Project of a 300 Watt Prototype Fusion Reactor

This is a project to complete the engineering, manufacturing, and test operation of a 300 watt spherical, phase I, DeLuze fusion reactor. The basic technological approach has already been disclosed by Brookhaven National Lab and proven operational at Lawrence Livermore Lab. This project will demonstrate and quantify the parameters of "continuous" operation and the use of catalytic gases to facilitate such operations.

Considerable materials and manufacturing engineering has been completed. A machine shop with sufficient equipment, experience, and engineering support at the University of Hawaii has been lined up to manufacture this project as a finished, turn-key product. A draftsman at a local engineering firm was hired to produce the manufacturing drawings to the requirements of this machine shop. This drafting has been about 30-40 % completed. These AutoCAD files and written specifications will then be submitted to the machine shop's engineering staff. The AutoCAD files will be translated into SolidWorks. Stress and thermal analysis will be done via computer simulation. Corrections and needed manufacturing changes will be then done. A quote for turn-key construction will then be given by the machine shop.

The line transformer for the power supply has already been designed by Mitchell Electronics Corporation of New York. Mitchell will finish the design of the instrumentation transformers. Tinitron of Oregon will design the secondary tank transformer. PaceTech, LLC of Hawaii will provide gas inlet and outlet control, and mass spectrum analysis. I have designed the power supply and electrical circuits.

Considerable materials engineering has been completed including finding suppliers of appropriate materials able to meet the exacting specifications of this job. The reactor chamber is of borosilicate glass by Nautilus Marine Service of Germany. The fabricated high voltage, high vacuum insulators will be of Corning Macor (TM), a machinable glass ceramic. Our machine shop has the capability of machining Macor to appropriate tolerances. Seals will be Parafluor Ultra by Parker Hannifin Co of the US. Station post insulators by Victor Insulators Inc. of New York. Fluid insulation will be Dow Corning's PMX-561 silicon transformer fluid. Titanium alloy for conductors, metal fittings, and the titanium sphere will by Bal-Tec of California. Most of the other machined components will be fabricated of chlorinated polyvinyl chloride (CPVC) plastic. Other components will be off the shelf items. Custom electronics will be fabricated by myself in conjunction will the machine shop. The design is basically complete as far as materials engineering is concerned.

To finish and construct this project; design, quotation, fundraising, and manufacturing needs to be completed. This includes finishing the drawings, design of secondary tank transformer, and design of the instrumentation transformers. The result will be a prototype 300 watt reactor ready for testing.

This project needs to be funded and completed. The goal is to put into operation a 300 watt phase I, spherical DeLuze fusion reactor. It is to be run on deuterium. It is also to be run with and without a catalyst gas, tetradeuteromethane. Operational parameters will be recorded including voltage, current draw, temperature, gas pressure, gas mass spectrum analysis, neutron and other radiation output levels. Power levels, stability, ease of operation, power gain and other factors will be calculated from the recorded data. Preliminary operational maps will be drawn to predict operational parameters of larger devices.

An 18 inch sphere, comprised of two joined hemispheres, of 1/2 inch thick borosilicate glass is shown. A 1/2 inch diameter titanium alloy sphere is concentrically aligned at the center of this glass sphere. Electrical connection to this titanium target sphere is provided across the envelope in a high vacuum and high voltage insulated manner. This sphere is suspended in a cylindrical tank composed of CPVC in an appropriately insulated manner. Beneath the envelope, electrical connection is made to one of the secondary terminals of a tank transformer also within this cylindrical tank.

The envelope is rigidly held in alignment with CPVC components supported on ceramic insulators as shown. The secondary transformer is appropriately spaced from the reactor envelope. Electrical connection to it's other secondary terminal and it's primary windings are brought out from the tank in an insulated manner. High vacuum line connections are brought out from the reactor through the tank for connection to gas inlet and outlet apparatus.

This reactor and tank is to be placed in an appropriately shielded facility with proper radiation measuring instruments for gamma, x-ray, and neutron flux and spectrum measurements.

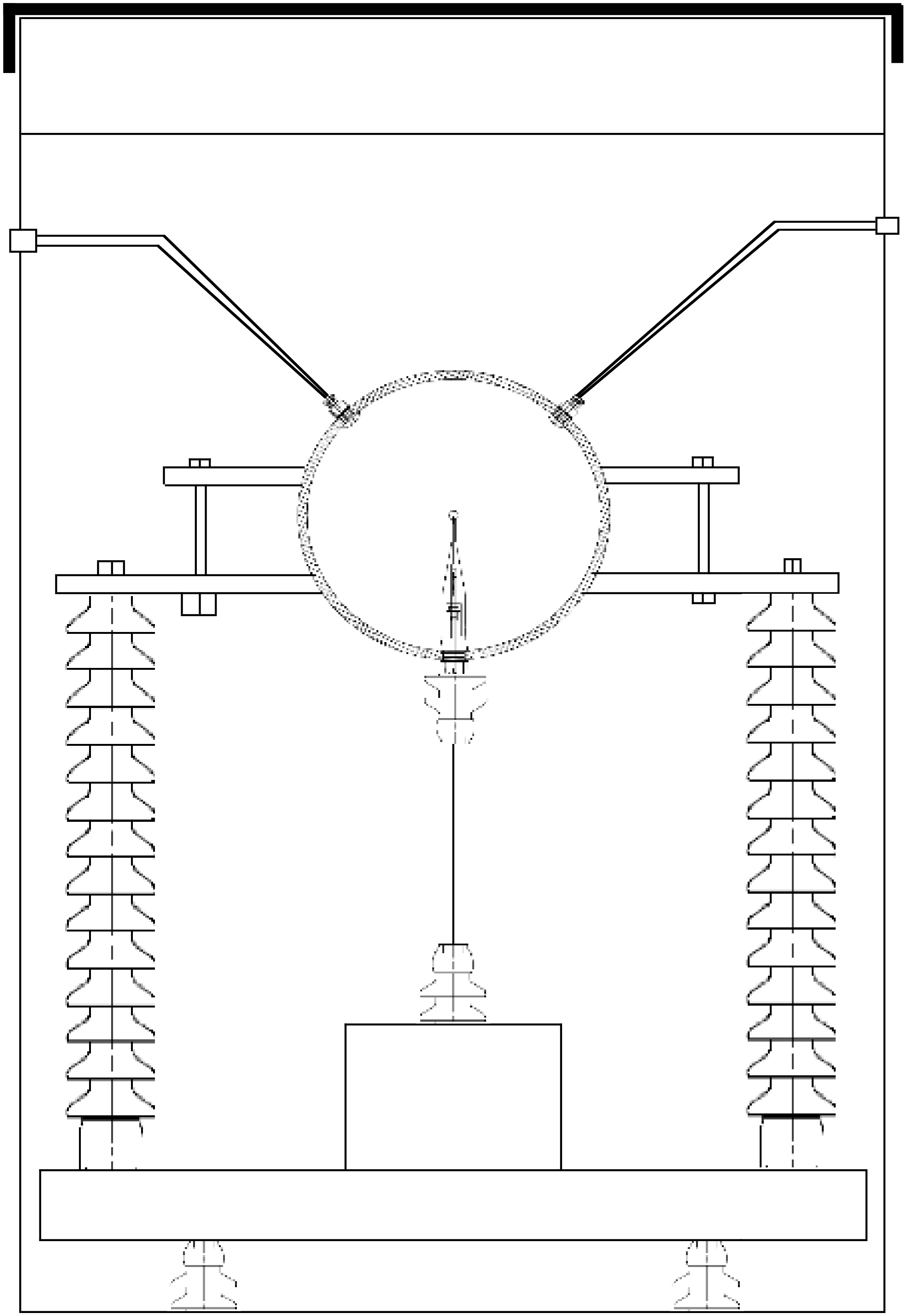
Connections to gas inlet and outlet apparatus to provide quantified fuel and catalyst inlet mixtures and mass spectrum analysis will be outside. Additionally, gas outlet will be analyzed with mass spectrum analysis. An external power supply will be provided, as shown in the schematic.

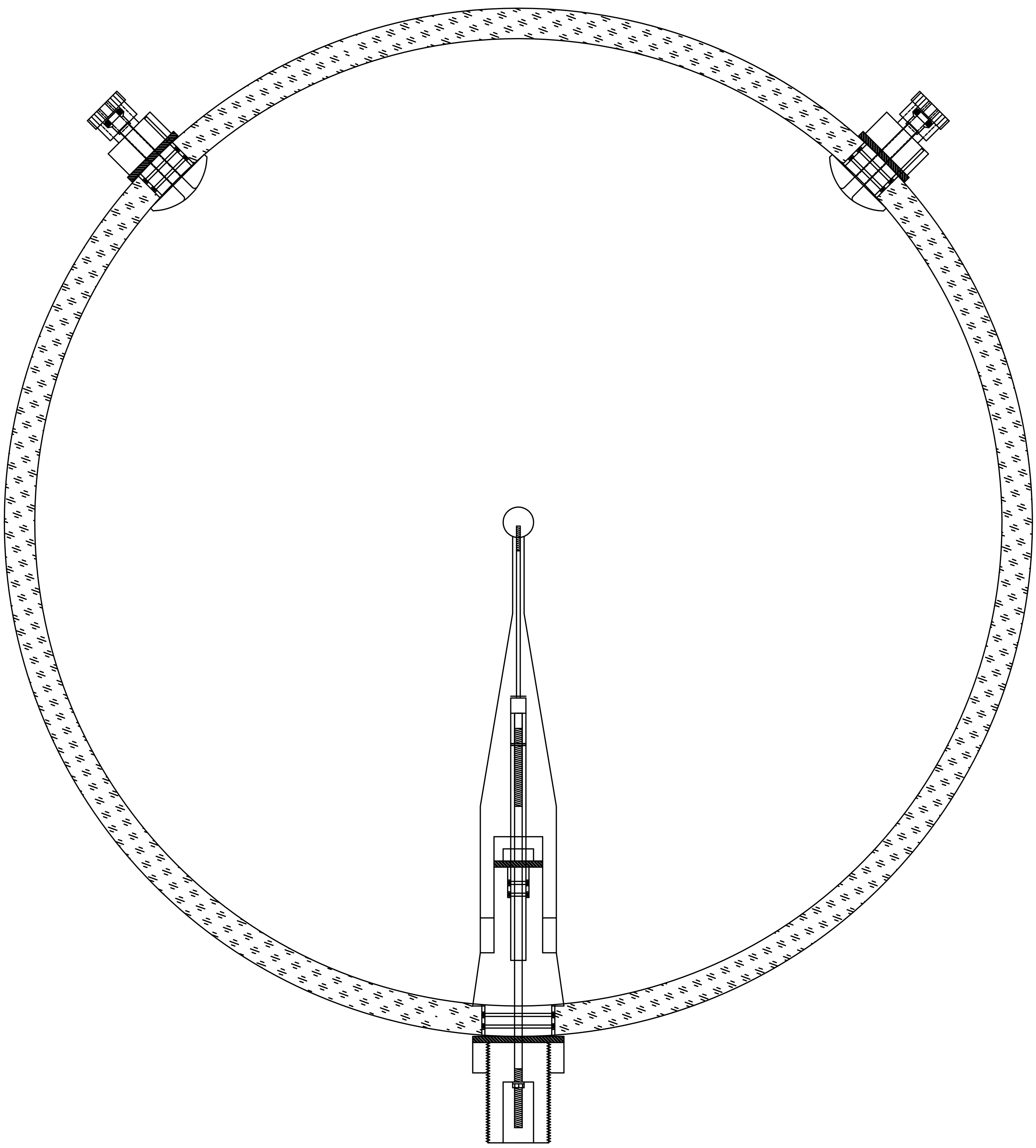
Electrically, the power supply takes line 60 Hz AC. The output current and voltage is monitored and recorded. The potential is adjustable between 0 and 10 KV AC. The initial tank transformer will have a 35 to 1 step up ratio. This will provide a maximum of 350 kV between the spherical target and earth ground. The transformers are to be rated at 1 kW continuous duty. The maximal anticipated operational power is only 300 watts, so this includes a very conservative safety margin.

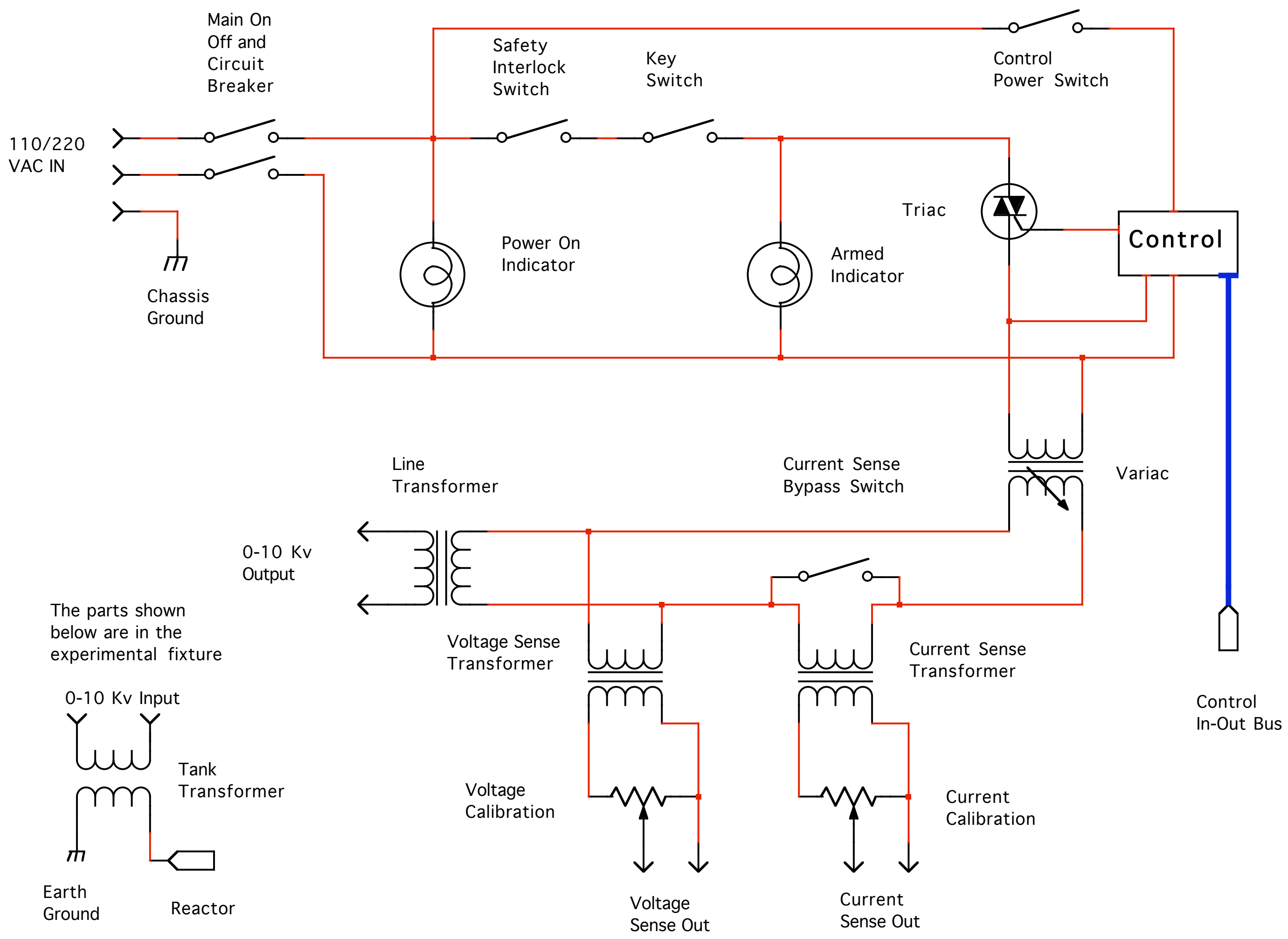
The design of this power supply system is such that if 350kV proves to be inadequate, the operational range of the power supply can be changed just by substituting another tank transformer with a differing step up ratio. The tank transformer housing and connections are so designed to handle other tank transformers having outputs to over 1 MV with no redesign.

The reactor, wiring, tank transformer and the related support apparatus will be submerged in PMX-561 silicon transformer fluid. Design dimensions will be such that operation to the 5 MV level will be feasible without significant redesign.

This design provides for sufficient potential to be applied to the reactor within anticipated requirements for operation.






Main On
Off and
Circuit
Breaker
Safety
Interlock
Switch
Key
Switch
Control
Power Switch
110/220
VAC IN
Triac
Control
Power On
Indicator
Armed
Indicator
Chassis
Ground
Line
Transformer
Current Sense
Bypass Switch
Variac
0-10 Kv
Output
The parts shown
below are in the
experimental fixture
Voltage Sense
Transformer
Current Sense
Transformer
Control
In-Out Bus
0-10 Kv Input
Tank
Transformer
Voltage
Calibration
Current
Calibration
Earth
Ground
Reactor
Voltage
Sense Out
Current
Sense Out