

April 2, 1973

SPECIFICATION FOR A HIGH VOLTAGE POWER SUPPLY

PS - 445-950-21

1.0 Scope

1.1 This document specifies the minimum requirements for a power supply assembly consisting of a three phase transformer, high voltage rectifier assembly and filter choke mounted inside a tank (see Figs. 1A,1B, and Fig. 2).

2.0 Applicable Documents

2.1 The following documents of the issue in effect on date of invitation for bids shall form a part of this specification to the extent specified herein.

- |                   |                                |
|-------------------|--------------------------------|
| a) ANSI C34.2     | Semiconductor Power Rectifiers |
| b) ANSI C57.12.00 | Power Transformers             |
| c) ANSI C57.18    | Rectifier Transformer          |
| d) MIL-T-27C      | Transformers and Inductors     |

2.2 This specification shall take precedence over all applicable documents should a conflict occur.

3.0 Power Supply Requirements

3.1 Electrical - Unit shall meet the following requirements:

- a) Input Power: 480 V AC RMS, 60 Hz  $\pm$  3 Hz, applied directly through a motor driven circuit breaker.
- b) Output: 47 kV DC, 7A DC average.
- c) Output Ripple: 0.5% P-P max when an external 0.47  $\mu$ f capacitor is connected across the power supply output terminals.
- d) Polarity: Reversible. Either output terminal can be grounded.
- e) Power Transformer Impedance: 5% (+ 1%, -0%)
- f) Electrostatic Shield: Provide an electrostatic shield between the primary and secondary transformer windings.
- g) Taps: Primary taps to provide -5%, -10%, -15%, -20% of output voltage.

- 3.1 h) Transformer and Rectifier Configuration: Transformer configuration to be Delta-Wye with three phase bridge rectifier (Fig. 1A) or Delta-Wye Delta with 2 three phase bridge rectifiers in series (Fig. 1B). Filter choke must be of sufficient inductance to meet requirements 3.1 C in either case, and must be capable of holding off 47 kV across its terminals. Provide surge windings if required. Filter inductance shall be greater than critical inductance for load resistances of 7K ohm to 25K ohm. Choke to be mounted in series with the negative output terminal.
- i) Duty: Continuous at full power.

### 3.2 Rectifier Requirements

- a) Voltage - Rectifier diodes to have a minimum safety factor of two in peak inverse voltage rating.
- b) Current - Rectifier diodes to have a minimum safety factor of 1.5 in average and peak current carrying capability rating.
- c) Transient Suppression - Each diode to be shunted by a suitable capacitor and resistor. Additional suppression across transformer output terminals to be included at vendor's discretion.

### 4.0 Environmental Operating Conditions

- a) Cooling: Natural convection on tank surface. Fins may be used if required (See Fig. 2).
- b) Ambient Temperature: 0-55° C.
- c) Humidity: 50% max at 55° C, 80% max at 25° C.
- d) Barometric Pressure: 28 - 31 inches Hg.

### 5.0 Mechanical

- a) Construction: Tank mounted, oil filled. Oil to be 10C type. Oil temperature and level gages and interlocks shall be provided and mounted as specified in Fig. 2. Diode assembly to be mounted on a top mounted removable plate to provide convenient removal of diode assembly for inspection and maintenance. The filter choke shall be mounted on a second removable plate. Use gaskets to seal removable plates.

- 5.0 b) Mounting: Tank to be constructed for floor mounting. Provide lifting hooks on sides of transformer of adequate mechanical strength to lift whole weight of tank. Also provide fork lift holes on base of tank. Lifting eyes to be used to allow tank tops only to be lifted. Tank top to be bolted down (not welded).
- c) Terminals: See Fig. 2 for layout. Bushings used shall have adequate mechanical strength to be able to support connecting cables.
- d) Finish: All exposed parts shall be primed and painted light gray, Federal standard 595 colorchip No. 26440. Terminals, bushings, and other parts requiring electrical contact with external wiring or cables shall be free of paint.
- e) Nameplate Data: The nameplate shall contain the following minimum information:
- 1) Manufacturer's name and model number
  - 2) Nominal transformer primary voltage
  - 3) Power supply output voltage and current
  - 4) Power supply transformer and rectifier configuration
  - 5) Filter choke inductance
  - 6) Date of manufacture
  - 7) Sub-Contract No.

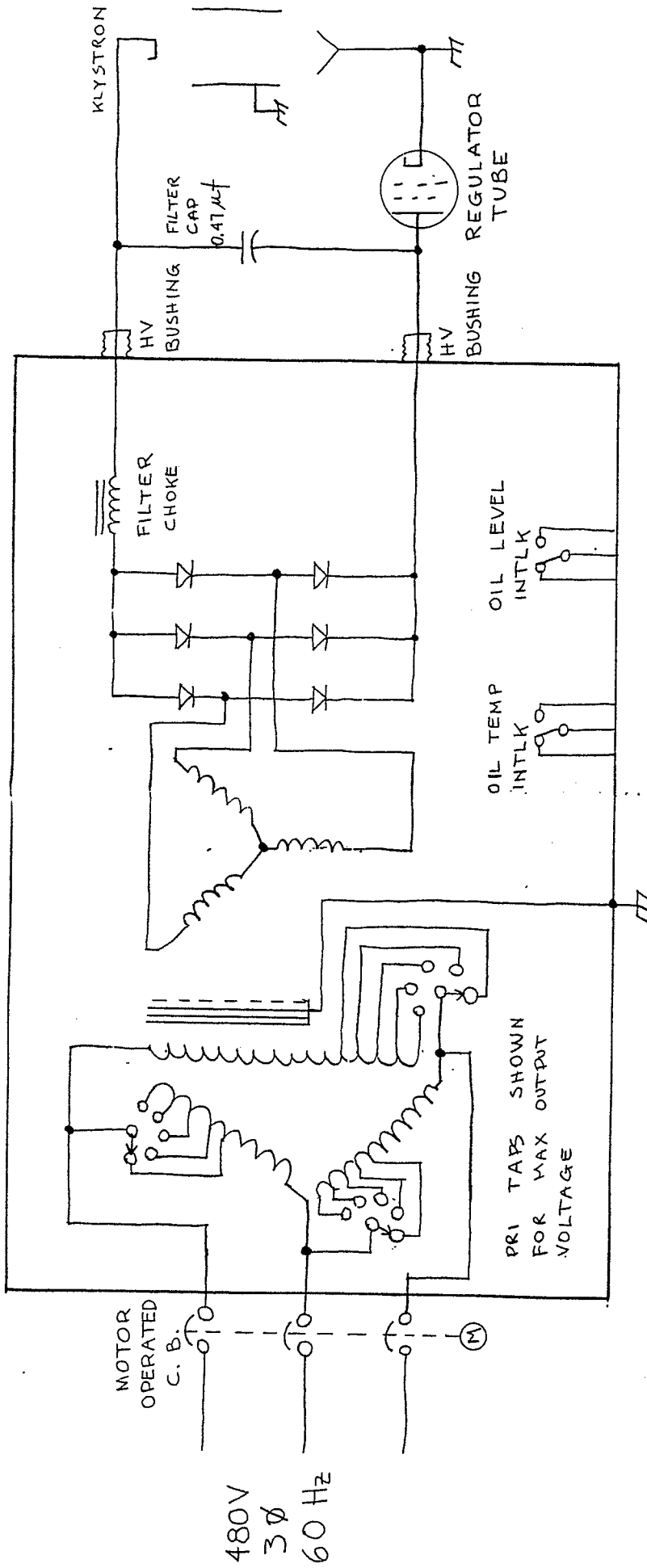
6.0 General

- a) The transformer shall be manufactured in a careful manner in accordance with good design and sound practice.
- b) It shall be able to withstand shock and vibration incidental to shipment and handling by common carrier and personnel.
- c) The vendor shall furnish with his bid the following:
  - 1) Approximate size and weight of power supply
  - 2) Rectifier configuration and type of diodes used
  - 3) Inductance of filter choke
  - 4) Transient suppression network values used across diode rectifiers and transformer secondary windings

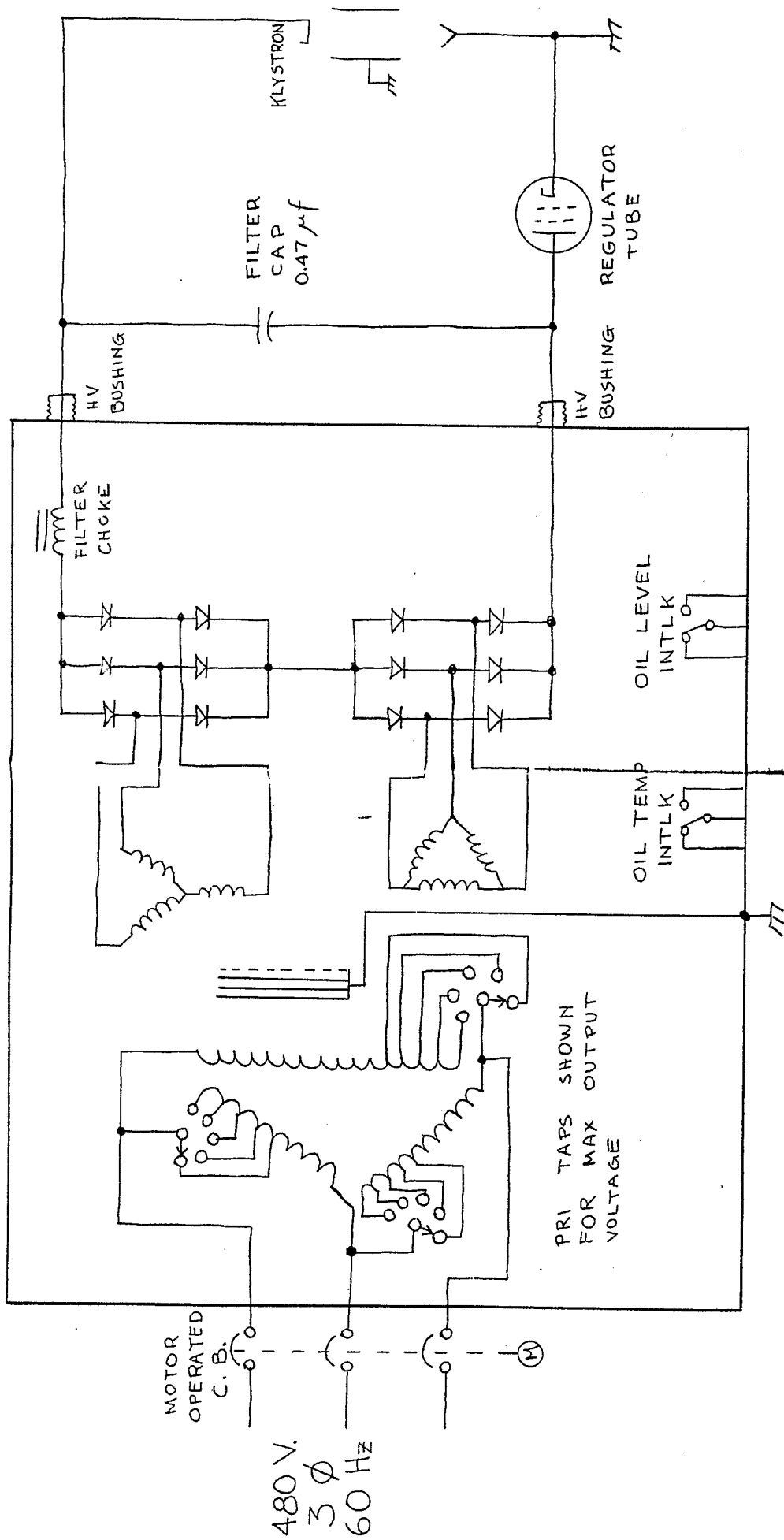
7.0 Test Provisions

- a) Visual and mechanical inspection per paragraph 4.8.1.1 of MIL-T-27C
- b) Resistance measurements per the applicable paragraphs of section 91 of ANSI C57.18.
- c) Polarity and phase relation tests at rated voltage per the applicable paragraphs of section 97 of ANSI C57.18.

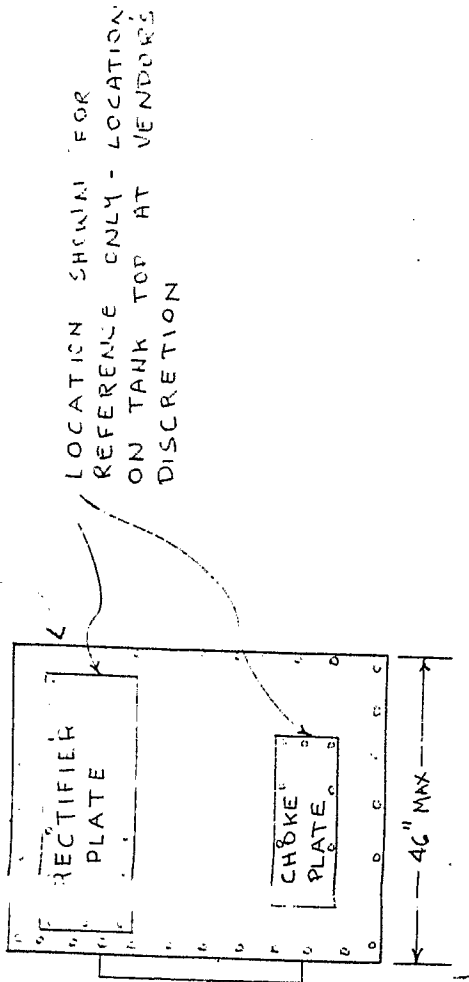
- 7.0 d) No load loss and exciting current at rated input voltage per the applicable paragraphs of section 93 of ANSI C57.18.
- e) Impedance (including load loss) at the rated input voltage per the applicable paragraphs of section 93 of ANSI C57.18.
- f) Dielectric tests per the applicable paragraphs of section 92 of ANSI C57.18.
- g) Temperatures rise test per the applicable paragraphs of section 93 of ANSI C57.18.
- h) Plate transformer hipot test  
Primary: Apply 2000 V RMS between primary and core for 60 sec.  
Sec: Apply 70 kV RMS between secondary (ies) and primary/core for 60 seconds.
- i) Power supply hipot test: Apply 70 kV RMS, 60 Hz, for 60 sec. between the P.S. output terminals and ground. The two output terminals shall be strapped together for this test. Filter choke and rectifiers are part of this test and must be connected per Fig. 1A or 1B.
- j) Open load test: The power supply shall be snapped on at full voltage with only the filter capacitor connected across its output terminals. SLAC will furnish the filter capacitor used for this test upon request. This test shall be performed 10 times each first with P.S. positive terminal grounded, and then with negative terminal grounded.
- k) SLAC personnel is to be informed 48 hours prior to the performance tests specified in Items 7 h, i, j and reserves the right to witness them.



STANFORD LINEAR ACCELERATOR U.S. ATOMIC ENERGY COMMISSION	THE SPEAR KLYSTRON POWER SUPPLY	FIG. 1A.
R. ECKER, CHIEF R. ECKER, APPR	DATE 4-2-73	PS 445-950-21-R0 B
	SCALE NONE	

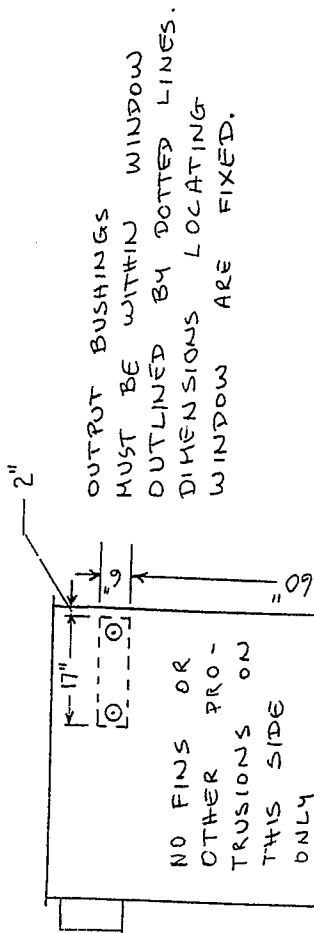
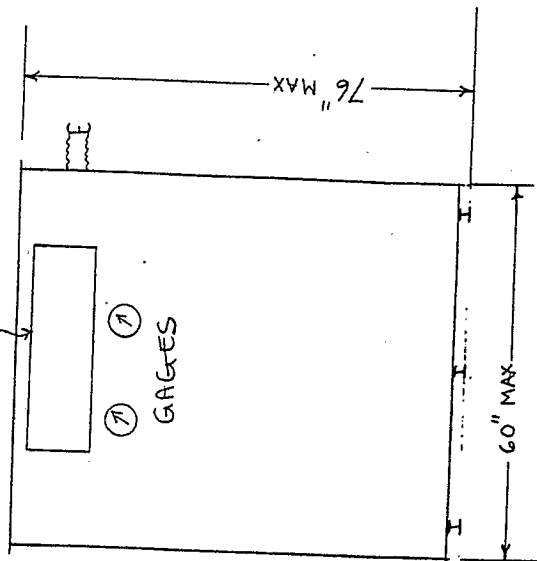


STANFORD LINEAR ACCELERATOR U.S. ATOMIC ENERGY COMMISSION		TITLE	FIG. 1B
DR. R. BECKEN DR. R. ECKEN		DATE	4-2-73
APPROVED		TITLE	NONE
		PS	445-950-21-R0
			B



FORK LIFT PROVISIONS ON THESE TWO SIDES

BOX ENCLOSING INPUT POWER TERMINALS (15)



STANFORD LINEAR ACCELERATOR U.S. ATOMIC ENERGY COMMISSION		TYPE SPEAR KLYSTRON POWER SUPPLY		FIG. 2	
ENGINEER R. ECKEN		DATE 4-2-73		SCALE NONE	
APPROVED BY R. ECKEN		DRAWN BY K. BAILEY		PS 445-950-21-RO	
				B	

