Instruction Manual No. 0101-8071-4

Model STIH-270-2M
and
Model STIH-270-2MB
Four-Hearth Electron Beam SuperSource™

Airco Temescal, A Division of Airco Inc.

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USER RESPONSIBILITY

This equipment will perform in accord with the instructions and information contained in this manual, and its referenced documents, when such equipment is installed, operated, and maintained in compliance with such instructions. The equipment must be checked periodically. Defective equipment should not be used. Parts that are broken, missing, plainly worn, distorted, or contaminated, should be replaced immediately. Should such repair or replacement become necessary, Airco recommends that a telephonic or written request for service advice be made to Airco Temescal.

The equipment, or any of its parts, should not be altered without the prior written approval of Airco Temescal. The user and or purchaser of this equipment shall have the sole responsibility for any malfunction which results from improper use, faulty maintenance, damage, improper repair or alteration by any party other than Airco Temescal.

SAFETY

1) Do not work alone.

2) Equip the system with proper safety interlocks (water, cover, power supply doors, etc.). Never override the interlocks during operation.

3) Make sure the controlling power supply has a wall-mounted KEYLOCK main power switch (customer-supplied) to prevent turning on the power by mistake.

4) Assume when working inside the chamber that all the components may be at lethal potential.

5) Do not touch high voltage leads.

6) Use ground hooks to ground the equipment.

7) If no adequate earth ground exists, refer to the installation section for instructions on establishing ground.

8) Never leave loose ends on high voltage equipment.

9) Post high voltage warning signs conspicuously in operating areas.

10) The preferable location of the SuperSource™ in the system chamber is with its back facing away from all foot traffic.

11) The preferable location of the viewing port is above and to the side of the SuperSource.

12) Wear safety glasses as required.

13) Allow only experienced personnel in the operating area; keep others out.

CONTENTS

REFERENCE DRAWINGS FOR MODEL STIH-270-2M

412-1274-G	STIH-270-2M Electron Beam Source Assembly
0412-1274-0G	STIH-270-2M Electron Beam Source Assembly Parts List (3 pages)
0412-1274-1G	STIH-270-2M Source Assembly Parts List
0412-1274-2G	STIH-270-2M Source Assembly Parts List
0412-1274-3G	STIH-270-2M Source Assembly Parts List
204-0284-A	Emitter Assembly
412-1303-A	Crucible Rotation Assembly
0412-1303-0A	Crucible Rotation Assembly Parts List (2pages)
412-1392-0A	Crucible Rotation Drive Assembly
0412-1392-0A	Crucible Rotation Drive Assembly Parts List

REFERENCE DRAWINGS FOR MODEL STIH-270-2MB

216-9154-E	STIH-270-2MB Electron Beam Source Assembly
0216-9154-0E	STIH-270-2MB Electron Beam Source Assembly (4-Pocket Bottom Drive) Parts List (3 pages)
0216-9154-1E	STIH-270-2MB (6-Pocket) Assembly Parts List
0216-9154-2E	STIH-270-2M with 25 cc Crucible Parts List
216-9163-A	Crucible Rotation Assembly
216-9172-A	Crucible Rotation Drive Assembly

SECTION 1

INTRODUCTION

The Airco Temescal Models STIH-270-2M and STIH-270-2MB Electron Beam SuperSources each have four crucibles. They are designed to evaporate four different materials sequentially or to provide a long uninterrupted run with a single evaporant. Different crucible configurations can be designed to meet customer specifications. The 2M model has a choice of right or left-hand drive assembly and the 2MB model indicates the drive is through the bottom. Except for this distinction the units are identical. Appropriate reference drawings are included for each model.

SECTION 2

COMPONENTS AND SPECIFICATIONS

The components described below are shown in figures 1 and 2. See the maintenance section of this manual for exploded photographs of these components.

2.1 CRUCIBLE AND DRIVE ASSEMBLIES

The four crucibles of the SuperSource are spaced at quadrants around the top of the circular crucible assembly. While one crucible is in position for evaporation, the other three are shielded by the housing. The bottom of the crucible assembly has a

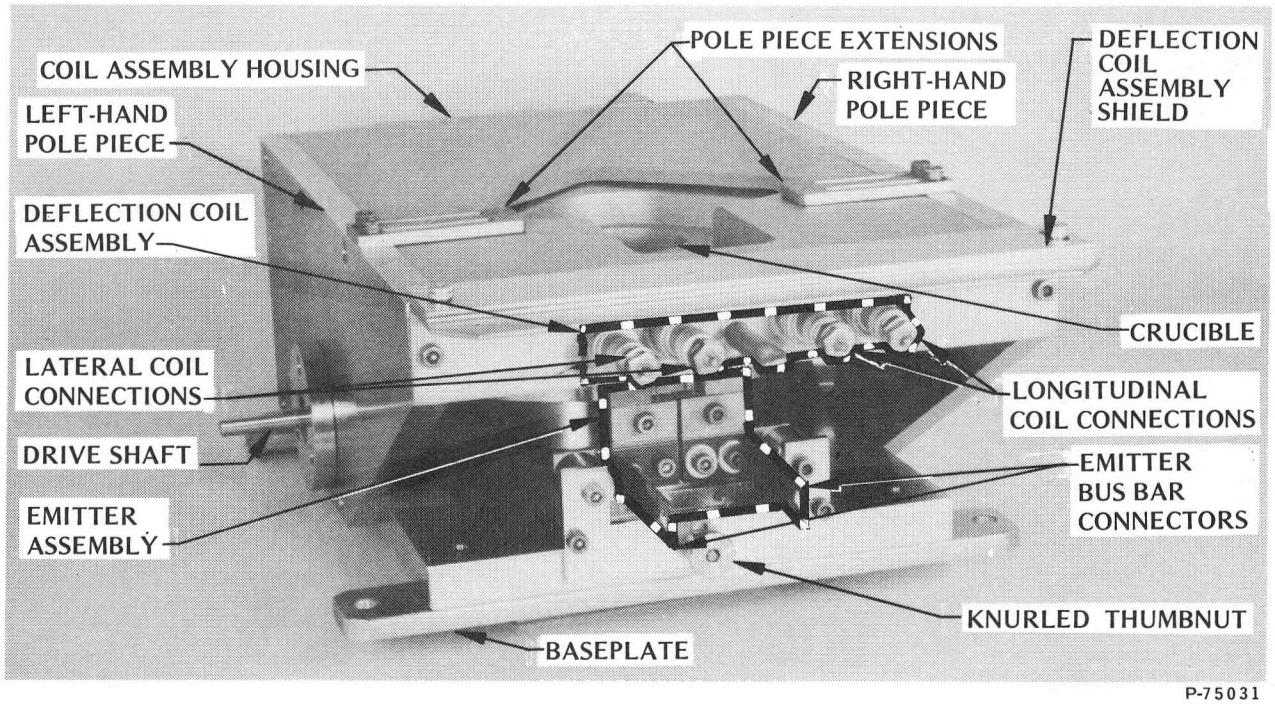


Figure 1. The STIH-270-2M SuperSource, front view

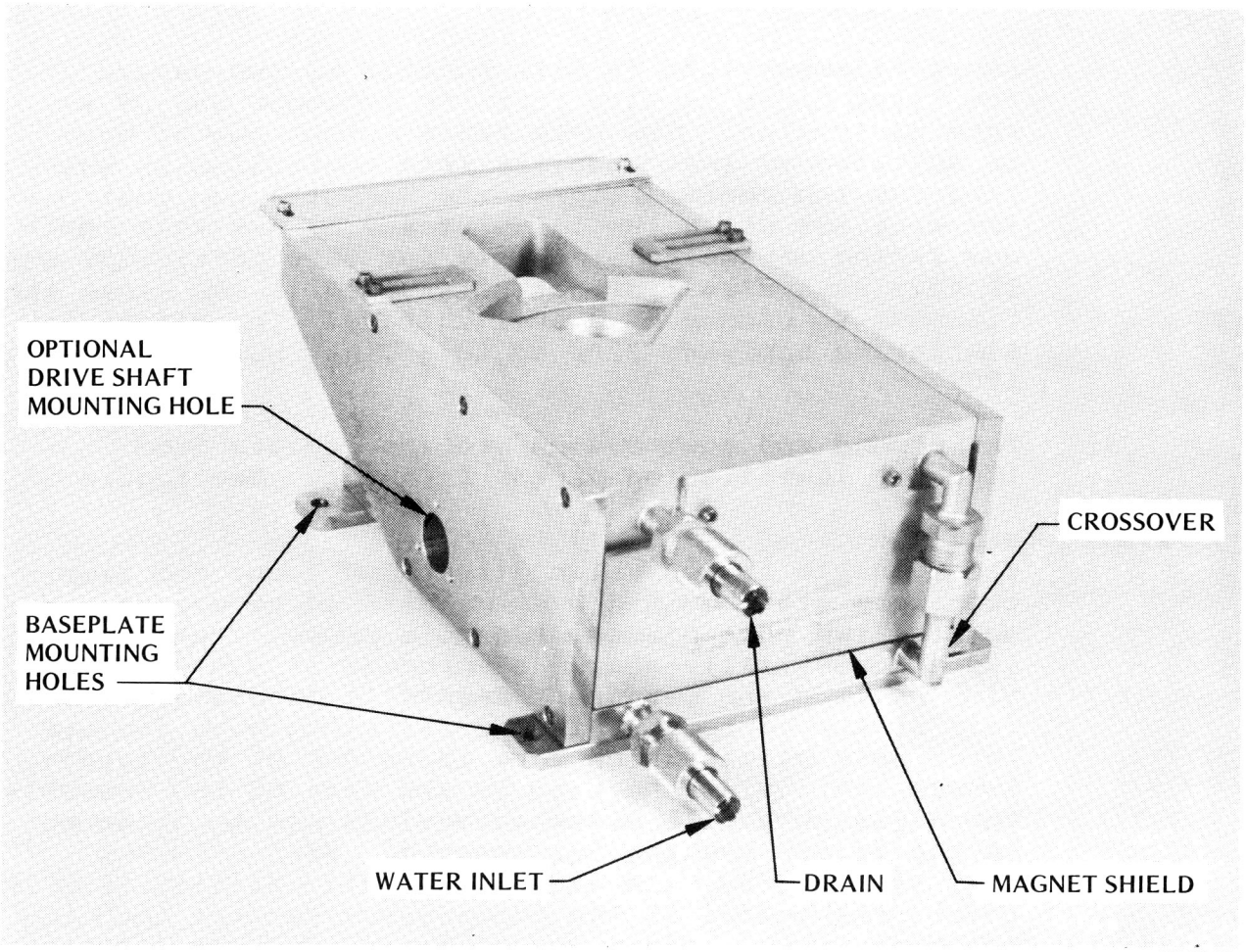


Figure 2. The STIH-270-2M SuperSource, rear view

gear ring which mates with the gear on the inner end of the drive assembly shaft. On the 2M model the outer end of the 1/4-inch-diameter shaft extends horizontally from the housing (to either side, as desired) and is machined flat to accept a mechanical coupling. On the 2MB model, the feed is through the bottom. One turn of the drive shaft equals one-quarter turn of the crucible assembly.

2.2 EMITTER ASSEMBLY

The emitter assembly generates the electron beam. It is located on the front of the SuperSource, and consists essentially of an electron-emitting filament and a beam former. The filament is easily replaced; the entire unit can be disassembled for cleaning.

A filament should last 100-plus hours of operating time while evaporating metals. Shorter life can be expected when evaporating dielectric materials because of the localized high pressure in the area of the filament.

Short filament life is attributable to two causes. The first cause results from the improper use of a rate controller. The rate range potentiometer must be adjusted so that when the rate controller is putting out its maximum signal the Temescal gun controller will not drive the filament any harder than maximum rating of the power supply for that particular gun. If this rate signal is not attenuated it can cause the filament to open due to over-voltage. The effect is similar to applying 220V ac to a light bulb rated 120V ac.

The second and most common problem results from improper installation of the filament. See figure 9d.

2.3 MAGNETS

The magnetic fields which direct and focus the electron beam are provided by a main-field permanent magnet, two pole pieces, two pole piece extensions, and a hermetically-sealed electromagnet (the deflection coil). The permanent magnet is located at the rear of the source. This magnet, along with the two large pole pieces which form the sides of the SuperSource, maintains the beam on the area of the crucible. The adjustable pole piece extensions may be attached on top of the housing, or removed. When attached, they tighten the beam (see figure 3). Sliding them in toward the center of the SuperSource further tightens the beam; sliding them out diffuses the beam. (When they are slid out as far as possible with the screws

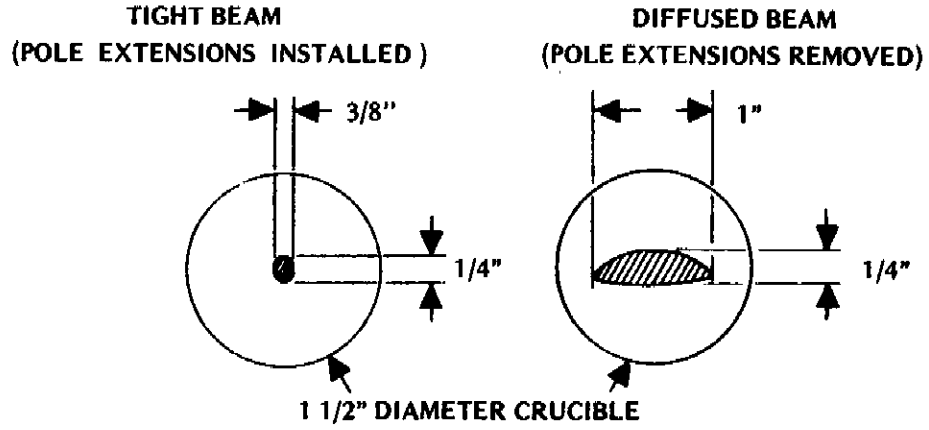


Figure 3. Approximate spot size with pole piece extensions on and off

still engaged, the effect is the same as if they were removed.) The deflection coil is used for more accurate beam positioning and for X-Y sweep.

2.4 COOLING SYSTEM

Water circulates through canals in the baseplate and housing for cooling during operation. The water inlet and outlet are located on the rear of the SuperSource.

2.5 ACCESSORIES

2.5.1 Feedthroughs

The feedthroughs described below are essential for SuperSource installation.

a) High Current Octal (part number 0402-7463-0, o-ring sealed; 0502-0093-0, metal sealed): This feedthrough provides power for the deflection coil. The conductors are 0.064-inch diameter (1.6 mm) beryllium copper wire. Connectors and mating plugs are included, and connecting pins are provided for the o-ring sealed model. Maximum bakeout temperature is 125°C (257°F).

b) High Voltage (part number 0718-8483-0, 1-inch-diameter, o-ring sealed; 0020-7572-1, 1-1/4-inch-diameter, o-ring sealed; 0302-2573-0, metal-sealed): This feedthrough provides power for the emitter. The conductors are 5/16-inch (7.8 mm) OFHC copper rods with ceramic insulators. The vacuum end of the rod is shielded to protect the ceramic from evaporants and high voltage arcing. (An external protective shield, such as the Airco Temescal High Voltage Enclosure, part number 0503-1563-0, should be used with this feedthrough for safety.)

c) Water (part number 0902-0193-0, o-ring sealed; 0902-0173-0, metal-sealed): This feedthrough provides water for cooling the crucible. An adjustable flow switch is included. Maximum pressure rating is 100 psig (7.0 kg/cm^2).

d) Rotary Motion, Model BR-2B (part number 0918-6483-0): This bellows-sealed feedthrough may be used manually or in conjunction with an external motor.

2.5.2 SuperSource Installation Kit

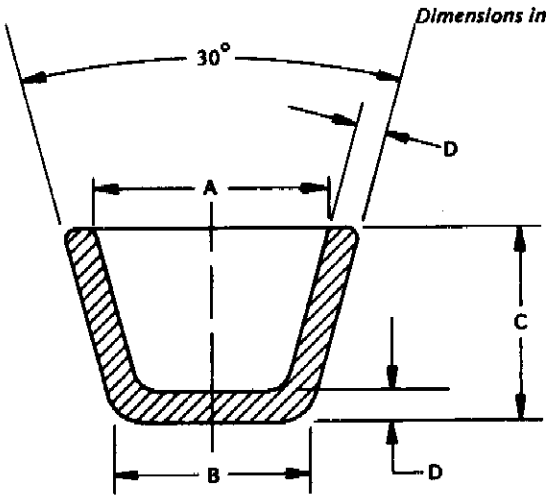
This installation kit (part number 0503-0201-1) contains the feedthroughs described above. All feedthroughs in the kit are o-ring models, designed to mate with 1-inch bolt holes.

2.5.3 Turret Indexing Controller and Drive Mechanism
The turret indexing controller (part number 0408-9770-0) is a quarter-rack panel which controls the drive mechanism (part number 0212-6664-0). The panel includes a position indicator. These accessories are ideal for systems where automatic or semiautomatic operation is desired.

2.5.4 Crucible Liners
Crucible liners are used to increase evaporation rates by reducing the thermal conductivity between the evaporant and the water-cooled crucible. The crucible liners described below are available for the Super-Source. The dimensions of these liners are shown in figure 4.

a) Molybdenum (part number 0503-0292-0): These high-strength inserts are machined from solid-rod molybdenum. Caution should be exercised when using molybdenum inserts, because some metals alloy with molybdenum.

b) Intermetallic Composite (titanium diboride/boron nitride) (part number 0503-0302-0): The most common use of intermetallic inserts is for evaporating aluminum. The intermetallic composite should not be used with materials that react with boron



MATERIAL	A	B	C	D	Volume (cc)
Molybdenum	1.230	1.130	0.670	0.125	10
Intermetallic Composite	1.230	1.130	0.670	0.125	10
Graphite	1.230	1.130	0.670	0.125	10
Vitreous Carbon	1.300	1.130	0.670	0.093	11

Figure 4. Crucible liner specifications for the STIH-270-2M and STIH-270-2MB (dimensions in inches)

(nickel, silicon, iron, silicon monoxide, silicon dioxide, cobalt, titanium) or with metals of high melting temperatures, such as tantalum or tungsten. Intermetallic inserts have good thermal shock resistance up to 1800°C (3272°F).

c) Graphite (part number 0503-0292-1): These inserts are machined from ATJ-grade, solid-rod graphite. Materials such as pure gold, silver, and copper do not alloy with graphite and are easily removed from the insert.

2.6 SUPERSOURCE SPECIFICATIONS

a) Crucible diameter:	1.5 inches (38 mm)
b) Crucible volume (each):	15 cc
c) Maximum power:	10 kW
d) Emission voltage	4 kV to 10 kV
e) Maximum bakeout:	150°C
f) Filament voltage:	5V, maximum
g) Filament current:	35A, maximum
h) Deflection coil current:	3A, maximum
i) Water requirements:	3 gpm, 20°C
j) Rotation torque:	10 inch/pounds

SECTION 3

INSTALLATION

3.1 GENERAL

READ ALL THE INSTRUCTIONS CAREFULLY BEFORE INSTALLING THE SUPERSOURCE.

The installation instructions and safety precautions below are quite specific. Taking a casual attitude toward these instructions may result in inefficient or unsafe operation. The SuperSource is operated in conjunction with a high voltage power supply, which has its own installation and safety requirements. Consult the power supply manual for additional information, particularly concerning interlocks.

3.2 UNPACKING

Remove the source from its shipping container. Do not destroy this container before verifying that the gun is in good working order. While unpacking, check the components in the container against the packing list. Inspect all parts for possible damage in shipping. Any damage should be reported immediately to the carrier and to the Airco Temescal Service Department. Any discrepancy between the parts list and the actual parts received must be reported to Airco Temescal representatives.

NOTE

To avoid contamination, wear lint-free linen gloves when handling any component used in the vacuum chamber.

3.3 INSTALLATION REQUIREMENTS

The following components are required for installation of the SuperSource.

a) Water feedthrough and tubing (3/8-inch-o.d. copper or type 304 stainless steel).
b) Low voltage feedthrough and wire for connecting the deflection coil (#16-AWG).
c) High voltage feedthrough and wire for connecting the emitter (#6-AWG flexible copper barewire).
d) High voltage shielding (type 304 stainless steel).

e) A rotary feedthrough and drive shaft or cable for rotating the crucible.
f) Interlock switches (see below).
g) A water supply with a minimum flow of 3 gallons (7.6 liters) per minute.

CAUTION
Inadequate water flow may cause the crucible to alloy with the evaporant. Damage caused by inadequate water flow is not covered by the warranty.

h) A high voltage power supply.
i) A magnetic shunt (if two SuperSources are being installed in one chamber).
j) (Optional) A water-cooled shield for secondary electrons (see paragraph 3.4.9).

3.4 INSTALLATION (figure 5)

CAUTION
THE SUPERSOURCE MUST BE MOUNTED ON NON-MAGNETIC MATERIAL. MOUNTING ON MAGNETIC MATERIAL WILL SEVERELY DISTORT THE SUPER-SOURCE'S MAGNETIC FIELD.

3.4.1 Position the SuperSource

The location of the SuperSource depends on several factors. The source must be level. The operator should be able to view the SuperSource from the side. The SuperSource should not be oriented so that the back of it points toward the operator or toward a work area. The high voltage leads should be kept short (4 to 8 inches, 100 to 200 mm) because long leads complicate the problem of shielding. If two SuperSources are to be installed in one chamber, the requirements of the second source must be taken into account. For flexibility, the SuperSource is designed so that the drive shaft may extend from either side or, in the case of the STIH-270-2MB, from the bottom.

Once the optimum location has been determined, bolt the SuperSource loosely to the baseplate. Tightening down the bolts at this point would make connecting the water lines more difficult.

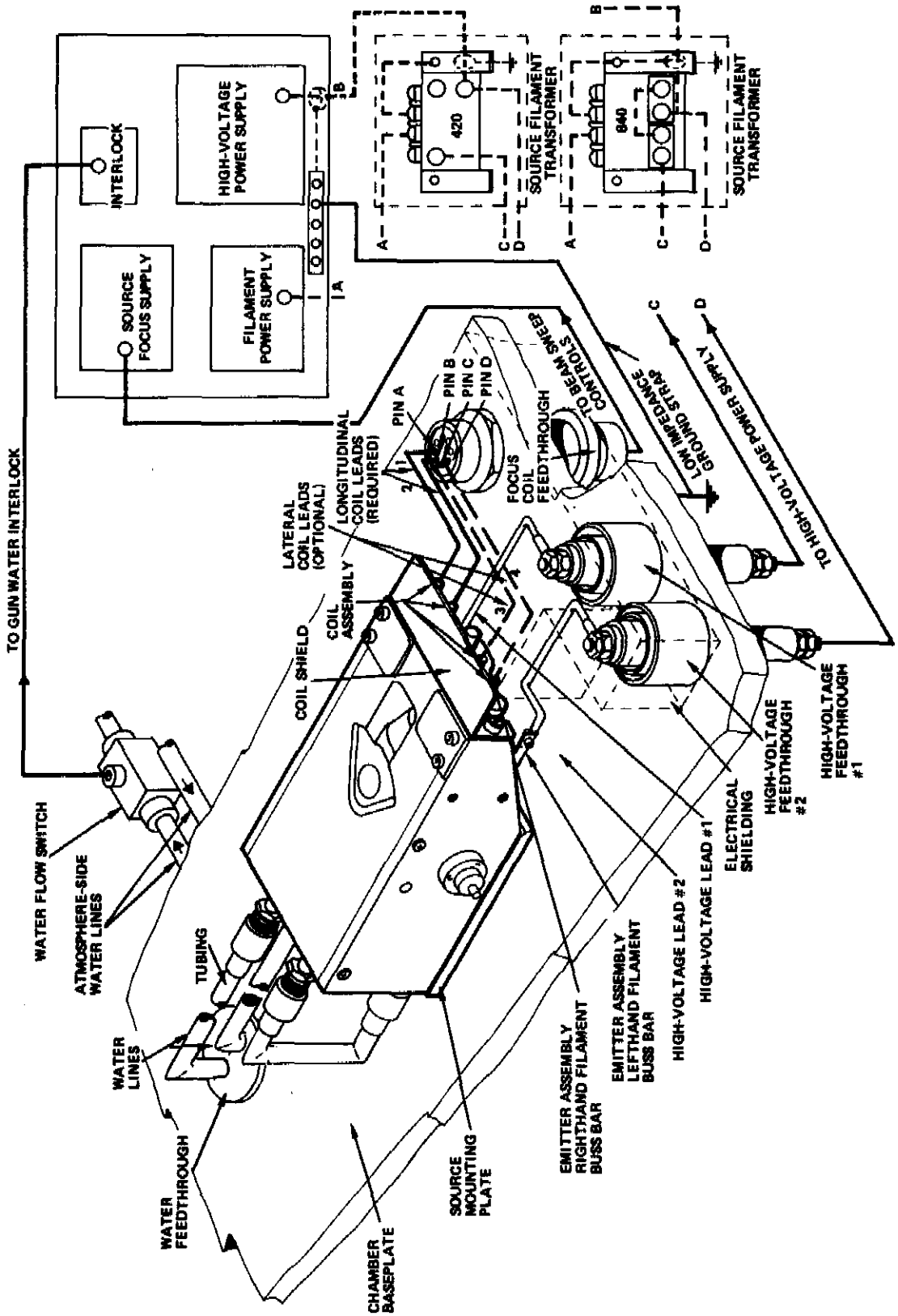


Figure 5. STIH-270-2M installation diagram

3.4.2 Install the Water Lines

a) Unscrew the connectors and remove the RL gaskets.
b) Remove the water lines from the chamber.
c) Make sure the surfaces to be joined are bright clean. Use abrasives as necessary.
d) Before joining, make sure the connecting nut is over the water line. (After joining, there is no way to put it on.)
e) The most common method of joining the lines is silver soldering. Use 3/8-inch-o.d. copper tubing. Make the bends before bolting the SuperSource tightly against the baseplate. Make sure the bends are at least 1/2-inch from the connection. Avoid putting any tension on the connections. If the source is left loosely bolted, the bends can be gradually readjusted so that no tension results when the SuperSource is tightened down. It may be necessary to work between the connections and baseplate bolts, tightening first one, then the other.

   A second method is heliarc welding. In this case, use 3/8-inch, type 304 stainless steel tubing.
f) Coat the gaskets with vacuum grease (Apiezon L, or equivalent) and put them in place.

3.4.3 Mount the SuperSource on the Baseplate

When the water lines are joined and the connections mated, tighten down the mounting bolts. Make a positive ground through the mounting bolts.

3.4.4 Connect the Drive Shaft

The end of the drive shaft is machined flat to receive a coupling connecting setscrew.

3.4.5 Attach Leads to the Deflection Coil Assembly

Use #16-AWG wire. Pliable Teflon tubing, glass sleeving, or ceramic beads can be used to insulate these leads. (Make sure there are no shorts to the surrounding environment.) The two leads on the right are for longitudinal sweep; the two on the left are for lateral sweep.

NOTE

When connecting the deflection coil to the power supply, make sure that the polarity matches the polarity of the coil (positive grounded, negative to control). Damage resulting from connecting these leads in reverse order is not covered by the warranty.

3.4.6 Connect the High Voltage Leads to the Emitter Bus Bar Connectors

Use the #6-AWG copper barewire supplied with the SuperSource. (1/16-inch x 1/2-inch copper straps are an acceptable alternative.) Facing the connectors, the left-hand side is the common and the right-hand side is insulated.

3.4.7 Install High Voltage Shielding

Shielding of the high voltage leads is required for the following reasons. Over a period of time, evaporant material accumulates on the inner surfaces of the chamber. When this material subsequently begins to flake off, some of it will fall onto the high voltage leads and cause arcing. Also, the electron beam ionizes gas molecules present in the chamber during evaporation. These positively-charged ions produce a sputtering effect which corrodes the metal when they are attracted to the SuperSource cathode.

The shielding configuration should be determined with these two factors in mind. Figure 6 shows a typical shielding layout. Shielding material should be type 304 stainless steel. The shields should be placed at least 1/4 inch from the high voltage feedthrough. Grounded components should not be in the shielded area.

3.4.8 (Optional) Install a Shutter

The shutter must be at least 3 inches above the hearth.

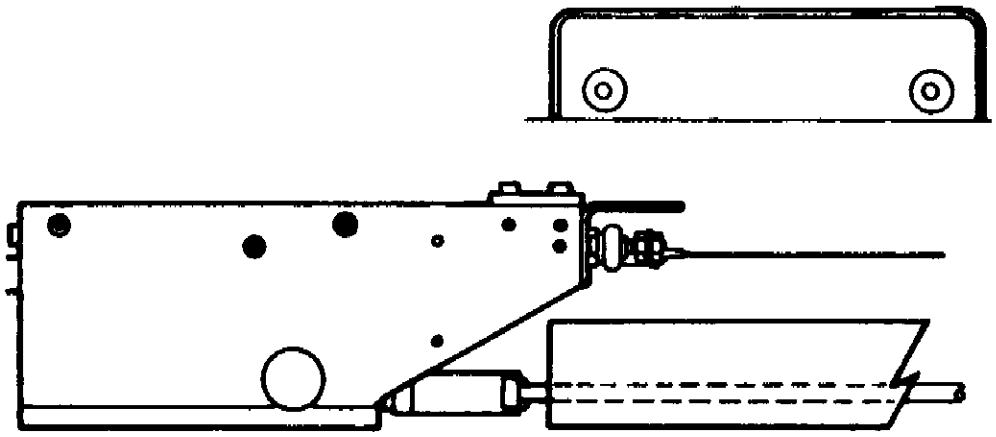


Figure 6. Schematic diagram of high voltage shielding layout

3.4.9 (Optional) Install Secondary Electron Shielding

When evaporating materials with a high atomic weight, such as tungsten or gold, a secondary beam may bounce off the evaporant and arch back toward the rear of the gun where the water lines are located. If this is likely to occur, a water-cooled shield at least 5 inches (127 mm) high should be installed at the rear of the gun.

3.4.10 Connect All Protective Interlocks

Minimum interlocking associated with the chamber includes a water flow switch and a chamber closure switch. Pressure interlocking is desirable in some applications and additional interlocking may be required at the power source.

3.4.11 Make the External Connections

a) Low Voltage Leads: Provide an external positive ground to the baseplate and an auxiliary ground between the baseplate and the power supply.
b) High Voltage Leads: Use #6-AWG copper wire with 10 kV insulation. Space these leads at least 1-1/2 inches from ground potential. Be careful in routing high voltage cables. They should be loose, rather than taut; avoid sharp bends. The cables should not be near heat-producing components. Make sure the ends of the high voltage leads are securely clamped.
c) Water: Minimum pressure requirements must be met to avoid damaging the SuperSource.

3.4.12 Verify Earth Ground

Be sure the earth ground to the building (and hence to the system) is at zero resistance. The water pipes usually provide proper earth ground, but not always. Do not assume their resistance: measure it. When earth ground needs to be devised, two copper-clad steel rods driven in the ground six feet apart with a copper sulfate or salt solution poured around them will provide a reference for establishing ground. Measure the resistance between these rods. Earth ground is established when the resistance is zero.

The SuperSource operates at extremely high voltage with respect to earth ground. It may place ungrounded elements at dangerous potential. This potential varies directly with the coupling between the SuperSource, the components, and the impedance to ground.

3.5 INSTALLING A SECOND SOURCE

When two electron beam sources are installed in one chamber, a shunt bar must be installed between them to prevent the magnetic components in the two sources from affecting each other. Figure 7 shows a suggested configuration, with the water lines used to support the shunt. In many cases, this configuration will need to be modified.

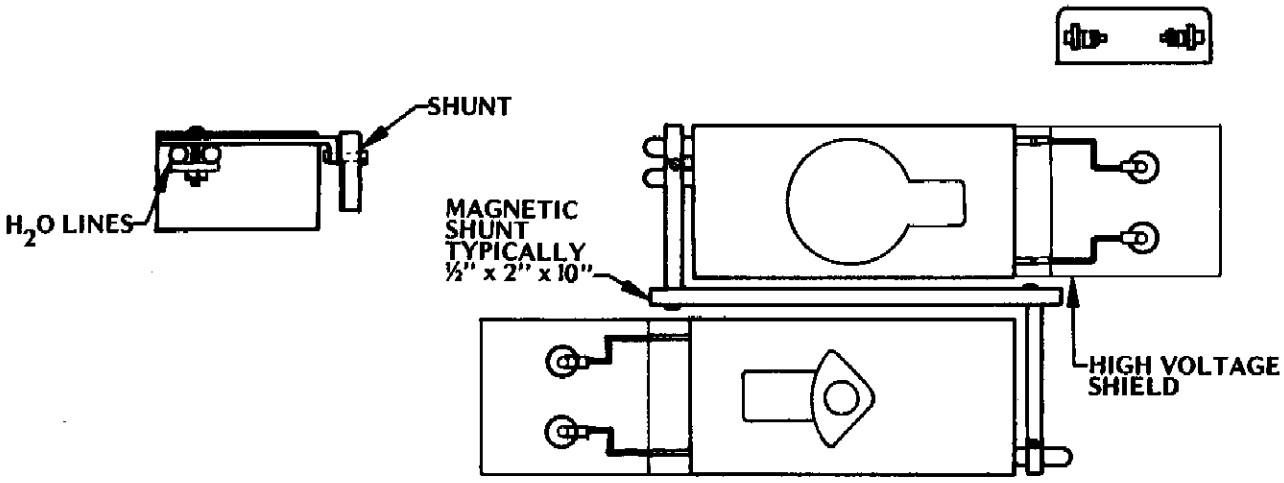


Figure 7. Schematic diagram of typical chamber layout using two sources

SECTION 4

OPERATION

4.1 GENERAL

The following instructions are intended as a general guide only. Details will vary from application to application, and must be determined by the operator. Technical data on various aspects of electron beam deposition are available from Airco Temescal upon request.

4.2 CONTROLS

The electron beam can be controlled electronically by varying emission voltage, emission current, and focus current. The tightness of the beam is controlled by means of pole piece extensions.

4.2.1 Emission Voltage

The SuperSource is designed to operate between 4 kV and 10 kV. Depending on the selected voltage, magnetic shunt bars may be required (see chart below). These shunt bars should be installed as shown in drawing 412-1274.

SHUNT BAR REQUIREMENTS

Emission Voltage	Number of Shunt Bars Required
With Pole Piece Extensions:	
8 to 10 kV	0
6 to 8 kV	1
4 to 6 kV	2
Without Pole Piece Extensions:	
8 to 10 kV	0
6 to 8 kV	1
5 to 6 kV	2

4.2.2 Emission Current

The energy of the beam varies directly with the emission current.

4.2.3 Focus Current

The focus current is the current which passes through the deflection coil. Both longitudinal (X) and lateral (Y) adjustment of the beam's position are possible by adjusting focus current.

4.2.4 Pole Piece Extensions
Figure 3 illustrates the effect of the pole piece extensions.

4.3 OPERATING THE SUPERSOURCE

1) With the vacuum chamber at atmosphere, place the evaporant in the crucibles. Make sure each crucible is at least half full. (See figure 8.)

CAUTION
Evaporating with a crucible less than half full may cause damage to the SuperSource.

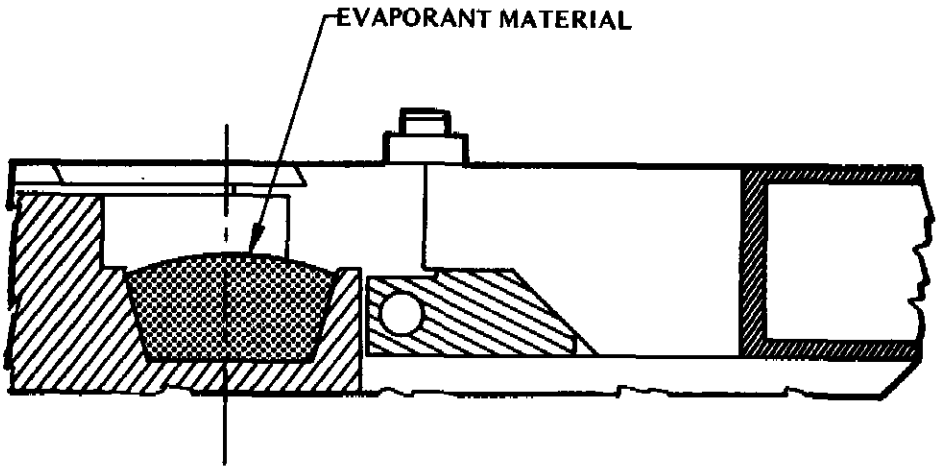


Figure 8. Schematic diagram showing proper evaporant level

2) Verify that all interlocks are satisfied.
3) Evacuate the vacuum chamber to 10^{-4} torr.

NOTE
Continual operation at high pressure (5×10^{-4} or higher) drastically reduces filament life.

4) If the power supply has a variable emission voltage control, set it to the desired level.
5) Turn on the high voltage power supply. (Do not apply power to the filament at this point.)
6) Set emission current at the lowest level. This step is critical.

7) Set longitudinal focus current at the lowest level. If the power supply has a lateral focus control, also set the lateral focus current at the lowest level.
8) Apply power to the SuperSource filament and gradually increase emission current to 20 mA. A fluorescence should appear on or near the rear of the evaporant.

CAUTION

If the fluorescence appears at the emitter and bends downward rather than upward, the polarity of the deflection coil has been reversed. Bring the system up to air, reconnect the coil leads properly, and begin again.

9) Using the focus control(s), center the fluorescence on the evaporant. Increasing longitudinal focus current moves the beam toward the deflection coil. When emission voltage is 10 kV, 0.75 amperes will center the beam. Lower current is required for centering at lower voltages.

NOTE

If the beam impinges on the crucible wall instead of the evaporant, copper will be evaporated and the run will be contaminated.

10) Increase emission current very slowly until the beam spot appears in the fluoresced area. Readjust the beam placement as necessary. (Better evaporation rates can be obtained by placing the beam approximately 1/16-inch off center toward the rear of the crucible.)
11) Slowly increase the emission current until the proper evaporation level has been reached.
12) Operation from this point on will vary from application to application.

4.4 VENTING THE SYSTEM

Allow two to three minutes for the filament and emitter assembly to cool before venting. Exposing a hot filament to atmosphere will cause rapid oxidation and shorten filament life.

SECTION 5

MAINTENANCE

5.1 GENERAL

The most common maintenance procedures for the SuperSource are routine inspection, superficial cleaning, replacement of emitter assembly components (particularly the filament), and replacement of the o-rings in the crucible assembly. In addition to the instructions for the above, this maintenance section includes complete disassembly sequences. If thorough cleaning of the entire SuperSource is required, suitable cleaning agents for the various materials used in the SuperSource should be chosen.[1] The parts list tells what material each part is made of. If glass bead honing is used, parts should be ultrasonically cleaned before reinstallation. Airco Temescal sells a spare parts kit which contains all the necessary parts for routine maintenance. These parts are listed as item #22 in the parts list.

5.2 INSPECTION

5.2.1 After Each Run

a) Inspect the pool level in each hearth. Add evaporant as required to maintain proper pool level. (See figure 8.)

b) Look for loose flakes and other debris. Be sure to inspect the area around the emitter assembly, the high voltage insulators, and the high voltage feedthroughs. Debris and flakes blowing into these regions can cause short circuits. Use an industrial vacuum cleaner to remove this material.

5.2.2 Every Eight Hours

a) Check insulators and feedthroughs for cracked or fouled components. Replace cracked insulators and clean fouled feedthroughs. The two high voltage spacing insulators and the four flanged insulators of the emitter assembly can be inspected without taking them apart.

b) Check the emitter assembly for evaporant buildup. Be sure to clean the emitter clamp tracks. Use 240-grit emery paper (or finer). Coarse sand

[1] See *Metals Handbook, Volume II*, American Society of Metals, Metals Park, Ohio.

paper can raise the metal surface enough to cause arcing in the chamber.

c) Examine the crucible for residual waste from the previous evaporation run. If left in the crucible, this material can cause thermal shorts and reduce the evaporation rate.

d) Check the filament. It should be replaced under the following conditions:
   1) Catastrophic failure. The filament has burned apart.
   2) The filament has not burned completely apart, but has thin places in it which cause hot spots at the crucible.
   3) The filament has sagged in the center from running at very high temperatures. (A sagging filament will burn the anode.)
   4) The filament has been improperly installed (backward or badly aligned) and is functioning poorly.
   5) The filament is warped.
   6) The contact areas around the legs of the filament have oxidized so much that a layer of insulation has formed between the filament and the filament clamps.

e) Check the anode. If burned, replace it.

5.3 REPLACING THE FILAMENT OR ANODE AND DISASSEMBLING THE EMITTER

5.3.1 General Disassembly Instructions

a) Wear lint-free linen gloves to handle all components used in the vacuum chamber to avoid contamination. Touching the filament with bare hands will considerably shorten filament life.

b) Be sure the main power supply is off. If the power supply has a keylock switch, keep the key while working inside the chamber.

c) Use grounding hooks.

d) Disconnect the filament leads from either the high voltage feedthrough or the filament bus bars.

5.3.2 Illustrated Step-by-Step Procedure (Figures 9a through 9i)

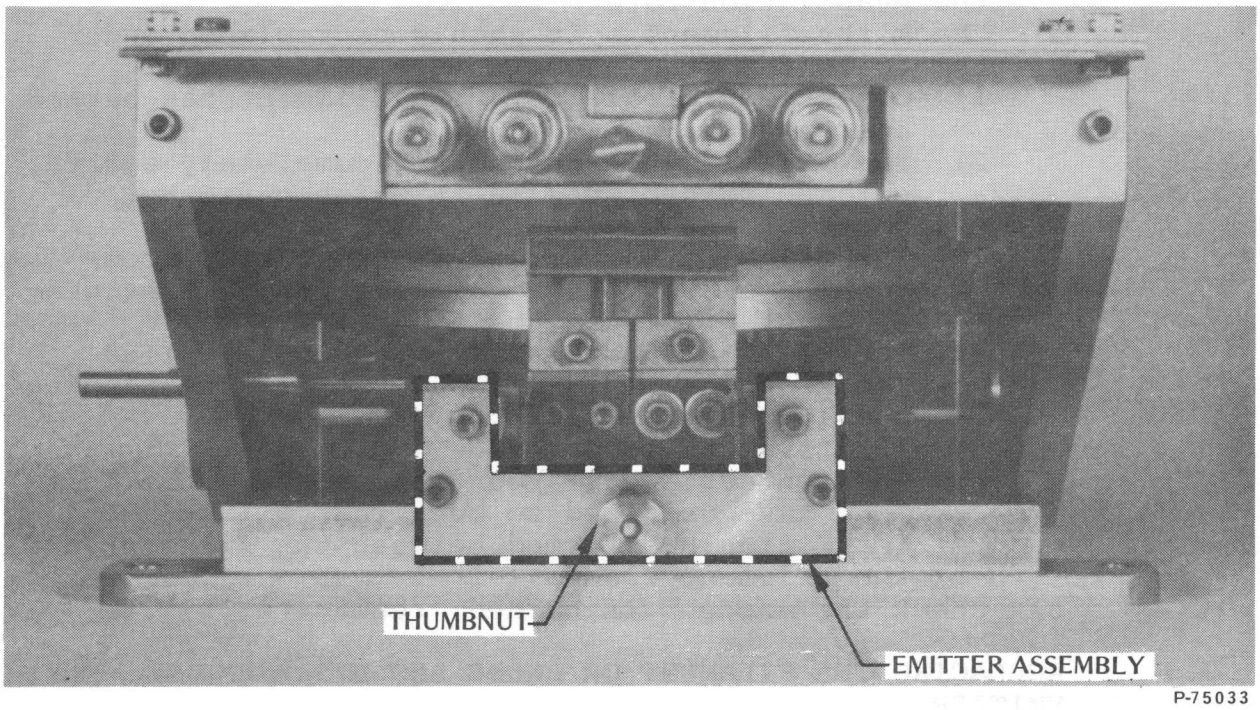


Figure 9a. Remove the knurled thumbnut at the bottom of the emitter assembly. Grasp the sides of the assembly and pull it straight out of the seating.

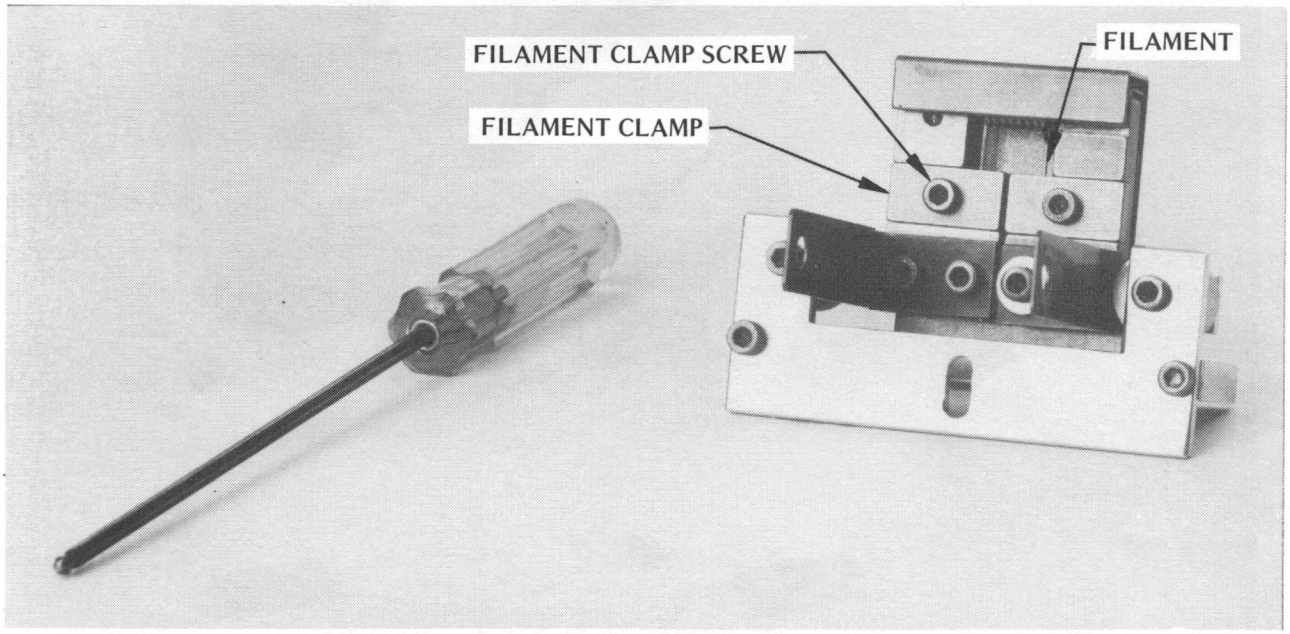


Figure 9b. Using the ball-end tool provided by Airco Temescal, remove the two screws which hold the filament clamps in place. These clamps are grooved on their inside face to receive the filament legs.

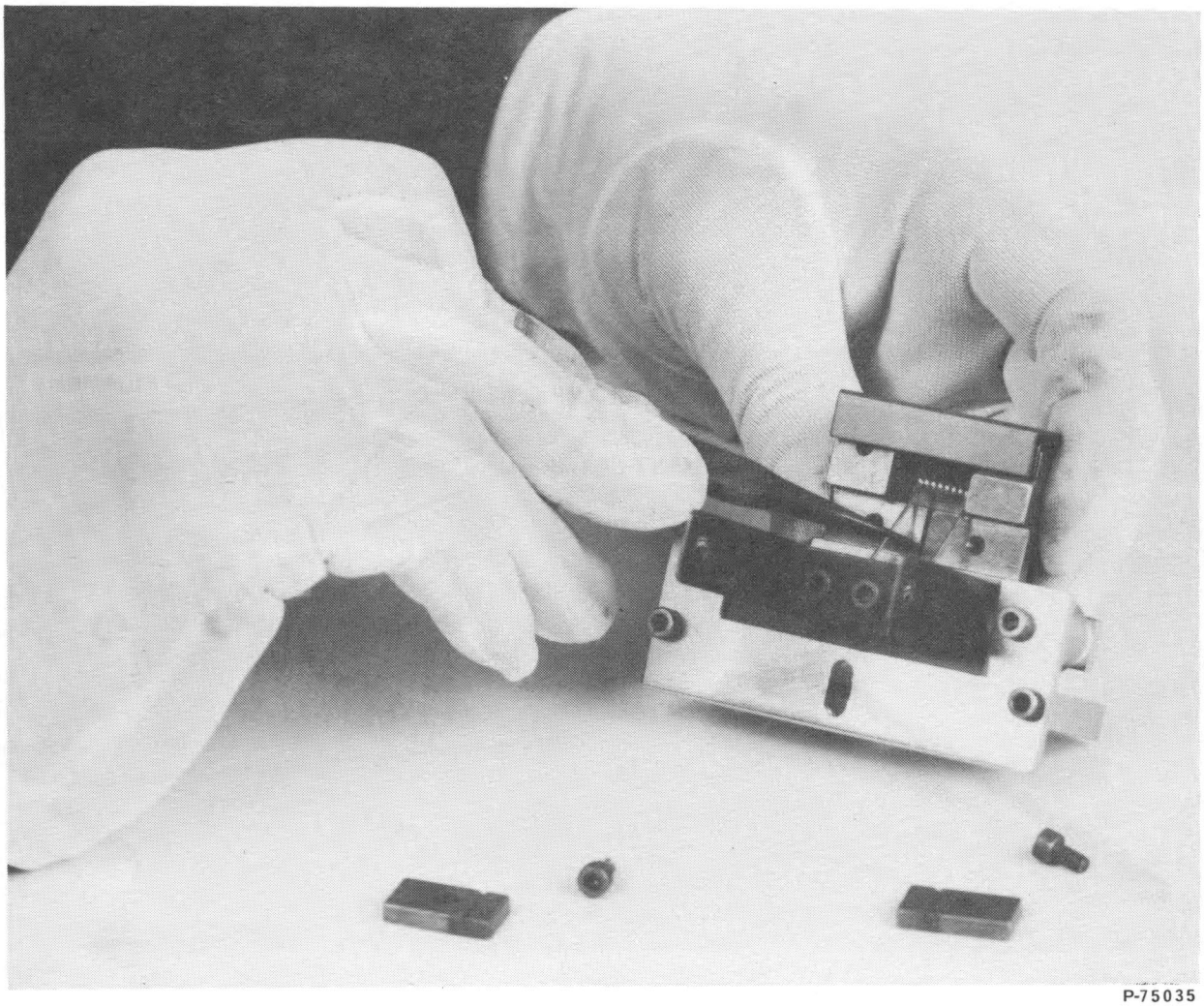


Figure 9c. Remove the filament from the filament cavity, using tweezers if necessary. Remove any broken filament material from the filament clamps and filament cavity. Use 240-grit emery paper or finer to clean any oxide off the grooves in the clamps. Check the surface at the back of the filament cavity for signs of oxidation, and clean as required. Be careful not to leave any particles on the emitter assembly after cleaning. If total disassembly is the aim, refer to figure 9f.

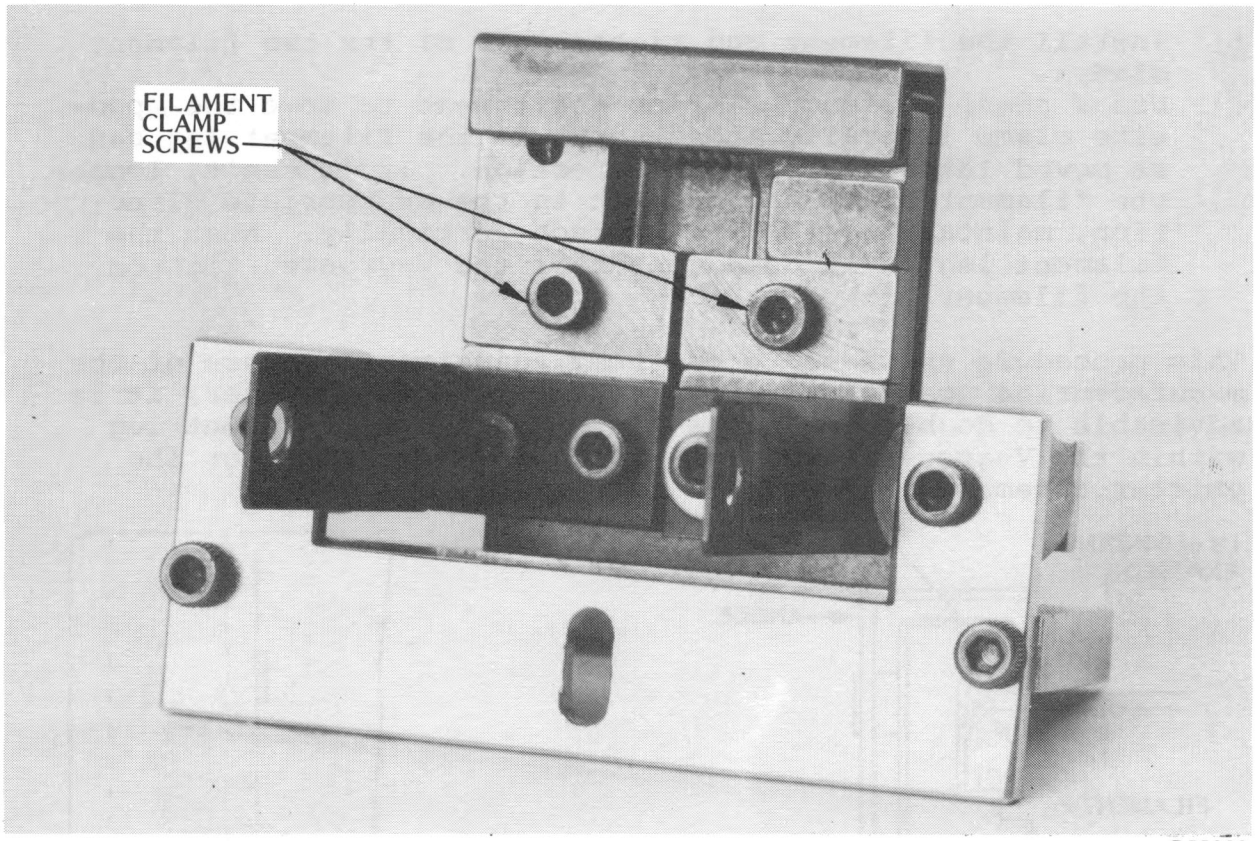


Figure 9d. Because the filament is symmetrical, it can be installed backwards. When it is installed backwards it is too far from the anode and it becomes emission-limited. In order to obtain any emission at all, the temperature of the filament must be several hundred degrees hotter than normal. At some emission level, probably 500 or 600 milliamps dc, the filament cannot give off any more electrons without raising the high voltage level. The filament must always be installed so that the coil is facing in the direction of the filament straps (closer to the anode). If the intensity of the light coming from the filament is two or three times brighter than normal, it indicates that the filament is installed backwards.

Align the filament blocks so that they are vertically parallel within ±0.001 inch. The filament blocks normally run red hot. If they are not parallel, they will either pull the filament apart when they expand, or push it together and cause the coils to short upon contact.

The following procedure should be followed when replacing a filament:

a) Align filament blocks vertically.

b) Install the filament and tighten one of the two filament clamps.
c) Use a sharp knife or similar instrument to move the opposite clamp laterally and observe if the filament leg can be moved laterally in each direction. If it can't, loosen the filament block and move it in the appropriate direction, maintaining the ±0.001 inch vertically. When the filament leg is in dead center of the V-groove, tighten the filament clamp.

This procedure should be a one-time adjustment because of the manufacturing specifications of the filament. However, it is advisable to double check the centering of the filament leg within the V-groove each time a filament is changed or the emitter assembly is rebuilt.

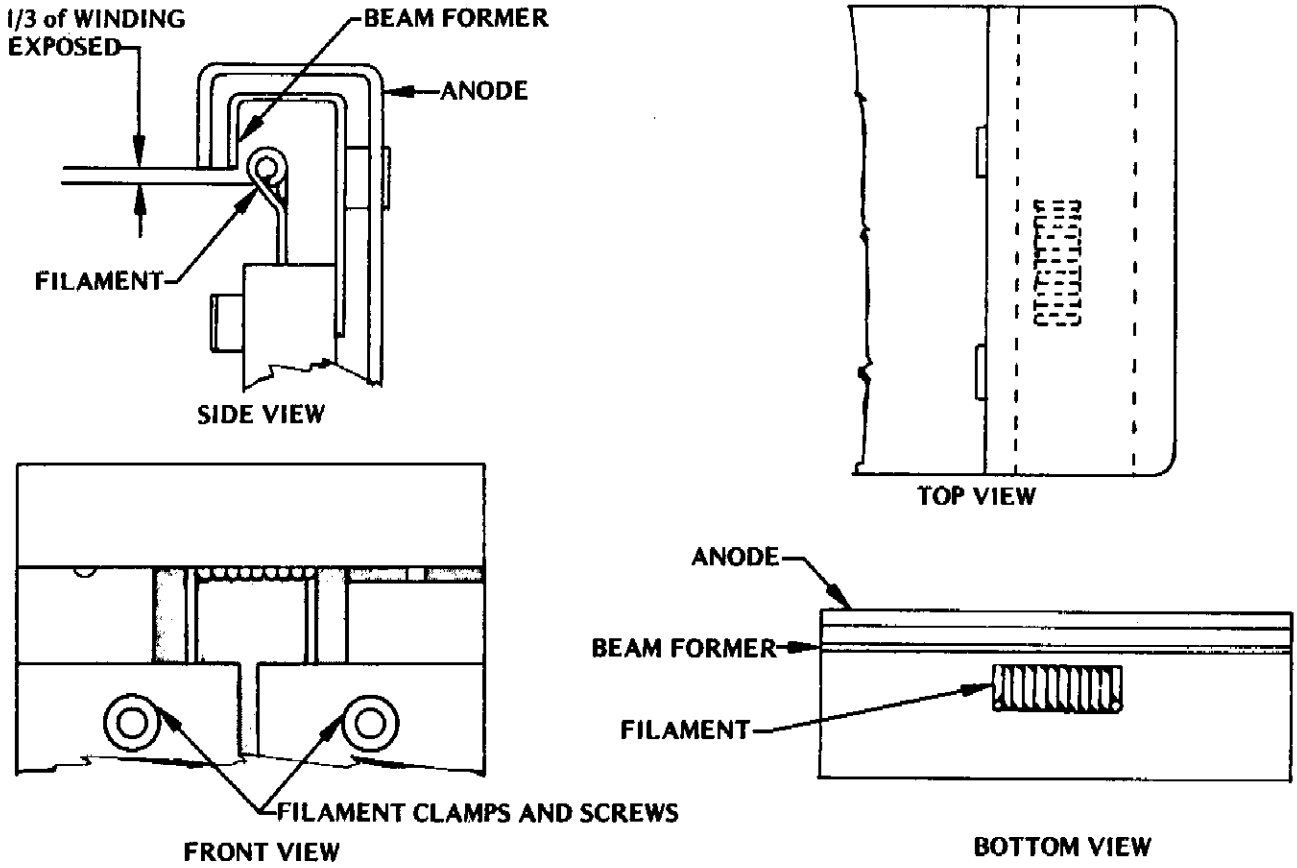


Figure 9e. The filament, beam former, and anode must be parallel in all their common axes. After the filament is installed, electrically check the filament continuity between the cathode blocks. When inserting the emitter assembly, make sure that it is snug against the mounting blocks before tightening the thumbnut. The anode plate should be flush with the beam opening in the crucible assembly. The high voltage leads may now be reconnected.

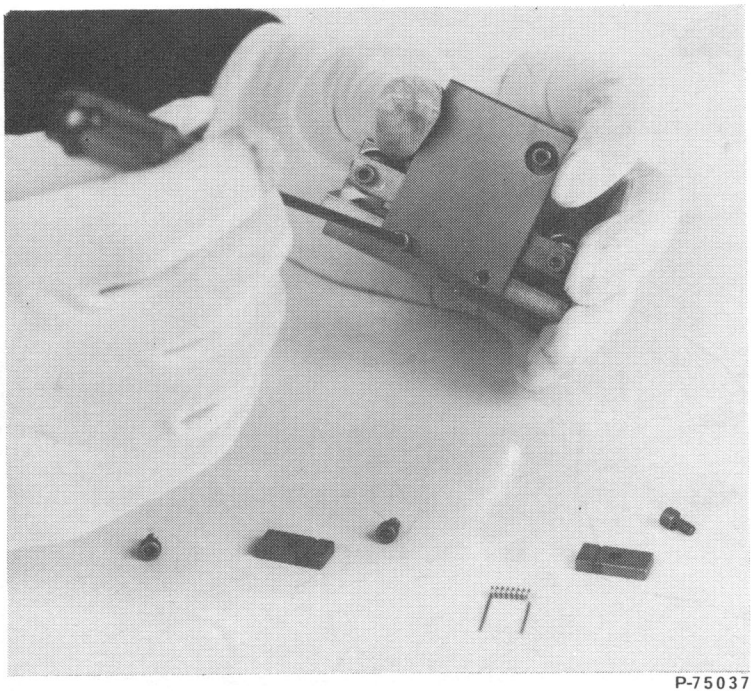


Figure 9f. Continue from step c for total disassembly. Remove the two screws holding the anode on the mounting bar.

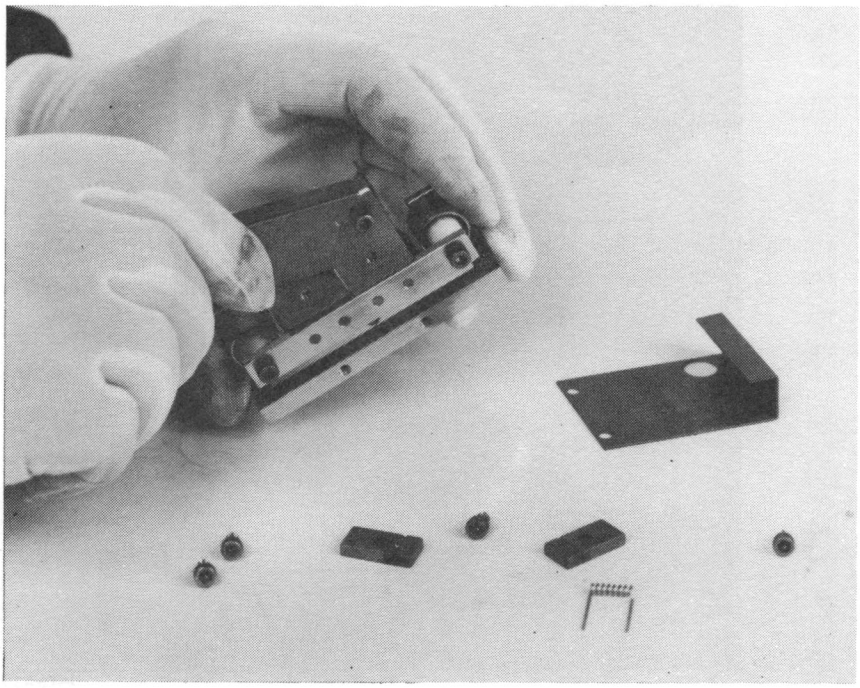


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Figure 9g. Loosen the screw (holding the beam former) enough to slide it off the assembly.

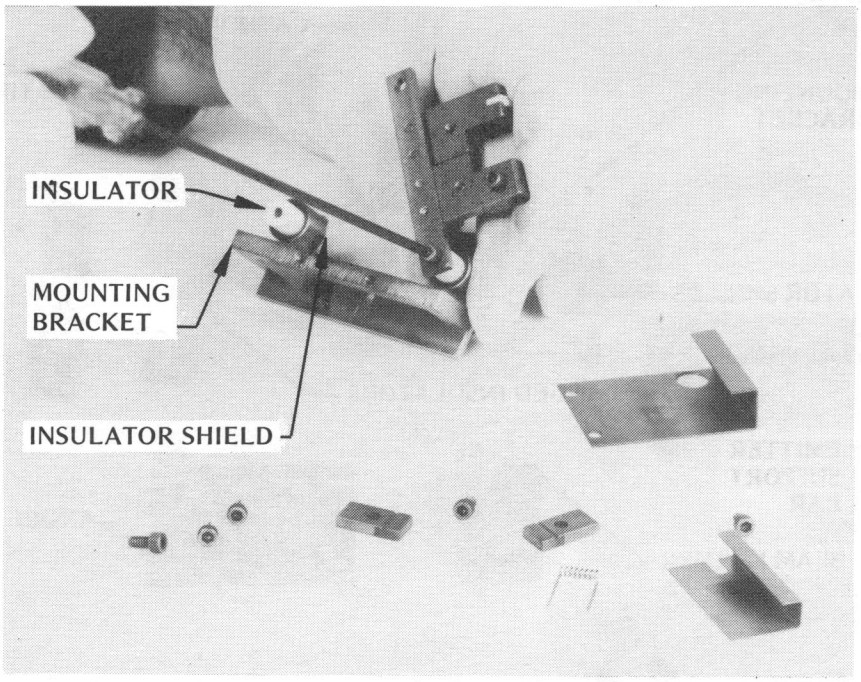

Figure 9h. Remove the filament block and mounting bar from the high voltage spacer insulators. Remove the insulators, insulator shields, and mounting bracket from the emitter support bar.

Looking into the bus bar connectors, remove the screws holding the bus bar on the right side of the bar. Note the location of the locating insulator (top of block), and the flanged insulators on the screws. When the left-hand block (ground) is removed, disassembly is complete.

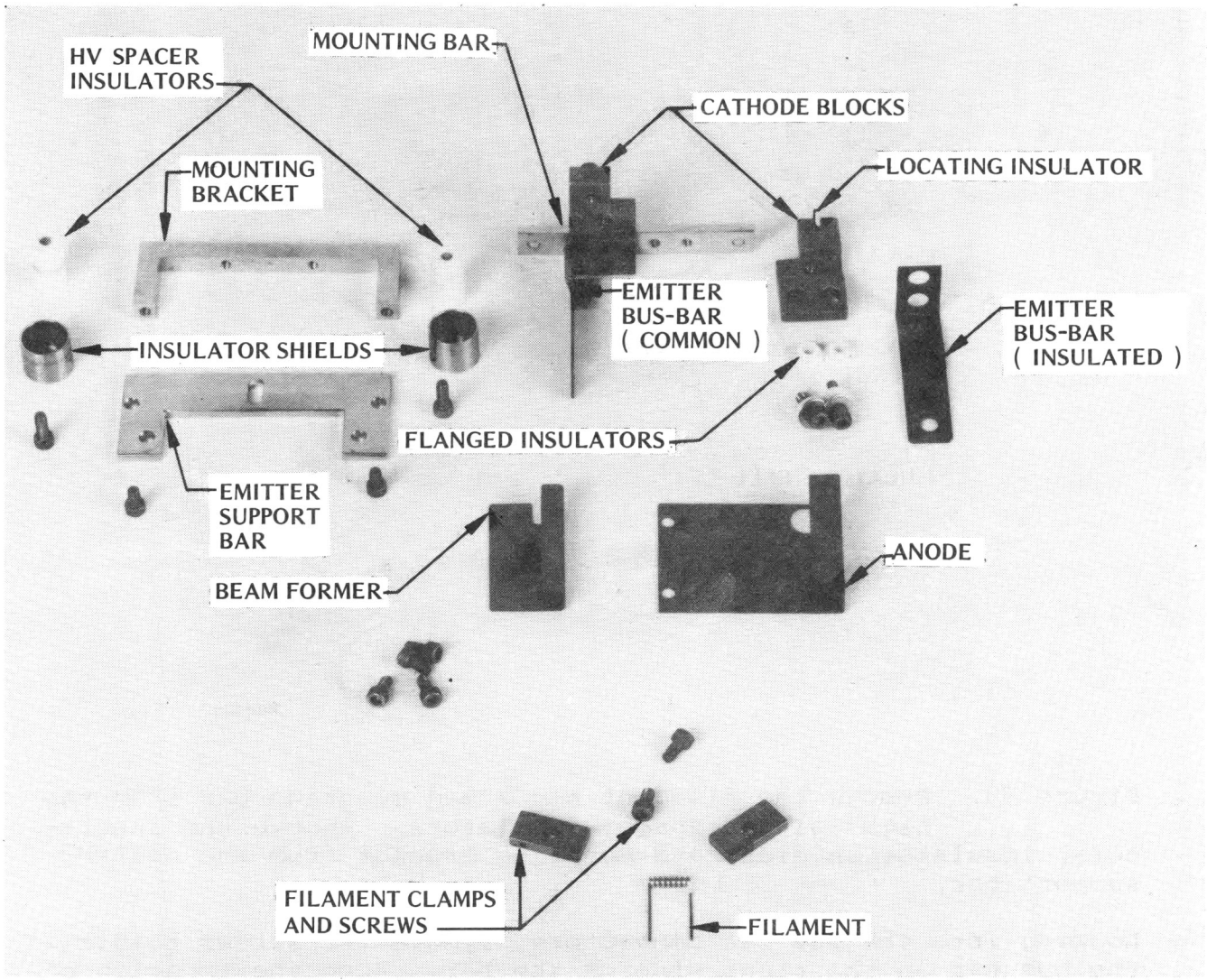

Figure 9i. Emitter assembly components.

5.4 SUPERSOURCE DISASSEMBLY

5.4.1 General Disassembly Instructions

1) Make sure the power supply is OFF. If the power supply has a keylock, retain possession of the key while removing the SuperSource from the vacuum chamber.
2) Use grounding hooks.
3) In order to prevent contamination of the vacuum system, wear lint-free linen gloves or their equivalent when handling any part which is to be reinstalled without cleaning. (It is not necessary to wear gloves while handling parts which are to be cleaned prior to reinstallation.)

5.4.2 Removing the SuperSource From the Vacuum Chamber

1) Remove the shielding from the high voltage leads.
2) Using the tools supplied, disconnect the filament leads and coil leads at the source or at the insulator.
3) Turn off the water, and, by some means external to the chamber, force compressed air through the lines to remove surplus water. This will prevent moisture from getting into the chamber. When the lines are clear, disconnect them.
4) Remove the four baseplate bolts.
5) Disconnect the rotary feed.
6) Remove the source from the chamber.

5.4.3 Illustrated Disassembly Sequence for the SuperSource (Figures 10a through 10f)

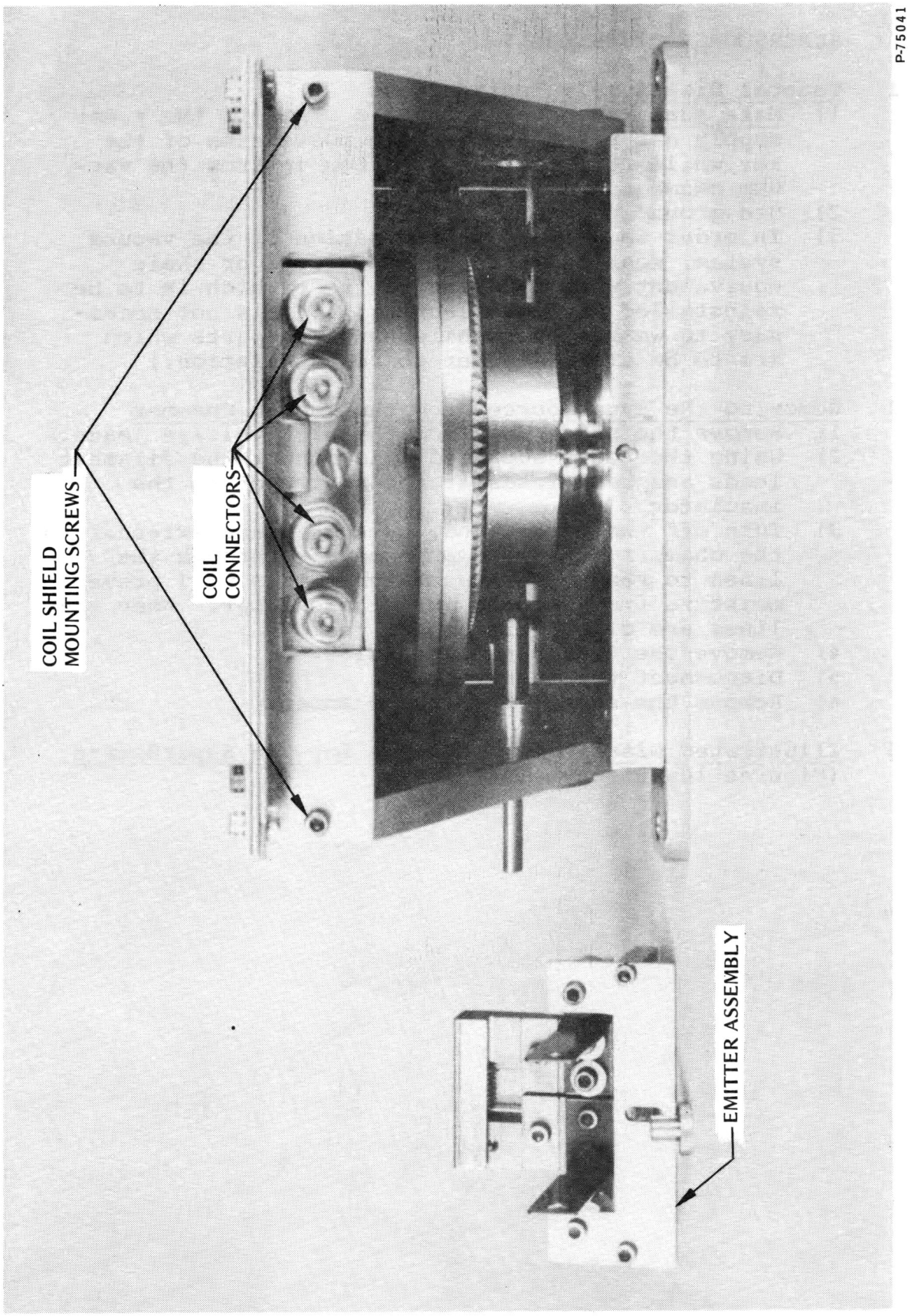

Figure 10a. Remove the emitter assembly as shown in figures 9a and 9b. Then, unscrew the two coil shield mounting screws and remove the coil shield. When removing the second screw, hold the shield so it doesn't fall and damage the ceramic coil connectors.

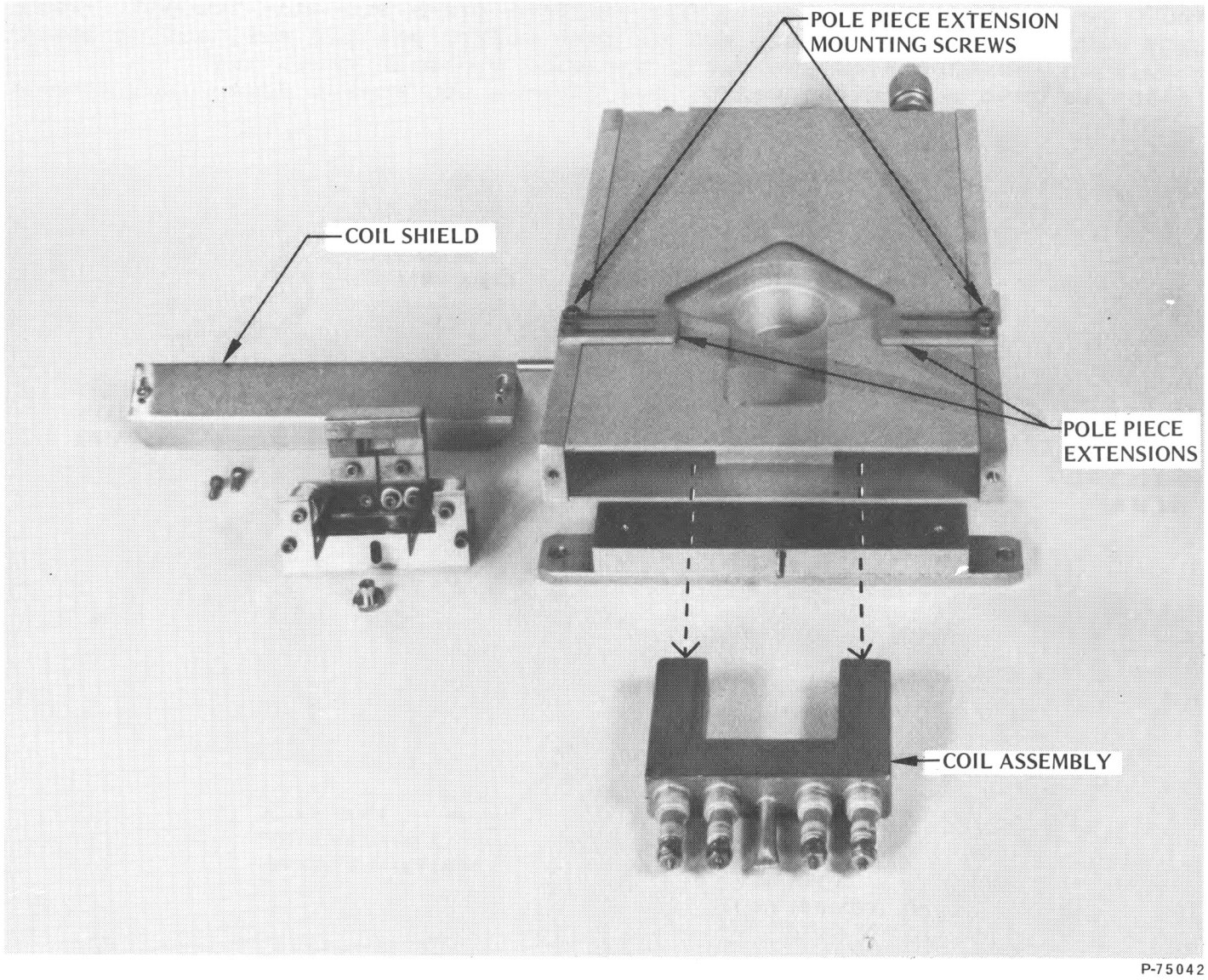

Figure 10b. Grasp the coil assembly firmly and pull it straight out of the coil assembly housing. Then unscrew the pole piece extension mounting screws and remove the pole piece extensions.

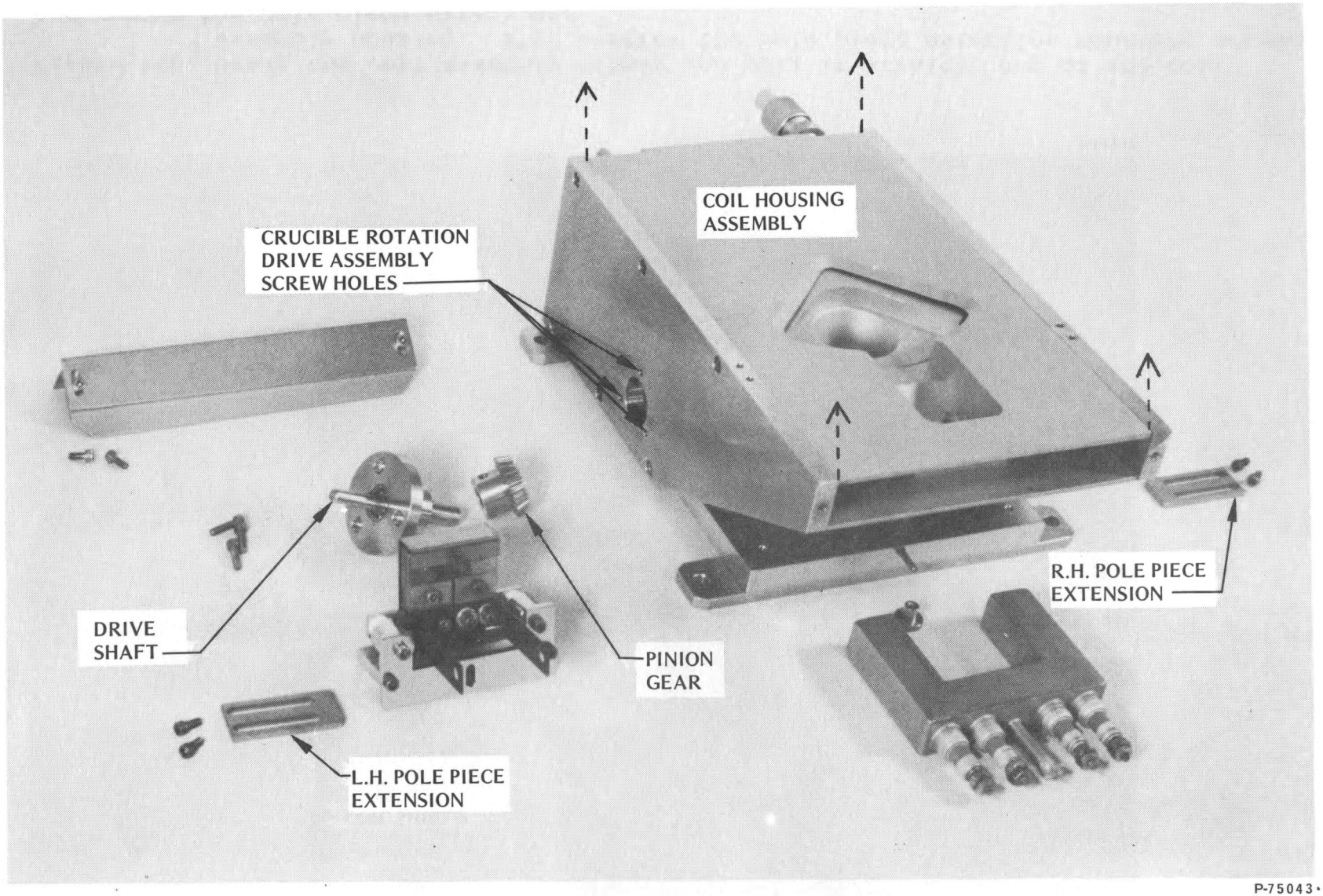

Figure 10c. Reach inside the housing and loosen the pinion gear setscrew. Unscrew the three crucible rotation drive assembly screws. Holding the drive shaft in one hand and the pinion gear in the other, gently pull them apart and remove them. (Do not lose the small woodruff key.) Then remove the three upper screws on both pole pieces and lift off the coil housing assembly. Note that the permanent magnet is still attached to the coil housing assembly.

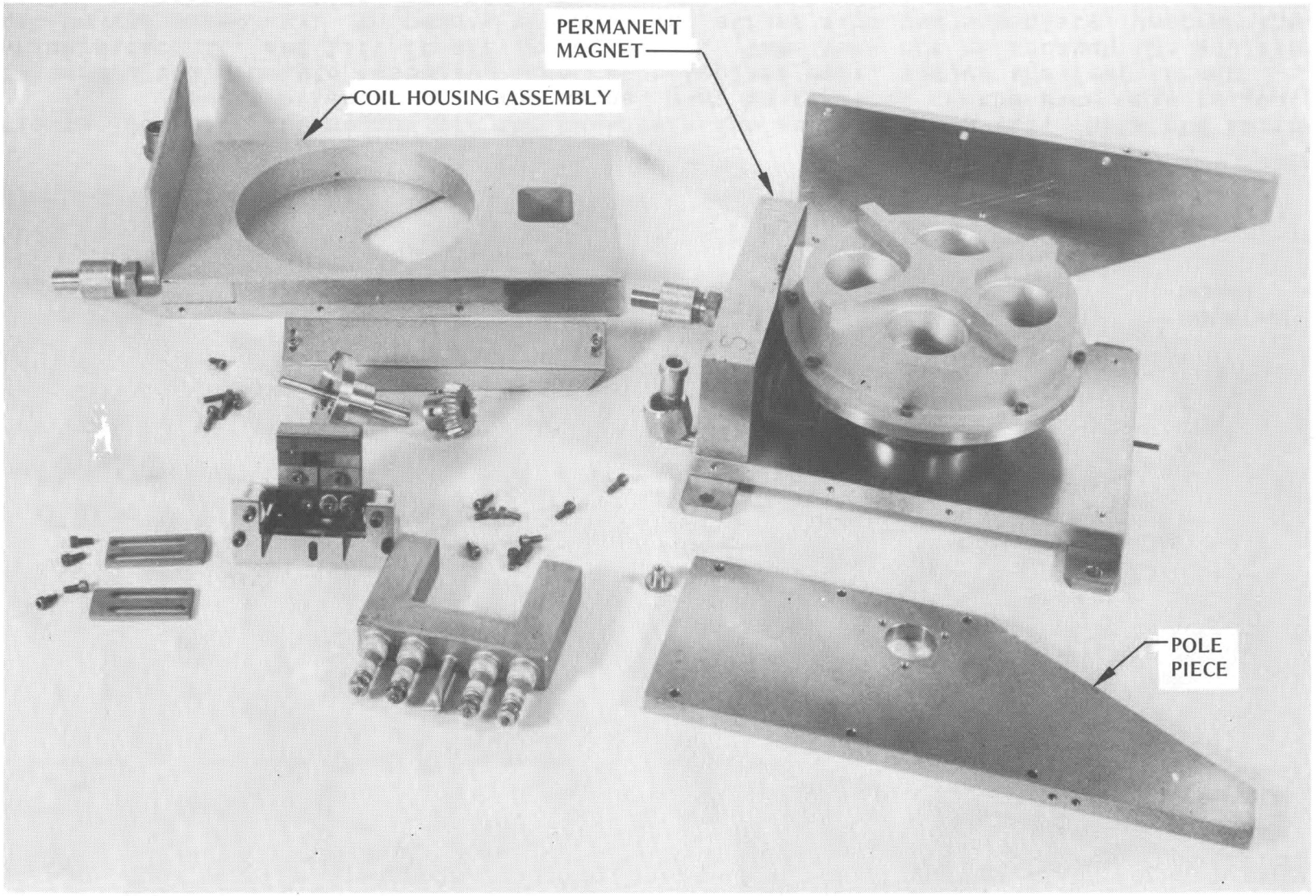

Figure 10d. Unscrew the three lower screws on the pole pieces and pull them off the permanent magnet. CAUTION: Sliding the permanent magnet against a magnetic surface will degauss it. Dropping or striking it sharply against a metal surface can also cause it to degauss. Since the field of the permanent magnet directs the beam onto the crucible, damage to the magnet could allow the beam to be directed behind the source, into the crucible wall, or onto surrounding equipment in the system.

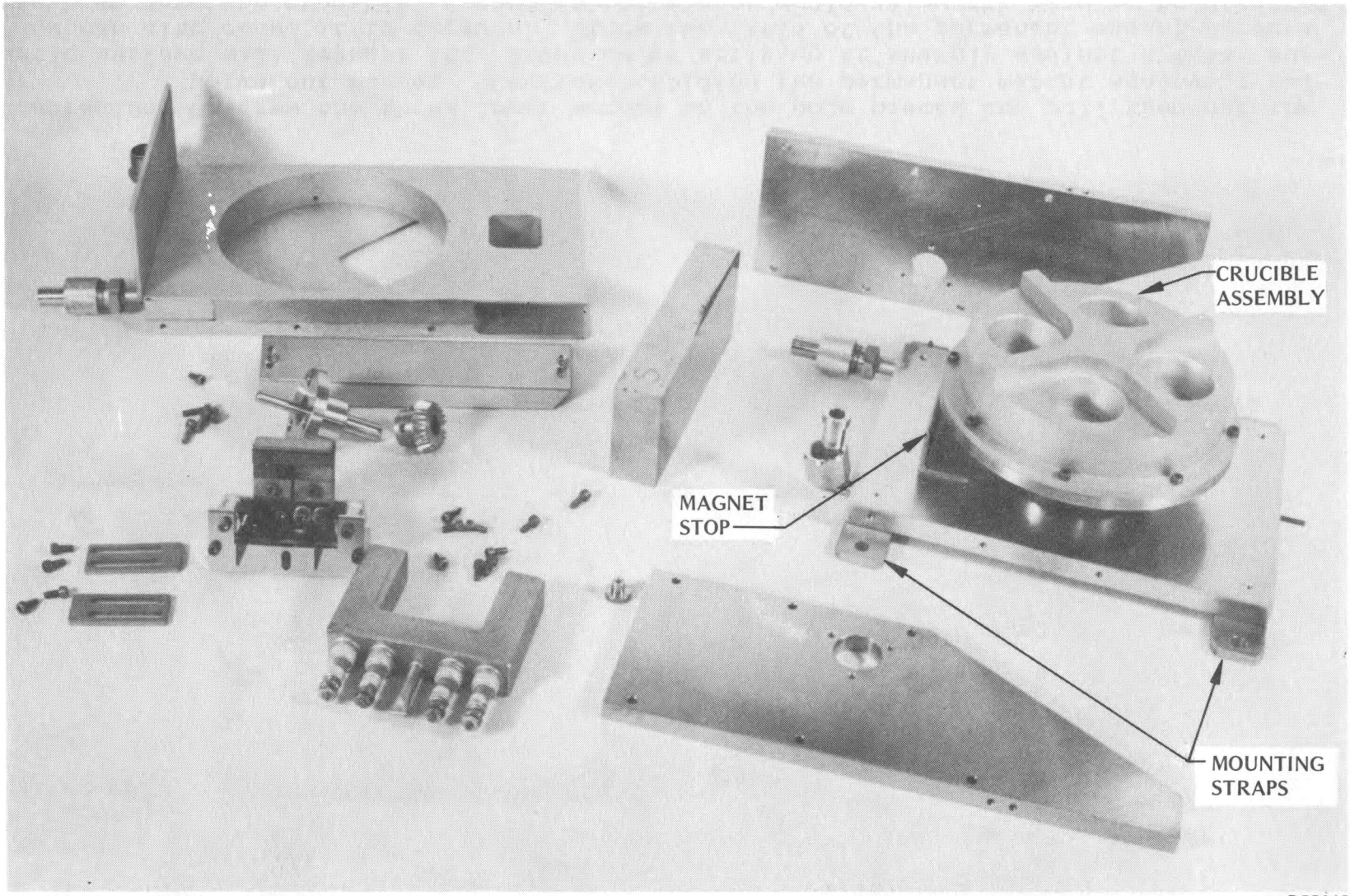

Figure 10e. Lift the magnet off the baseplate (no screws attach it). Note the north-south orientation. The magnet must be replaced in the same orientation. To remove the crucible assembly, turn the baseplate over, remove the four screws which attach it, and lift it off the assembly. Take care not to scratch the #32 finish on the baseplate. To remove the mounting straps from the baseplate, unscrew their mounting screws and lift them off. This completes the disassembly.

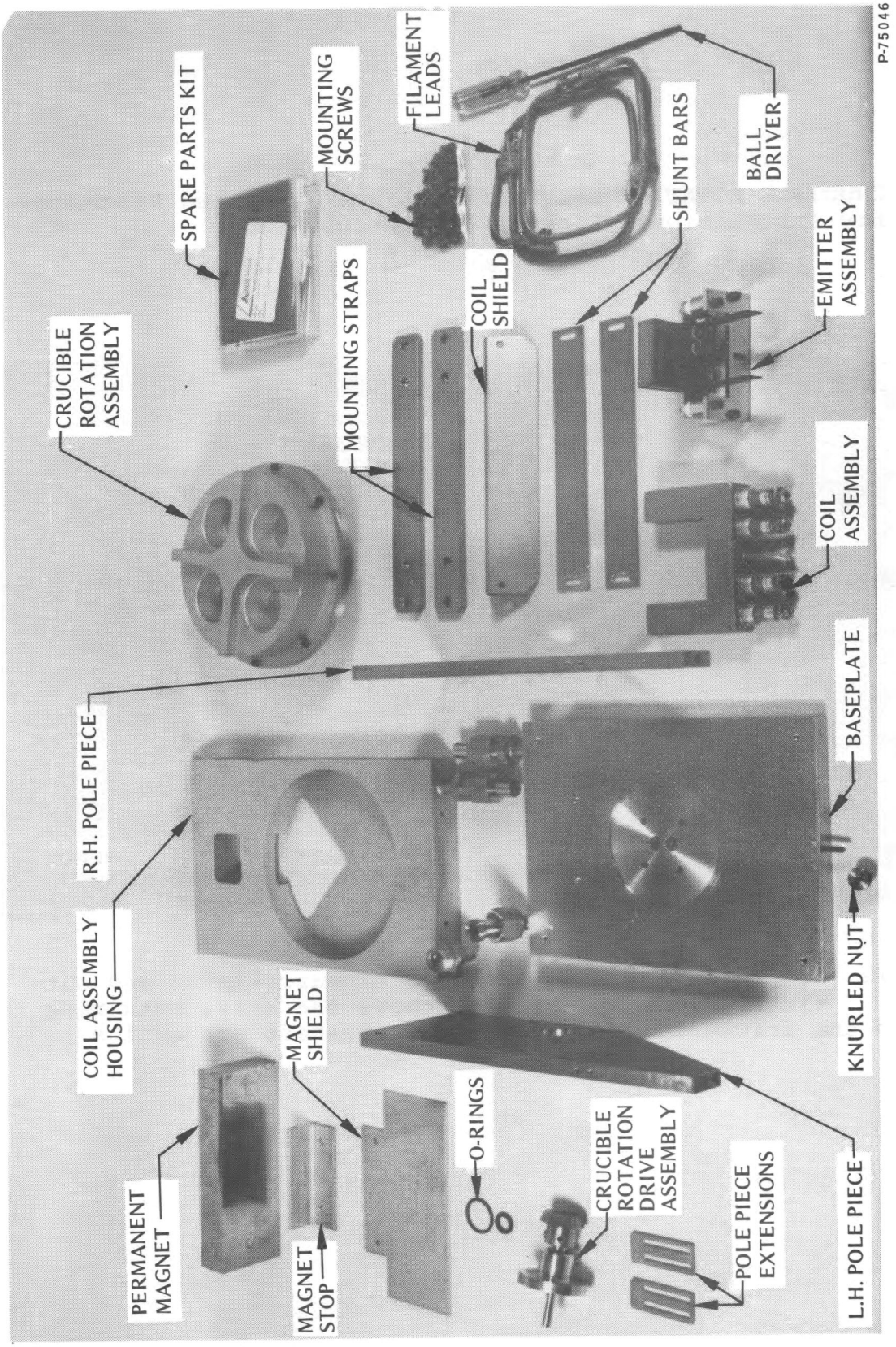

Figure 10f. Components of the STIH-270-2M SuperSource. Further disassembly of the crucible rotation drive assembly is shown in paragraph 5.5, and further disassembly of the crucible rotation assembly in paragraph 5.6.

5.5 CRUCIBLE ROTATION DRIVE ASSEMBLY, Illustrated Disassembly Instructions (Figures 11a through 11c)

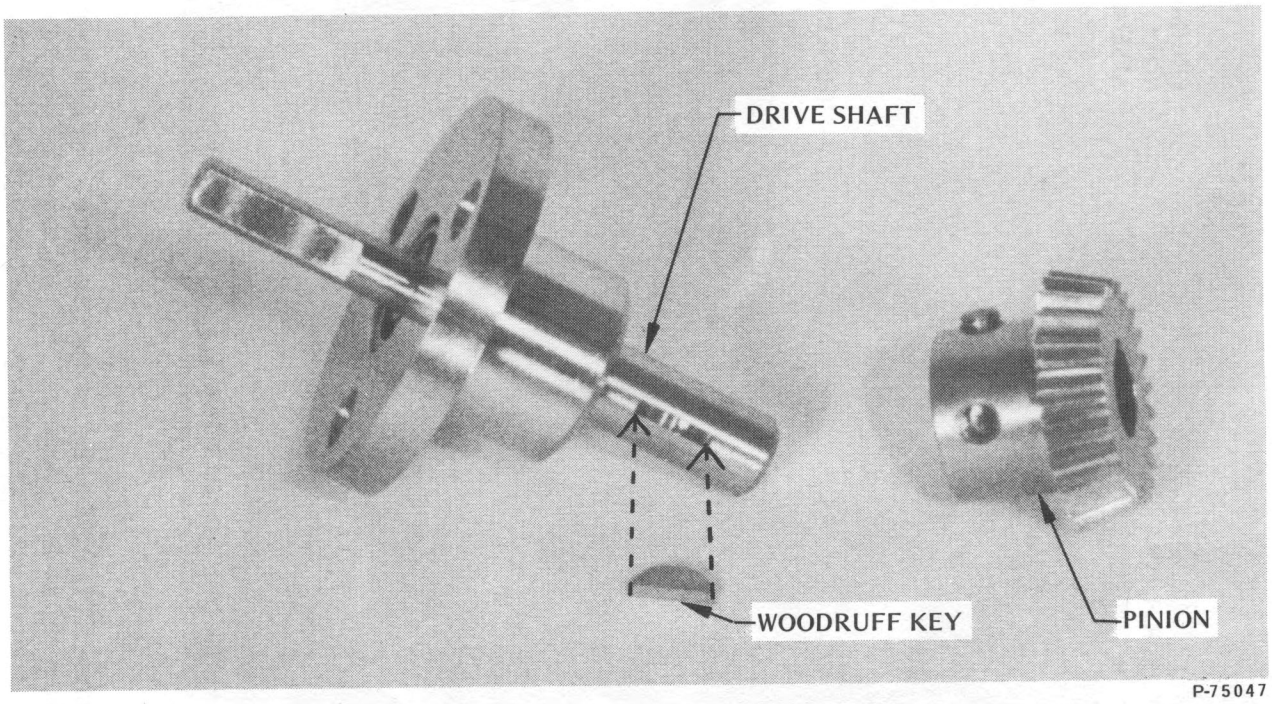

Figure 11a. Use retaining ring wrenches (Truarc inside and outside, or equivalent) to remove the small retaining ring from the driveshaft and pull the driveshaft out of its housing.

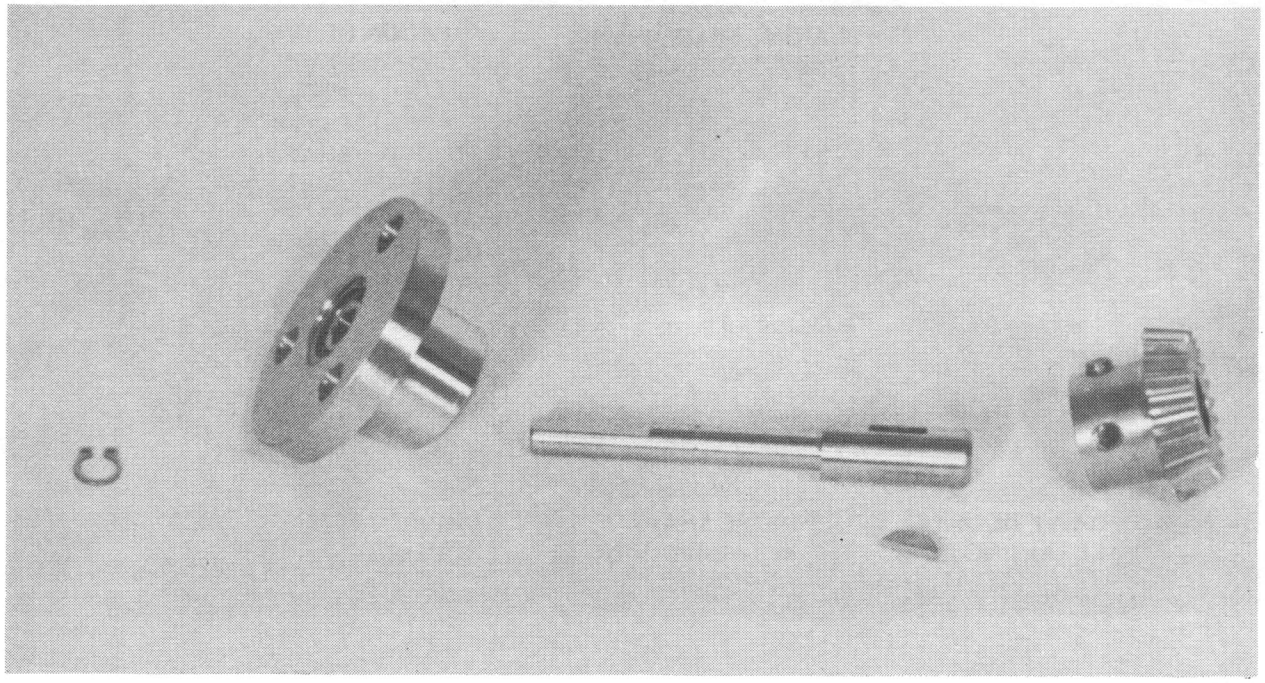

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Figure 11b. Remove the large retaining ring from the drive housing and then remove the bearings and bearing spacer.

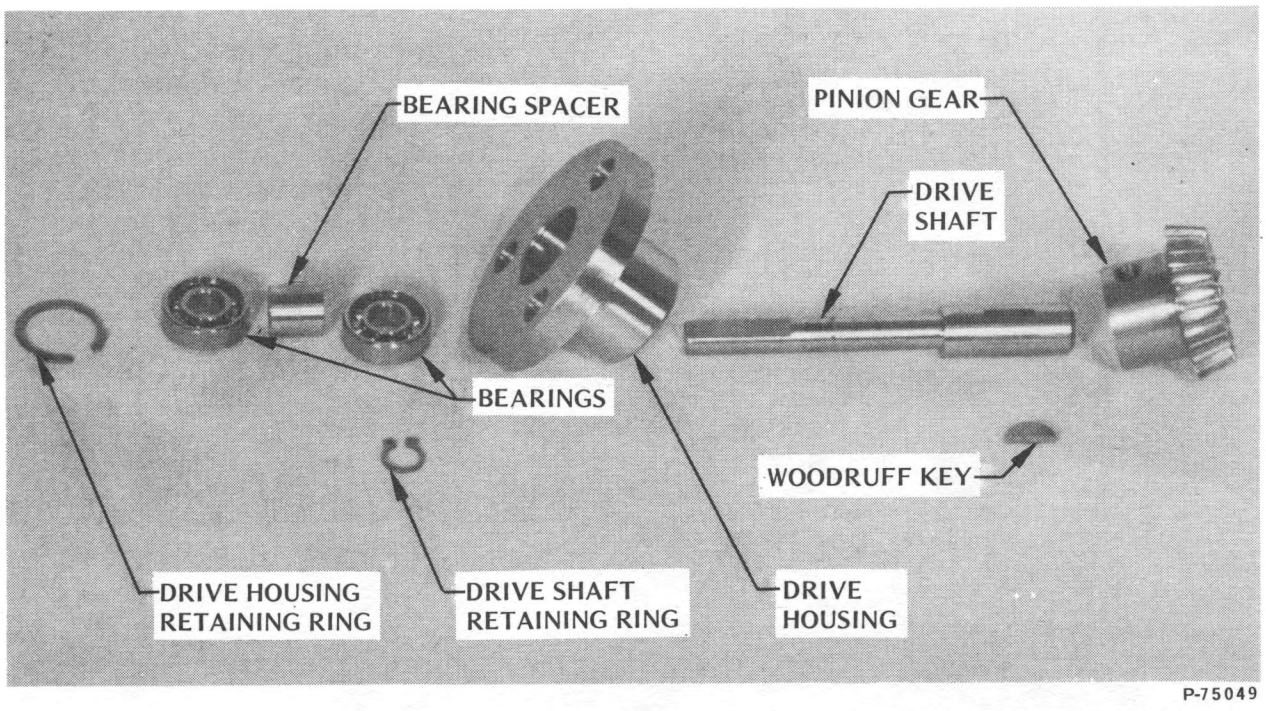


Figure 11c. Components of the crucible rotation drive assembly

5.6 CRUCIBLE ROTATION ASSEMBLY, Illustrated Disassembly Instructions (Figures 12a through 12e)

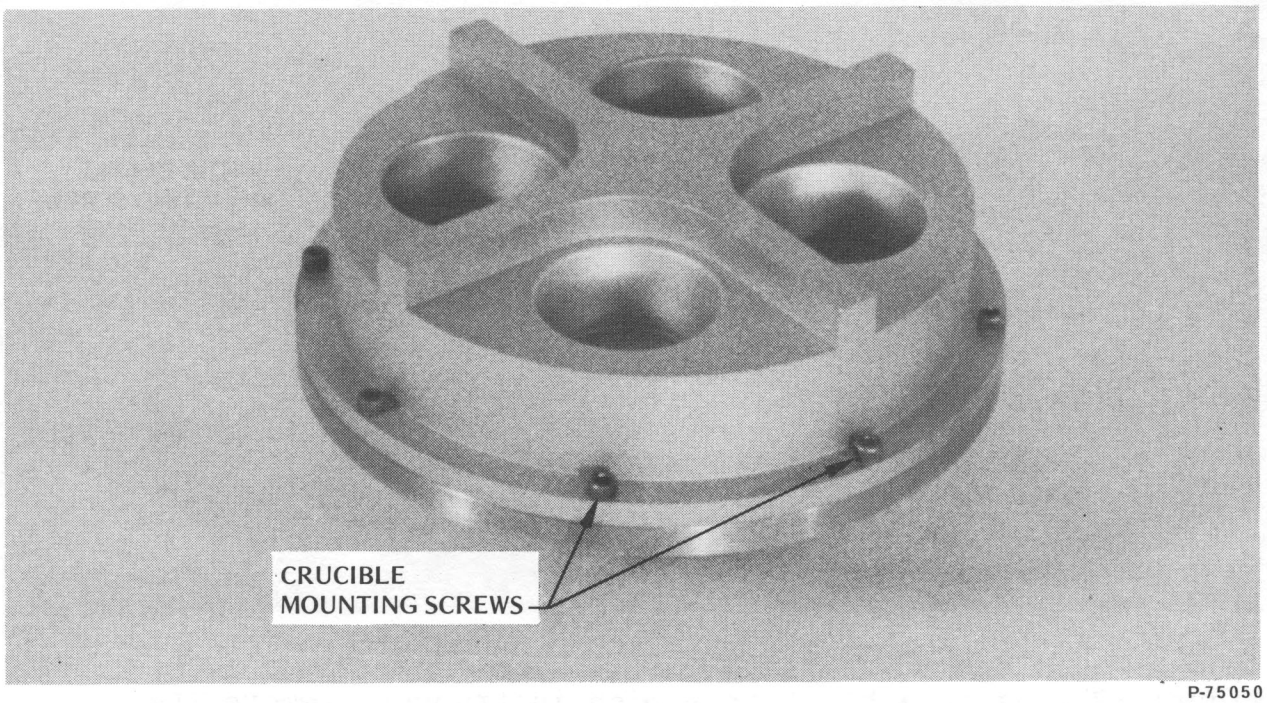


Figure 12a. Unscrew the eight crucible mounting screws and lift the crucible off the mounting flange.

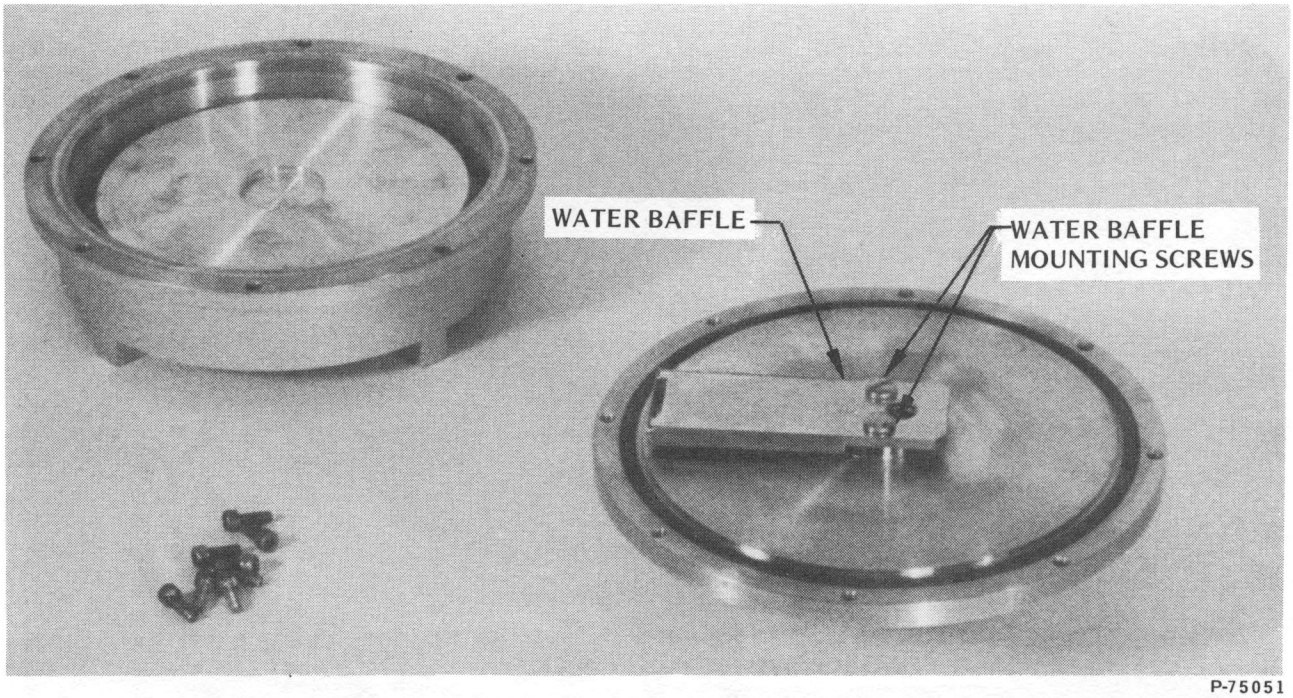


Figure 12b. Using a blunt or wooden instrument, remove the o-ring from its groove. Be careful not to score it. Unscrew the water baffle mounting screws and lift the water baffle off the pivot shaft.

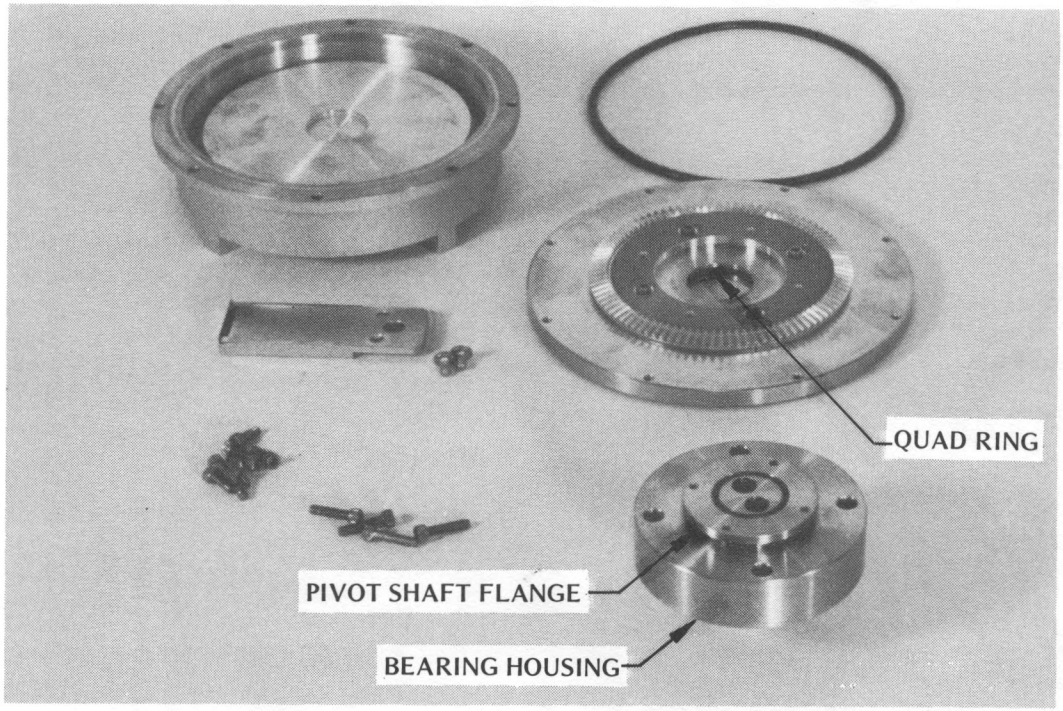


Figure 12c. Turn the inner part of the crucible assembly over and lift the bearing housing off the pivot shaft, taking care not to damage the quad-ring inside the flange. (The quad-ring may be removed at this time.) Remove the spacer from the bearing housing and the retaining ring from the pivot shaft. Grasp the pivot shaft by its flange and pull it out of the bearing housing. Do not scratch or score the bearing surface or quad-ring surface of the pivot shaft.

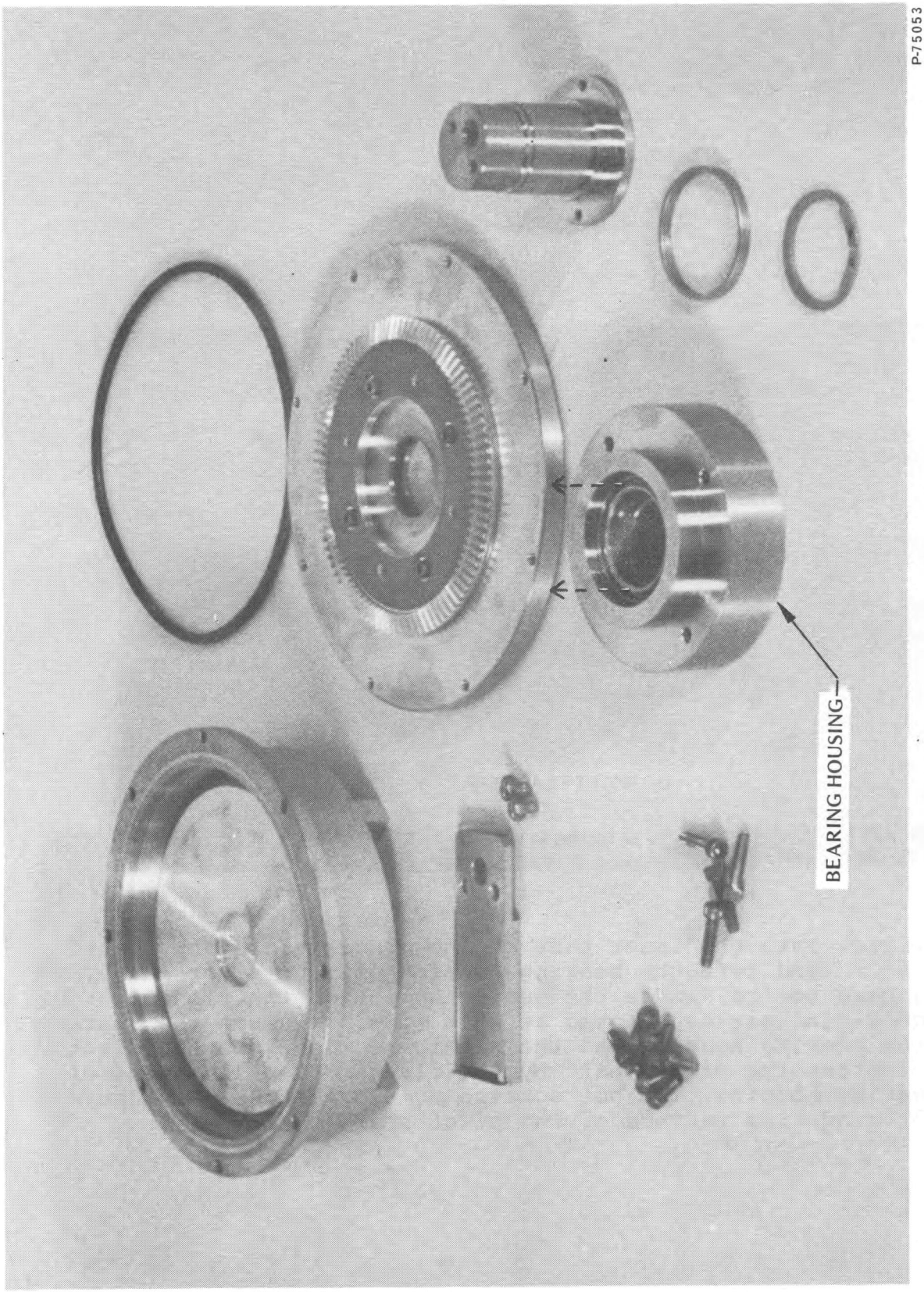


Figure 12d. Remove the bearing spacer from the bearing housing. These are precision bearings and should be handled gently.

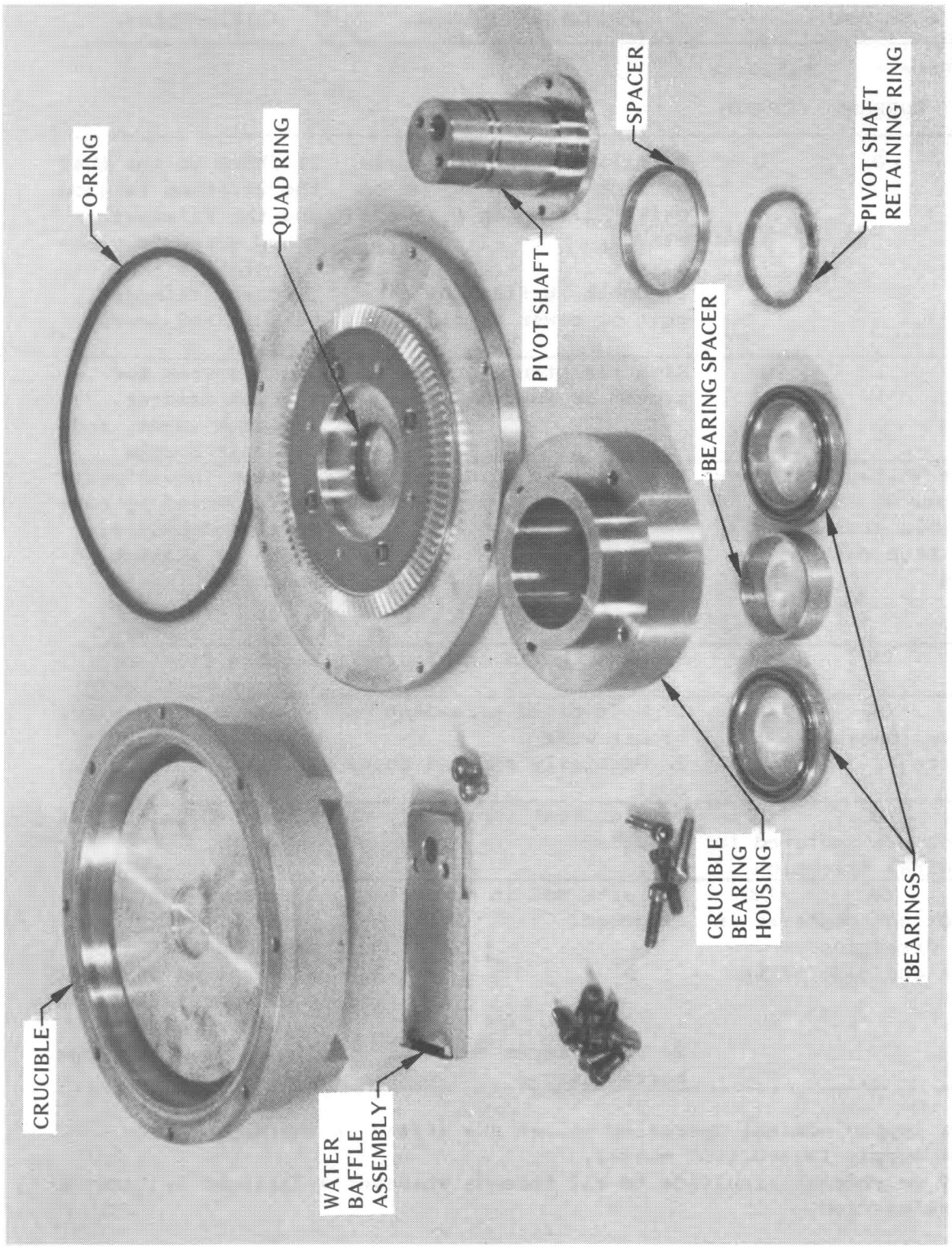


Figure 12e. Components of the crucible rotation assembly

5.7 TROUBLESHOOTING

Symptom			Probable Cause	Correction
Beam Power* VOLTAGE	Beam Power* CURRENT	Filament CURRENT		
OK	0	0	1) Filament broken, loose, or high resistance due to oxide buildup on filament clamps	1) Check to see that the filament is good and the filament clamp screw is clean and tight**
			2) Break in filament circuit or power supply	2) Check filament circuit and power supply
0	1	OK	High resistance ground in system or source	Check system for shorted emitter, filament leads, and/or feedthroughs
Emission voltage and current kicks up and down, and visible arcing or heat at high voltage insulators			High voltage insulators fouled or failed	Examine insulators: 1) If fouled by conductive deposits, clean by glass-bead honing 2) If physically damaged, replace
OK	OK	High	Filament helix shorted	Replace filament (cannot replace)**
OK	OK	OK	1) Main field permanent magnet weak	1) Charge or replace permanent magnet**
Excessive longitudinal coil current			2) Partially shorted focus coil	2) Replace focus coil**
OK	OK	OK	Coil current improperly adjusted	Adjust focus current
Beam spot not centered in longitudinal direction				
OK	OK	OK	1) Parts not in correct alignment	1) Ensure that all parts are tight and snug and that the filament is correctly positioned and is not warped or sagging
Beam spot not centered in lateral direction or tails on one side of the spot				
			2) Pole Pieces or other parts damaged	2) Repair or replace damaged parts**

*Power supply nominal operating values are listed in the appropriate power supply instruction manual.

**Apply molybdenum disulfide to all threads whenever a fastener is removed and reinserted.

Symptom			Probable Cause	Correction
Beam Power*		Filament		
VOLTAGE	CURRENT	CURRENT		
OK	OK	OK	1) Beam off center and/or focus too close to edge	1) Readjust the focus current so that the beam is centered in the crucible
Melt wetting or eroding crucible			2) Insufficient water flow	2) Ensure that the cooling water is flowing through the crucible at a minimum of 4 gal/min
			3) Emitter out of adjustment	3) Ensure that the emitter is adjusted
			4) Filament may be out of alignment	4) Ensure that the filament is aligned
OK	OK	OK	Water leaking past water seal	Replace and lubricate quad-ring***.
A pressure burst on ion gauge when crucible is rotating				
OK	OK	OK	Lack of lubrication on water seal	Replace and lubricate quad-ring***
Crucible sticks or is difficult to rotate				

*Power supply nominal operating values are listed in the appropriate power supply instruction manual.

**Apply molybdenum disulfide to all threads whenever a fastener is removed and reinserted

***Apply Dow Corning Vacuum Grease or its equivalent.

SECTION 6

UNDERSTANDING THE SUPERSOURCE

6.1 THE NATURE OF ELECTRON BEAMS

The Airco Temescal STIH-270-2M SuperSource operates on principles similar to the cathode ray tube. A tungsten filament heated to incandescence in a vacuum emits electrons spontaneously. The free electrons produced by this thermionic emission can be accelerated by means of an anode. Since electrons are sensitive to electrostatic and magnetic fields, their paths can be directed. An electron beam, then, is a stream of electrons moving under the influence of an electrostatic and/or magnetic field in a vacuum. An electron beam of sufficient energy will vaporize any known substance.

When power is applied to the emitter filament, electrons are emitted randomly. The cavity on the side and at the back of the filament, which is at the same high negative potential as the filament itself, produces an electrostatic field which forms the beam. Magnetic fields created by the permanent magnet, pole pieces, pole piece extensions, and the electromagnetic deflection coil direct the beam through a 270° arc toward the ground potential of the material in the crucible. Changes in deflection coil current (focus current) change the configuration of the magnetic field, and hence the path of the beam.

6.2 270° BEAM DEFLECTION

In early electron beam evaporation systems, the emitter was either placed above the crucible, in which case the filament was quickly coated with evaporant material, or placed to the side and deflected in such a manner that a substantial fraction of the beam didn't strike the evaporant. Airco Temescal's 270° beam deflection design focuses the entire beam on the evaporant and provides complete shielding from evaporant. Another important feature of this design concerns ion erosion. An electron beam creates large numbers of positively charged ions which are attracted to the cathode. Before the introduction of 270° beam deflection, filaments were typically eroded by ion bombardment in approximately eight hours.

Filaments in the SuperSource may last as long as two hundred hours. (Ion population is a function of vacuum chamber pressure and evaporation rate; the degree of ion erosion will vary, depending on these two factors.)

6.3 THE VACUUM ENVIRONMENT

The normal vacuum chamber pressure for the operation of electron beam sources is 10^{-4} torr or less. At this pressure, known as the region of molecular free flow, residual gas molecules rarely collide with one another or with molecules of the evaporant. Obviously, the fewer residual gas-evaporant collisions, the higher the purity of the run will be.

The importance of the chamber's base pressure in achieving high purity deposition depends on the vapor pressure of the evaporant. In evaporation with resistance heaters and boats, a vapor pressure of 10^{-2} is considered high. With this vapor pressure, a chamber base pressure of 10^{-5} torr will contain enough gas molecules to seriously contaminate a run. In electron beam evaporation, vapor pressures as high as one torr can be achieved. With these vapor pressures, the ratio of evaporant to contaminant is so high that base pressures on the order of 10^{-4} are quite adequate for high purity deposition. Stray molecules of evaporant actually remove contaminating gases faster than they can be replaced. (Frequently, shutters are used to shield the substrates from the evaporant until the evaporant has been warmed up, i.e., until a minimum desired vapor pressure has been achieved.)

6.4 THERMAL EFFICIENCY

One of the main advantages of electron beam evaporation is the high density of energy which can be focused on the surface of the evaporant. The mechanisms by which energy is lost from the area of impact are conduction, convection, radiation, vaporization, ionization, and the production of secondary electrons and X-rays. At relatively low temperatures, conduction is the most important mechanism. For molten materials, convection dominates. As energy density and temperature increase further, radiation and then vaporization become the primary mechanisms. (For every material there is a temperature at which energy transfer by radiation equals that by vaporization. Some of these temperatures are given in the table at the end of this section.)

Temperature is proportional to beam energy. Generally speaking, high beam energy and a high temperature are desirable, since the aim is to maximize the percentage of energy that goes into latent heat of vaporization. However, there are qualifications. Evaporation rates are proportional to temperature. The higher the evaporation rate, the denser the cloud of evaporant above the crucible, and the greater the chance that the electrons in the beam will collide with atoms of evaporant and give up their energy. This process of ionization represents a loss of efficiency.

6.5 COLD HEARTH EVAPORATION

Highly reactive materials, such as tantalum, cannot be successfully evaporated using boats with resistance heaters. Electron beam crucibles are made of water-cooled copper so that these materials are contained in a solid skull of their own material during evaporation. Since the molten evaporant contacts only the skull, there is no possibility of contamination by the crucible.

Not all evaporants are treated in this manner. Some, such as aluminum and tin, are allowed to melt all the way to the hearth. Others, such as chromium, silica, and zinc sulfide, sublime. The temperature gradient within the evaporant is controlled both by varying beam energy and by inserting crucible liners to reduce the heat transfer between evaporant and crucible.

6.6 HEAT OF VAPORIZATION AND RADIATION HEAT BALANCE

Element	Melting Temperature K	Crossover Temperature K	Crossover Heat Flux kW/in^2
Zn	693	598	0.0013
Mn*	1517	1327	0.034
Al	932	1663	0.085
Cu	1357	1789	0.113
Sn	505	1812	0.12
Cr*	2176	1885	0.14
Pb	1823	1953	0.16
Au	1336	2049	0.20
Fe	1809	2102	0.22
Co	1768	2119	0.22
Ni	1725	2121	0.22
Ti	1940	2412	0.39
Zr	2125	3457	1.6
Mo	2890	3680	2.0
Nb	2740	3860	2.5
Ta	3269	4525	4.6
W	3650	4738	5.6

*Sublime in vacuum

SECTION 7

RECOMMENDED SPARE PARTS

DESCRIPTION	QTY.	MATERIAL	PART NUMBER
7.1 STIH-270-2M (412-1274-C)			
Emitter Assembly (see 7.1.1)			0204-0284-0
Coil Assembly (see 7.1.2)			0312-6923-0
Crucible Rotation Assembly (see 7.1.3)			0412-1303-0
Crucible Rotation Drive Assembly (see 7.1.4)			0412-1392-0
Spare Parts Kit (see 7.1.5)			0412-1561-0
Gasket, Union, RL, #3/8	2	Viton	0020-4811-2
Nut, Union Knurled, RL, #3/8	1	304 SST	0020-4911-2
Nipple, Solder, RL, #3/8	1	304 SST	0020-5611-2
Bar, Shunt	2	CRS Ni Pl	0214-9311-0
Lead, Filament	2	Copper	0303-3292-0
Brazement, Coil Assembly Housing	1	Copper/SST	0412-1423-0
Shield, Coil	1	304 SST	0412-1452-0
Pole Piece, Left-Hand	1	E-Brite 26-1	0412-1464-1
Pole Piece, Right-Hand	1	E-Brite 26-1	0412-1464-2
Extension, Pole	2	416 SST	0412-1471-0
Shield, Magnet	1	Copper	0412-1482-0
Magnet	1	Alnico 5	0412-1492-0
Stop, Magnet	1	304 SST	0412-1501-0
Weldment, Baseplate	1	304 SST	0412-1523-0
Strap, Mounting	2	304 SST	0412-1542-0
O-ring, #2-110	1	Viton	2231-0110-1
Nut, Machine Hex, #6-32 NC-2B	2	18-8 SST	1360-1200-0
Screw, Socket Head, #6-32 NC-2A x 5/16"	2	18-8 SST	1321-1253-0
Screw, Socket Head, #6-32 NC-2A x 1/2"	27	18-8 SST	1321-1255-0
Nut, Knurled Thumb, PIC #4074	1	SST	1371-4074-0
Wrench, Bondhus Ball Driver, 7/64	1		6990-0015-0
Instruction Manual	1		0101-8071-0
Bag, 12" x 24"	1	Poly	8121-1224-0
Box, Shipping	1	Cardboard	
Insert, Shipping Box, Left-Hand	1	Styrene	
Insert, Shipping Box, Right-Hand	1	Styrene	

DESCRIPTION	QTY.	MATERIAL	PART NUMBER
7.1.1 EMITTER ASSEMBLY	1		0204-0284-0
Insulator, Flanged	1	Alumina	0303-3131-0
Insulator, Locating	1	Alumina	0303-6721-0
Filament	1	Tungsten	0303-9351-0
Block, Cathode, Left-Hand	1	Moly	0303-9362-0
Block, Cathode, Right-Hand	1	Moly	0303-9372-0
Clamp, Filament	2	Moly	0303-9382-0
Beam Former	1	Moly	0303-9392-1
Anode	1	Tantalum	0204-0292-0
Shield, Insulator	2	304 SST	0204-0302-0
Bracket, Mounting	1	304 SST	0204-0312-0
Bar, Mounting	1	304 SST	0204-0322-0
Bar, Emitter Support	1	304 SST	0204-0332-0
Bar, Filament Bus (Left-Hand and Right-Hand)	1 pr.	Tantalum	0204-0343-0
Insulator, High Voltage Spacing	2	Alumina	0418-4631-0
Screw, Socket Head, #6-32 NC-2A x 1/4"	9	18-8 SST	1321-1252-0
Screw, Socket Head, #6-32 NC-2A x 3/8"	4	18-8 SST	1321-1254-0
Screw, Socket Head, #6-32 NC-2A x 1/2"	2	18-8 SST	1321-1255-0
Washer, Flat Cut, #6	2	18-8 SST	1378-1200-0
7.1.2 COIL ASSEMBLY	1	SST/Alumina	0312-6923-0
Nut, Machine Hex, #6-32 NC-2B	8	18-8 SST	1360-1200-0
Washer, Flat Cut, #6	8	18-8 SST	1378-1200-0
7.1.3 CRUCIBLE ROTATION ASSEMBLY	1		0412-1303-0
Gear, Bevel	1	SST	0204-0493-1
Flange, Bearing Housing Crucible Mounting	1	304 SST	0214-9272-0
Spacer	1	304 SST	0412-9281-0
Crucible	1	OFHC Copper	0412-1314-0
Flange, Crucible Mounting	1	304 SST	0412-1323-0
Shaft, Pivot	1	304 SST	0412-1333-0
Assembly, Water Baffle, including	1	304 SST	0412-1342-0
Plate, Water Baffle	1	304 SST	0412-1352-0
Channel, Water Baffle	1	304 SST	0412-1362-0
Spacer, Bearing	1	304 SST	0412-1381-0
Screw, Socket Head, #6-32 NC-2A x 1/4"	4	18-8 SST	1321-1252-0
Screw, Socket Head, #6-32 NC-2A x 3/8"	8	18-8 SST	1321-1254-0
Screw, Socket Head, #6-32 NC-2A x 5/8"	4	18-8 SST	1321-1256-0
Screw, Bind Head, #8-32 NC-2A x 1/4"	2	18-8 SST	1340-1452-0

DESCRIPTION	QTY.	MATERIAL	PART NUMBER
Ring, Retaining, #5108-106H	1	SST	1384-1106-0
Quad-ring, #4-215	1	Buna-N	2108-0215-0
O-ring, #2-019	1	Viton	2231-0019-1
O-ring, #2-250	1	Viton	2231-0250-0
Bearing, Thin Section, MPB #TCNF-17-24	2	SST	9120-1724-0
7.1.4 CRUCIBLE ROTATION DRIVE ASSEMBLY	1		0412-1392-0
Pinion, Bevel	1	SST	0204-0493-2
Housing, Drive	1	304 SST	0412-1402-0
Shaft, Drive	1	304 SST	0412-1412-0
Key, Woodruff, #211	1	SST	1304-0211-0
Ring, Retaining, #5008-62H	1	SST	1384-0062-8
Ring, Retaining, #5100-25H	1	SST	1384-1025-0
Spacer, Shaft, PIC #B8-14	1	303 SST	9013-2814-0
Bearing, ND, #SS-R-4	2	SST	9120-1270-0
7.1.5 SPARE PARTS KIT	1		0412-1561-0
Gasket, Union, RL, #3/8	4	Viton	0020-4811-2
Gauge, Filament Location	1	304 SST	0202-4121-0
Anode	1	Tantalum	0204-0292-0
Insulator, Flanged	4	Alumina	0303-3131-0
Insulator, Locating	1	Alumina	0303-6721-0
Filament	5	Tungsten	0303-9351-0
Beam Former	1	Moly	0303-9392-1
Insulator, High Voltage Spacing	2	Alumina	0418-4631-0
Screw, Socket Head, #6-32 NC-2A x 1/4"	2	18-8 SST	1321-1252-0
Screw, Socket Head, #6-32 NC-2A x 1/2"	2	18-8 SST	1321-1255-0
Quad-ring, #4215	1	Buna-N	2108-0215-0
O-ring, #2-019	1	Viton	2231-0019-1
O-ring, #2-250	1	Viton	2231-0250-0
Box, Shipping	1	Plastic	6642-0002-0

7.2 STIH-270-2MB (0216-9154-0)

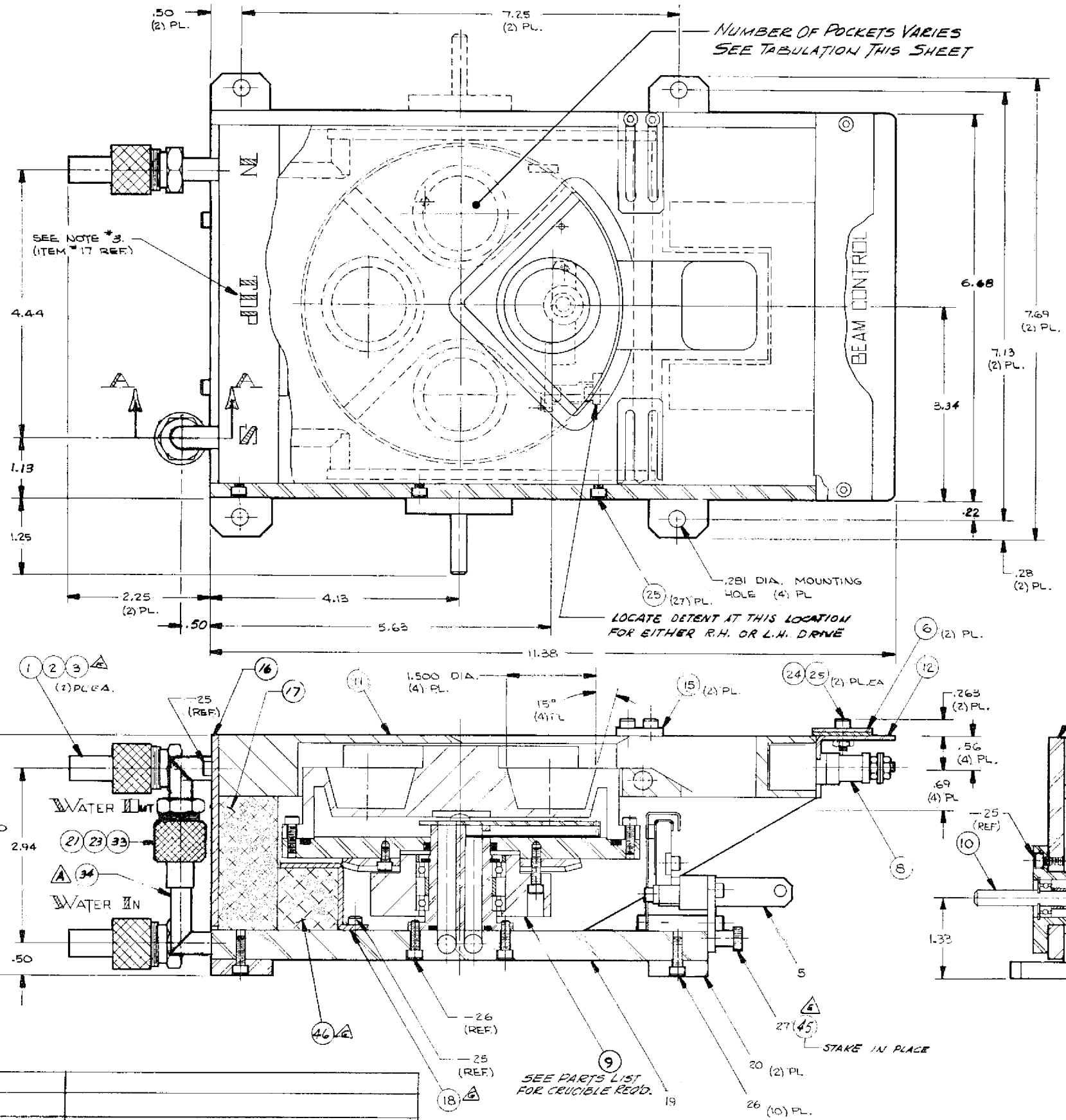
The parts list for the STIH-270-2M (part number 0412-1274-0) applies as shown in paragraph 7.1, with the following exceptions to subassembly parts lists:

7.2.1 EMITTER ASSEMBLY 0204-0284-0

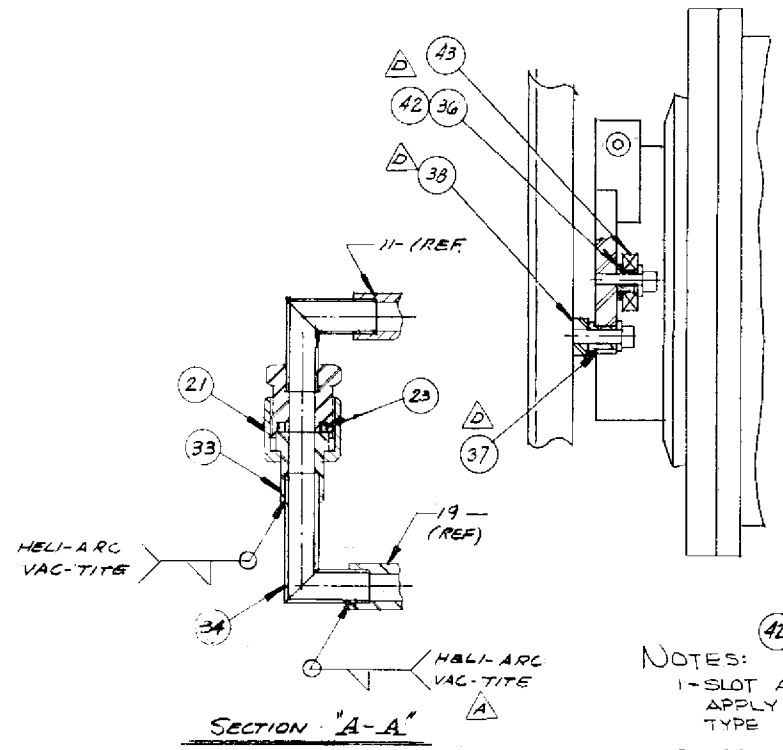
No Change

7.2.2 COIL ASSEMBLY 0312-6923-0

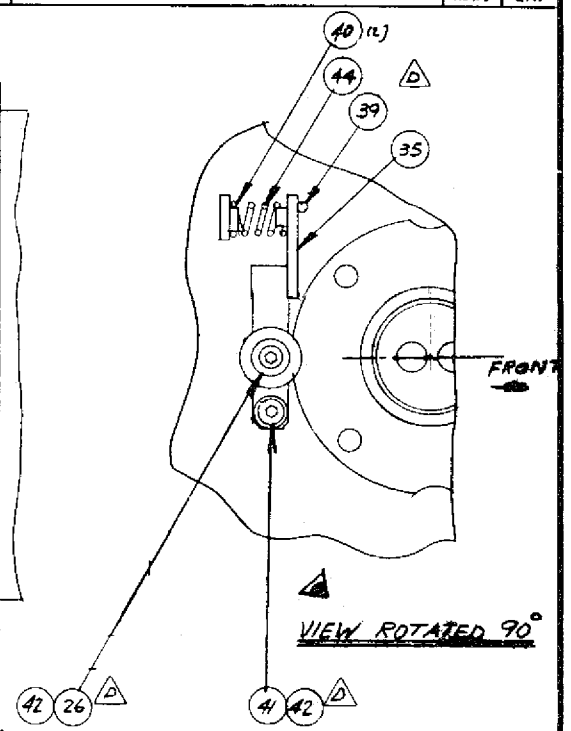
No Change



ITEM	PART NO.	DESCRIPTION	MAT'L	QTY.



SECTION "A-A"



VIEW ROTATED 90°

NOTES:

1- SLOT ALL SCREWS FULL LENGTH AND APPLY A LIGHT COAT OF "ROCOL" TYPE DFSM OR EQUIV. MOLYDISULFIDE.

2- APPLY A LIGHT COAT OF VACUUM GRADE GREASE TO THE UNION GASKETS.

3- CHARGE MAGNET TO 420 GAUSS, (MEASURED AT CENTER OF TOPSIDE OF MAGNET), PLACE MAGNET IN ASSEMBLY WITH POLARITY AS SHOWN, (POLARITY DEVIATION CAN CAUSE BEAM DAMAGE), AND CONDUCT BEAM TEST.

4- STAMP **SERIAL** No. ON BASE PLATE .19-.25 HIGH. x .005-.015 DEEP.

5- CLEAN ASSEMBLY AFTER BEAM CHECK AND PLACE IN A POLY-BAG. FILAMENT LEADS, SPARE PARTS KIT AND WRENCH TO BE PACKAGED WITH ASSEMBLY IN SHIPPING BOX. INSTRUCTION MANUAL TO BE SHIPPED SEPARATELY.

6- ALL DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.

0412-1274-4	(2) 25cc POCKETS - (2) 15 cc. POCKETS
0412-1274-3	(1) 25CC POCKET - (3) 15CC POCKETS
0412-1274-2	(6) POCKET CRUCIBLE
0412-1274-1	LAZY SUSAN CRUCIBLE
0412-1274-0	STIH-270-2M E.B. SOURCE
PART NO	DESCRIPTION

REV.	DESCRIPTION	BY	DATE	APP'D
H	ITEM #17 P/N WAS 0412-1492-0 DCN 1354	R.L.	8/27/81	RL
G	DELETED ITEM (18) 0412-1501-0 REPLACED BY 0317-0221-0. ADDED ITEM (46) 0317-0212-0 CORRECTED DETENT LOCATION AS PER DCN #07718 ADD 0412-1274-0	J.W.	12/21/77	RL Corrected
F	ITEMS 2 & 3 CHANGED QTY REQD. WAS (1) ASSD. — NEED (2) EACH ASSY	J.W.S	2/10/77	JWS
E	ADDED ITEM 45 & NOTE STAKE IN PLACE ITEM 37 P/N 0314-9501-0 TO 0204-0242-0	J.W.	4/18/77	JWS
D	ADDED DETENT COMPONENTS ITEMS 35-44 INCREASED ITEM #26 QTY FROM (10) TO (11)	J.W.	9/14/76	RCD
C	ADDED 2 PARTS LISTS (6 POCKET CRUCIBLE) ADD TABULATION	JWS	12/4/75	RCD
B	ADDED -1 PARTS LIST (CARROUSEL CRUCIBLE)	DERRICK	3/10/75	RCD
A	ADDED ITEMS 21, 33, 34 & 28, SECT "A-A"	JWS	1/22/75	RCD

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED

FINISH | TOLERANCE XXX ± — ANG ± — XX ± — X ± — | INTERP. RADII BREAK ALL EDGES | MISD ON DWG. | FINAL ASSY.

BERKELEY AIRCO Temescal CALIFORNIA
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

DRAWN BY	DATE	CHK BY	APP BY	SCALE
RICH DERRICK	11/15/74	J.K.		N.T.S.

STIH-270-2M E.B. SOURCE (TURRET)

STIH-270-2M E.B. SOURCE ASSY. | DRAWING NUMBER 412-1274 | REV. H

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	ALNICO Temescal PARTS LIST	1/3	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1274-0	G	WF 12/74	RCD				RICH DERRICK	
DWG. TITLE STIH-270-2ME.B. SOURCE ASS'Y.				(4-POCKET)			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2ME.B. SOURCE				NEXT ASS'Y FINAL ASS'Y.			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
UNION GASKET, 3/8"	1	0020-4811-2		2					
UNION KNURLED NUT, 3/8"	2	0020-4911-2		2					
SOLDER NIPPLE, 3/8"	3	0020-5611-2		2					
INSTRUCTION MANUAL	4	0101-		1					
EMITTER ASS'Y	5	0204-0284-0	X	1					
SHUNT BAR	6	0214-9311-0		2					
FILAMENT LEAD	7	0303-3292-0	X	2					
COIL ASS'Y	8	0312-6923-0	X	1					
CRUCIBLE ROTATION ASSEMBLY	9	0412-1303-0	X	1					
CRUCIBLE ROTATION DRIVE ASS'Y.	10	0412-1392-0	X	1					
COIL ASS'Y HOUSING BRAZEMENT	11	0412-1423-0	X	1					
COIL SHIELD	12	0412-1452-0		1					
POLE PIECE, L.H.	13	0412-1464-1		1					
POLE PIECE, R.H.	14	0412-1464-2		1					
POLE EXTENSION	15	0412-1471-0		2					
MAGNET SHIELD	16	0412-1482-0		1					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	Aerojet Temescal PARTS LIST	2/3	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1274-0	G	WF 12/74	EcD				RICH DERRICK	
DWG. TITLE STIH-270-2MEB SOURCE ASS'Y.				(4-POCKET)			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2MEB SOURCE				NEXT ASS'Y FINAL ASS'Y.			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

	DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
	MAGNET	17	0412-1492-0		1					
G	BRACKET, MAGNET	18	0317-6821-0		2					
	BASE PLATE WELDMENT	19	0412-1523-0		1					
	MOUNTING STRAP	20	0412-1542-0		2					
	NUT, HEX UNION #3/8 (TEME-FIT.)	21	0420-0011-2		1					
	SPARE PARTS KIT	22	0412-1561-0	X	1					
	O-RING, # 2-110	23	2231-0110-1		1					
	NUT, MACH HEX, #6-32NC-2B	24	1360-1200-0		2					
	SCREW, SOC HD., #6-32NC-2A x 3/8" LG, SST	25	1321-1254-0		27					
D	SCREW, SOC HD., #6-32NC-2A x 1/2" LG, SST	26	1321-1255-0		11					
	KNURLED THUMB NUT, #6-32NC-2B SST, PIC#4074	27	1371-4074-0		1					
	WRENCH, BONDHUS BALL DRIVER 7/64"	28	6990-0015-0		1					
	BAG, 12" x 24" POLYTHYLENE	29	8121-1224-0		1					
	SHIPPING BOX	30	8130-1073-0		1					
	SHIPPING BOX INSERT, L.H.	31	8130-1073-4		1					
	SHIPPING BOX INSERT, R.H.	32	8130-1073-3		1					
	SOLDER NIDDLE #3/8 (TEME-FIT.)	33	0420-1411-2		1					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	Ametek Tenescal PARTS LIST	3/3	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1274-0	G						PLANNER - DATE	NEXT ASS'Y W/O NO.
DWG. TITLE							ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	
JOB TITLE				NEXT ASS'Y				

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
WATER LINE TUBING WELDMENT	34	0204-3042-0		1					
ARM, PIVOT-INDEX	35	0314-9282-0		1					
BUSHING, BEARING-INDEX	36	0314-9291-0		1					
BUSHING, FLANGED-PIVOT ARM	37	0204-0242-0		1					
SPACER	38	0314-9401-0		1					
PIN, SPRING -.062 DIA. X .62 LG. 416-SST	39	1306-1058-0		1					
SCREW, SOC HD - #6-32 NC-2A X .19 LG 18-8 SST	40	1321-1251-0		2					
SCREW, SOC HD - #6-32 NC-2A X .75 LG 18-8 SST	41	1321-1257-0		1					
WASHER, FLAT - #6 NOM 18-8 SST	42	1378-1200-0		3					
BEARING, BALL OPEN SST NIO # SSR-4	43	9120-1270-0		1					
SPRING, COMPRESSION SST ASC SPRING # C0300-038-08105	44	9551-0045-0		1					
SCREW, SET SOC HD CUP PT #6-32 X 3/4 LG SST	45								
MODIFICATION, MAGNET	46	0317-6812-0	X	1					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE			TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1274-1	G			Amicel Temescal **PARTS LIST**	1/1			
DWG. TITLE STIH-270-2M SOURCE ASSY				3/10/75 nlp (LAZY SUSAN CRUCIBLE)			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2M				NEXT ASS'Y FINAL ASSY			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
STIH-270-2M B.B. SOURCE ASSY	1	0412-1274-0	X	1					
CARROUSEL CRUCIBLE	2	0215-6394-0		1					
NOTE: REMOVE CRUCIBLE,									
0412-1314-0, FROM CRUCIBLE									
ROTATION ASSY, 0412-1303-0,									
AND RETURN TO STORES.									
REPLACE THE REMOVED CRUCIBLE									
WITH ITEM #2 FROM ABOVE.									

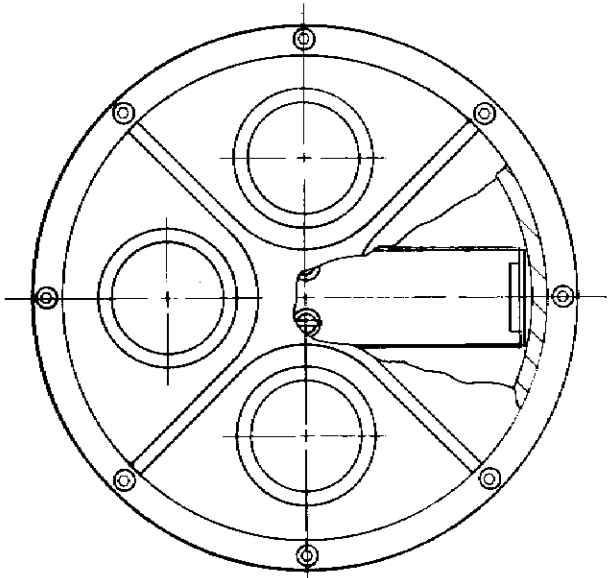
DRAWING NO.	REV.	CHK. DATE	APPV. DATE	Ametek Temescal **PARTS LIST**	1/1	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1274-2	G							
DWG. TITLE STIH-270-2M SOURCE ASSY							PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2M (6 POCKET)				NEXT ASS'Y FINAL ASSY			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

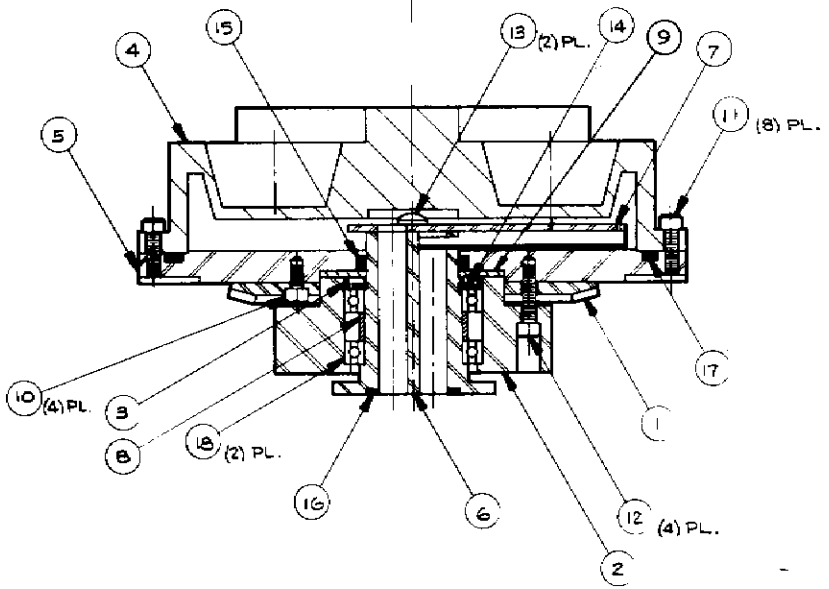
DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
STIH-270-2M E.B. SOURCE ASSY	1	0412-1274-0	X	1					
CRUCIBLE, 6 POCKET	2	0217-1034-0		1					
COIL ASSY HOUSING BRAZEMENT	3	0217-4533-0		1					
E BEARING HOUSING, CRUCIBLE MTG. FLG.	4	0315-4242-0		1					
NOTE:									
1. REMOVE CRUCIBLE,									
0412-1314-0 FROM CRUCIBLE									
ROTATION ASSY, 0412-1303-0,									
AND REPLACE WITH ITEM* 2 ABOVE.									
2. REPLACE COIL ASSY HOUSING									
BRAZEMENT 0412-1423-0 WITH									
ITEM *3 ABOVE.									
3. RETURN 0412-1314-0		E 4. REMOVE CRUCIBLE MTG. FLG BEARING HOUSING FROM							
AND 0412-1423-0 TO STORES		CRUCIBLE ROTATION ASSEMBLY AND REPLACE							
FOR CREDIT.		WITH ITEM 4							

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	AMCO Tenescal PARTS LIST	1/1	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1274-3	G							
DWG. TITLE ASSEMBLY, SOURCE - STIH-270-2M				WITH (1) 25 cc CRUCIBLE			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2MS				NEXT ASS'Y ———			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
ASSEMBLY, SOURCE - STIH-270-2M	1	0412-1274-0	X	1					
CRUCIBLE	2	0217-5874-0		1					
NOTE REMOVE CRUCIBLE -0412-1314-0- FROM									
CRUCIBLE ROTATION ASSEMBLY - 0412-1303-0									
AND REPLACE WITH ITEM #2 ABOVE.									

ITEM NO.	D.	DESCRIPTION	MAT'L	QTY.





NOTES:

1- SLOT ALL SCREWS FULL LENGTH AND APPLY A LIGHT COAT OF "ROCOL" TYPE DFSM, OR EQUIV. MOLY DISULFIDE.

2- BEARINGS TO BE CLEAN AND FREE OF FOREIGN MATTER.

3- APPLY A LIGHT COAT OF VACUUM GRADE GREASE TO QUAD AND O-RINGS.

4- HYDRO-STATIC TEST AT 150 P.S.I. AND VAC-CHECK PER A.T.D SPEC # ES-003

REV.	DESCRIPTION	BY	DATE	APPVD
A	ADD ITEM 9; IS WAS ATD "2108-0121-0; UPDATE VIEW		3-22-74	

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED

FINISH | TOLERANCE: XX ± — ANG ±— ; XXX ± — X±— | BREAK ALL EDGES | USED ON ENG. 412-1274

BERKELEY — AIRCO Temescal — CALIFORNIA
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

DRAWN BY	DATE	CHK BY	APP BY	SCALE
RICH DERRICK	11/14/74	J.K.		FULL

STIH-270-2M E.B.S. -TURRET

CRUCIBLE ROTATION ASS'Y. 412-1303 A

WARNING: MICRO FILM CHANGE CONTROL
10-5-76

PARTS LIST "412-1303-0" APPLIES

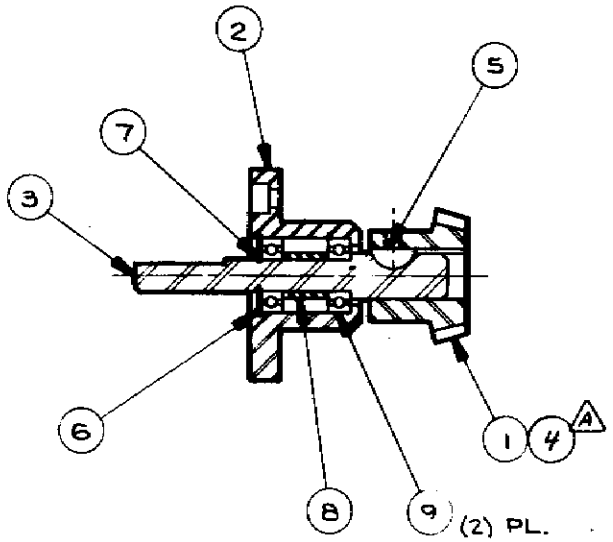
DRAWING NO.	REV.	CHK. DATE	APPV. DATE	AIRCO Temescal PARTS LIST	1/2	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1303-0	A	HF 12/74	RCD				R. DERRICK	
DWG. TITLE CRUCIBLE ROTATION ASSY.							PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-3 EB SOURCE				NEXT ASS'Y 0412-1274-0			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
BEVEL GEAR, BEVEL GEAR SET	1	0204-0493-1		1					
BEARING HOUSING CRUCIBLE MTG FLANGE	2	0214-9272-0		1					
SPACER	3	0214-9281-0		1					
CRUCIBLE	4	0412-1314-0		1					
CRUCIBLE MTG FLANGE	5	0412-1323-0		1					
PIVOT SHAFT	6	0412-1333-0		1					
WATER BAFFLE ASSY.	7	0412-1342-0	X	1					
BEARING SPACER	8	0412-1381-0		1					
(A) WASHER, BACK-UP, QUAD RING	9	0314-3672-0		1					
SCREW, SOC HD, #6-32NC-2A x 1/4" LG, SST	10	1321-1252-0		4					
SCREW, SOC HD, #6-32NC-2A, x 3/8" LG, SST	11	1321-1254-0		8					
SCREW, SOC HD, #6-32NC-2A x 5/8" LG, SST	12	1321-1256-0		4					
SCREW, BIND HD, #8-32NC-2A x 1/4" LG, SST	13	1340-1452-0		2					
RETAINING RING #5108-106H, SST	14	1384-1106-0		1					
(A) MINNESOTA RUBBER #Q4215 QUAD RING, , BUNA-N	15	2108-0215-0		1					
O RING #2-019, VITON	16	2231-0019-O		1					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	Temescal PARTS LIST	2/2	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1303-0		WF 12/7/78	RCD				R. DERRICK	
DWG. TITLE CRUCIBLE ROTATION ASSY.							PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-3 EB SOURCE				NEXT ASS'Y 0412-1274-0			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
O RING #2-250, VITON	17	2231-0250-O		1					
BEARING, THIN SECTION, MPB, #TCNF 17-24, SST	18	9120-1724-0		2					

ITEM	PART NO.	DESCRIPTION	MAT'L	QTY.



(2) PL.
SEE NOTE * 1.

NOTES:

1- BEARINGS TO BE CLEANED AND FREE FROM FOREIGN MATERIAL.

REV.	DESCRIPTION	BY	DATE	APP'D
A	ADDED ITEM 4 SET SCREW		12-16-75	

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED

FINISH √ | TOLERANCE XXX ± — ANG ± — XX ± — X ± — | INTRL. DASH | BREAK ALL EDGES | USED ON DWG. 0442-1274

BERKELEY **AIRCO Temescal** CALIFORNIA
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

DRAWN BY	DATE	CHK'D BY	APP'D BY	SCALE
RICH DERRICK	7/10/75	WF		FULL

STIH-270-3 E.B. SOURCE (TURRET)

CRUCIBLE ROTATION DRIVE ASS'Y.

412-1392 A

WARNING: MICRO FILM CHANGE CONTROL

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	AIRCO Temescal PARTS LIST	1/1	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0412-1392-0	A	WF 12/20	RCD				R. DERRICK	
DWG. TITLE CRUCIBLE ROTATION DRIVE ASSY.				11-19-74 ASAP			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-3 EB SOURCE				NEXT ASS'Y			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
PINION, BEVEL, GEAR SET	1	0204-0493-2		1					
DRIVE HOUSING	2	0412-1402-0		1					
DRIVE SHAFT	3	0412-1412-0		1					
SET SCREW, SOC. HD. CUP PT. SST #10-32 NF-2A X 3/16" LG	4	1311-1751-0		1					
WOODFUFF KEY, #211, SST, PIC#CR211	5	1304-0211-0		1					
RETAINING RING, SST, TRU-ARC #5008-62H	6	1384-0062-8		1					
RETAINING RING, SST, TRU-ARC #5100-25H	7	1384-1025-0		1					
SHAFT SPACER, SST PIC #B8-14	8	9013-2814-0		1					
BEARING, SST, NEW DEPARTURE, #SS-R-4	9	9120-1270-0		2					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	AMCO Temescal PARTS LIST	1/3	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0216-9154-0	E							
DWG. TITLE STIH-270-2MB E.B. SOURCE ASS'Y (4-POCKET) (BOTTOM DRIVE)				HL 9/18/75			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2MB E.B. SOURCE				NEXT ASS'Y			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
UNION GASKET, 3/8"	1	0020-4811-2		2					
UNION KNURLED NUT, 3/8"	2	0020-4911-2		2					
SOLDER NIPPLE, 3/8"	3	0020-5611-2		2					
INSTRUCTION MANUAL	4	0101-		1					
EMITTER ASS'Y	5	0204-0284-0	X	1					
SHUNT BAR	6	0214-9311-0		2					
FILAMENT LEAD	7	0303-3292-0	X	2					
COIL ASS'Y	8	0312-6923-0	X	1					
CRUCIBLE ROTATION ASSEMBLY	9	0216-9163-0	X	1					
CRUCIBLE ROTATION DRIVE ASS'Y	10	0216-9172-0	X	1					
COIL ASS'Y HOUSING BRAZEMENT	11	0412-1423-0	X	1					
COIL SHIELD	12	0412-1452-0		1					
POLE PIECE, L.H.	13	0412-1464-1		1					
POLE PIECE, R.H.	14	0412-1464-2		1					
POLE EXTENSION	15	0412-1471-0		2					
MAGNET SHIELD	16	0412-1482-0		1					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	PARTS LIST	2 / 3	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0216-9154-0	E	m						
DWG. TITLE STIH-270-2MB E.B. SOURCE ASS'Y (4-POCKET)				HL 9/18/75			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2MB E.B. SOURCE				NEXT ASS'Y			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

	DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
	MAGNET	17	0412-1492-0		1					
E	BRACKET, MAGNET	18	03/7-6821-0		1					
	BASE PLATE WELDMENT	19	0412-1523-0	X	1					
	MOUNTING STRAP	20	0412-1542-0		2					
	NUT, HEX UNION #3/8 (TEME-FIT)	21	0420-0011-2		1					
	SPARE PARTS KIT	22	0412-1561-0	X	1					
	O-RING #2-110	23	2231-0110-1		1					
	NUT, MACH. HEX #6-32NC-2B	24	1360-1200-0		2					
	SCREW, SOC HD #6-32NC-2A x 3/8" LG. SST	25	1321-1254-0		27					
A	SCREW, SOC HD #6-32NC-2A x 1/2" LG. SST	26	1321-1255-0		1					
	KNURLED THUMB NUT, #6-32NC-2B SST, PIC #4074	27	1371-4074-0		1					
	WRENCH, BONDHUS BALL DRIVER 7/64"	28	6990-0015-0		1					
	BAG, 12"x24" POLYETHYLENE	29	8121-1224-0		1					
	SHIPPING BOX	30			1					
	SHIPPING BOX INSERT, L.H.	31			1					
	SHIPPING BOX INSERT, R.H.	32			1					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	AMBAC Tenescal PARTS LIST	3/3	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0216-9154-0	E	M						
DWG. TITLE STIH-270-2MB E.B. SOURCE ASS'Y (4-POCKET)				HL 9/18/75			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2MB E.B. SOURCE				NEXT ASS'Y			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

	DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
	SOLDER NIPPLE #3/8 (TEME-FIT)	33	0420-1411-2		1					
	WATER LINE TUBING WELDMENT	34	0204-3042-0		1					
A	ARM, PIVOT — INDEX	35	0314-9282-0		1					
A	BUSHING, BEARING - INDEX	36	0314-9291-0		1					
A	BUSHING, FLANGED - PIVOT ARM	37	0204-0242-0		1					
A	SPACER	38	0314-9401-0		1					
A	PIN, SPRING - .062 DIA x .62 LG, 416 - SST	39	1306-1058-0		1					
A	SCREW, SOC HD - #6-32 NC-2A x .19 LG, 18-8 SST	40	1321-1251-0		2					
A	SCREW, SOC. HD - #6-32 NC-2A x .75 LG 18-8 SST	41	1321-1257-0		1					
A	WASHER, FLAT - #6 NOM, 18-8 SST	42	1378-1200-0		3					
A	BEARING, BALL - OPEN SST, N.D P/N, SSR-4	43	9120-1270-0		1					
A	SPRING, COMPRESSION - SST ASC SPRING P/N C0300-038-0810S	44	9551-0045-0		1					
B	SCREW, SET SOC HD CUP PT #6-32 X 3/4 LG SST	45			/					
E	MODIFICATION, MAGNET	46	0317-6812-0	X	1					

DRAWING NO.	REV.	CHK. DATE	APPV. DATE			TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0216-9154-1	E			Ametek Ionscal **PARTS LIST**	1/1			
DWG. TITLE ASSEMBLY, SOURCE - STIH-270-2MB (6 POCKET)							PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2MB - 6 POCKET				NEXT ASS'Y ———			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SPR	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
ASSEMBLY, SOURCE - STIH-270-2MB	1	0216-9154-0	X	1					
CRUCIBLE, 6 - 1⅛ DIA POCKETS	2	0217-1034-0		1					
BRAZEMENT, HOUSING - COIL ASSEMBLY	3	0217-4533-0		1					
HOUSING, BEARING - CRUCIBLE MTG. FLG.	4	0315-4242-0		1					

NOTES:

1- REMOVE CRUCIBLE, 0412-1314-0, FROM CRUCIBLE ROTATION ASSEMBLY, 0412-1303-0, AND REPLACE WITH ITEM #2.

2- REMOVE COIL ASSEMBLY HOUSING BRAZEMENT, 0412-1423-0, AND REPLACE WITH ITEM #3.

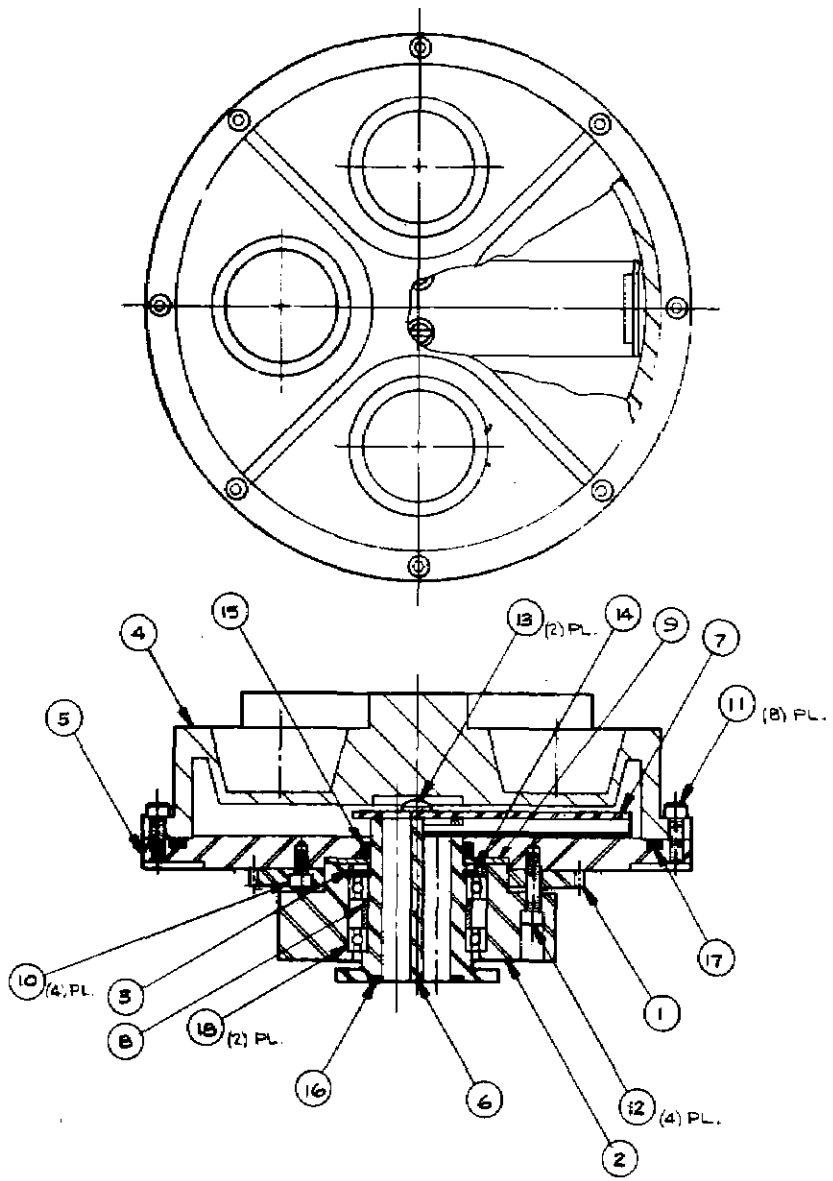
3 - REMOVE CRUCIBLE MTG FLG BEARING HOUSING, 0214-9272-0, FROM CRUCIBLE ROTATION ASSEMBLY, 0412-1303, AND REPLACE WITH ITEM #4.

4 - RETURN THE REPLACED ITEMS, 0412-1314-0 - 0412-1423-0 - AND 0214-9272-0 TO STORES FOR CREDIT.

DRAWING NO.	REV.	CHK. DATE	APPV. DATE	Arthur Temescal PARTS LIST	1/1	TOTAL NO. OF UNITS	ENG. RELEASE BY - DATE	PROJ./WORK ORDER NO.
0216-9154-2	E							
DWG. TITLE ASSEMBLY, SOURCE - STIH-270-2M				WITH (1) 25cc CRUCIBLE			PLANNER - DATE	NEXT ASS'Y W/O NO.
JOB TITLE STIH-270-2MS				NEXT ASS'Y ———			ACCT. / PLANN. / STORES / STAGE / I.C. / OTHER	

DESCRIPTION	ITEM	PART/STOCK NO.	SUB	UNIT QUAN.	TOTAL REQ.	STORES ISS.	STORES CODE	DEC. FT.	P.O. NO. - VENDOR - DATE REMARKS - NOTES - MISC.
ASSEMBLY, SOURCE - STIH-270-2M	1	0216-9154-0	X	1					
CRUCIBLE	2	0217-5874-0		1					
NOTE: REMOVE CRUCIBLE -0412-1314-0- FROM									
CRUCIBLE ROTATION ASSEMBLY - 0412-1303-0									
AND REPLACE WITH ITEM #2 ABOVE.									

ITEM NO.	DWG.	DESCRIPTION	MATL.	QTY.
1	0503-2762-0	GEAR MODIFICATION		1
2	0214-9272-0	BEARING HOUSING, CRUCIBLE MTG FLG		1
3	0214-9281-0	SPACER		1
4	0412-1314-0	CRUCIBLE		1
5	0412-1323-0	CRUCIBLE MOUNTING FLANGE		1
6	0412-1333-0	PIVOT SHAFT		1
7	0412-1342-0	WATER BAFFLE ASSY		1
8	0412-1381-0	BEARING SPACER		1
A 9	0314-3672-0	WASHER, BACK-UP, QUAD RING		1
10	1321-1252-0	SCREW, SOC. HD. #6-32 NC-2A x 1/4" LG	SST	4
11	1321-1254-0	SCREW, SOC. HD. #6-32 NC-2A x 3/8" LG	SST	8
12	1321-1256-0	SCREW, SOC. HD. #6-32 NC-2A x 5/8" LG	SST	4
13	1340-1452-0	SCREW, BIND. HD #8-32 NC-2A x 1/4" LG	SST	2
14	1384-1106-0	RETAINING RING #5108-106W	SST	1
A 15	2108-0215-0	QUAD RING MINN. RUBBER #Q4215	BUNA-N	1
16	2231-0019-0	O'RING #2-019	VITON	1
17	2231-0250-0	O'RING #2-250	VITON	1
18	9120-1724-0	BEARING, THIN SECTION, MPB #TCNF 17-2W	SST	2



NOTES:

1- SLOT ALL SCREWS FULL LENGTH AND APPLY A LIGHT COAT OF "ROCOL" TYPE DFSM, OR EQUIV. MOLY DISULFIDE.

2- BEARINGS TO BE CLEAN AND FREE OF FOREIGN MATTER.

3- APPLY A LIGHT COAT OF VACUUM GRADE GREASE TO QUAD AND O-RINGS.

4- HYDRO-STATIC TEST AT 150 P.S.I. AND VAC-CHECK PER A.T.D SPEC # ES-003

REV.	DESCRIPTION	BY	DATE	APP'D
A	ADD ITEM 9; IS WAS ATD# 2108-0121-0; UPDATE VIEWS	Mee	5-24-76	

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED

0216-9154-0

BERKELEY AIRCO Temescal CALIFORNIA
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

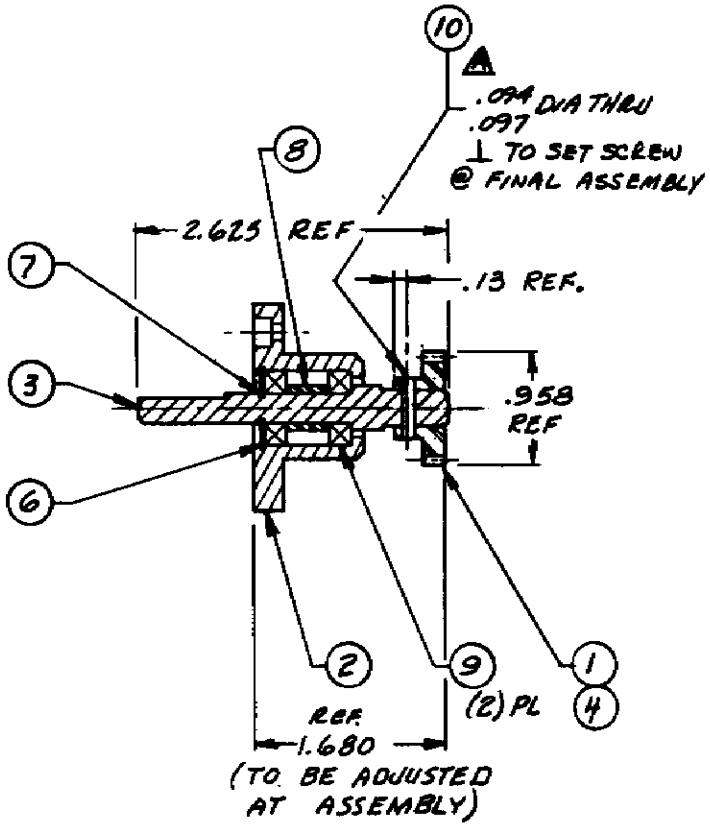
DRAWN BY Mee | DATE 9 22 75 | CHK'D BY 11 | APP'D BY RJS | WEIGHT FULL

STIH-270°-2MB E. B. SOURCE TURRET

CRUCIBLE ROTATION ASSY. 216 9154 B

0101-8071-4

PARTS LIST 0216-9163-0 APPLIES REF. DWG 0216-9150-0



ITEM	PART NO.	DESCRIPTION	MAT'L	QTY.
1	0216-9192-0	PINION GEAR		1
2	0412-1402-0	DRIVE HOUSING		1
3	0216-9202-0	DRIVE SHAFT		1
4	1911-1250-0	SCREW, SET, SOC. HD. CUP PT, #6-32 NC-2A X .125 LG	18-8 SST	1
A 5	—			
6	1384-0062-8	RETAINING RING TRU-ARC #5008-62 H	SST	1
7	1384-1025-0	RETAINING RING TRU-ARC #5100-25 H	SST	1
8	9013-2814-0	SHAFT SPACER PIC #BB-14	SST	1
9	9120-1270-0	BEARING NEW DEPARTURES #SS-R-4	SST	2
A 10	1306-1256-0	PIN-SPRING ROLL, 3/32 ϕ X 1/2" LG.	SST	1

NOTES:

1. BEARINGS TO BE CLEAN AND FREE OF ALL FOREIGN MATTER.

REV.	DESCRIPTION	BY	DATE	APPVD
A	REMOVED (5) - WOODRUFF KEY # 1304-0211-0	HUFF	1/8/76	
	ADDED (10) ϕ .094/.097 NOTE			

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED

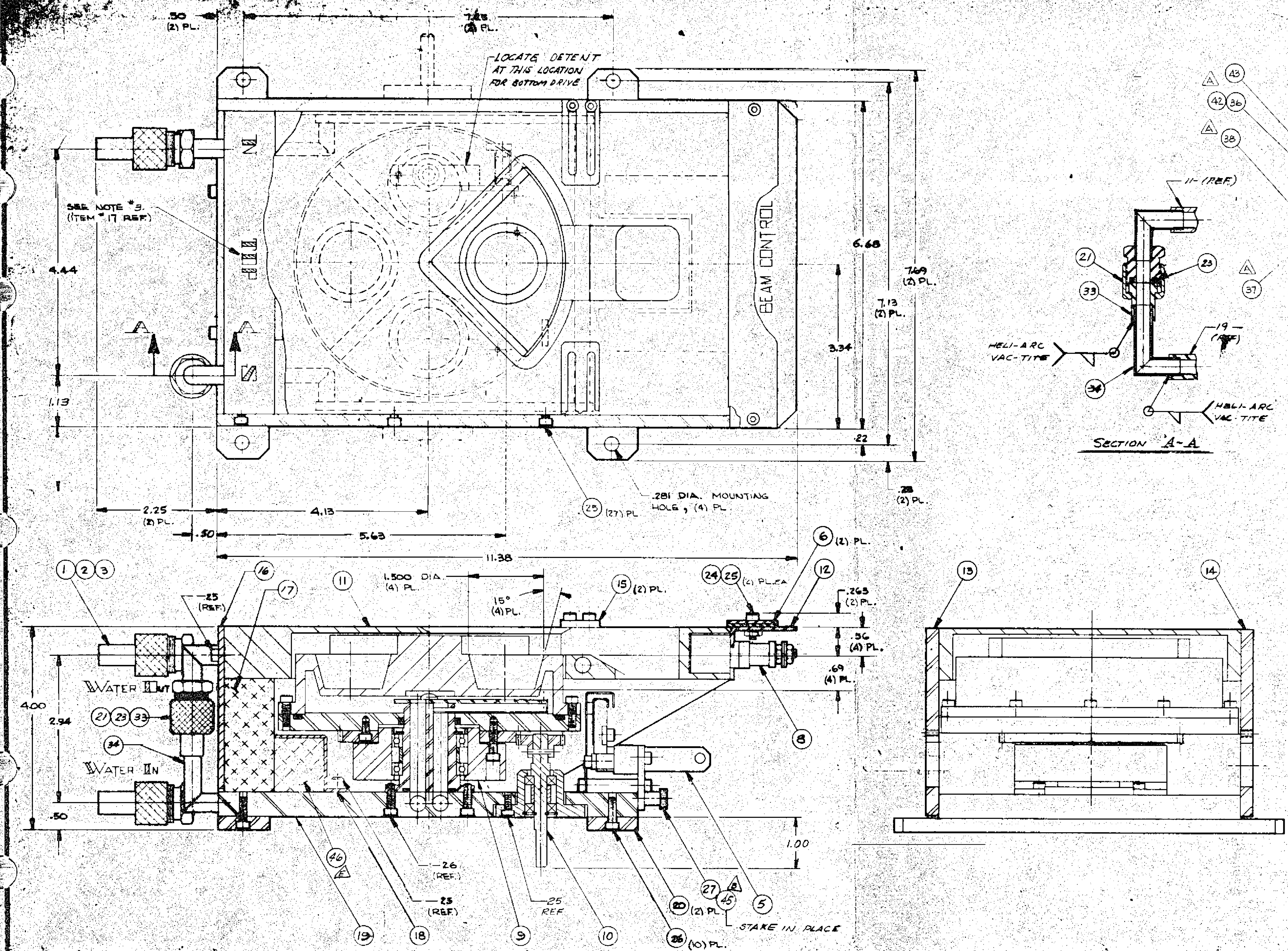
FINISH √ TOLERANCE XXX ± — AND ± — XX ± .02 ± — BREAK ALL EDGES — USED ON ENG. 0216-9154-0

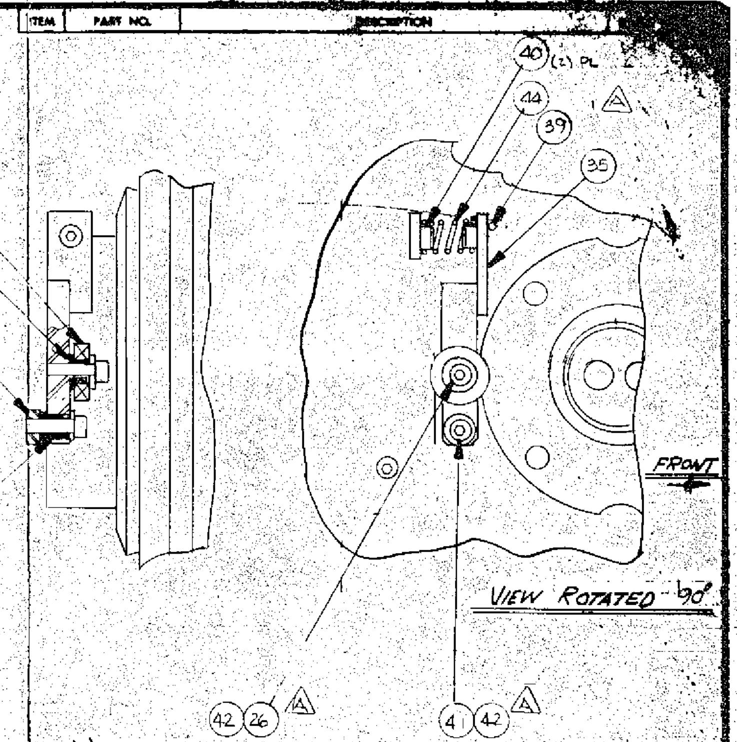
BERKELEY AIRCO Temescal CALIFORNIA
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

DRAWN BY Mer DATE 9/16/75 CHK BY DERRICK APP BY RH SCALE FULL

STIH-270°-2MB E.B. SOURCE (TURRET)

CRUCIBLE ROTATION DRIVE ASS'Y 216-9172 A





NOTES:

1- SLOT ALL SCREWS FULL LENGTH AND APPLY A LIGHT COAT OF "ROCOL" TYPE DFSM OR EQUIV. MOLY DISULFIDE.
2- APPLY A LIGHT COAT OF VACUUM GRADE GREASE TO THE UNION GASKETS.
3- CHARGE MAGNET TO 420 GAUSS, (MEASURED AT CENTER OF TOP SIDE OF MAGNET). PLACE MAGNET IN ASSEMBLY WITH POLARITY AS SHOWN, (POLARITY DEVIATION CAN CAUSE BEAM DAMAGE), AND CONDUCT BEAM TEST.
4- STAMP SERIAL No. ON BASE PLATE .19-.25 HIGH. X .005-.015 DEEP.
5- CLEAN ASSEMBLY AFTER BEAM CHECK AND PLACE IN A POLY-BAG. FILAMENT LEADS, SPARE PARTS KIT AND WRENCH TO BE PACKAGED WITH ASSEMBLY IN SHIPPING BOX. INSTRUCTION MANUAL TO BE SHIPPED SEPARATELY.
6- ALL DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.

E	DELETED ITEM (18) 0412-1501-0 REPLACED BY 0317-6826-0, ADDED ITEM (46) 0317-6812-0 CORRECTED DETENT LOCATION AS PER DCN #0718	J.W.	4/21/77
D	ITEMS 2 & 3 CORRECTED QTY REQ'D WAS (1) REQD - NEED (2) PER ASSY	AME	9/10/77
C	ADDED TABULATION 0216-9154-2	F.F.	
B	ITEM 37 CHG. P/NO 0312-9301-0 TO 0204-0242-0 - ADDED ITEM 45 AND NOTE - STAKE IN PLACE	J.W.	
A	ADDED DETENT COMPONENTS ITEMS 35-44		

0216-9154-2	ASSEMBLY, SOURCE - STIH-270-2M W/12.5CC CRUCIBLE	C
0216-9154-1	ASSEMBLY, SOURCE - STIH-270-2MB (6 POCKET)	
0216-9154-0	ASSEMBLY, SOURCE - STIH-270-2MB	
PART No	DESCRIPTION	

10-28-77

WARNING: MICRO FILM CHANGE CONTROL

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED

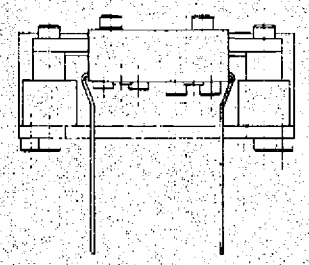
AIRCO Temescal
A DIVISION OF AIR REDUCTION COMPANY, INC.

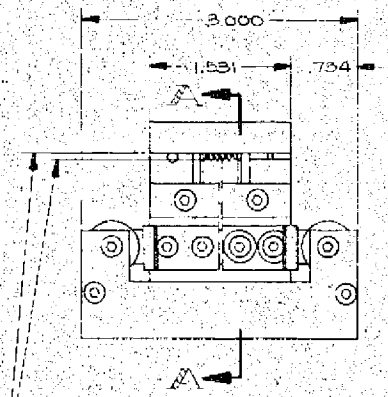
STIH-270-2MB E.B. SOURCE (BOTTOM DRIVE)

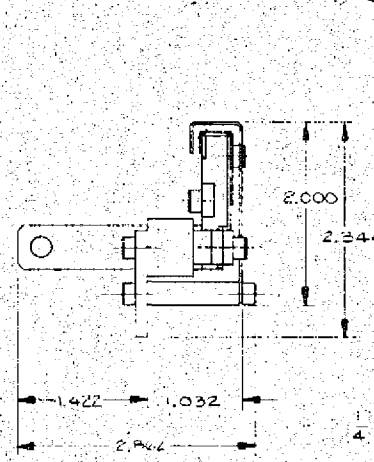
STIH-270-2MB E.B. SOURCE ASSY 216-9154 E

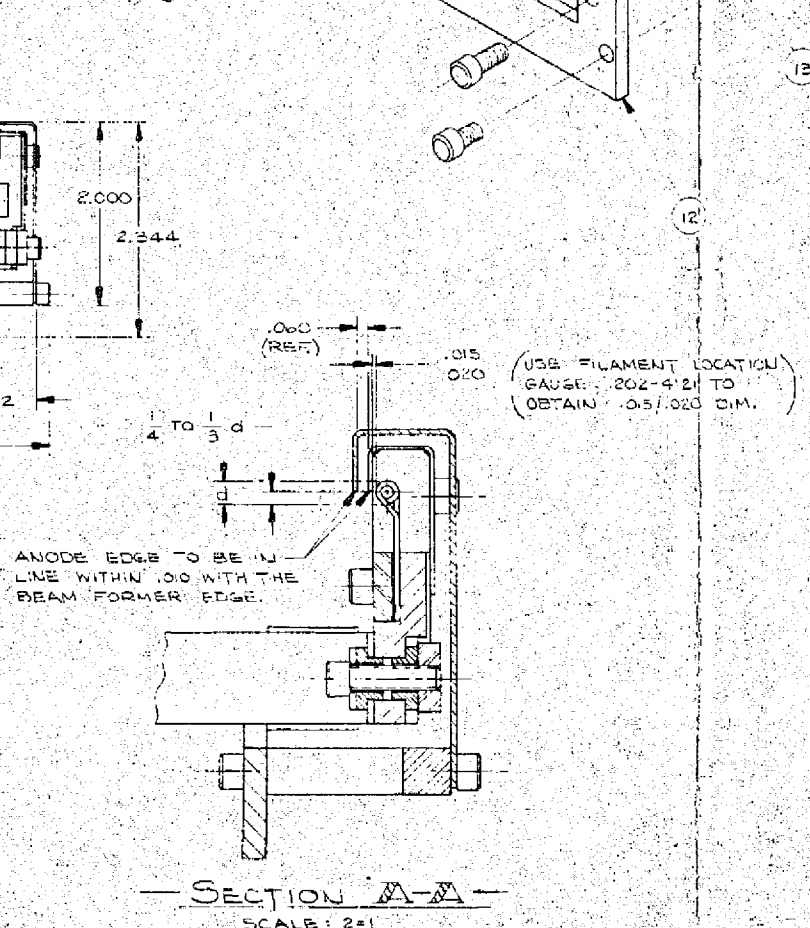
PARTS LIST 0216-9154-0 APPLIES REF: 0412-1274-

0101-8071-4









— SECTION A-A —
SCALE: 2=1

ITEM	PART NO.	DESCRIPTION	MATL	QTY.
1	303-3131	FLANGED INSULATOR		4
2	303-6721	LOCATING INSULATOR		1
3	303-9351	FILAMENT		1
4	303-9362	CATHODE BLOCK, L.H.		1
5	303-9372	CATHODE BLOCK, R.H.		1
6	303-9382	FILAMENT CLAMP		2
A 7	303-9392-1	BEAM FORMER (MOLYBDENUM)		1
8	204-0246	ANODE		1
9	204-0302	INSULATOR SHIELD		2
10	204-0313	MOUNTING BRACKET		1
11	204-0322	MOUNTING BAR		1
12	204-0332	EMITTER SUPPORT BAR		1
13	204-0343-0	FILAMENT BUSS BAR-PAIR (L.H. & R.H.)		1 pr
14	418-4631	H.V. SPACING INSULATOR		2
20	321-1252-0	SCREW, SOC. HD. CAP, #6-32 NC-2A x 1/4" LG.	SST	9
21	321-1254-0	SCREW, SOC. HD. CAP, #6-32 NC-2A x 3/8" LG.	SST	4
22	321-1255-0	SCREW, SOC. HD. CAP, #6-32 NC-2A x 1/2" LG.	SST	2
23	1378-1200-0	WASHER, FLAT, #6	SST	2

NOTES:

1—USE WHITE COTTON GLOVES WHILE HANDLING FILAMENT (AT NO TIME HANDLE FILAMENT WITH BARE HANDS).

2—CHECK FOR ELECTRICAL ISOLATION BETWEEN ANODE AND CATHODE BLOCKS, AND FOR FILAMENT CONTINUITY BETWEEN CATHODE BLOCKS.

3—ALL DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.

4—CLOT ALL SCREWS FULL LENGTH AND COAT WITH KOLOL, MODEL DF2M, OR EQUIV.

5—TURN DOWN WASHERS, ITEM 23, TO .344 DIA.

REV.	DESCRIPTION	BY	DATE	APP'D
A	ITEM 7 WAS (303-3392-0 (TANTALUM))	Mac	3-20-76	

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED

FINISH √ TOLERANCE XXX ± — ANG ± — XX ± — 7 ± PITCH RADII BREAK ALL EDGES

USED ON DWG. 204-0214

BERKELEY AIRCO Temescal CALIFORNIA
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

DRAWN BY R. DERRICK DATE 10/21/71 CHK BY [illegible] APP BY [illegible] SCALE FULL

14 STH-270° 2.8 SOURCE (4-POCKET)

EMITTER ASSY. 204-0284 A

WRITING MICRO FILM CHANGE CONTROL 9-15-76

Issue 1 Photo reduced 11-10-73

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