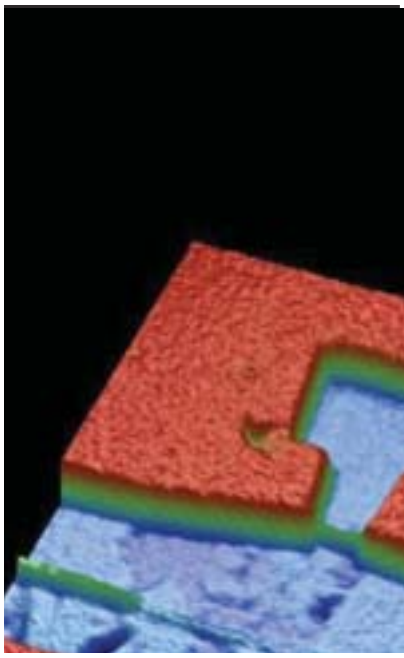


Hollow Cathode Electron Source

Model 5000

Technical Manual
425185

Veeco

Solutions for a nanoscale world.™

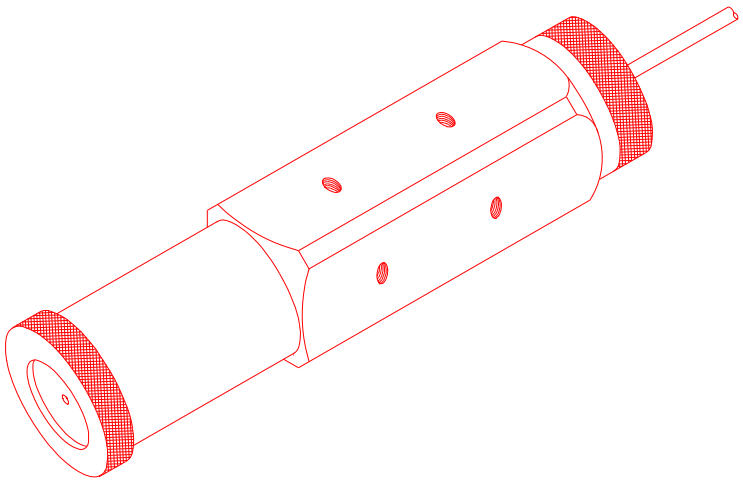
Chapter 3: Description

Physical Description

The assembled hollow cathode is shown in FIGURE 3.1. The HCES is approximately 31.8mm (1.25 in.) square and 110mm (4.35 in.) long. The gas feed tube requires roughly another 25mm (1 in.), resulting in an overall installed length of about 156mm (6.125 in.)

.

FIGURE 3.1 Assembled Hollow Cathode Electron Source



The source is disassembled by unscrewing the keeper retainer and main retainer (refer to FIGURE 3.2 on page 5). To disassemble further, remove the cathode from the union fitting (refer to FIGURE 3.3 on page 6). Note that after operation, the cathode typically cannot be removed without damage. The component nomenclature is shown in these figures.

NOTE

Keeper covers may be added to the HCES for extended operation in oxygen. Refer to "Drawings" on page 24.

The insulators used within the source (refer to FIGURE 3.2 on page 5) are made of alumina and have no fragile ceramic-to-metal seals. Contamination of the target and/or substrate is minimized by using a refractory material, such as tantalum, for the cathode.

CAUTION

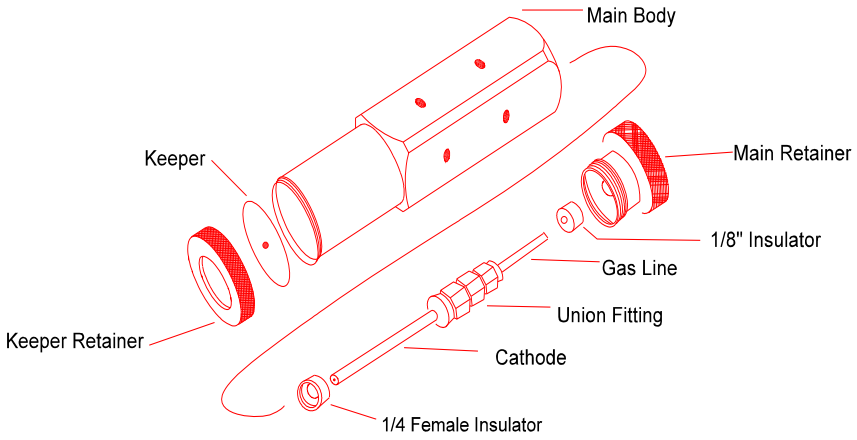
To avoid damage to the insulators, hand tighten the knurled parts.

Eight holes are provided within the main body for mounting or venting, with two on each of the four sides of the square section (refer to FIGURE 3.1 on page 4 and FIGURE 3.2). All eight holes are threaded (¼–20) to permit a variety of mounting arrangements.

CAUTION

To avoid inadequate venting from the back of the main body, leave at least four of these holes open.

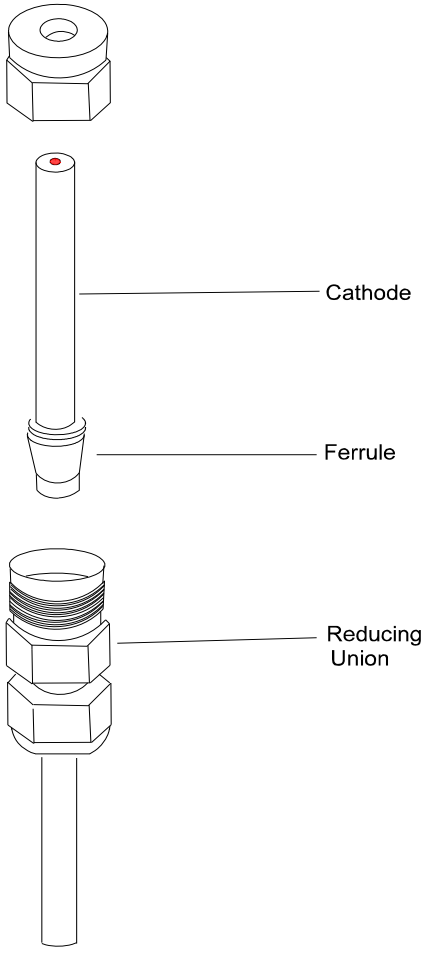
FIGURE 3.2 Partially Disassembled Hollow Cathode Electron Source



CAUTION

To avoid contacting the union fitting and electrically shorting the cathode to the keeper and main body make sure the mounting screws do not penetrate more than 5mm (0.2 in) into the main body (refer to FIGURE 3.2).

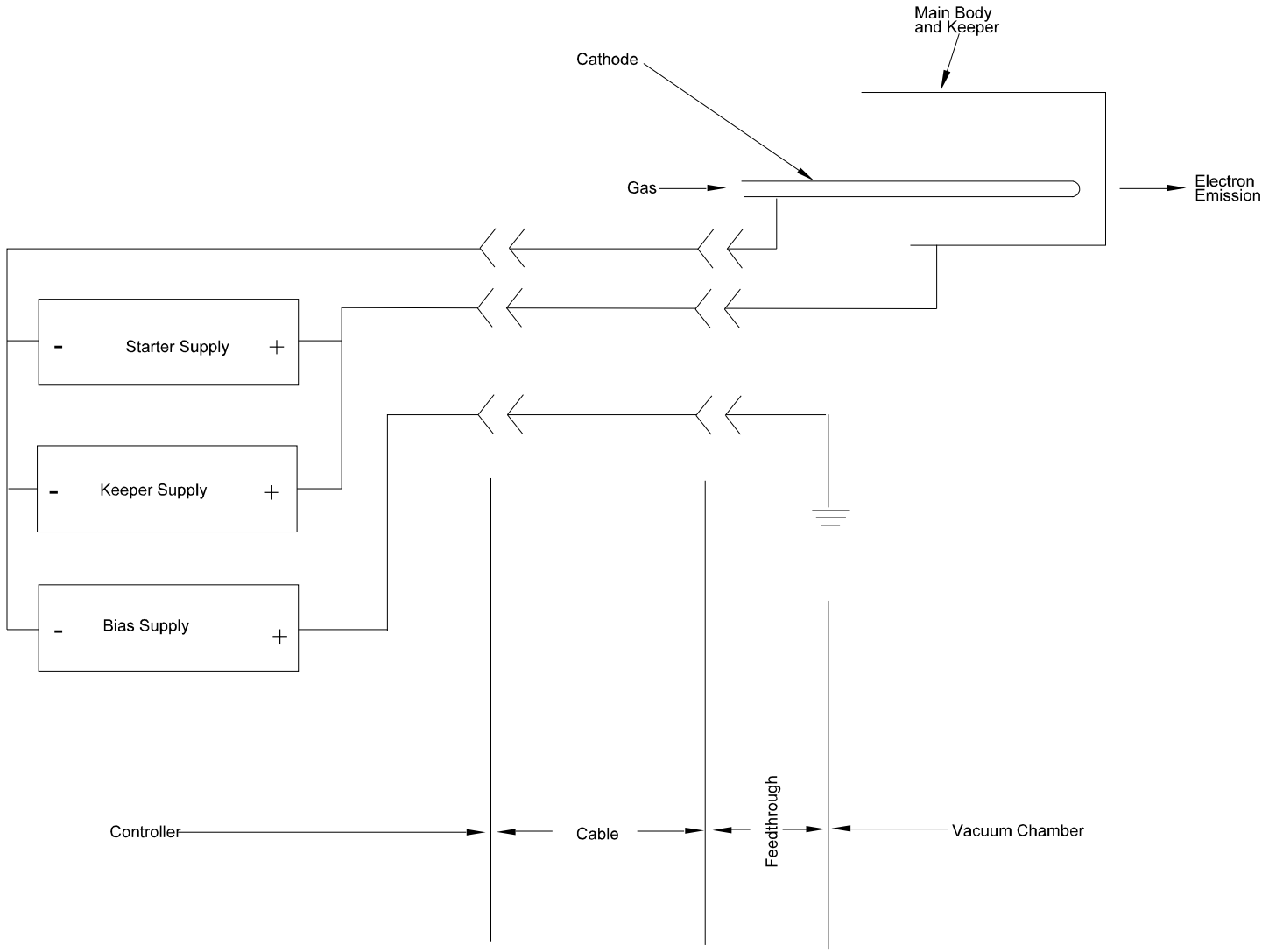
FIGURE 3.3 Removal of Cathode from Union Fitting



Electrical Description

Historically, three electrical power sources, designated starter, keeper, and bias (emission), are required for routine operation. The starting supply energizes a high-voltage discharge between the cathode and surrounding keeper (main body). This discharge serves to raise the cathode temperature to the required value for operation. As soon as this temperature is reached, the discharge is sustained by the low-voltage keeper supply. Assuming an ion beam is present, to which the electron emission may couple, the electron emission through the keeper aperture is controlled by varying the potential of the bias supply through a feedback loop. See FIGURE 3.4 on page 7 for a simplified HCES schematic diagram. Refer to the Veeco Mark II⊕ HO and Mark III⊕ controller technical manuals for detailed instructions for automatic operation with Mark II and Mark II⊕ series ion sources.

FIGURE 3.4 Simplified Schematic Diagram of Hollow Cathode Electron Source and Controller



Keeper

It is sometimes easier to discard the keeper and use a new one. If the keeper aperture becomes enlarged, keeper replacement may also be necessary. The main effect of an enlarged keeper is to increase the gas flow required for starting.

Insulators

Replace the insulators inside the hollow cathode when a new cathode assembly is installed; this should present no problems when routinely replaced.

Insulators are used to mount the hollow cathode and to isolate it from the vacuum chamber (refer to **FIGURE 5.2**). These insulators are protected from conductive deposits by sputter cups and should require only infrequent maintenance, although some applications may require more frequent attention. Use a small multi-meter to measure the resistance across these mounting insulators each time any maintenance is performed on the hollow cathode. Replace the mounting resistors any time the resistance is less than the maximum.

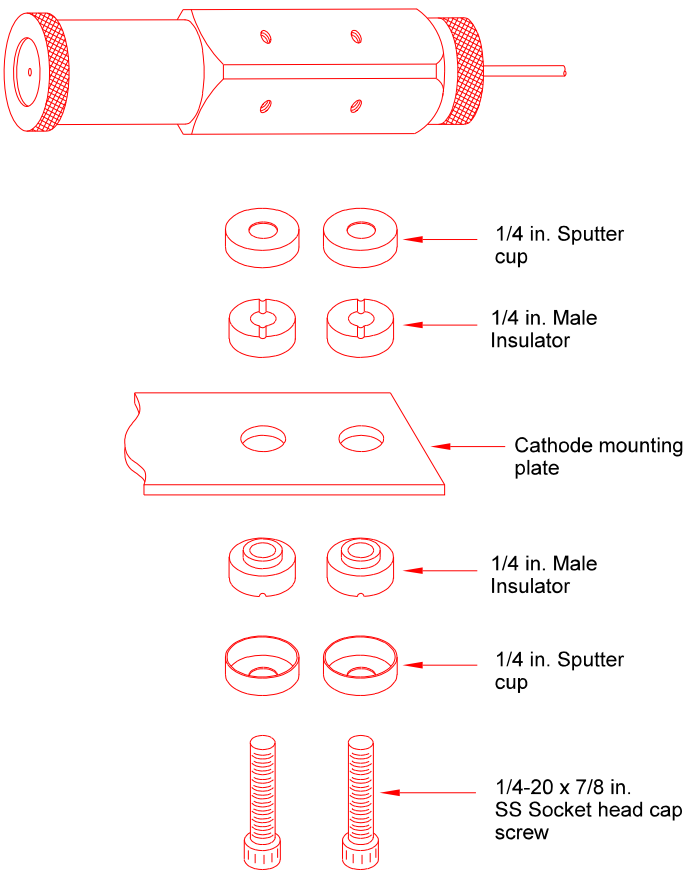
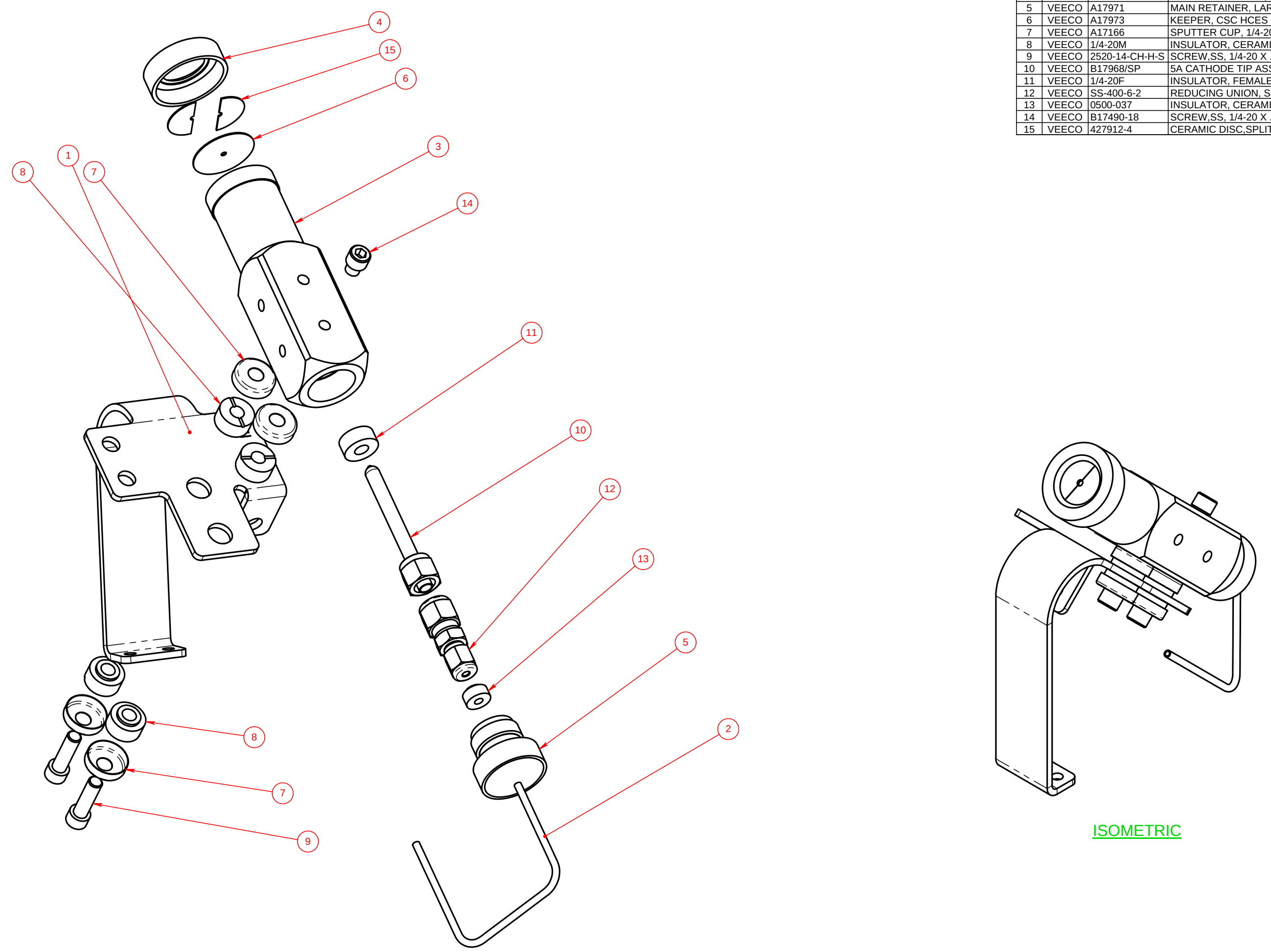


FIGURE 5.2 Source Mounting Configuration

Hollow Cathode – Mark II⊕ source

ITEM	VENDOR	VENDOR #	DESCRIPTION / MATERIALS	QTY
1	VEECO	427622	BRACKET, HCES MOUNT, MARK II+	1
2	VEECO	427745	GAS TUBE, MARK II+ HCES	1
3	VEECO	A17969	MAIN BODY, CSC HCES	1
4	VEECO	A17970	KEEPER RETAINER, CSC HCES	1
5	VEECO	A17971	MAIN RETAINER, LARGE HOLLOW CATHODE, CSC HCES	1
6	VEECO	A17973	KEEPER, CSC HCES	1
7	VEECO	A17166	SPUTTER CUP, 1/4-20	4
8	VEECO	1/4-20M	INSULATOR, CERAMIC, M # 1/4	4
9	VEECO	2520-14-CH-H-S	SCREW,SS, 1/4-20 X .875 SHCS	2
10	VEECO	B17968/SP	5A CATHODE TIP ASSY	1
11	VEECO	1/4-20F	INSULATOR, FEMALE	1
12	VEECO	SS-400-6-2	REDUCING UNION, SS, .250 TO .125	1
13	VEECO	0500-037	INSULATOR, CERAMIC MALE #6	1
14	VEECO	B17490-18	SCREW,SS, 1/4-20 X .250 SHCS, AU PLTD	1
15	VEECO	427912-4	CERAMIC DISC,SPLIT HCES .925/.04/.140	2



EXPLODED ASSEMBLY

A	EC11944: INITIAL RELEASE	TR	7-9-08
	CHANGE	CHG / CHK	DATE

UNLESS OTHERWISE SPECIFIED:
UNITS: ±INCHES [±mm]

TOL in.: .X .1; .XX .02; .XXX .005; .XXXX .0005
TOL [mm]: .X .5; .XX .13; .XXX .013
SURFACE FINISH: 32 FAO
ANGLE ± 1 deg.

DIMENSIONED IN ACCORDANCE WITH ASME Y14.5M–1994 STANDARDS
REMOVE ALL BURRS AND SHARP EDGES
ALL THREADS CLASS 2

DRAWN	TR	DATE 3-21-08
CHECK		DATE
ENGR	TR	DATE 3-21-08
MFG ENGR		DATE
PROJ MGR		DATE

TITLE
HCES
MARK II+
W/KEEPER COVER

DO NOT SCALE DRAWING
SCALE 1:4 SHEET 1 OF 1

Veeco
VEECO INSTRUMENTS

THIRD ANGLE PROJECTION

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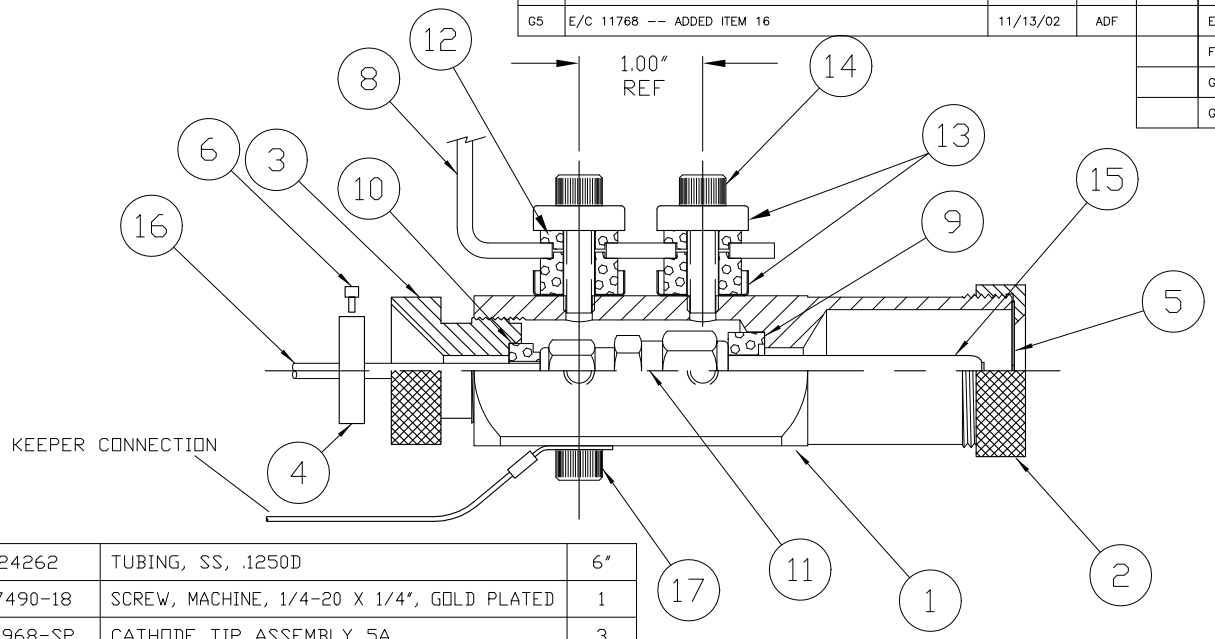
SIZE	PART NUMBER	REV
D	HCES W COVER	A

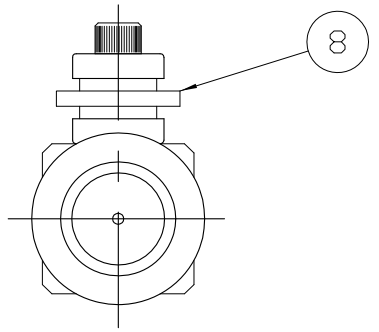
Hollow Cathode – Mark II source

G2	EC 11551 CHANGED PN ITEM 7 IN B17968/SP BOM TO A ITI PN.	04/10/02	ADF
G3	E/C 11599 -- REMOVED LOWER LEVEL BOM & ADDED 3 PARTS	10/7/02	---
G4	E/C 11649 -- DUPLICATE PN ITEM 10	11/13/02	ADF
G5	E/C 11768 -- ADDED ITEM 16	11/13/02	ADF

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	D	SEE ECO E1864	5/17/95	JG
	E	SEE ECO E4750	5/22/97	TLE
	F	SEE ECO E7441	2/3/99	JAB
	G	SEE ECO E7492	2/23/99	JAB
	G1	CORRECTED BOM QTY ITEM 4	01/29/02	ADF





G5

ITEM	PART NO.	DESCRIPTION	QTY.
16	424262	TUBING, SS, .1250D	6"
17	B17490-18	SCREW, MACHINE, 1/4-20 X 1/4", GOLD PLATED	1
15*	B17968-SP	CATHODE TIP ASSEMBLY 5A	3
14	2520-14-CH-H-S	SCREW, MACHINE, 1/4-20 X 7/8", SOCKET HEAD	2
13	A17166	SPUTTER CUP, 1/4-20	4
12	1/4-20M	INSULATOR, MALE, 1/4-20	4
11	SS-400-6-2	REDUCING UNION, 1/4" TO 1/8"	1
10	0500-037	INSULATOR, MALE, NO. 6	1
9	1/4-20F	INSULATOR, FEMALE, 1/4-20	1
8	A26934	HCES SA MOUNT BRACKET MARKII	1
6	0201-SS-490	SCREW, SS, 4-40 x .188, SHCS	1
5	A17973	KEEPER	2
4	CS-28	CLAMP, SPLIT HUB	1
3	A17971A	RETAINER, MAIN	1
2	A17970	RETAINER, KEEPER	1
1	A17969	BODY, MAIN	1

NOTES:

1) ITEM 5, QTY (1) FOR SPARE
2) ITEM 12, QTY (4) FOR SPARE
*3) ITEM 15, QTY (2) FOR SPARE,

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
FINISH: 125 RMS
TOLERANCES ARE:
.XX ± .01
.XXX ± .005
ANGLES ± 30'
DO NOT SCALE DRAWING
USE DIMENSIONS ONLY
DEBURR AND BREAK EDGES

APPROVALS	DATE
DRAWN	6 JUN 95
CHECKED	
ENGR	6 JUN 95
LEAD ENGR	J. Miller
FINAL PLOT	

THIRD ANGLE PROJECTION

COMMONWEALTH SCIENTIFIC CORPORATION
500 Pendleton Street, Alexandria, Virginia 22314

DRAWING TITLE
HOLLOW CATHODE NEUTRALIZER ASSY
HCES 5000

SIZE	JOB NO.	DWG NO.	REV
B		B17968	G5

SCALE 1/1 | SIMILAR TO | SHEET 1 OF 1