

**NATIONAL ELECTROSTATICS CORP.**

Instruction Manual No. 2HT036900 for  
Operation and Service of  
**R. F. OSCILLATOR**  
**Model 2HA036900**  
**R. F. Oscillator Power Supply**  
**Models 2HA036910**

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## I. **INTRODUCTION**

The National Electrostatics Corporation R. F. Oscillator and Oscillator Power Supply were originally developed to drive the NEC R. F. ion sources but may be used for R. F. sources from any manufacturer.

Since the actual connections, and adjustment of the connections, between the oscillator and the source are largely a matter of user experience and involve a certain amount of trial and error, they will not be covered in this manual. All such adjustments must, however, be done while monitoring the current output of the power supply and with air cooling of the oscillator tubes. Due to the presence of high voltage, the actual adjustments may only be done with the power supply off. These details are covered in the appropriate sections of this manual.

## II. DESCRIPTION

### A. R. F. Oscillator, Model 2HA036900

Drawing & Parts List 2HA036900, Schematic 2HS027990

This oscillator uses two 4CX250B power tetrodes in a grounded cathode astable multivibrator circuit. The output frequency is in the neighborhood of 100 MHz.

Note that while these tubes require only 6V for filament power, a resistor has been added in series with each tube to allow operation from a standard 6.3 VAC filament transformer winding.

These tubes require air cooling any time power is applied to the oscillator, including warm-up or stand-by where only the filaments are energized. Air cooling is normally provided by mounting the oscillator chassis bottom to a panel which has a fan set into its other side. Experience has shown that overlapping 1/3 of a standard 4-1/2" cooling fan provides plenty of cooling. The airflow direction should be from the inside of the chassis outward through the vacuum tubes thus cooling both the tube base connections and the plate radiator. While the maximum operating temperature of these tubes is 250°C, proper cooling will normally keep the plate radiator below 100°C, thus assuring long tube life.

### CAUTION

High voltage is present on the plate coil even during warm-up. This voltage should be considered lethal. Adjustment of the oscillator R. F. clips, leads, or bands must only be done with the power supply off.

### Mounting

The oscillator may be mounted in any position as long as the air cooling requirement is met. Two 8-32 screws into the two outer mounting ears are usually sufficient. Installation in an area of high vibration may require use of four 8-32 screws into the four inner lugs.

### Power Connections

Power connections are made through an MS3102A-18-20P five pin panel connector mounted on the oscillator chassis. A mating MS3108B-18-20S cable end connector is provided.

Connections are as follows:

Pin A:	Plate supply, +500 to +800V, 200 ma
Pin B:	Screen supply, +200V, 20 ma
Pin C and D:	Filament supply, 6.3VAC, 5.2A
Pin E:	Power supply common for screen and plate supplies (grounded internally to oscillator chassis)

### Output Connections

Output power is taken from the oscillator by means of clips which are fastened to the output coil. Appropriate clips are the Mueller #45. These clips should always be attached to points which are symmetrical with respect to the plate coil center tap.

B. R. F. Oscillator Power Supply, Standard Model 2HA036910

Drawing & Parts List 2HA036910, Schematic 2HS034890

This power supply uses a single transformer to provide all operating voltages for the NEC R.F. Oscillator. This results in a unit that is both compact and efficient. One center-tapped winding, with its associated rectifiers, inductor, filter capacitors, and bleeder resistors, provides both 600 VDC for the plate supply, and 300 V for the raw screen supply. Dropping resistor R3 and Zener diode CR6 regulate the screen supply at 200 VDC.

The standard power supply has a pair of 6.3 V filament windings which are connected in parallel, in the proper phase, to provide sufficient current capability. The heater in the time delay relay also operates from the filament supply.

Proper warm-up for the oscillator tubes is provided through time-delay relay K1 which grounds the screen supply for one minute following turn on. Zero screen voltage during this time means zero electric field at the cathodes' emitting surfaces and zero stress on the emitter material until after the space charge has had a chance to build up.

**CAUTION**

Note that the plate voltage is on even during warm-up. This voltage is potentially lethal. Extreme care must always be exercised when working near the R. F. source and oscillator.

### Connections

Power input is through an MS3102A-14S-7P panel connector and power output is through an MS3102A-18-20S panel connector. Matching MS3106A-4S-7S and MS3106B-18-20P cable connectors are provided.

Connections are as follows:

<u>Input</u>	<u>Output</u>
Pin A: AC hot, 115V, 3A, 50-400Hz	Pin A: Plate supply, +600DC
Pin B: AC neutral	Pin B: Screen supply, +200VDC
Pin C: Ground	Pins C and D: 6.3VAC, 6A
	Pin E: Power supply common

We recommend that AC power for the cooling fan and for the power supply be provided from the same AC circuit. This assures cooling any time the power supply is on and provides an audible warning that high voltage is present at the oscillator.

Note that the D.C. ground reference for the power supply is provided only at the oscillator to prevent ground loops. If the NEC power supply is used with a different oscillator, the user must insure that an appropriate ground is provided, preferably within the oscillator itself.

### Current Monitor

Two banana jacks are provided for monitoring the total plate plus screen current output of your power supply. To use this feature, simply connect any 0-500 ma meter between these connectors. The reading will be accurate as long as the voltage drop of your instrument is less than .5 volts. This connection may be permanent, but is actually only necessary during the set-up and adjustment of the source. The maximum continuous current allowed is 200 ma maximum.

Under normal operation with the 2HA036900 oscillator the following currents may be expected:

- 1) warm-up, 40-60 ma
- 2) oscillator on, no discharge 80-90 ma
- 3) oscillator on, with gas discharge 100-150 ma

It is not necessary to short the current monitor jacks together when the meter is removed; diode CR5 breaks forward under these conditions and carries the current without interrupting the power supply.

### Mounting

The power supply may be mounted in any convenient position. It is best to mount the bottom of the chassis firmly against a solid panel in which case the chassis cover plate (bottom) should be discarded. Two 8-32 screws are adequate if the mounting position is upright, otherwise four should be used.



### Options

Upon request the following power supply options are available:

- 1) Filter capacitors potted for use in pressure vessel.
- 2) External mounting tabs

**III. DOCUMENTATION**

R.F. Ion Source Oscillator	Drawing No. 2HA036900 Parts List No. 2HA036900 Parts List No. 2HA036901 Parts List No. 2HA036902
R.F. Ion Source Oscillator	Drawing No. 2HS027990
R.F. Ion Source Power Supply Assembly	Drawing No. 2HA036910 Parts List No. 2HA036910 Parts List No. 2HA036911
R.F. Ion Source Oscillator Power Supply Schematic	Drawing No. 2HS034890
R.F. Ion Source Power Supply PC Board	Drawing No. 2HR031060 Parts List No. 2HR031060 Parts List No. 2HR031061