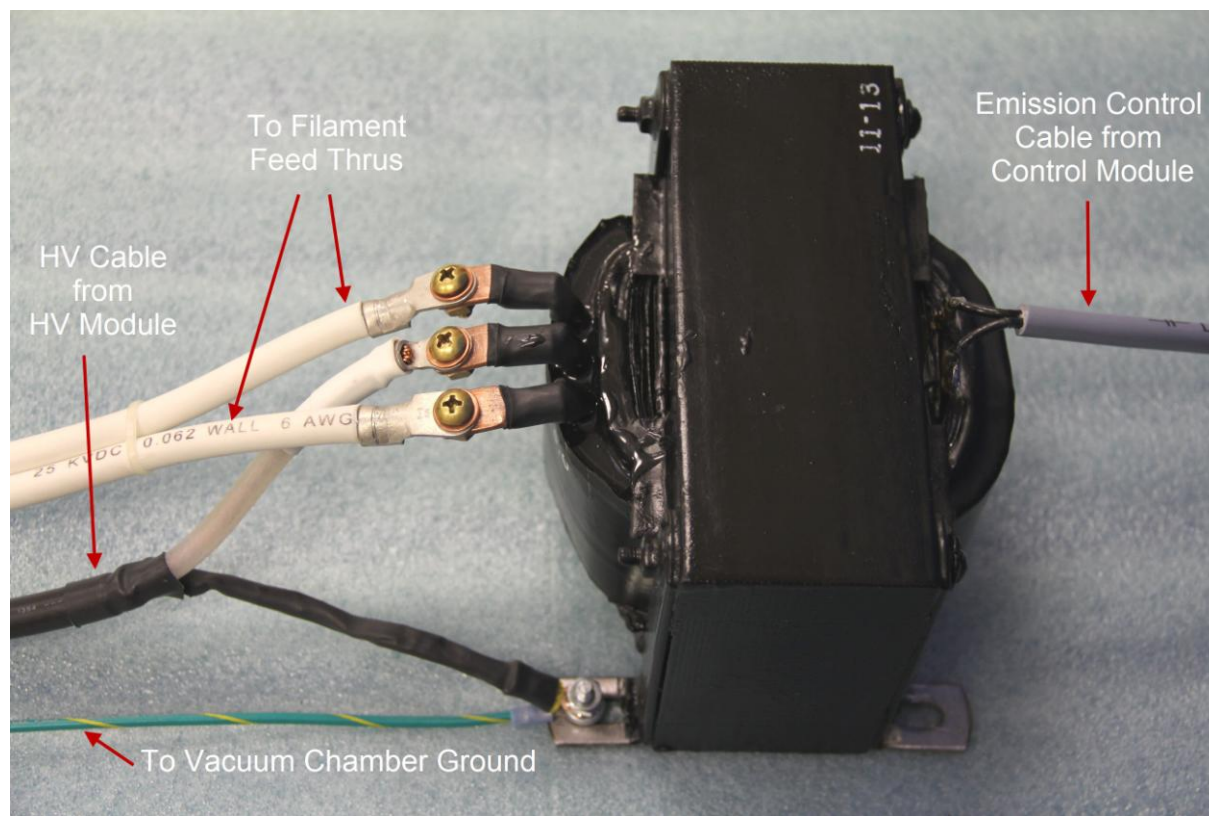
SYSTEM GROUNDING

Each of the four Modules has a Module Ground Stud. Connections should be made as follows:

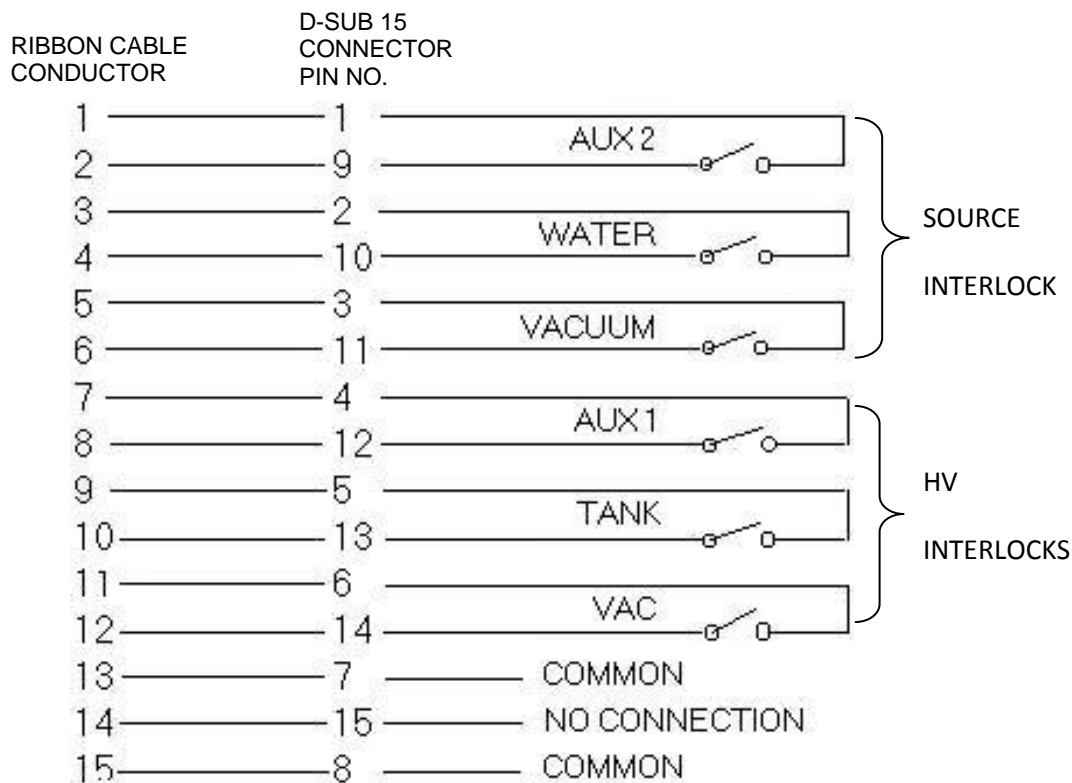
1. Connect the Control Module Ground Stud to the High Voltage Module Ground stud.
2. Connect the High Voltage Module Ground Stud to the Power Module Ground Stud.
3. Connect the Power Module Ground Stud to the System Ground Stud.
4. Connect the Sweep Ground Stud to the Vacuum Tank Ground.

Warning: Even though this power supply can work well without grounding the cases mentioned above, for the safety of the operating personnel, grounding must be done before operating the power supply.

FILAMENT TRANSFORMER WIRING PHOTO



INTERLOCK CONNECTIONS



The external interlocks are connected to the Power Supply and their installation is described below.

WARNING

All statements pertaining to operator and equipment safety apply only if the external interlocks are installed as specified below and only if the operator does not disable the safety features, inherent in the interlocks, by bypassing the switches. Although these interlocks are designed to protect both operator and equipment, extra care and good judgment should always be exercised when operating High Voltage equipment. It is conceivable that, under certain circumstances, an interlock could fail and hence, the interlocks should never be solely relied upon to provide 100% safety at all times.

HIGH VOLTAGE INTERLOCKS

The **E-Beam Gun Power Supply** has two groups of interlock connections: one for the High Voltage and another for the Emission Current (Source Current). The High Voltage has the following interlocks:

- AIR
- VACUUM
- TANK
- AUX 1

AIR:

Designed to detect when the equipment is overheating, both the Air Interlock light and the High Voltage will shut off should the temperature become too high. This happens when there is not sufficient fresh air in the system. **In the event that this occurs, check the airflow of the High Voltage Module.** It is recommended, however, that the equipment not be turned off because the system fan will drop the temperature of the equipment more rapidly. Pushing the HV “OFF” button again will reset the Air Interlock switch automatically if the temperature has dropped sufficiently. **The light of the Air Interlock will come back on only if the reset has been successful.**

VACUUM:

A vacuum switch should be installed on the Tank so that it closes whenever there is enough vacuum inside the Tank.

TANK:

When these interlocks are installed, the switches on the doors and high voltage panels will normally remain open. They will be closed only when the doors of the chamber and all panels are in place. These interlocks should be closed only when there is no possible chance of coming into contact with high voltage.

AUX 1:

This interlock is provided to enable the user to insert additional interlocks, such as emergency off pushbuttons, crucible rotation interlocks, etc. If more than one interlock is required, simply connect the interlock switches in series.

EMISSION INTERLOCKS

The interlocks for the Emission Current are:

- FUSE
- HVAC
- WATER
- AUX 2

FUSE:

This fuse is in series with the Filament Transformer Primary Winding. If the Filament Transformer is overloaded, the fuse will be burnt and its LED indicator will turn off. However, if the LED indicator is off, the Fuse is not necessarily burnt as there is a Surge Current Sensor Circuitry that can also turn off this LED indicator. Push the Source “OFF” button to turn the LED indicator back on. After resetting, the emission can be turned back on by pushing the Source “ON” button. However, if the both the Emission and the LED indicator are off again, there must be a problem that needs attention. At such point, check the Fuse first. Before replacing the fuse, find out the cause of burning the Fuse. If the fuse is not burnt, it could result from the Secondary Winding being in short circuitry that causes the Surge Current Sensor Circuitry to act. An inspection of the Filament Transformer and/or the Filament circuitry is required before operations can be resumed.

Warning: Even though the Filament Driver Circuitry is protected, repeatedly trying to turn on emission without removing the cause of the failure may permanently damage the Filament Driver Circuitry.

HVAC:

The purpose of this interlock is to ensure that sufficient vacuum is present inside the Tank before the source can be energized. Normally, this level of vacuum is the same for the level required to energize the vacuum gauge filaments.

WATER:

A water flow switch should be installed in the return line of the cooling system for the E-BEAM GUN. This switch should close automatically once there is sufficient water flow to cool the Gun and associated shields.

AUX 2:

This interlock is provided to enable the user to insert additional interlocks. If more than one interlock is required, simply connect the interlock switches in series.

REMOTE CONTROL CONNECTIONS

D-SUB 37 REMOTE CONTROL SIGNAL LIST (CAN BE DIVIDED INTO TWO 15 CONDUCTOR RIBBON CABLES AND CONNECTED TO TWO D-SUB 15 CONNECTORS)

HAND HELD		PLC		FUNCTION DESCRIPTION
Ribbon Cable Conductor No.	D-SUB 37 Pin No.	Ribbon Cable Conductor No.	D-Sub 37 Pin No.	Signal Direction
				(Digital High = +12V Digital Low = 0V) All output signals have 1 K Ω Resistor in series
1	1	21	11	
2	20	22	30	OUT
3	2	23	12	OUT
4	21	24	31	OUT
5	3	25	13	IN
6	22	26	32	IN
7	4	27	14	OUT
8	23	28	33	IN
9	5	29	15	IN
10	24	30	34	IN
11	6	31	16	IN
12	25	32	35	
13	7	33	17	OUT
14	26	34	36	OUT
15	8	35	18	IN
16	27	36	37	
17	9	37	19	
18	28			
19	10			
20	29			

* This voltage is mainly for remote control use. It can supply enough current for the recommended remote control circuitry. Do not use this voltage for other purposes.

** The High Voltage is turned on by the Low-to-High **edge** of the ON/OFF Control Signal. 5V is enough for the High State, but do not input more than 12V. During the time that the ON/OFF Control Signal stays high, the front panel ON/OFF push buttons also gain control of the ON/OFF operation for safety reasons. The High Voltage is turned off by the **Low State** of its ON/OFF Control Signal. During the time that this Signal stays low, the front panel “ON” button **cannot** turn on the High Voltage. These statements are also true of the Emission Current.



*** Both the High Voltage and Emission Current take differential inputs. Each Input Terminal for Hand-Held signals has a 10 K Ω input resistance, while each Input Terminal for PLC signals has a 20 K Ω resistance. The different input resistances match the maximum voltages of the Hand-Held unit and the PLC, which are 5V and 10V respectively.

**** This pin needs to be connected to the Digital Ground at the Remote Control Unit. The Remote Control Unit cannot gain control if this fails to be done, even if it is connected to, and selected on the Control Module. This is important safety feature to ensure that the Power Supply has a control source at all times.

^ Most customers prefer a high voltage that is adjustable only from the front panel of the Control Module. However, customers can still have the choice of a remotely adjustable high voltage by performing the following steps:

1. Take off the top lid of the Control Module.
2. On the PCB that is labeled “P20X”, where “X” can be any alphabet, look for the two jumpers located next to two orange-colored relays.
3. The HV Adjust Variable Resistor on the front panel has sole control over the high voltage, even if the Remote Control is selected, when the two jumpers each contacts a center pin as well as a pin on the 6-pin DIP Header closest to the label “R75” on the PCB. This is where the two jumpers are located at the time of shipment from Niles Electronics. Moving the jumpers so that each contacts a center pin and a pin closest to the label “R78” on the other side of the 6-pin DIP Header will give the user the option of adjusting the high voltage from the Remote Control Unit when the Remote is selected. Be sure that the two jumpers are together, so that both are either closest to “R75” or to “R78.”

REMOTE CONTROL CONNECTIONS - NEW

REMOTE CONTROL CONNECTIONS

Sold after Jan. 1st, 2008

Hand Held			PLC			Description
Ribbon Cable Conductor No.	D-Sub 37 Pin No.	D-sub 15 Pin No.	Ribbon Cable Conductor No.	D-Sub 37 Pin No.	D-sub 25 Pin No.	
Inside the Case	On the Rear Panel	At the Remote End	Inside the Case	On the Rear Panel	At the Remote End	
			17	9	1 ΔΔ	To the "Center" Lug of the "Off" momentary Switch. Δ
			18	28	14 ΔΔ	To the "Normal Close" Lug of the "Off" momentary Switch. Δ
			19	10	2	To the "Center" Lug of the "On" momentary Switch. Δ
			20	29	15	To the "Normal Open" Lug of the "On" momentary Switch. Δ
1	1	1	21	11	3	Ground for Digital Signals
2	20	9	22	30	16	Is this remote control activated? H=YES L=NO
3	2	2	23	12	4	Are all HV Interlocks OK? H=YES L=NO
4	21	10	24	31	17	Are all Emission Current Interlocks OK? H=YES L=NO
5	3	3	25	13	5	HV ON/OFF Control Signal **
6	22	11	26	32	18	Emission Current ON/OFF Control **
7	4	4	27	14	6	Analog Control Reference Voltage $V_{REF} = 5.3 \sim 5.6V$ *
8	23	12	28	33	19	Non-Inverting Input for HV *** ^
9	5	5	29	15	7	Inverting Input for HV *** ^
10	24	13	30	34	20	Non-Inverting Input for Emission Current ***
11	6	6	31	16	8	Inverting Input for Emission Current ***
12	25	14	32	35	21	Ground for Analog Signals
13	7	7	33	17	9	HV Reading +5V represents 10KV
14	26	15	34	36	22	Emission Current Reading -3V Represents 600mA
15	8	8	35	18	10	GND-Ribbon Cable in use. OPEN-No Connection ****
16	27	NC	36	37	23	
			37	19	11	Filament precondition on/off. Low=On High(Open)=Off


Δ In order to have the "Power On/Off Remote Control" function , the J24, which marked as Power On/Off, jumper on the PCB PSGCON inside the Control Module needs to be at the "remote" side. If it is at the "local" side, the power on/off cannot be remotely controlled.

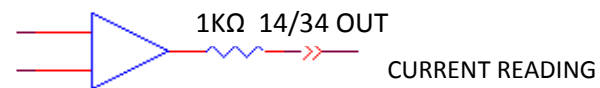
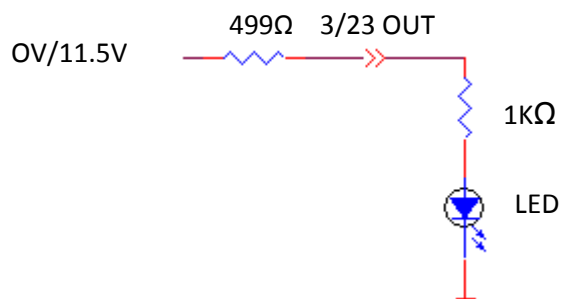
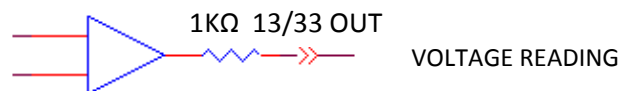
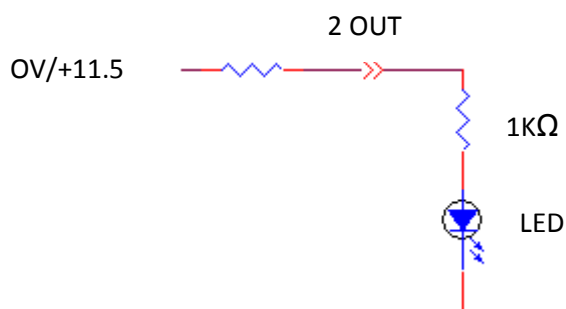
ΔΔ If jumper J24 on PCB PSCON is set at "remote" and the PLC Remote Control is not used, Pin 1 needs to be connected to Pin 14 for front panel Power On/Off functioning properly.

RECOMMENDED REMOTE CONTROL CIRCUITRY

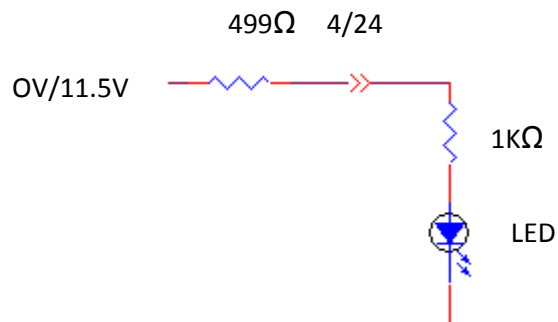
RIBBON CABLE
CONDUCTOR NO.

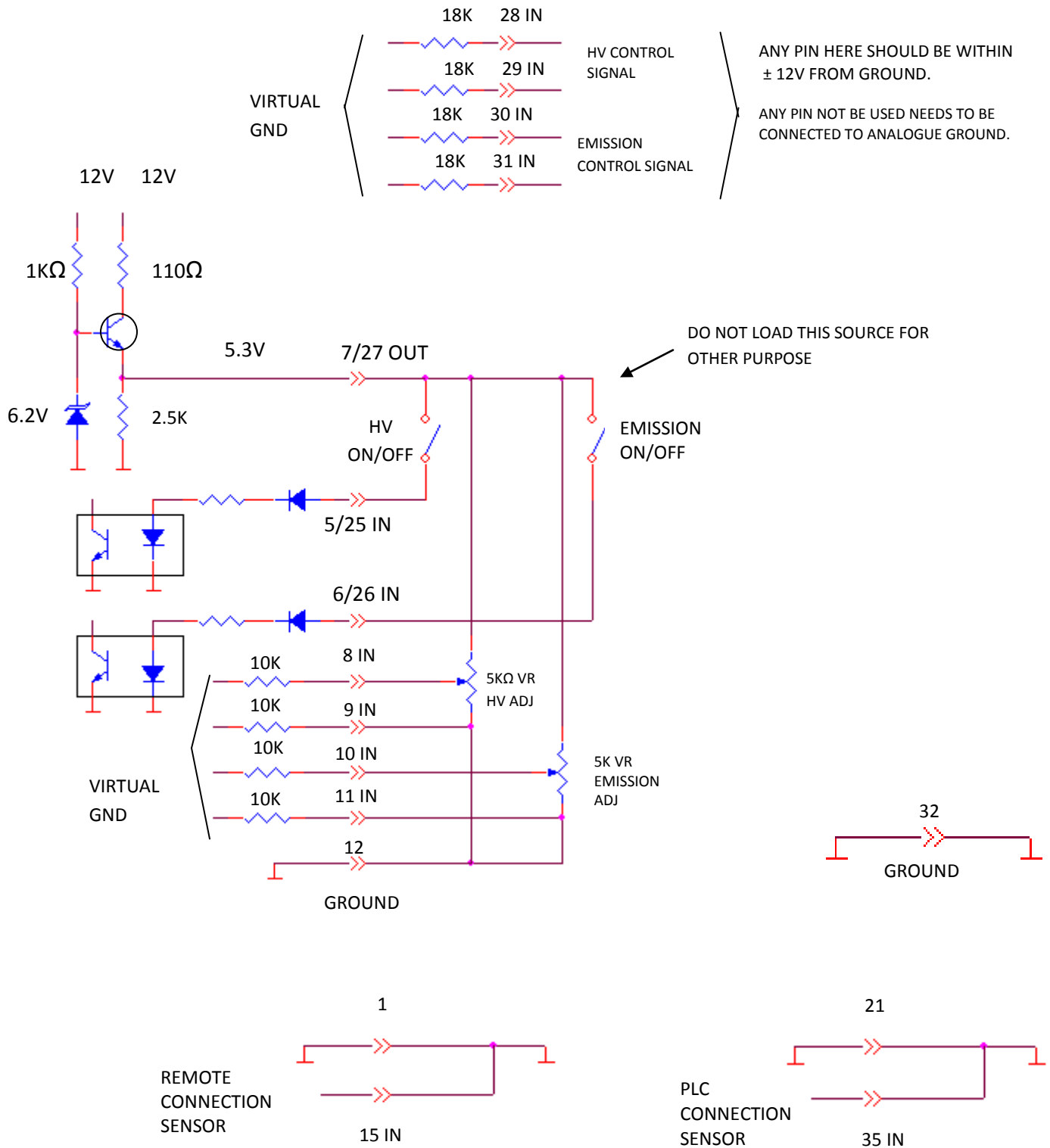


REM: LEFT SIDE OF  REPRESENT ITS OUTPUT OR INPUT RESISTANCE



THESE TWO READINGS SHARE THE SIGNALS SENT TO FRONT PANEL'S HV & CURRENT METERS

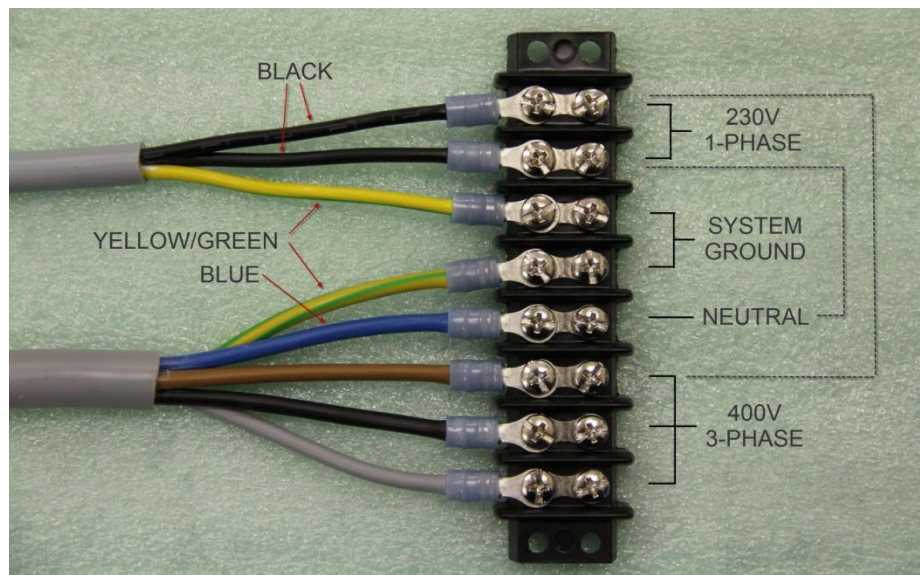
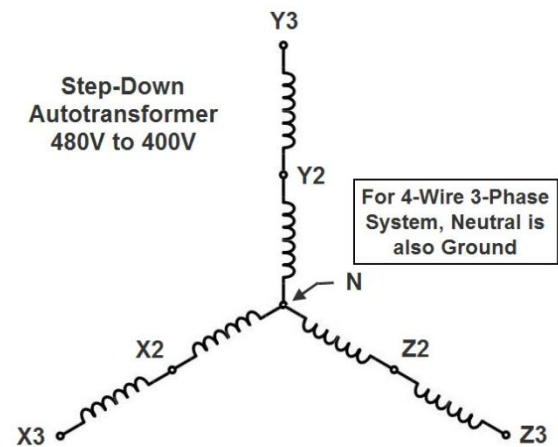
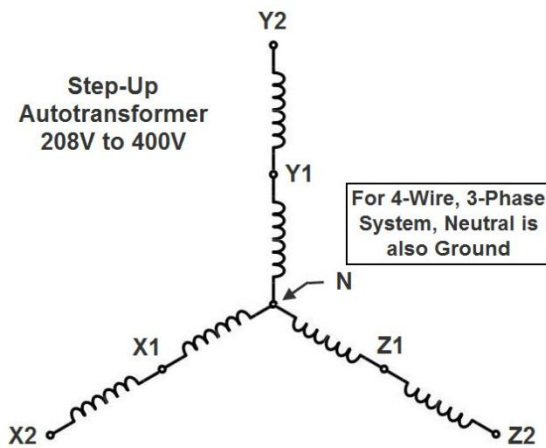




VOLTAGE-MATCHING AUTOTRANSFORMER

Voltage between terminals:

	N	X1	Y1	Z1	X2	Y2	Z2	X3	Y3	Z3
N	0	120	120	120	230	230	230	277	277	277
X1	120	0	208	208						
Y1	120	208	0	208						
Z1	120	208	208	0						
X2	230				0	400	400			
Y2	230				400	0	400			
Z2	230				400	400	0			
X3	277							0	480	480
Y3	277							480	0	480
Z3	277							480	480	0



4

POWER MODULE



SWITCHES:

There are two Magnetic Hydraulic Circuit Breakers. One for control electricity while another for power electricity. Flipping them upwards will turn electricity and their **pilot lights** on. Flipping them downwards turns electricity and their **pilot lights** off.

PILOT LIGHTS:

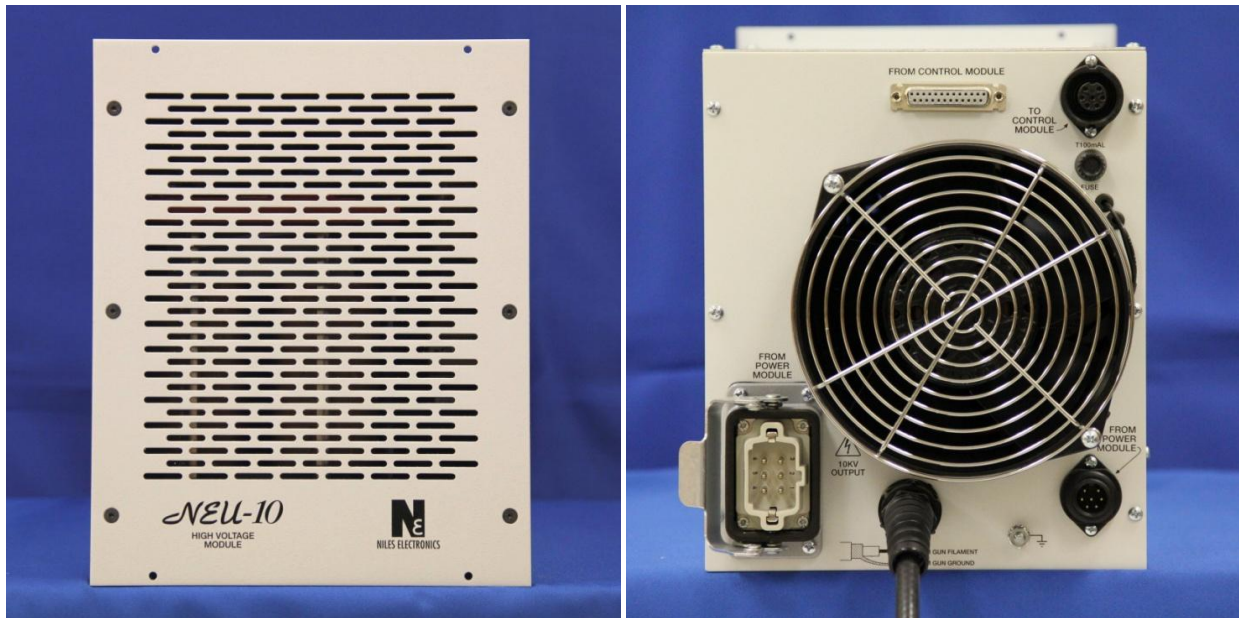
There are four **Pilot Lights**. If any light goes off while the switch is at on position, it is the sign of electricity failure.

FUSE:

There is a fuse located at the back panel. This fuse is part of Magnetic Contactor coil circuitry. If this fuse is burnt, the Magnet Contactor will not work. Thus, power cannot be turned on.

5

HIGH VOLTAGE MODULE



There are no controls that can be touched on the front panel of the High Voltage Module. The output connection is to be made on the back panel. Please note that the NE-4 and the NE-6 models have different power ratings (4 KW and 6 KW, respectively) but are otherwise identical in outward appearance and in operation of these modules.

FUSE:

There is a fuse located at the back panel. This fuse is part of power source for HV driver circuitry. If this fuse is burnt, there will be no HV output even though everything looks fine.

WARNING:

Turn off all the power before checking this fuse.

6

CONTROL MODULE



FUNCTIONS

The front panel of the Control Module consists of four distinct functions that are clearly labeled at the top of each section. They are, from left to right:

- MAIN POWER
- HIGH VOLTAGE
- OUTPUT POWER & CONTROL SOURCE
- EMISSION CURRENT



MAIN POWER:

The Main Power has a Key Lock that prevents unauthorized access to the Power Supply. The OFF button lights red after the Key Lock is turned on. The ON push button lights green when the main power is on. If the Key Lock is turned off, no lights will be lit.

WARNING

This does not mean there is no voltage inside the Modules.



HIGH VOLTAGE:

The High Voltage Interlock Indicator Lights, from left to right, are:

AIR: Temperature inside HV Module

VAC: Vacuum

TANK: Tank High Voltage Access

AUX 1: Auxiliary External Interlocks

The Interlock LED Indicators (Air, VAC, Tank, Aux 1) light when the conditions these LEDs reflect are correct for operation of the system. (For greater detail of these Interlocks, please see Chapter 3 – Interlock Connections.)

The **Voltage Adjust Variable Resistor** (labeled **ADJUST** on the panel) is located at the lower right of the High Voltage control group and is used to set the output voltage. The digital meter at the center of the High Voltage control group displays measured High Voltage.

Each flash of the Cut Back LED indicates the occurrence of arcing inside the Vacuum Chamber under normal operation. Since the Power Supply is designed to handle arcing quite well, the user may not notice its occurrence without the Cut Back LED. During an arc, the Power Supply is designed to cut the high voltage to 0V for about 20 milliseconds before recovering to full voltage. Consequently, the Voltage Meter will dip, giving apparently random readings. If arcing continues, the Voltage Meter will not give a steady reading and the Cut Back LED will continue flashing.

METER ZERO ADJ:

DC Voltage Drifting is a very common phenomenon in any analogue circuitry. It is just a matter of the amount of drifting. One count on the Digital Display represents 1 millivolt the meter receives. One millivolt is considered very small amount in the circuitry that handles the power rated at thousands of watts. The readings of the Digital Meters may drift from time to time. This feature gives users the ability to adjust the meter reading to zero when its reading is supposed to be zero and does not show zero. The readings of the true values will also be affected by the same amount of drifting reading. When the power supply is first turned on, the meters rarely go to zero. It is considered normal. The readings will gradually go stable, usually, it may take more than 30 minutes. We recommend that adjust the meter zero after the reading goes stable. This feature becomes important when the HV or Emission Current accuracy is critical. You can adjust the meter reading to zero as frequently as you like. However, this feature is designed for long term drifting.

OUTPUT POWER & CONTROL SOURCE:

The digital meter at the center of the panel displays the output power.



The Control Source Switch, located below the power meter, has three settings to select the source from which the High Voltage and Emission Current will be controlled.

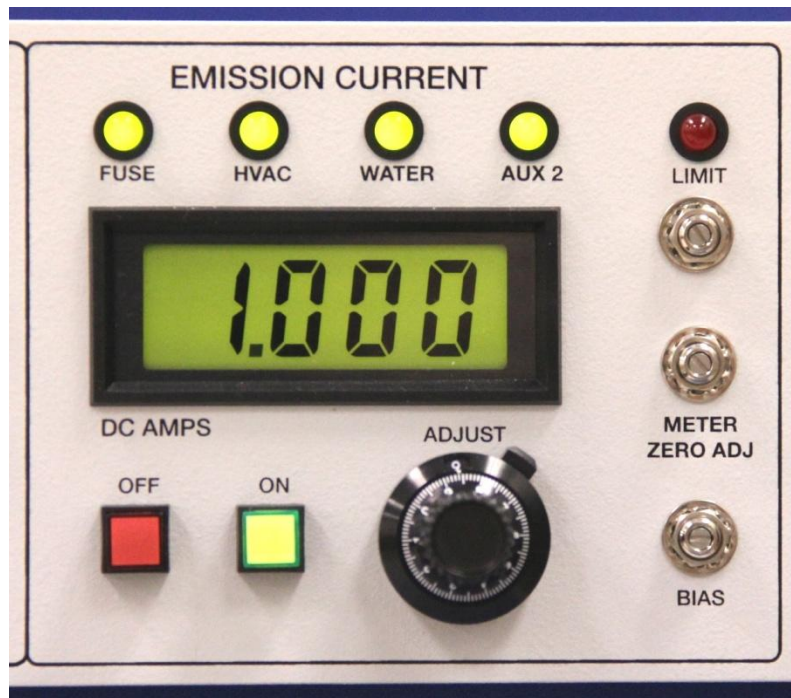
- **PLC:** automatic control
- **FRONT PANEL:** controlled by the Front Panel
- **HAND:** manual control via the Hand-Held Remote Control
- **METER ZERO ADJ:** Adjust the meter reading to 0.00 while both HV and Emission meters' readings are zero.
- **CAL:** The power calibration gives the user more accurate reading about the power. This Semi-Variable Resistor should not be touched before all the three Zero

Meter Adj are properly adjusted. It is recommended that adjust this SVR at the rated power of the power supply by following the following formula:

$$\text{Power} = \text{Voltage} \times \text{Current}$$

For example, if the HV is 10KV and emission current is 600mA, then the power reading should be 6.00KW that is the result of

$$10\text{KV} \times 600\text{mA} = 6.00\text{KW}$$



EMISSION CURRENT:

The Emission Current Interlock Indicator Lights, from left to right, are:

- **FUSE:** In series with Primary of Filament Transformer.
- **HVAC:** High Vacuum
- **WATER:** Water
- **AUX 2:** Auxiliary Interlock 2

(The functions of these Interlock Switches have been described in detail in Chapter 3 – Interlock Connections.)

The ON/OFF function is provided by the two pushbuttons at the lower left of the Emission Current section. . The OFF button lights red when the Source Filament is OFF. The ON button lights green when the Source Filament is ON.

The Limit Semi-Variable Resistor is used to limit the emission current by limiting the SCR turn-on angle. Since the line voltage is also a factor of the SCR output power, simply setting the Limit Semi-Variable Resistor will not definitively set the limit for maximum emission. If the line voltage changes, the Limit Semi-Variable Resistor will need to be adjusted accordingly.

The Limit LED indicates whether or not emission is being limited by the limit Semi-Variable Resistor. If the light is on, emission is being limited.

The BIAS Semi-Variable Resistor is used to calibrate the Adjust Variable Resistor so that a setting of zero on the Adjust Variable Resistor is the point just before the emission current comes on.

The Emission Current Variable Resistor (labeled ADJUST on the front panel) is used to set the desired value of emission current.

The digital meter at the center of the EMISSION CURRENT displays measured emission current.



FILAMENT PRECONDITION:

Filament precondition should be processed when there is no HV appears in the chamber by the following procedure:

- 1) Connect, through a relay for example, Pin 19 of Remote Control D-sub 37 Connector to its Pin11 that is Digital Ground to turn on filament driver.
- 2) Adjust the SVR located at the left, lower corner of Rear Panel with “Filament Precondition” label to the brightness you like to have the filament preconditioned.
- 3) Disconnect the Pins described above, step 1, to stop filament precondition.

Note: HV On/Off, Emission On/Off and Emission Control can override, or more accurately described, interrupt, the precondition function. In other words, if HV is turned on while the precondition is on or in process, the precondition will be prohibited by HV ON. If HV is turned Off and the precondition is still on, then the precondition will resume.



FUSES IN THE BACK:

There are three low-current fuses located on the back panel. Each one has its own failure indicator. The neon indicator will light up when its corresponding fuse is burnt. The specifications of the fuses are clearly labeled. Only replace them with the same specification fuses.

OPERATION OF THE CONTROL MODULE

PRELIMINARY PRECAUTIONS

Prior to turning the system on for the first time, it is essential that the following conditions be ascertained:

- The system has been installed correctly (see Chapter 3 Installation).
- The Vacuum Tank is operational.
- The Filament Transformer is installed according to specifications and is not shorted to ground.
- The E-Beam gun has material in its crucible.

INITIAL TURN ON

1. Turn on the KEYLOCK.
2. Observe the Interlock lights. All the Interlock lights should be on. If any of these lights are not illuminated, this means that at least one of the Interlocks is open. These Interlock must be identified and properly remedied.
3. Wait at least five seconds.
4. Turn on the High Voltage by pressing the “ON” pushbutton.
5. Turn the “ADJUST” Variable Resistor Knob to the desired voltage. High Voltage will now be applied to the E-Beam gun.
6. Turn on the E-Beam source by depressing the “ON” pushbutton of the EMISSION CURRENT.
7. Slowly adjust the BIAS Variable Resistor of the EMISSION CURRENT until a small amount of emission current is evident. Check the E-Beam gun crucible for a beam.

TURN OFF

1. Reduce the ADJUST Variable Resistor of the EMISSION CURRENT to zero. If the indicated emission does not go to zero, the BIAS setting is too high and should be reduced before reducing the ADJUST Variable Resistor to zero.
2. Turn off the source filament power by depressing the OFF pushbutton of the EMISSION CURRENT.

3. Turn off the High Voltage by depressing the OFF pushbutton on the HIGH VOLTAGE. The indicated voltage reading will go to zero.
4. Press the red “OFF” in the MAIN POWER section.
5. Turn off the KEYLOCK.
6. Flip the Magnetic Hydraulic Circuit Breaker on the Power Module downwards to the “OFF” position.

WARNING

The system is NOT completely de-energized at this point, although it consumes very little power in this stand-by state. To completely de-energize the Power Supply, either unplug both power plugs from the source, or turn off power at the source itself.

WARRANTY

The E-Beam Gun Switching Power Supply is guaranteed against faulty materials, functioning, and workmanship for a period of 12 months after delivery by Niles Electronics.

This warranty only covers failures due to defects in material or workmanship that occur during normal use, as described in this product manual. This warranty shall not apply if any repair has been performed or any alteration has been made by anyone other than an authorized Niles Electronics representative. This warranty shall not apply if failures occur which result from abuse, misuse, negligence, accident, mishandling, faulty installation, misapplication, improper operation or maintenance, alteration, modification, improper voltage supply, lightning damage, or damage that is attributable to acts of God.

The warrantor shall not be liable for incidental or consequential damages resulting from the use of this product, or arising out of any breach of this warranty. All express and implied warranties are limited to the applicable warranty period set forth above.

Repairs made under warranty at Niles Electronics' facilities will be made free of charge. Freight cost, both ways, will be at customer's expense. Niles Electronics reserves the right for any final warranty adjustment.

This warranty is limited only to repairs. No returns for refunds.

SAFETY WARNING

IN CASE OF EQUIPMENT FAILURE:

If the equipment malfunctions, **DO NOT ATTEMPT TO TROUBLESHOOT.** The equipment was not designed for user troubleshooting, which may be dangerous to do. Contact Niles Electronics in the event of Power Supply failure. Shipment of the equipment back to Niles Electronics for repair may be necessary. If the customer's company cannot afford the down-time, it is recommended that spare units be purchased.

USER RESPONSIBILITY

The user is responsible for proper installation and operation, in accordance with the procedures described in this manual. If the user has any doubt about understanding these procedures, please contact Niles Electronics.

The warranty shall be null and void if the equipment has not been installed properly.

Alteration of the design of any function of the equipment, without the written consent of Niles Electronics, Inc. voids the warranty and is entirely the responsibility of the user.

CONTACT

Please contact Niles Electronics for any inquiries, installation, or repair issues.

Our address is:

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