

# ***EB Sources'***

***Model: EB2***

***Your New  
Full Production  
Source***

***Model: EB2***  
***Multi-Pocket Source***

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***Instruction Manual***

***Part Number #EB2-0001***

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***October, 2004***

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registered trademarks of their respective companies***

# ***Safety Warning***

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***High (Potentially Lethal) Voltages are present within an Evaporation System. Great care must be exercised when performing maintenance.***

***Human Contact With High Voltages Can Be Fatal.***

***Short all HV Feed thru connections with a grounding hook!***

***Danger- High Voltage***

# *Warranty*

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*This Electron Beam Gun is guaranteed against faulty materials, function, and workmanship for a period of 24 months from delivery date of source.*

*This warranty is valid only for normal use where regular maintenance has been performed as instructed. This warranty shall not apply if repair has been performed or an alteration made by anyone other than an authorized EBSources' Representative, or if a malfunction occurs through abuse, misuse, negligence, or accident. No charge for repairs will be made under warranty at EB Sources' facilities.*

*Defective parts will be repaired or replaced at EB Sources' option. Customer will be responsible for freight charges to EB Sources' facility.*

***For the safety of the EB Sources' technicians, customers are requested to supply a list of materials which have been evaporated in the crucible when the e-gun is returned for repair.***

# *User Responsibility*

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The user is responsible for proper operation and ordinary maintenance of the Equipment and for following procedures described in this manual - including reference documents. Proper operation includes timely replacement of parts that are missing, broken or plainly worn. If the user has a reasonable doubt about understanding the use or installation of a component, EB Sources or your local representative should be called.

***It is very important that the user properly install the equipment as described in Section 3, (Installation) and (Grounding) of this manual.***

**Failure to install or ground properly will void this warranty!!!**

**Alteration of the design or any function of equipment voids this warranty and is entirely the responsibility of the user.**

# ***Table of Contents***

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<i><b>Safety Warning</b></i>	<i><b>ii</b></i>
<i><b>Warranty</b></i>	<i><b>iii</b></i>
<i><b>User Responsibility</b></i>	<i><b>iii</b></i>
<i><b>Photo Reference</b></i>	<i><b>v</b></i>
<i><b>1 <u>Unpacking</u></b></i>	
<i>Installation Kit</i>	<i>1-1</i>
<i><b>2 <u>Description</u></b></i>	
<i>Specifications</i>	<i>2-1</i>
<i><b>3 <u>Installation</u></b></i>	
<i>Required Components</i>	<i>3-0</i>
<i>Vacuum Tank Ground</i>	<i>3-2</i>
<i>High Voltage</i>	<i>3-5</i>
<i>Multi-Source Installation</i>	<i>3-6</i>
<i>Accessories</i>	<i>3-7</i>

## **4 Operation**

<i>Getting Started</i>	<i>4-0</i>
<i>Shutdown</i>	<i>4-1</i>
<i>Adjusting the Electromagnetic Field</i>	<i>4-1</i>

## **5 Servicing**

<i>Emitter Removal</i>	<i>5-0</i>
<i>Crucible Removal</i>	<i>5-0</i>
<i>Coil Housing Removal</i>	<i>5-0</i>
<i>Filament Replacement</i>	<i>5-1</i>
<i>Emitter Disassembly</i>	<i>5-1</i>
<i>Emitter Reassembly</i>	<i>5-1</i>
<i>Emitter Alignment Specifications</i>	<i>5-3</i>
<i>Coil Assembly</i>	<i>5-4</i>
<i>Coil Connector Assembly</i>	<i>5-4</i>
<i>Bearing Housing Sub Assembly</i>	<i>5-5</i>
<i>Crucible Rotation Assembly</i>	<i>5-5</i>
<i>Base Plate Assembly</i>	<i>5-7</i>
<i>Coil Housing Install</i>	<i>5-8</i>

## **6 Trouble Shooting**

<i>Power Problems</i>	<i>6.0</i>
<i>Beam Problems</i>	<i>6.1</i>
<i>Rotation Problems</i>	<i>6.2</i>

## **Photo Reference:**

<i>Installation Kit</i>	<i>1.1</i>
<i>Coil Wire Reference</i>	<i>3.1</i>
<i>Side and Bottom Drive Kit</i>	<i>3.3</i>
<i>Adjusting Electromagnetic Field</i>	<i>4.1</i>
<i>Emitter</i>	<i>5.2,5.3</i>
<i>Coil Assembly</i>	<i>5.5</i>
<i>Coil Connector</i>	<i>5.5</i>
<i>Rotation Assembly</i>	<i>5.6,5.7</i>
<i>Base Plate Assembly</i>	<i>5.8,5.9,5.10</i>

# 1

## *Unpacking*

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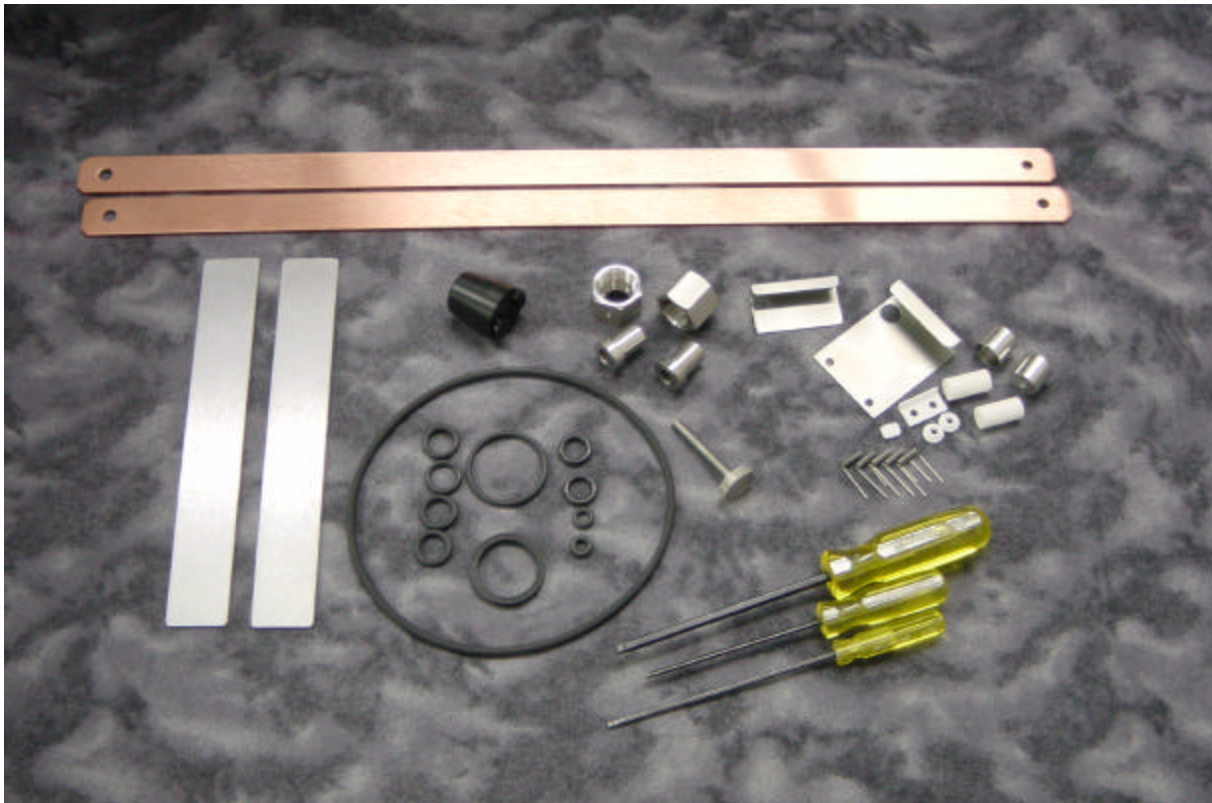
*Your Model EB2 Multi-pocket Source is packed in a specially designed double wall carton and heavy foam padding surrounds your new source. Please save this box and the padding in the unlikely event that you need to return your EB2 for repair. EB Sources cannot be held liable, and may not be able to repair without charges, sources which are damaged in shipment due to improper packing.*

*You will find your new source, manual, spare parts, and of course the tool kit, inside the double walled-carton. Please check for shipping damage. Your new source is very rugged, so this should not be a problem. Please report any deficiencies to your representative or to EB Sources immediately. Also take care to read the warranty on Page ii as to the limits of our liability.*

*Your new source has been assembled under clean-room conditions and sealed in a polyethylene bag for shipment. A pair of gloves is included for installation of your new source into your system.*

# *Installation kit*

<i>Description</i>	<i>Part Number</i>	<i>Qty.</i>
<i>Emitter Rebuild Kit</i>	<i>EB-5270</i>	<i>1</i>
<i>O ring Kit</i>	<i>EB-5200</i>	<i>1</i>
<i>Screwdriver Kit</i>	<i>EB-5050</i>	<i>1</i>
<i>Allen Wrench</i>	<i>5/32"</i>	<i>1</i>
<i>Allen Wrench</i>	<i>7/64"</i>	<i>1</i>
<i>Allen Wrench</i>	<i>3/32"</i>	<i>1</i>
<i>Powder Free Latex Gloves</i>		<i>1pr</i>
<i>Shunt Bar</i>	<i>EB2-2424</i>	<i>2</i>
<i>Copper Buss Bar</i>	<i>EB-2434</i>	<i>2</i>
<i>Quad Ring Tool</i>	<i>EB-2433</i>	<i>1</i>
<i>Thumb Screw</i>	<i>EB-2825</i>	<i>1</i>
<i>VCR Nut, Female</i>	<i>EB-2304c</i>	<i>2</i>
<i>VCR Gland</i>	<i>EB-2304b</i>	<i>2</i>





# 2

## *Description*

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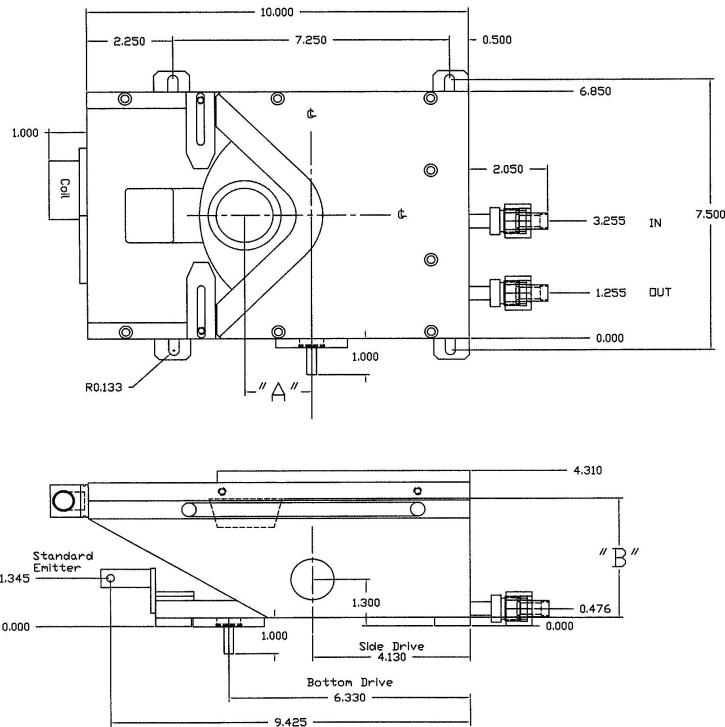
*The EB2's most notable feature is: Ease of maintenance*

- 1 The crucible is removable from above by using air or nitrogen to blow down the waterlines to the source assembly. Next, remove the 6 screws that hold the water-cooled cover plate, and remove the screws which hold the crucible in place. Attach the thumb screw to the center of the crucible and lift out.**
- 2 The EB2's coil housing is also removable for cleaning at this time without removing the base assembly or the magnet from the chamber. This means you won't need to regauss your magnet because you needed to clean the coil housing. You will find that there are no water lines attached to the coil housing to get bumped or broken.**
- 3 The magnet arms are just that, for magnetic fields only, not water passages like other equipment manufacturers.**
- 4 The coil is a stand-alone assembly which can be easily removed for cleaning or repair. It has a 4-pin connector which keeps the terminals free of deposits and shorting when mated with the 4-pin connector plug which is wired to the octal feed thru -unlike some sources where you forget which wire goes where or break a terminal while cleaning or rewiring the coil.**

# ***EB-2 Specifications***

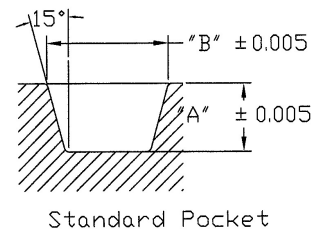
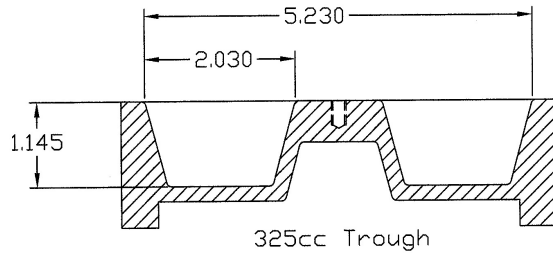
<b><u>Electron Beam Deflection:</u></b>	<b><u>270°</u></b>
<b><u>Power Rating:</u></b>	<b><u>10kW</u></b>
<b><u>Maximum High Voltage:</u></b>	<b><u>10kV</u></b>
<b><u>High Voltage Range:</u></b>	<b><u>5kV to 10kV</u></b>
<b><u>Lateral Coil Resistance:</u></b>	<b><u>3.0 Ohm</u></b>
<b><u>Sweep, Lateral Coil:</u></b>	<b><u>+/- 1 Amp</u></b>
<b><u>Longitudinal Coil Resistance:</u></b>	<b><u>9.5 Ohm</u></b>
<b><u>Sweep Longitudinal Coil :</u></b>	<b><u>+/- 1 Amp</u></b>
<b><u>Emission Current:</u></b>	<b><u>up to 1 Amp@10kV</u></b>
<b><u>Filament Power:</u></b>	<b><u>600 Watts Maximum</u></b>
<b><u>Water Requirements:</u></b> <i>Impute water temperature should be 60° F (15° C) @ 60 psi (4.2 kg/cm) with 3/8" (10mm) lines.</i>	<b><u>3 gpm @ 10kW</u></b>
<b><u>Weight:</u></b> <i>As delivered, less shipping carton</i>	<b><u>46 lbs. (20.81 kg)</u></b>
<b><u>Dimensions:</u></b> <i>Note: dimensions less drive protrusions</i>	<b><u>4.310"H x 8.060"W x 13.050"L</u></b> <b><u>10.947 cm H x 20.472 cm W x 33.147 cm L</u></b>
<b><u>Maximum Crucible Volume:</u></b>	<b><u>4 x 40cc or 325cc Trough</u></b>

# EB2 Reference Dimensions



<u># of Pockets</u>	<u>Size</u>		<u>"A"</u>	<u>"B"</u>
<u>4</u>	<u>7,15,25,30 cc</u>	<i>with web</i>	<u>1.750"</u>	<u>3.550"</u>
<u>4</u>	<u>30,40 cc</u>	<i>without web</i>	<u>1.750"</u>	<u>3.750"</u>
<u>4</u>	<u>40 cc</u>	<i>with web</i>	<u>1.800"</u>	<u>3.800"</u>
<u>6</u>	<u>7,15 cc</u>	<i>with web</i>	<u>1.930"</u>	<u>3.550"</u>
<u>6</u>	<u>25 cc</u>	<i>with web</i>	<u>1.930"</u>	<u>3.675"</u>
<u>1</u>	<u>235 cc</u>	<i>trough</i>	<u>1.750</u>	<u>3.550"</u>
<u>1</u>	<u>325 cc</u>	<i>trough</i>	<u>1.800"</u>	<u>3.800"</u>

# *Crucible Dimensions*



Size	Pockets	“A”	“B”	Part Number
7cc	4	.500	1.125	EB-7407
	6			EB-7607
15cc	4	.670	1.485	EB-7415
	6			EB-7615
25cc	4	.680	1.855	EB-7425
25cc	6	.920	1.633	EB-7625
30cc w/web	4	.790	1.920	EB-7430 w/web
30cc w/o web	4	.940	1.800	EB-7430 w/o web
40cc w/web	4	1.020	2.030	EB-7440 w/web
40cc w/o/web	4	1.020	2.030	EB-7440 w/o web
235cc	Trough	.820	1.925	EB-7235 trough
325cc	Trough	1.145	2.030	EB-7325 trough

# 3

## *Installation*

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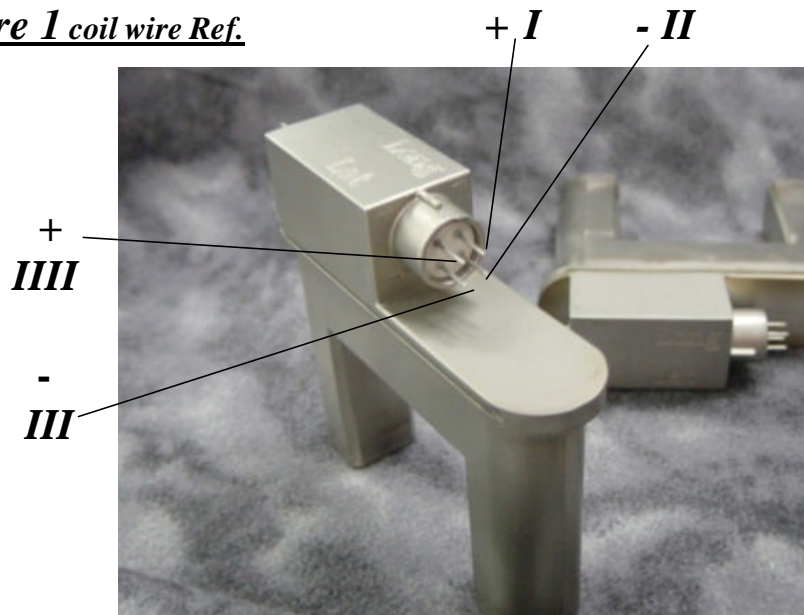
### *Required Components:*

*The following is the minimum list of components required for setting up the new source for safe operation.*

- 1 Two high voltage feedthrus (15 kv@ 70 Amps). Bare copper straps are provided for hookup inside chamber. Use #6 AGW copper wire with lugs for attaching the feedthru to the filament transformer.**
- 2 Use a solid copper strap or wire #6 or greater, no more than 7 strands ( not copper braid), to attach between the base plate ground and the two 8' grounding rods (6' apart). Connections must be extremely tight and oxide free. Before attaching the #6 wire, check that the resistance is 3ohms or less Note: we suggest that you use an additional HV feedthru as a ground point. Attach one side directly to the base plate of your new source and the other side to the 8' grounding rods.**
- 3 Attach a grounding hook with at least 6' of #6 copper wire to the grounding rod. Note:This is the first step in safety: Ground your system before touching anything.**
- 4 Mount the filament transformer as close as possible to the HV feedthru. *Ensure that there is clearance to ground, as the HV feedthru will arc 1" to ground at 10 thousand volts!!!!* You can use plexiglass 1/4" thick to build an enclosure. Be sure to maintain a 2" minimum clearance all the way around.**

- 6 Use 3/8" O.D. x 1/16" wall 304 stainless steel tubing for the water connections. You will need to weld or braze the fittings to the tubing and to the feedthru you have chosen. Use of bellows for water is a very bad idea ( i e: very thin walls, lots of harmonics).
- 7 Use three-way valves on the inlet and outlet water lines for your source. Attach either a nitrogen or an air line on the inlet water line with a three-way valve to use for blow down of your source. Attach a three-way valve on the outlet water line to a drain or bucket. (Especially important on closed loop water systems.)
- 8 Use a flow meter w/interlocks on the source outlet water line.
- 9 Use a standard water filter on the inlet water line. Mount the filter away from your system for easy maintenance.
- 10 Interlocks: thermocouple, water, chamber door, transformer cover, (if available), temperature, and Ion gauge. Should be placed in series (logically ANDed) so that if one interlock fails, the source is shut off automatically.
- 11 Use a shutter assembly to protect your product from contamination during material warm up, pre-deposit and post-deposit. A min. 5" dia. stainless steel disk x 1/8" thick will work quite well for this application. The shutter disk should be a min. of 3" from the top of the source pocket. Insure that it is easy to remove for periodic cleaning.

**Figure 1 coil wire Ref.**



**Note:** Never use mild steel for the mounting of your new source. This includes chambers, system base plate, standoffs, feedthrus, shutter assemblies, rotation assemblies, shielding, screws, or bolts.

304 stainless steel is the material of choice for mounting your new source and related hardware.

Your new source can be either mounted flush to the system base plate (for side drive), or you can mount it on standoffs (for bottom drive or even side drive).

***Chamber Grounding—Figure 3***

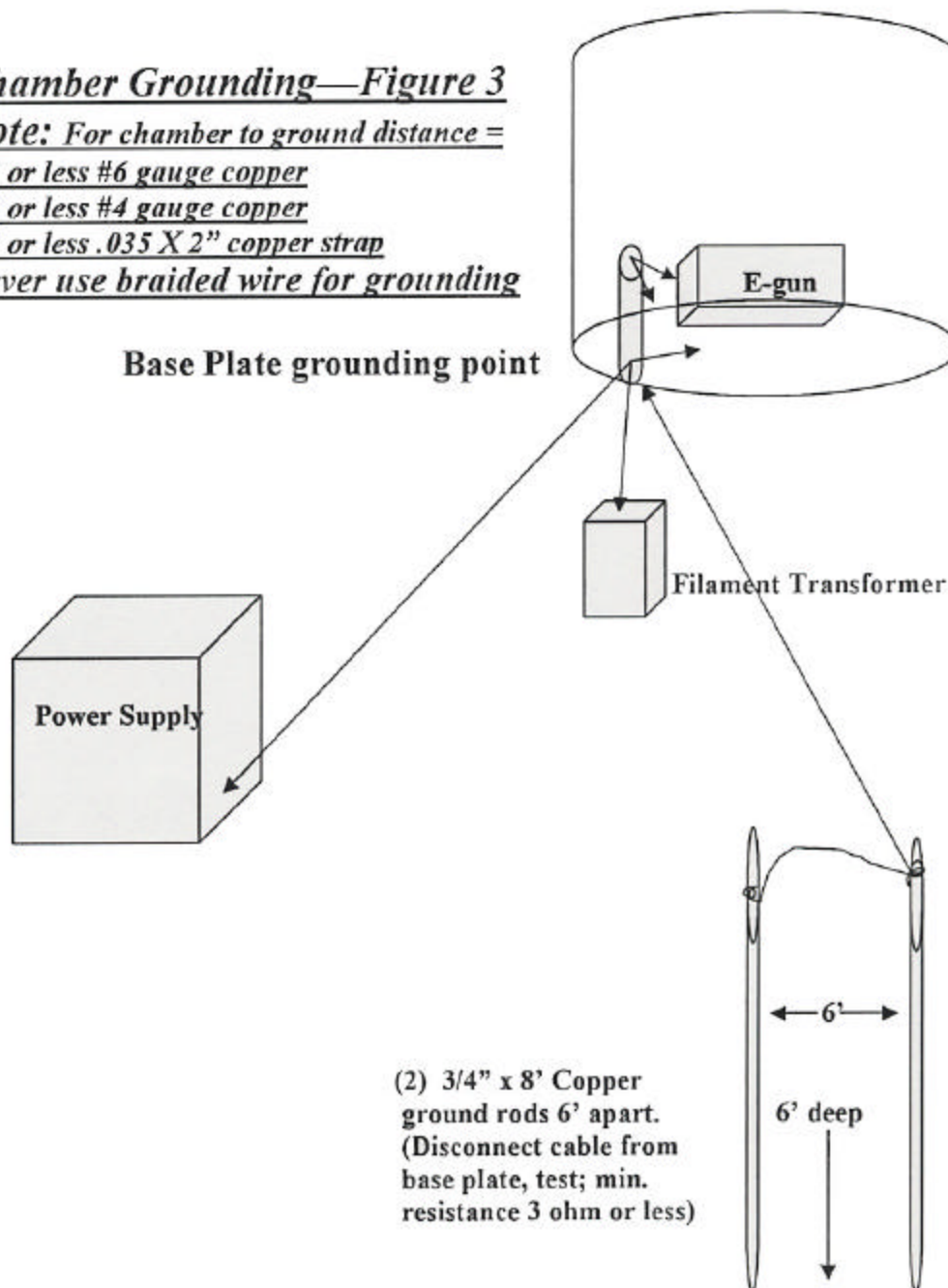
***Note:*** For chamber to ground distance =

***10' or less #6 gauge copper***

***20' or less #4 gauge copper***

***60' or less .035 X 2" copper strap***

***Never use braided wire for grounding***



(2) 3/4" x 8' Copper ground rods 6' apart. (Disconnect cable from base plate, test; min. resistance 3 ohm or less)

**NOTE: DO NOT use water pipes for system ground connections. Use ground rods as shown in Figure 3. It shows you the correct way to ground your vacuum system: Earth ground rods (2) to source base plate (Note: An old HV feedthru works really well as a base plate ground point); from the base plate to the power supply; and from the base plate to the filament transformer.**

The crucible rotation can either be right- or left-side mounted for side drive, or bottom mounted for bottom drive. Conversion kits are available to convert from:

**Side to Bottom Kit:**

**Spur gear #EB2-2420**

**Drive gear #EB2-2419**

**Drive shaft #EB2-2425**

**Bottom to Side Kit:**

**Bevel gear #EB2-2422**

**Drive gear #EB2-2423**

**Drive shaft #EB2-2426**

**Drive Housing Assembly**

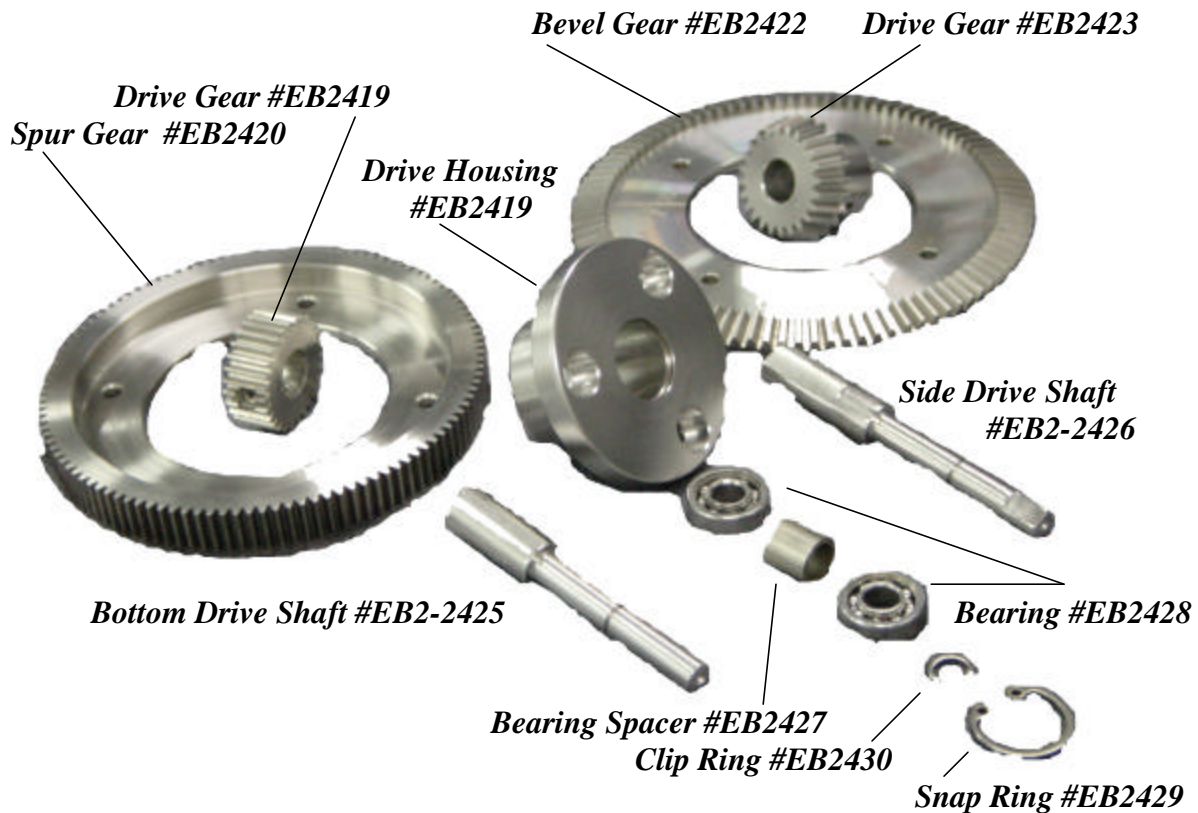
**Drive Housing #EB2-2418**

**Drive Bearing #EB2-2428**

**Bearing Spacer #EB2-2427**

**Clip Ring #EB2-2430**

**Snap Ring #EB2-2429**



*Note: bearing housing assembly is the same for both side and bottom drives*



## *High Voltage*

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- 1 Use decals or other warning labels to inform employees and customers, as to the Lethal Voltages that are present during process. (Note: always use a grounding hook before touching any high- voltage component, even if the High Voltage is off.)
- 2 **Jumping interlocks means you are putting someone's life in danger. Double check your system for jumped interlocks prior to running your process.**
- 3 *High Voltage: 10,000 volts can jump 1" (inch) at atmosphere! Make sure all safety shields and doors are secure before starting your process.*

# *Danger*

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# *High Voltage*

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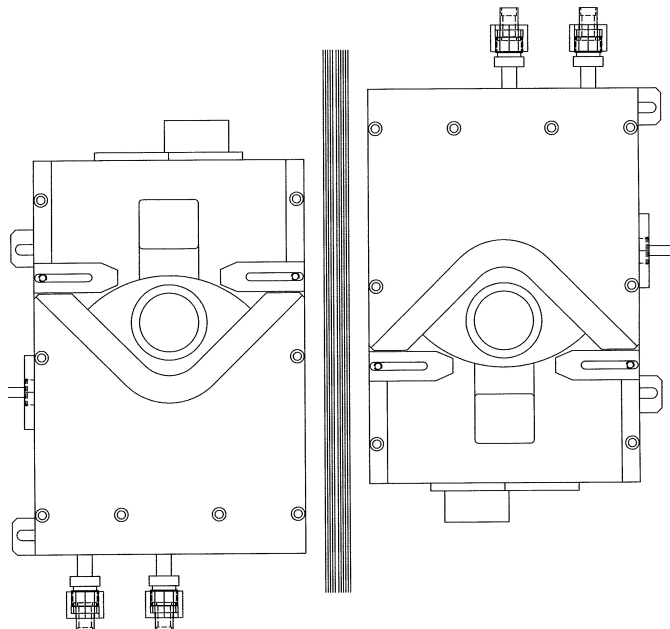
## *Multi-Gun Installation*

Multi-source installation can be achieved by use of a Magnetic Shunt Assembly. The magnetic shunt is a combination of magnetic and non-magnetic materials sandwiched together to form a magnetic barrier between the two sources.

***Warning!!! You must mount the sources with the same side facing each other - i.e.: South to South or North to North (oppose each other) for the coils to work properly.***

The assembly must extend 1" beyond all parts of your sources.

- 1 Magnetic metals, new metal or mild steel: .020 to .030 inch thick, qty. 5
- 2 Non-magnetic metals, copper or 300 series stainless steel: .020 to .030 inch thick, qty. 6
- 3 300 series stainless steel washers: .020 to .050 thick
- 4 Alternate the assembly of metals, air gapping with washers (i.e.: magnetic, washer, non-magnetic, washer, ...)



## Recommended Accessories

1 We recommend the switcher type power supplies made by Niles Electronics ([Nileselectronics.com](http://Nileselectronics.com)) Really tough, hard-working power supplies. (Note: these supplies are like that watch commercial: It takes a licking and keeps on ticking.)

### 2 Filament Transformer

EB-3620      7V 40Amp  
EB-3640      12V 50 Amp  
EB-3641      12V 70 Amp/ 6V 140Amp

### 3 Feedthru by EB Sources

#### Side Drive Kit : #EB-5001

EB-2200	High Voltage	F/T	2ea
EB-2300	3/8" Water	F/T	1ea
EB-2750	Rt. Angle Rotary	F/T	1ea
EB-2700	Rotary (Shutter)	F/T	1ea
EB-2100	Octal (8-pin)	F/T	1ea

#### Bottom Drive Kit: #EB-5002

EB-2200	High Voltage	F/T	2ea
EB-2300	3/8" Water	F/T	1ea
EB-2700	1/4" Rotary	F/T	2ea (1 shutter)
EB-2100	Octal (8 pin)	F/T	1ea

#### Additional Feedthru:

EB-2000	1/2" Water	F/T	
EB-2500	3/4" Shaft Seal	F/T	
EB-2550	Gas: 1/8" FPT	F/T	

or 6" welded pipe, (1/8", 1/4", or 3/8" Dia.)

#### Optional Components:

EB-1000	Ground Buss Bar
EB-2204	H.V. Clamp (Pr)
EB-2456	Coil Connector Assembly
EB-2450	EB2 Coil Assy. (9 x 3 ohm)
EB-1086	Emitter Assy. (STD)
EB-1087	Emitter Assy. (Dielectric)
EB-5051	Water Flow Switch: 1/4" NPT fittings, 1-6 gpm adjustable

# 4

## *Operation*

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### *General Operation: Getting Started*

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Check your system, water on, pumps running, interlocks made. Make sure the operating controls of the power supply are within reach of the view port.

Now you are ready to load your new source with vacuum-grade material.

***Insure a clear view*** of the pocket from the view port window. Close up and pump down. At an operating pressure of  $1 \times 10$  torr or better, set the operating voltage to 7kV or 10kV; beam position to *neutral*, emissions to *zero*, reset the sweeps amplitudes to *zero*.

When the system reaches the desired pressure, turn on the High Voltage. ***Watching the pocket, turn on the filament current. Slowly turn up the current until you can see the beam spot on the material.***

***Note: Never increase the current more than 100ma if you cannot see the beam in the center of the crucible!!!!***

***Use the sweeper controls - longitudinal (front to rear) and lateral (left to right) - to help locate the beam spot. If you cannot find it, Shut off the emission current and the High Voltage !!!!***

Check the leads on the coil to see if they are reversed. If not, go to the Troubleshooting Section **6** checklist.

## ***General Operation :Shutdown***

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After terminating the final layer of the run sequence, turn down the filament current, turn off the High Voltage. Allow the emitter several minutes to cool down before opening the chamber. (A yellow oxide will form around the filament if you vent too quickly. (Use nitrogen gas to vent, and you will avoid this problem.)

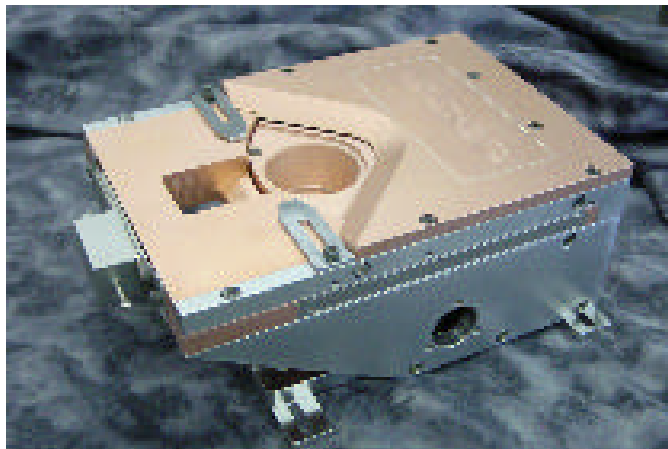
## ***Adjusting the Electromagnetic Field***

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***Position:*** *The beam can be pulled towards the coil by either increasing the magnetic field or reducing the accelerating voltage. The ways of achieving this are: reducing the High Voltage, or increasing the coil current, or removing the shunt bar, or bringing the pole pieces in closer to the pocket.*

***Shape:*** *You can change the shape of the beam by sliding the pole extensions in or out.*

***Intensity:*** *Is controlled by the filament current. It can be affected by the way the emitter is assembled. Be sure to follow the instructions on how to adjust your emitter.*



# 5

## *Servicing*

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Your new EB2 source has been designed for high production and ease of maintenance. You need to be familiar with the assembly of this source.

### *Emitter Removal*

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**Caution: Make sure to use a ground hook to short all HV connections. The emitter may be extremely hot.**

Remove the leads from the HV feedthru on the emitter side. Remove the #6-32 that holds the emitter to the base plate. You can now rebuild this emitter or install a rebuilt emitter.

### *Crucible Removal*

---

**Turn off** the water; make sure you use the three-way valves to blow down your source of all water. Now, remove the six #10-32 screws that hold down the cover plate. Remove the screws that hold down the crucible. Insert the 10-32 thumb screw in the center of the crucible and lift out. ***Caution: take care to protect “O” ring surfaces at all times.***

### *Coil Housing Removal*

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***First***, follow the instructions for the crucible removal. Now, remove the eight #10-32 screws that hold the housing down and carefully lift the housing off the base assembly. There are four #10-32 screws that hold the field extensions to the sides of the coil housing. Remove the two #10-32 screws that hold the coil in place. Remove coil. Lift coil housing off the base assembly.

***Caution: Take care to protect “O” ring surfaces at all times.***

## *Filament Replacement*

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Squirt alcohol on the two screws that hold the filament clamps in place, remove the filament. Note: This will help stop the screws from seizing.

## *Emitter Disassembly*

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You will need a bottle of alcohol for tight screws, to keep from galling. Next you will need wire to string the emitter parts on for cleaning. (A bead blaster works well for this application). Wash with alcohol and vapor dry. You can clean the ceramics in the same way. Note: Discard any broken or cracked ceramics.

The #6-32 x 1/4" screws - which hold the filament clamps down - and the beam former need to be replaced, as they have been subjected to very high heat and could possibly gall.

## *Emitter Reassembly*

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Most problems are related to the emitter. With a little care, you can avoid serious problems. **Note: Do not tighten the screws down until instructed to do so. all screws are stainless steel.**

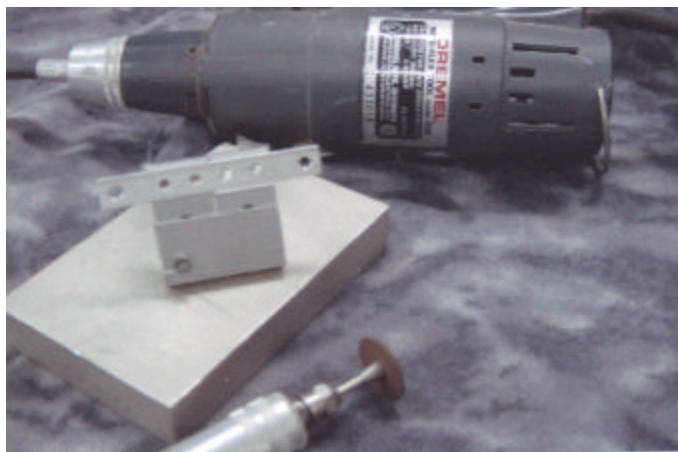
Assemble the Mounting Bracket (EB-1015), Left Hand Cathode Block (EB-1013), and Left Hand Buss Bar (EB-1021) using (2) #6-32 x 3/8" screws. Mount the #6 screws through the left buss bar and left cathode block into the mounting bar. Leave screws loose.

Next, mount the L Insulator (EB-1018), to the mounting bar, the Right Hand Cathode Block (EB-1012) and Right Hand Buss Bar (EB-1022) using (2) #6-32 x 1/2" screws. Mount (1) #6 washer and (1) Collar Ceramic (EB-1019) on each screw. Mount through right hand buss bar, through right cathode block, through L insulator into the mounting bar. Leave screws loose. ***Note: Be careful not to break the L insulator.***

Stand the assembly up and install the Insulator Cross (EB-1020) into the top of the right hand cathode block. Next, mount the Beam Former (EB-1011) on the assembly and secure with (1) 6-32 x 1/4" screw loosely. Spread the two cathode blocks apart as far as they are able and still be parallel, push down on the beam former and snug all screws of this assembly.

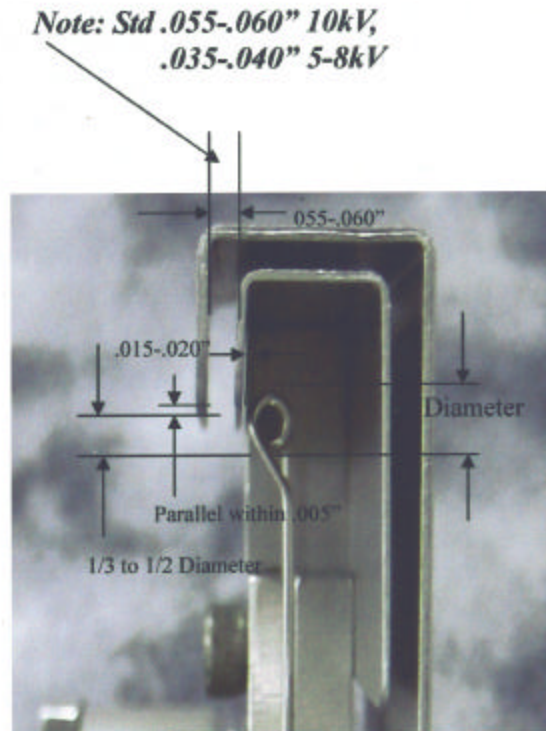
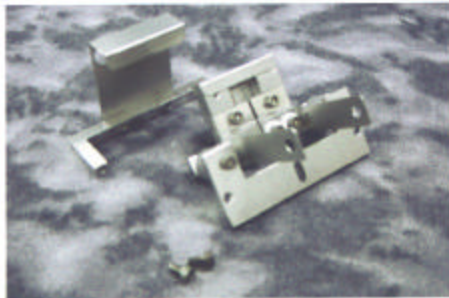


- 4 Install the filament (check the orientation) into this assembly, use (2) #6-32 x 1/4" screws and (2) Filament Clamps (EB-1058), loosely mount. Gently tap down on the assembly to settle the filament in place. Carefully slide the left hand filament clamp so that it is flush with the inside edge of the left cathode block, then snug down the #6 screw. Next, snug the right hand filament clamp in place. ***Do not adjust this clamp as you may warp your filament.*** Check to see the clearance between the right and left filament clamps. Check the alignment of the filament to the beam former. Is it parallel? If not, loosen one filament clamp (low side of filament) and gently lift up on the filament (with the allen wrench) to align it while pressing down on the clamp with your thumb, snug the #6 screw.
- 5 ***Note:*** Look at the back of this assembly. Are the screws sticking out from the mounting bar? If so, you will need to ***replace*** with shorter screws or carefully ***grind*** or ***file*** them off ***flush*** to the mounting bar.



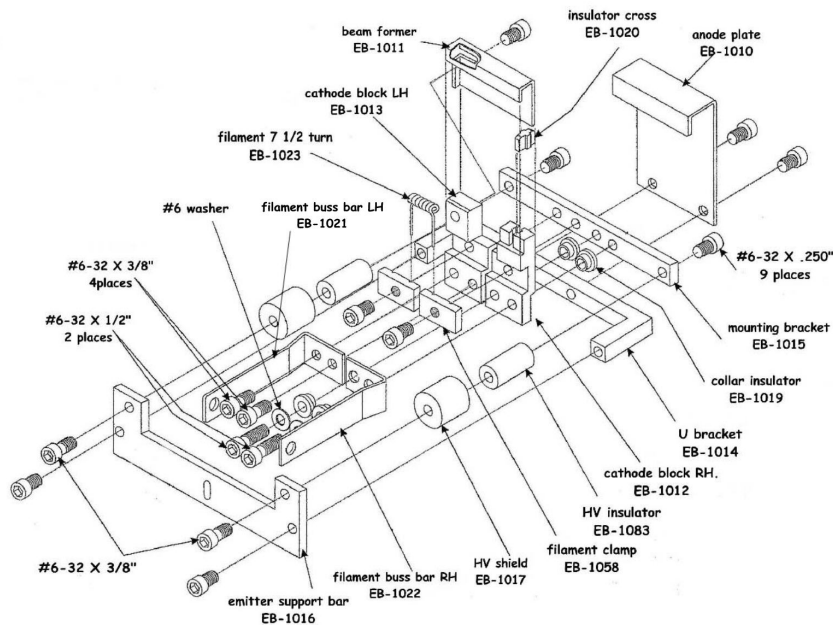


- 6 Mount the Anode (EB-1010) to the U Bracket (EB-1014) with (2) #6-32 x 1/4" screws, set aside. Next, loosely mount (2) HV insulators (EB-1083), and (2) HV Shields to the Emitter Support Bracket (EB-1016) using (2) #6-32 x 3/8" screws.
- 7 Attach the emitter support bracket assembly to the mounting bracket assembly with (2) # 6-32 x 1/4" screws. Set this assembly on a flat surface with the support bracket hanging over the edge. Gently push down on the support bracket and tighten the (2) #6-32 x 3/8" screws. Now reach around and tighten the (2) #6-32 x 1/4" screws thru the mounting bracket into the HV insulators.
- 8 Mount the U Bracket to the support bracket with (2) #6-32 x 1/4" screws. Gently push down on the mounting bracket, tighten the (2) #6-32 x 1/4" screws. Push down on the anode and tighten the last (2) # 6-32 x 1/4" screws.
- 9 ***Check your completed assembly for the alignment of the Beam Former to the Anode.***



# Emitter Components (EB-1087)

<i>Description</i>	<i>Part Number</i>	<i>Qty.</i>	<i>Reference</i>
<i>Anode</i>	<i>EB-1023</i>	<i>1ea</i>	<i>1</i>
<i>Beam Former</i>	<i>EB-1011</i>	<i>1ea</i>	<i>2</i>
<i>Cathode Block RH</i>	<i>EB-1012</i>	<i>1ea</i>	<i>3</i>
<i>Cathode Block LH</i>	<i>EB-1013</i>	<i>1ea</i>	<i>4</i>
<i>Filament Clamp</i>	<i>EB-1058</i>	<i>2ea</i>	<i>5</i>
<i>Filament Buss Bar RH</i>	<i>EB-1022</i>	<i>1ea</i>	<i>6</i>
<i>Filament Buss Bar LH</i>	<i>EB-1021</i>	<i>1ea</i>	<i>7</i>
<i>Mounting Bar</i>	<i>EB-1015</i>	<i>1ea</i>	<i>8</i>
<i>Emitter Support Bracket</i>	<i>EB-1016</i>	<i>1ea</i>	<i>9</i>
<i>U Bracket</i>	<i>EB-1014</i>	<i>1ea</i>	<i>10</i>
<i>HV Shield</i>	<i>EB-1017</i>	<i>2ea</i>	<i>11</i>
<i>HV Insulator</i>	<i>EB-1083</i>	<i>2ea</i>	<i>12</i>
<i>Collar Insulator</i>	<i>EB-1019</i>	<i>2ea</i>	<i>13</i>
<i>“L” Insulator</i>	<i>EB-1018</i>	<i>1ea</i>	<i>14</i>
<i>Cross Insulator</i>	<i>EB-1020</i>	<i>1ea</i>	<i>15</i>
<i>Filament 7 1/2 turn</i>	<i>EB-1023</i>	<i>1ea</i>	<i>16</i>
<i>Screw, 6-32 x 1/4”</i>		<i>7ea</i>	<i>17</i>
<i>Screw, 6-32 x 3/8”</i>		<i>6ea</i>	<i>18</i>
<i>Screw, 6-32 x 1/2”</i>		<i>2ea</i>	<i>19</i>



## ***Coil Assembly***

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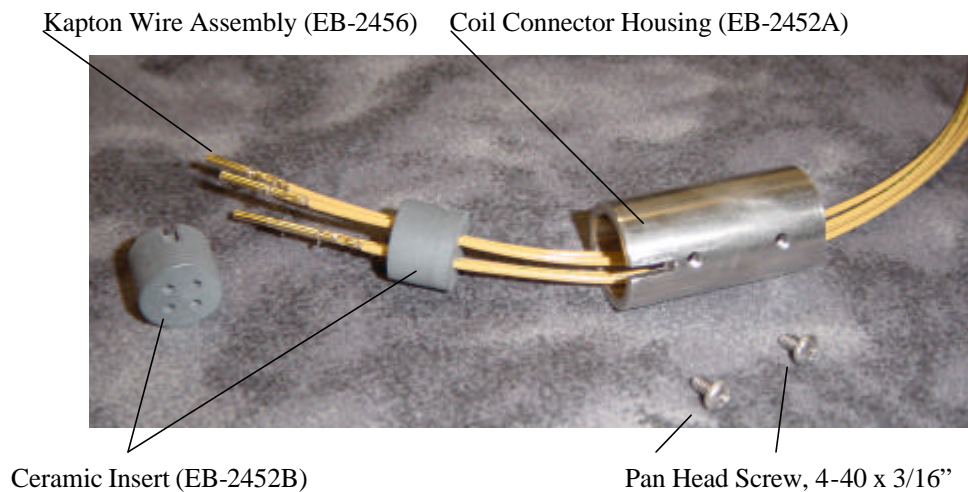
The Coil (EB-2450-1) is in a self-contained stainless steel housing that is hermetically sealed, with no user-serviceable parts.



## ***Coil Connector Assembly***

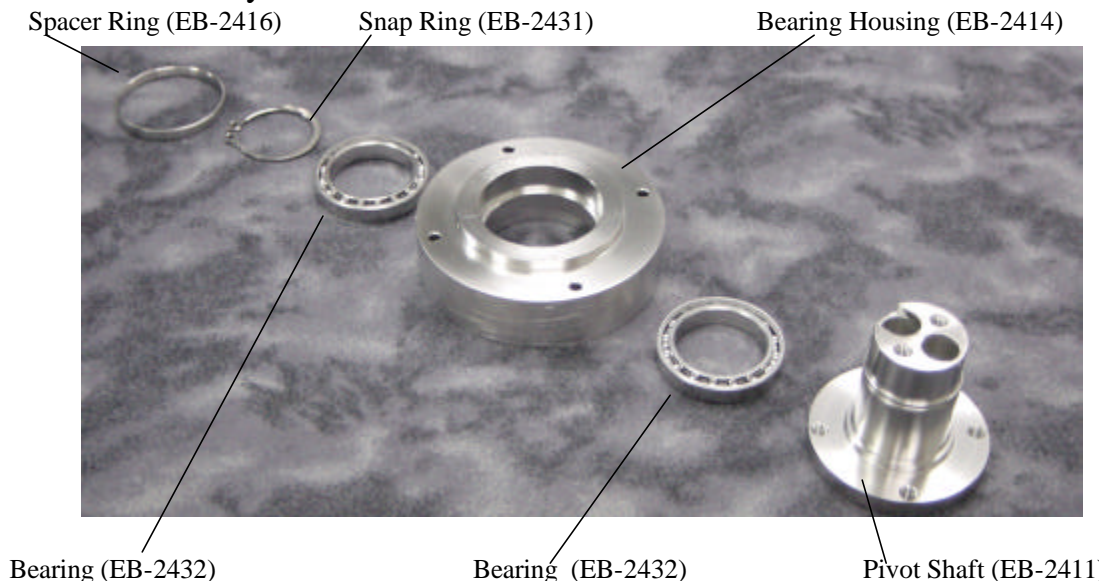
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The Coil Connector Assembly (EB-2456) consists of (2) Ceramic Inserts (EB-2452B), (4) Kapton Wire Assemblies (EB-2456-1)(standard length is 2'), (1) Coil Connector Housing (EB-2452A ) and (2) #4-40 x 3/16" pan head screws



## ***Bearing Housing Sub Assembly***

Mount (1) Bearing (EB-2432) onto Pivot Shaft (EB-2411). Next place the bearing housing onto the pivot shaft and place the next Bearing (EB-2432) onto the pivot shaft. ***Carefully mount the snap ring into the slot on the pivot shaft, being careful not to scratch the sealing surface of the pivot shaft.*** Next, mount the Spacer Ring (EB-2416) into the assembly. Mount the spacer ring into the assembly.

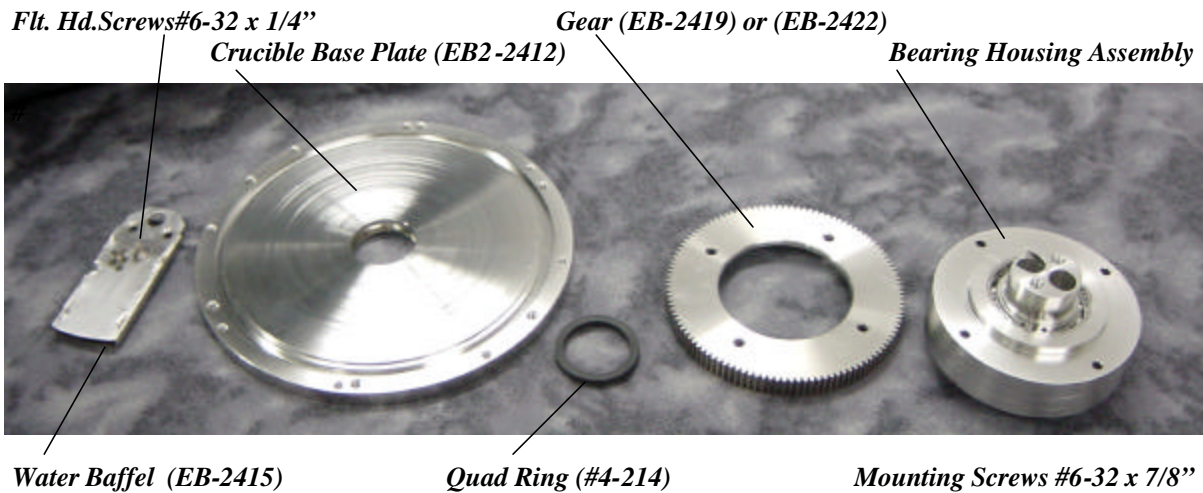


## ***Crucible Rotation Assembly***

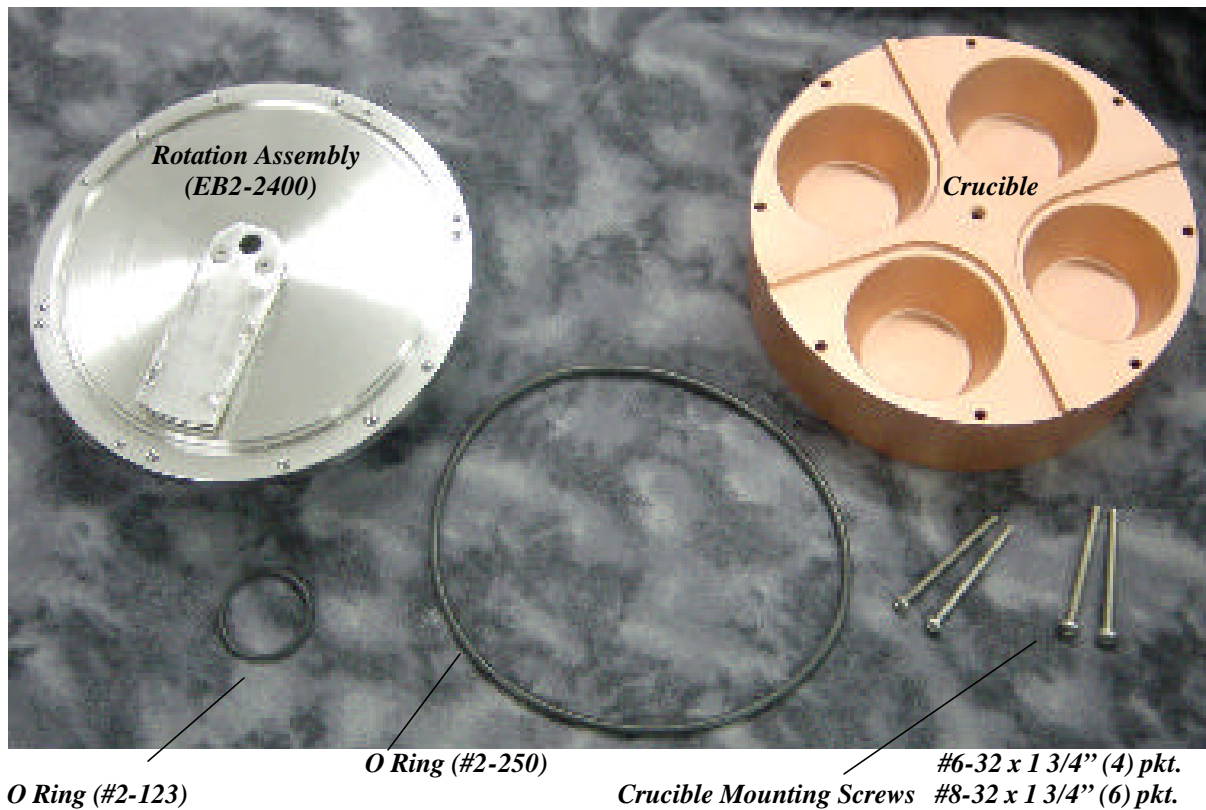
For this part of the assembly, you will need Apizon grease (type M) for the Quad Ring (#4-214) to fully lubricate the quad ring. Install the quad ring into the Crucible Base Plate (EB2-2404). Now you will need a gear, Bottom Drive Spur Gear(EB-2420), or the Side Drive Gear (EB-2422). Mount the gear facing down onto the bearing housing assembly; next, place the Quad Ring Tool (EB-2433) onto the top of the pivot shaft. ***Note: this will help keep from tearing the quad ring during assembly.*** Mount the crucible base with the quad ring installed onto the quad ring tool, and gently push down while rocking it slightly back and forth. Once in place, turn the assembly over and install (4) #6-32 x 7/8" screws into the bearing housing and snug down.

Turn the assembly back over and remove the alignment cone. Install the Water Baffle (EB-2415) using (2) # 6-32 x 1/4" flat head screws.  ***Holding bearing housing, rotate the water baffle to insure free movement.***

## Rotation Assembly (EB-2400)

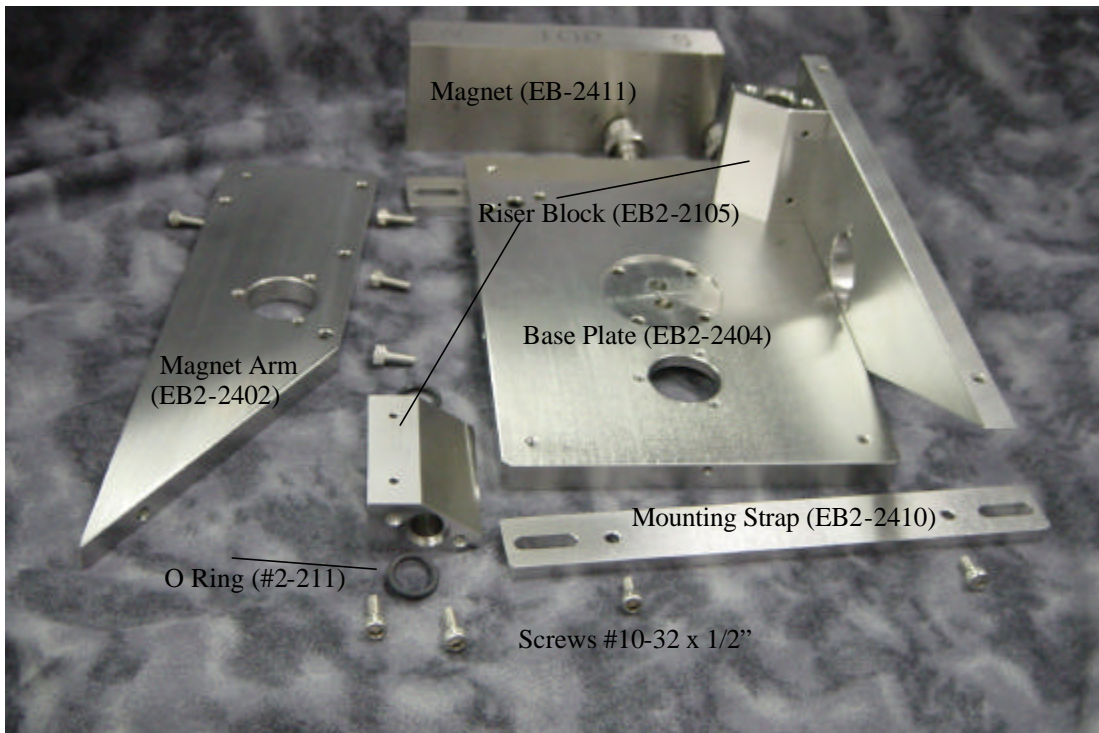


## Rotation Final Assembly



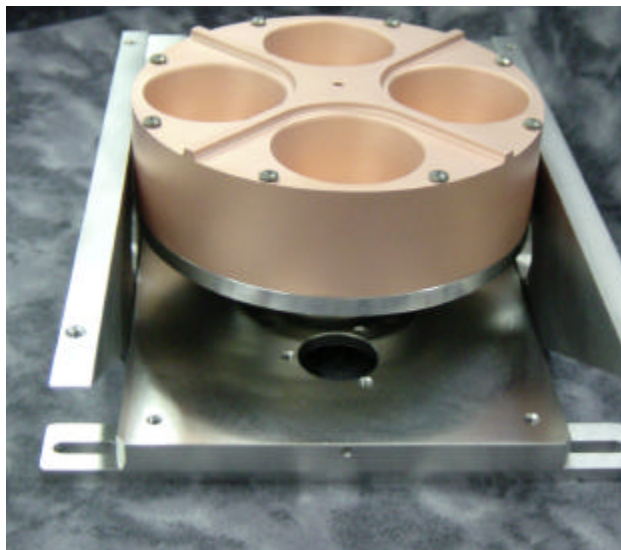
## ***Base Plate Assembly***

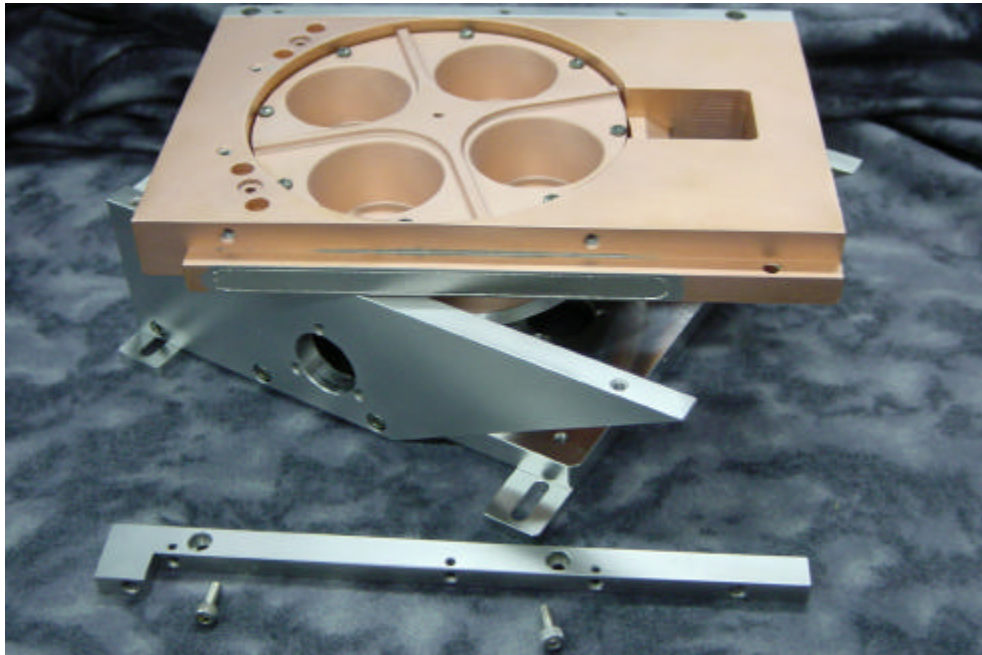
The Base Plate assembly consists of; (1) Base Plate (EB2-2404), (2) Magnet Arms (EB2-2402), (2) Riser Block (EB2-2405), (4) O-Rings (#2-211), use (4) #10-32 x 3/8" screws to mount the (2) Mounting Straps (EB2-2410), (1) Magnet (EB-2411), (*South facing the left side of source from front*), and (12) #10-32 x 1/2" screws.



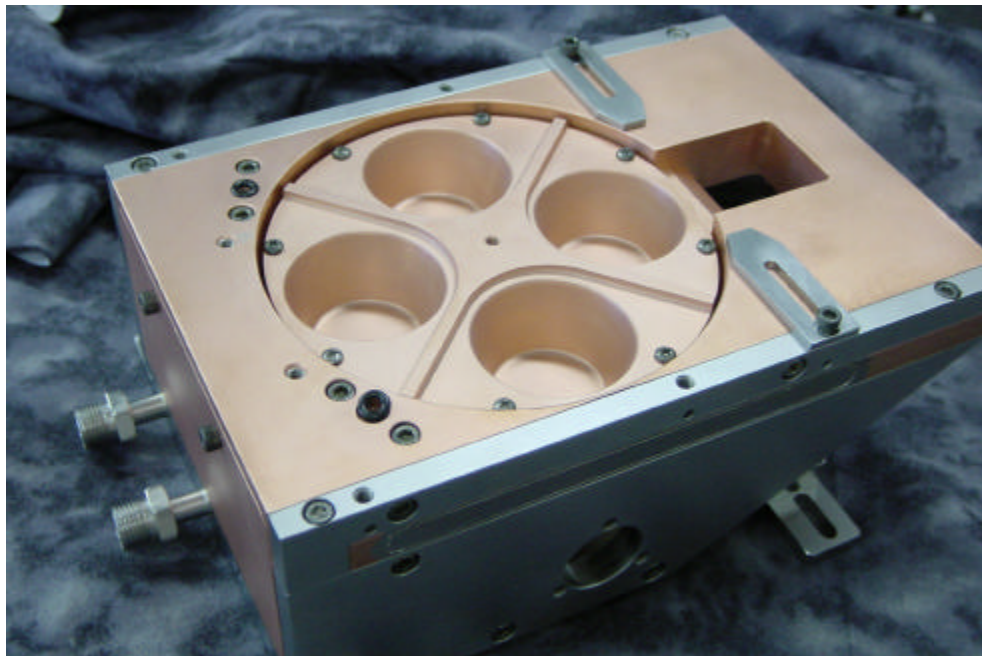
Mount the Crucible Rotation (EB2-2400) to the base plate assembly with (4) #10-32 x 1/2" screws.

***Note: the water baffle faces the front of your source.***



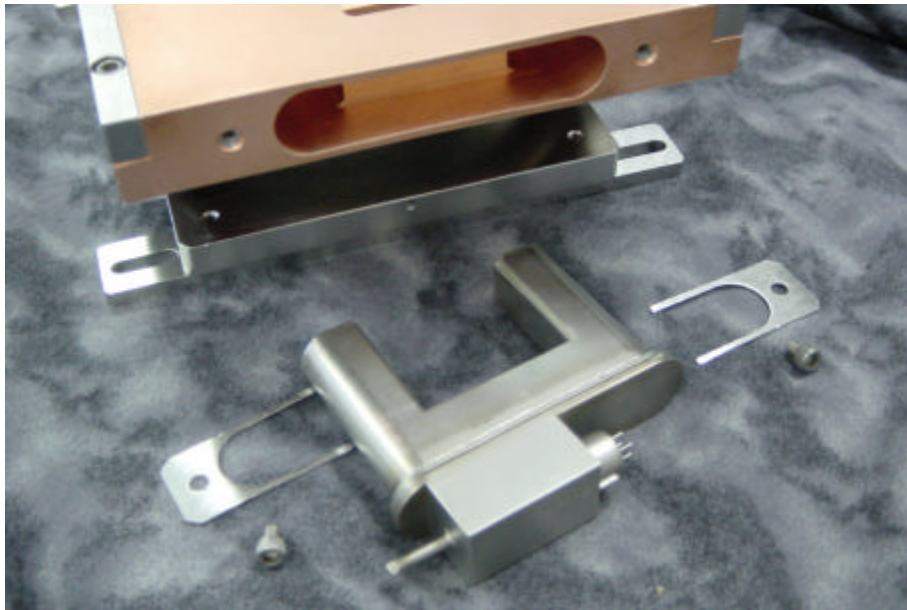


Insure the (2) O Rings (2-111) are in place on top of the riser blocks. Mount the Coil Housing (EB2-2404) onto the source base assembly. Next, mount the Field Extensions (EB2-2409) (***with the counter bore facing out***), onto the side of the coil housing with (4) 10-32 x 1/2" screws. Finish the assembly with (8) 10-32 x 1" screws.

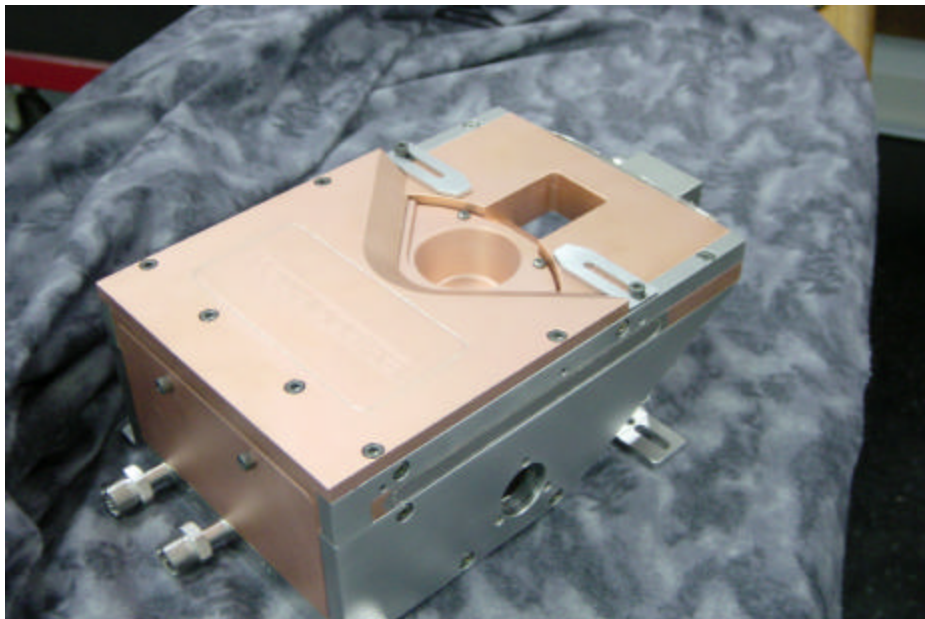


Next, mount the (2) Pole Extensions (EB-2421) with (2) 10-32 x 3/8" screws and install (2) O Rings (2-106) into the Coil Housing (EB2-2404)

Now you can mount the Cover Plate (EB2-2408x) onto the assembly using (6) 10-32 x 1/2" screws. Place (2) O Rings (2-110) into the water line fittings welded to the source base plate. Next mount the Coil Assembly (EB-2450-1) into the coil housing with the Coil Clips (EB-2455) using (2) #10-32 x 1/4" screws. Mount Rear shield (EB2-2417) with (2) 10-32 x 1/2" screws. Finally, install the emitter assembly with (1) #6-32 x 3/8" screw. You can now leak check your assembly.



***Note: Mount the drive onto your source with (3) 10-32 x 3/8" screws before installing into your system.***





## EB-2 Source Assembly Parts List

<i>Description</i>	<i>Part #</i>	<i>Qty.</i>	<i>Reference Page</i>
<i>Base Plate</i>	<i>EB2-2404</i>	<i>1</i>	<i>5.8</i>
<i>Mounting Strap</i>	<i>EB2-2410</i>	<i>2</i>	<i>5.8</i>
<i>Riser Block</i>	<i>EB-2405</i>	<i>2</i>	<i>5.8</i>
<i>Field Extension RH</i>	<i>EB2-2409R</i>	<i>1</i>	<i>5.9</i>
<i>Field Extension LH</i>	<i>EB2-2409L</i>	<i>1</i>	<i>5.9</i>
<i>Magnet Arm RH</i>	<i>EB2-2403</i>	<i>1</i>	<i>5.8</i>
<i>Magnet Arm LH</i>	<i>EB2-2402</i>	<i>1</i>	<i>5.8</i>
<i>Pole extension</i>	<i>EB-2421</i>	<i>2</i>	<i>5.9</i>
<i>Crucible Rotation Assy.</i>	<i>EB2-2400</i>	<i>1</i>	<i>5.7</i>
<i>Coil Plate Housing</i>	<i>EB2-2406</i>	<i>1</i>	<i>5.9</i>
<i>Permanent Magnet</i>	<i>EB-2411</i>	<i>1</i>	<i>5.8</i>
<i>Crucible Cover Plate</i>	<i>EB2-2408x</i>	<i>1</i>	<i>5.10</i>
<i>Crucible</i>	<i>EB2-2xxx</i>	<i>1</i>	<i>5.7</i>
<i>Rear Shield</i>	<i>EB2-2417</i>	<i>1</i>	<i>5.10</i>
<i>Coil Clip</i>	<i>EB-2455</i>	<i>2</i>	<i>5.10</i>
<i>Emitter Assy.</i>	<i>EB-1087</i>	<i>1</i>	<i>5.1</i>
<i>Coil Connector</i>	<i>EB-2456</i>	<i>1</i>	<i>5.5</i>
<i>Coil Assembly</i>	<i>EB-2450-1</i>	<i>1</i>	<i>5.5</i>
<i>VCR Nut, Female</i>	<i>EB-2304c</i>	<i>2</i>	<i>1.1</i>
<i>VCR Gland</i>	<i>EB-2304b</i>	<i>2</i>	<i>1.1</i>
<b><i>O Rings</i></b>			<b><i>Mtl.</i></b>
<i>Water Line</i>	<i>2-110</i>	<i>2</i>	<i>viton</i>
<i>Bottom Pivot Shaft</i>	<i>2-123</i>	<i>1</i>	<i>viton</i>
<i>Riser Block</i>	<i>2-111</i>	<i>4</i>	<i>viton</i>
<i>Crucible Cover Plate</i>	<i>2-106</i>	<i>2</i>	<i>viton</i>
<i>Crucible</i>	<i>2-250</i>	<i>1</i>	<i>viton</i>
<b><i>Screws</i></b>	<b><i>Type</i></b>		<b><i>Mtl.</i></b>
<i>6-32 x 3/8"</i>	<i>socket head cap</i>	<i>1</i>	<i>sst</i>
<i>10-32 x 1/4"</i>	<i>socket head cap</i>	<i>2</i>	<i>sst</i>
<i>10-32 x 3/8"</i>	<i>socket head cap</i>	<i>4</i>	<i>sst</i>
<i>10-32 x 1/2"</i>	<i>socket head cap</i>	<i>20</i>	<i>sst</i>
<i>10-32 x 1"</i>	<i>socket head cap</i>	<i>8</i>	<i>sst</i>

# 6

## Trouble Shooting

### Power Problems:

**Emission Current:** *must be turned higher than normal to evaporate !*

*Cause: Filament is warped badly or was installed backwards.*

*Correction: Remove emitter assembly and replace filament.*

**Emission Current:** *Goes to Maximum when voltage is turned on!*

*Cause: Metal flakes shorting emitter, or ceramics are coated with metal.*

*Correction: Ohm emitter assembly, remove metal flake, or replace ceramics. Re Ohm assembly, (0) Ohm to ground.*

### No Emission Current!

*Cause 1: Filament broken or leads loose.*

*Correction: Replace filament and tighten connections.*

### ***No Voltage!***

*Cause: High ground resistance.*

*Correction: Check emitter, filament, or HV feedthru for shorts.*

### **Beam Problems:**

***No beam visible in crucible as current is increased !(Note: Do not exceed 60 ma in this condition)***

*Cause 1: Magnet reversed.*

*Correction: Reassemble source with magnet's "S" end to the right side from the rear of your source.*

***Beam centered to the front of crucible, without coil current !***

*Cause 1: Voltage below 10 kV*

*Correction: Adjust voltage to 10kV.*

*Cause 2: Magnet strong*

*Correction: Place a shunt on rear of source, across both arms. Note: This will cause the beam to be defused (fuzzy)*

***Beam Centered to the back of crucible, without coil current!***

*Cause 1: Voltage above 10kV.*

*Correction: Adjust voltage to 10kV.*

*Cause 2: Magnet weak.*

*Correction: Remove shunts. If still weak, regauss magnet.*

**Beam: Does not have the desired shape**

*Cause 1: Filament is warped or misaligned.*

***Correction: Replace filament.***

*Cause 2: Pole extensions are in or out too far.*

***Correction: Adjust pole extensions.***

*Cause 3: Voltage set below 10 kV, will cause beam to spread out .*

***Correction: Adjust voltage.***

**Arcing and Blue Fluorescence Occur in Chamber!**

*Cause: Pressure is too high. Vacuum leak or water leak will cause this condition.*

***Correction: Check recently opened chamber seals, door, or feedthru for clean surfaces. Check water fittings on source, clean and snug. If necessary, leak check chamber.***

**Rotation Problems:**

**Loss of vacuum when crucible is rotated!**

*Cause: Quad ring is leaking.*

***Correction: Replace Quad Ring #4-214***

**Crucible is difficult to rotate!**

*Cause: Quad ring in need of lubrication.*

***Correction: Install new Quad Ring #4-214***

# Repair Supplies

## EB-2 Maintenance Kit

<u>Part Number</u>	<u>Description</u>	<u>Qty.</u>
<u>EB-5200</u>	<u>O Ring Kit</u>	<u>1</u>
<u>EB-5270</u>	<u>Emitter Rebuild Kit</u>	<u>1</u>

## EB-2 O Ring Kit: #EB-5200 (Note: O Ring material: Viton)

<u>#2-123</u>	<u>Bottom, Pivot Shaft</u>	<u>1</u>
<u>#2-106</u>	<u>Crucible Cover Plate</u>	<u>2</u>
<u>#2-110</u>	<u>Water Line</u>	<u>2</u>
<u>#2-111</u>	<u>Riser Block</u>	<u>4</u>
<u>#2-250</u>	<u>Crucible</u>	<u>1</u>
<u>#4-214</u>	<u>Quad Ring, Pivot Shaft</u>	<u>1</u>

## Emitter Rebuild Kit: #EB-5270

<u>EB-1010</u>	<u>Anode Plate</u>	<u>1</u>
<u>EB-1011</u>	<u>Beam Former</u>	<u>1</u>
<u>EB-1017</u>	<u>HV Shield</u>	<u>2</u>
<u>EB-1087</u>	<u>HV Insulator</u>	<u>2</u>
<u>EB-1019</u>	<u>Collar Insulator</u>	<u>2</u>
<u>EB-1018</u>	<u>"L" Insulator</u>	<u>1</u>
<u>EB-1020</u>	<u>Cross Insulator</u>	<u>1</u>
<u>EB-1023</u>	<u>Filament, 7 1/2 turn</u>	<u>5</u>
<u>Screw</u>	<u>6-32 x 1/4"</u>	<u>7</u>
<u>Screw</u>	<u>6-32 x 3/8"</u>	<u>6</u>
<u>Screw</u>	<u>6-32 x 1/2"</u>	<u>2</u>

*Note: All screws: 300 series stainless steel, socket head cap screw*